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NRC'S IMPLEMENTATION OF THE FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATIONS AND OTHER ACTIONS TO ENHANCE AND MAINTAIN NUCLEAR SAFETY

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

DECEMBER 3, 2014

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ONE HUNDRED THIRTEENTH CONGRESS
SECOND SESSION

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NRC'S IMPLEMENTATION OF THE FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATIONS AND OTHER ACTIONS TO ENHANCE AND MAINTAIN NUCLEAR SAFETY

WEDNESDAY, DECEMBER 3, 2014

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 9:03 a.m. in room 406, Dirksen Senate Building, Hon. Barbara Boxer (chairman of the committee) presiding.

Present: Senators Boxer, Carper, Whitehouse, Gillibrand, Markey, Vitter, Inhofe, Barrasso, Crapo, Wicker, and Fischer.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. The hearing will come to order.

Welcome, everyone.

We know that Congresswoman Capps is right outside the door, so we are looking forward to her testimony.

I am going to have testimony from myself and Senator Vitter. At that point, we will not have opening statements because we have votes starting very soon. We are going to have to get through the first panel in short order and then move to the second panel after a series of five votes.

It is going to be a really big break, an hour or hour and a half, so second panel, you can enjoy the sights or something while you wait for us to come back.

Today, we are holding our 10th hearing with the NRC since the earthquake, tsunami and nuclear meltdown in Japan three and a half years ago.

Japan is still struggling to recover at the accident site as efforts to build a giant underground ice wall to stop radioactive water from flowing into the sea recently failed. It will take years and tens of billions of dollars to clean up.

Children in Japan are forced to play in new indoor playgrounds because playing outdoors is still too dangerous in some locations.

The Fukushima disaster is a warning to us that we must do more to ensure the safety of nuclear power plants here in the United States. Instead of heeding this warning, I am concerned that the Commission is not doing what it should to live up to its own mission "to ensure the safe use of radioactive materials for

beneficial civilian purposes while protecting people and the environment."

Although Chairman Macfarlane said, when she announced her resignation, she had assured that "the agency implemented lessons learned from the tragic accident at Fukushima." She said, "the American people can be confident that such an accident will never take place here."

I say the reality is not a single one of the 12 key safety recommendations made by the Fukushima Near-Term Task Force has been implemented. Some reactor operators are still not in compliance with the safety requirements that were in place before the Fukushima disaster. The NRC has only completed its own action 4 of the 12 task force recommendations.

Further, I recently learned shockingly that the NRC has joined forces with Russia to block a European proposal requiring nuclear reactors to be retrofitted to ensure that they can be protected against severe earthquakes or other disasters.

That is great. That is what I have learned, and that means going right along with Mr. Putin and his plans for safety. The sad irony is obvious. All we have to do is remember Chernobyl.

Not only is the NRC delaying action on the post-Fukushima safety measures, the NRC is apparently acting to block a European proposal to require reactor safety upgrades worldwide. This is unacceptable.

The National Academy of Sciences recently concluded that the Fukushima meltdowns resulted because the power plant's operator failed to protect the reactor's key safety equipment from flooding, even though the large tsunami risk for the plant was well known.

The Academy went on to recommend that nuclear reactor operators act quickly to protect reactors from newly discovered risks.

NRC's failure to heed these expert warnings is especially relevant at my home State of California's Diablo Canyon power plant. Even after learning of newly discovered strong earthquake faults close to the power plan, the NRC has declined to act on a senior inspector's warning, its own senior inspector's warning, that the reactor should be shut down if it did not come back into compliance with its seismic licensing requirements.

An examination of NRC and PG&E documents provides evidence that the Diablo Canyon reactor operator also failed to comply with NRC safety regulations when it replaced its steam generators and other key reactor equipment without doing the analysis required to show that the new equipment could meet seismic safety standards.

These are my people. These are Lois Capps' people. We represent them. This is a dangerous situation that has been created here. Safety should be the highest priority and it is supposed to be at the NRC.

I have many other matters to discuss, but I am going to stop short of my time because here is the deal—we need to finish this first panel by the time of votes. Senator Inhofe, Senator Vitter and I will be making our statements. Then we will turn to Lois Capps.

Senator Vitter.

OPENING STATEMENT OF HON. DAVID VITTER, U.S. SENATOR FROM THE STATE OF LOUISIANA

Senator VITTER. Thank you, Madam Chair.

I will submit my full statement for the record.

I just want to express real regret that when Republicans on this committee unanimously requested what is completely standard a hearing on Mr. Baran's nomination to a full term, we were denied that opportunity before the committee vote yesterday.

I do not understand that. It is completely unprecedented. It was a very basic, very straightforward request that we get this hearing given that Mr. Baran is nominated now to a full term before a committee vote. That was completely denied even though it was very simple to give us that opportunity today.

We laid out a way that we could have gotten that focused opportunity today and had the committee action later today and not delayed a thing.

I just think it is very, very unfortunate that we were shut out of the normal process in that way. We will move forward, including in this hearing.

I will submit my full statement for the record.

Thank you.

[The prepared statement of Senator Vitter follows:]

STATEMENT OF HON. DAVID VITTER,
U.S. SENATOR FROM THE STATE OF LOUISIANA

Thank you, Chairman Boxer, for convening today's hearing, and I would like to thank our NRC commissioners for returning to testify in front of this committee. I would also like to thank our industry experts and stakeholders for being here today.

Before getting started I would like to bring some attention to the committee mark-up that occurred yesterday to consider several nominations, including the nomination of Commissioner Baran to fill the remainder of Chairman Macfarlane's term.

While it is true that we recently held a hearing to consider Baran's qualifications on September 11, 2014, the sole purpose of that hearing was to decide whether or not he was qualified to hold this position for the remainder of former Commissioner William Magwood's term, which will expire on July 30, 2015.

Chairman Macfarlane's term is set to expire on June 30, 2018. The difference between these two term lengths is drastic, and many questions remain concerning the qualifications of Baran, who only recently visited a nuclear reactor power station for the first time after being nominated.

While I appreciate Chairman Boxer's commitment to the safety of our nuclear reactor fleet, it is clearly a misstep to move forward on Baran's nomination for a drastically longer term without holding a full EPW nominations hearing. There is no precedent for disregarding the importance of making sure each member of the NRC is qualified for the exact position and term for which they have been nominated.

The decision to hold yesterday's EPW meeting is a clear change in committee precedent and will have long-term ramifications as we move into a new Congress.

There is no doubt that many will attempt to counter this statement, saying we can ask Commissioner Baran any questions we would like during today's oversight hearing. However, dividing our time and focus between the important oversight of the Commission and the future of the NRC's leadership undermines the purpose of this committee.

The bottom line is that no nominee, including Baran, should be given a free pass into office based solely on the merits of being handpicked by Majority Leader Harry Reid.

Ensuring our commissioners are well-qualified and that the NRC is conducting business in a fact-based and ethical manner is crucial to the health, reliability, and safety of our nuclear fleet.

It is the primary reason that our nuclear reactor fleet remains the safest in the world.

The NRC has made great strides since the departure of the previous chairman, and I fear that Senate Democrats continue to undermine that progress as they prioritize politics over facts, policy and safety.

Again, thank you very much for being here, and I look forward to hearing from you on these important issues.

Senator BOXER. Thank you, Senator.

I had a minute remaining. Let me say, the committee held a hearing to consider Mr. Baran's nomination on September 9. The 90-minute hearing was attended by eight members of the committee, four Democrats and four Republicans. Mr. Baran was asked 88 questions for the record, 83 submitted by Republicans.

Some have noted Mr. Baran is not qualified to receive a longer term as commissioner because he only visited one nuclear power plant before he was nominated to be an NRC commissioner. Publicly available travel records indicate that before Republican Commissioner Kristine Svinicki was nominated, she had visited no nuclear power plants.

Yet, no member of this committee, not one, not a Democrat, not a Republican, raised any similar concerns. I feel really comfortable that Mr. Baran, who is well known on Capitol Hill for his service here, has absolutely been vetted fully and completely.

I do respect that we have a difference of opinion here, but the facts are the facts. There were 88 questions answered in a 90-minute hearing. I just don't know what else you wanted from this guy.

Senator VITTER. Madam Chair, if I can reclaim my time.

Senator BOXER. Yes, you can.

Senator VITTER. It would have been nice to have the opportunity to explore all of this at a normal nomination hearing which is the complete norm, particularly for a full term on the NRC. It is absolutely unprecedented when the minority asks for that sort of a hearing for a full term for it to be completely denied.

We aren't given the opportunity and we don't have the opportunity today to fully debate this, unfortunately. That is what you shut down and I think that is what you wanted to shut down, but I am talking about the process. It is very, very unfortunate that once again the minority was completely shut down and shut out of our normal rights.

Senator BOXER. Well, a shutdown is in the eye of the beholder. I don't feel we did that in any way. I have tremendous respect for my colleagues and I look forward to getting past this and onto the hearing.

We will now turn to Congresswoman Capps. I would ask you to keep your remarks to the 5-minute limit.

Senator INHOFE. Madam Chairman.

Senator BOXER. Yes.

Senator INHOFE. Are we not going to have an opening statement?

Senator BOXER. We are not. We don't have time because we have votes at 10 o'clock.

Senator INHOFE. We are not going to have an opening statement?

Senator BOXER. No, but listen, the two of us and then I will call on you first for your questions. Then I will call on Senator Carper and then go back to the regular order.

Senator INHOFE. Let me submit my statement for the record. It is one I wanted to give.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA

Chairman Boxer, thank you for holding this hearing.

Over the last several years, I have consistently voiced my concern about the overregulation coming out of this Administration. It has been across every industry, including nuclear.

It started with Utility MACT and the Cross State Air Pollution Rule a few years ago; then came the 316(b) Water Rule this past year. Now, after a false start on the cap-and-trade bill, EPA is pressing ahead with aggressive and unauthorized greenhouse gas regulations for power plants. And when you also weigh the Waters of the United States rule and the new proposal to reduce the Ozone NAAQS standard, it's no surprise that the economy has not recovered under the Obama administration.

In fact, if the EPA brings the ozone standard down to 60 parts per billion, as it is taking comment on, it would put all 77 counties in Oklahoma out of attainment, making it impossible to do things like build new highways and factories. It could also stall much of the new oil and gas development going on around the country.

These are the things that we have tried to raise attention to over the last few years, and I anticipate that will continue to be the case.

But a few years ago, if there is an agency that I did not think would get brought into this thrall of overregulation, it would be the Nuclear Regulatory Commission.

I have always seen the NRC as being a leader of working cooperatively with industry to craft regulations in a way that appropriately balances safety and cost, particularly when it comes to the cumulative cost of regulations. So when I see that the NRC is working on some 50 or 60 new policies and regulations, knowing that many of them are redundant of other policies already on the books, I have to wonder where things went wrong.

Many of these regulations will only have marginal, if any, impact on improving safety—whether security or operational—and yet their cost is massive when everything is added together.

I want the nuclear fleet in the United States to be safe, and it is safe. The NRC on the whole has been doing its job well.

But the fact of the matter is that NRC has grown too large, and it doesn't have enough to do. I've said several times here that I helped push the Agency's budget higher because we thought a nuclear renaissance was coming. It did not, but the NRC got the money anyway. And what do Government agencies do when their budget grows faster than their mission? They overregulate.

I support reducing the NRC budget because I think a smaller NRC, at this point in time, will enable the Commission to focus its efforts on its core mission and not on the development of unnecessary and redundant regulations.

I appreciate you taking the time to come testify. I look forward to hearing your thoughts on these matters and look forward to working with you to craft solutions.

Senator BOXER. I will give you extra time in your questioning.

Senator INHOFE. Thank you.

Senator BOXER. Senator Carper, do you want that as well?

Senator CARPER. That would be great.

Senator BOXER. OK.

Senator BOXER. Congresswoman Capps.

STATEMENT OF HON. LOIS CAPPS, U.S. REPRESENTATIVE FROM THE STATE OF CALIFORNIA

Representative CAPPS. Chairman Boxer, Ranking Member Vitter and members of this committee, thank you for holding this hearing and for the opportunity for me to testify.

I also want to thank the NRC commissioners for being here as well as the experts we will hear from on the second panel.

I have worked closely with the NRC over the years and appreciate your hard work on these important issues. I am pleased you will also be hearing from my constituent and former State senator from California, Sam Blakeslee.

In addition to representing Diablo Canyon and the surrounding communities for many years in Sacramento, State Senator Blakeslee is also a scientist with a Ph.D. in Seismic Studies. He has unique and diverse experience on this important issue.

I am here today because my congressional district, as you mentioned, Senator, includes the Diablo Canyon Nuclear Power Plant which generates electricity for roughly 3 million Californians.

Owned and operated by PG&E, Diablo Canyon is an important economic driver in San Luis Obispo County, supporting hundreds of quality jobs and hundreds of millions of dollars in economic activity.

Also Diablo Canyon is the only nuclear power plant in the Nation operating at the highest seismic risk area as determined by the NRC.

In the early 1970s, while the plant was originally under construction, scientists discovered the Hosgri Offshore Fault less than 3 miles away, forcing a major redesign of the plant, pushing the project billions of dollars over budget.

Then in 2008, scientists discovered yet another fault, the Shoreline Fault which lies less than half a mile from the plant. As a result, seismic safety has always been a high priority at Diablo Canyon and its surrounding communities.

The issue took on new urgency in the wake of the Fukushima catastrophe in 2011. That tragedy put in such stark terms how little we actually knew about the seismic situation at Diablo Canyon and the potential consequences.

I last testified before this committee in April 2011, just weeks after the Fukushima catastrophe in Japan, to call attention to these issues and to push for additional seismic studies. Since then I have worked closely with the NRC, with you, Senator Boxer, with State Senator Blakeslee and State officials to investigate the seismic situation at Diablo Canyon and to make necessary safety improvements based on the best available information, which is why we pushed for additional seismic studies and independent analysis of the data.

These studies were completed earlier this year. PG&E released its internal analysis last September. The data is now being reviewed by the NRC and an independent peer review panel established by the California Public Utilities Commission.

I am pleased with this progress. I am eagerly awaiting the results of the independent analysis. In my view, this independent analysis is the most critical part of the process. Up until the release of this new data, the only seismic studies available were from the internal PG&E studies and the NRC's own review of those studies.

While the NRC and PG&E certainly have well qualified experts of their own, we all know independent analysis by outside experts is essential to the scientific process. The stakes are simply too high for us not to do everything in our power to fully identify and understand the risks and prepare for them.

Independent analysis and transparency also helps to build public confidence in this process. The more information that is available and accessible to the public, the more our constituents can engage in the oversight process and make their voices heard.

Considering how and when these faults were discovered, many of my constituents are understandably skeptical about the NRC process and the reliability of the seismic safety information they have been given.

Limiting independent review or public access to information only feeds skepticism. Congress established the NRC to be an independent watchdog of our nuclear facilities. The public needs to trust that the Commission is doing its job.

The best way to build that trust is through transparency and public engagement. Yet, one of the most common complaints I hear from my constituents is the frustration with the NRC's process and the lack of transparency.

While I know the NRC makes a strong effort on several fronts to engage with the public, clearly more needs to be done to address these concerns.

Madam Chair, the Fukushima tragedy has taught us that we constantly need to be questioning our emergency preparedness and doing all we can to be ready for any scenario. Even after the independent reviews are completed, even after the NRC finishes its review, we must not stop asking questions and demanding answers. It is often the scenario we never thought could happen that ends up causing the greatest alarm.

Thank you again for holding this hearing. I look forward to continuing to work with this committee and the NRC on this very important issue.

Senator BOXER. Congresswoman, thank you. We know you have other obligations. You can stay or go. However, you are free to go.

I wanted to say to my colleagues who just arrived, I think that is Ed and Roger, the two of us did openings. With Senator Vitter's approval, I am going to call on those of you who didn't get to do openings first. We will withhold our questions so you can have the time to do an opening statement and questions ahead of us. We will give you an extra minute to do that.

We would ask the Commission to please come up right now. We have Hon. Allison Macfarlane, Hon. Kristine Svinicki, Hon. William Ostendorff, Hon. Jeff Baran, and Hon. Stephen Burns. Welcome.

Chairman Macfarlane, we are going to start with you. You get to have 5 minutes. The other commissioners get to have 2 minutes if they wish. Welcome.

STATEMENT OF ALLISON M. MACFARLANE, CHAIRMAN, U.S. NUCLEAR REGULATORY COMMISSION

Ms. MACFARLANE. Good morning, Chairman Boxer, Ranking Member Vitter and distinguished members of the committee. It is good to see you this morning.

My colleagues and I appreciate the opportunity to appear before you on behalf of the U.S. Nuclear Regulatory Commission.

As you know, this is likely the last time I will appear before you in my capacity as Chairman of the NRC. Therefore, let me share with you some of the accomplishments we have made over the past two and a half years.

The NRC continues to make significant progress in implementing post-Fukushima safety enhancements. We have seen the first reac-

tors come into compliance with the mitigating strategies and spent pool fuel instrumentation orders. Licensees have purchased backup diesel generators, pumps, piping, cabling and other equipment and have strategically placed around their sites.

Some have built earthquake-proof structures to ensure that this equipment is protected from natural disasters. They have standardized connections on the components so that backup equipment can be quickly and easily connected.

Other licensees are preparing to make safety system modifications so they can complete their enhancements on time as required during their spring refueling outages.

As a result of these activities, nuclear power plants in the United States will have more defense and depth to cope with the prolonged loss of offsite power and other severe accident conditions. The NRC continues to work closely with licensees to monitor and inspect their progress.

The industry's two national response centers in Memphis and Phoenix are now operational. While the work is not done, the progress we have made is substantial and impressive. I believe it is essential that both the NRC and the industry keep this sustained focus until all of the Near-Term Task Force recommendations are addressed.

The NRC continues its oversight of new reactor construction at Watts Bar Unit 2, Plant Vogtle and V.C. Summer. While we have had to address quality control challenges with construction suppliers, we are satisfied with the overall work that is underway.

Licensees have an essential role in vendor oversight and construction quality. This responsibility must remain paramount for any new reactor construction. We expect to issue a decision on the operating license for the Watts Bar 2 plant in mid-2015.

We have renewed our focus at the NRC on the back end of the fuel cycle in part as a result of a number of recent reactor shutdowns. Licensees have requested certain license amendments and exemptions from NRC regulations to reflect changes that will occur when fuel is permanently removed from the units.

For instance, the NRC has granted Wisconsin's Kewaunee Power Station exemptions from specific emergency planning requirements, but we denied a separate exemption request related to certain physical security regulations that we believe were important to keep in place. Now that multiple reactors are decommissioning, I believe it is time for the NRC to examine whether specific regulations for decommissioning should be developed.

In August 2014, after a 2-year rulemaking process that included extensive public engagement, the Commission approved the NRC's final continued storage rule and generic environmental impact statement.

The implementation of the rule in October enables the NRC to complete several licensing actions that have been suspended pending the outcome of this rulemaking. The NRC will continue to ensure that spent fuel is stored safely and securely at reactor sites.

I firmly believe that this should not be a reason to slow or stop progress on permanent disposal solutions for the United States.

During my tenure, the NRC has also taken steps to enhance its public engagement including improving our public meeting process.

I am proud of the progress we have made in this area and I believe public engagement is equally important for industry.

Maintaining effective relationships with the local community around a nuclear power plant builds trust and facilitates open, effective discussions and decisionmaking.

We have also emphasized engagement at the interagency and international levels, recognizing that the NRC is best positioned to ensure safety and security when the interagency understands and supports our important mission.

Internationally, we have worked to further our cooperation and assistance to enhance global nuclear safety and security.

The NRC continues to be prudent in expending agency resources and is working to improve the transparency of our fees. We have engaged an independent firm to study and provide recommendations on fee allocation methods. We plan to hold a public meeting in early 2015 to address generic issues raised and public comments on the fee rule for fiscal year 2014.

The commission has also directed the NRC staff to take a hard look at how we can effectively, efficiently and flexibly meet our safety and security mission under any future circumstances.

The staff is currently working both internally and externally to analyze where the nuclear industry will be over the next 5 years and anticipate commensurate changes to the NRC skill sets and resources.

It has been an honor to lead the agency during the past two and a half years. I have learned much during my tenure, and I leave satisfied that the good work of the agency will continue well into the future.

I am grateful to the agency's talented and dedicated staff for their tireless efforts to support our important mission and to my colleagues for their support and for our collaboration.

Thank you for the opportunity to be here today. I am happy now to answer your questions.

[The prepared statement of Chairman Macfarlane follows:]

WRITTEN STATEMENT

BY ALLISON M. MACFARLANE, CHAIRMAN

UNITED STATES NUCLEAR REGULATORY COMMISSION

TO THE

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

DECEMBER 3, 2014

Chairman Boxer, Ranking Member Vitter, Chairman Whitehouse, Ranking Member Sessions, and Members of the Committee, my colleagues and I appreciate the opportunity to appear before you today on behalf of the U.S. Nuclear Regulatory Commission (NRC).

The NRC remains deeply engaged in activities to oversee the operational safety of nuclear reactors, fuel cycle plants and other materials facilities on a daily basis. We are successfully meeting a variety of challenges we face while also seeking to continuously improve our processes to remain a strong and effective regulator. Today, I'd like to highlight some of the NRC's accomplishments and challenges and address the agency's efforts to ensure it is operating efficiently and effectively.

THE COMMISSION

As the Committee is aware, the Commission is once again operating as a full group of five members with the arrival of Commissioners Jeff Baran and Stephen Burns. We are working well together and I am confident that the Commission will continue to operate collegially and effectively after my departure.

FUKUSHIMA

The NRC and the industry continue to make significant progress in implementing post-Fukushima safety enhancements at nuclear facilities across the United States. The agency

remains committed to completing this work. We have seen the first reactors come into compliance with the Mitigating Strategies and the Spent Fuel Pool Instrumentation Orders. Reactors that are required to come into compliance with these orders during their upcoming spring outages are preparing to make safety system modifications that will enable them to complete their required safety enhancements on time. The NRC continues to monitor licensees' progress and conduct thorough inspections to ensure that licensees are in compliance with NRC requirements.

Enhanced Capabilities to Mitigate Beyond-Design-Basis Accidents

The NRC's Mitigating Strategies Order required licensees to ensure that they are prepared to respond to beyond-design-basis accidents. These requirements include procuring additional equipment to maintain or restore core cooling, containment integrity, and spent fuel pool cooling for all units at a site.

Nuclear power plant licensees also continue to make plant modifications and procure additional equipment for their individual sites to support full implementation of the Mitigating Strategies Order by their established due dates. In October of this year, North Anna Unit 2 became the first plant to complete implementation of all mitigating strategies requirements. Many sites are scheduled to achieve full implementation by the end of 2015, with the remaining sites to be completed by 2016. These dates were established to align with refueling outage schedules. The one exception to this schedule is that some boiling water reactors are requesting schedule extensions for those parts of the mitigating strategies affected by the NRC's revision to the order on containment venting, which I will discuss further in a moment. During and after implementation, the NRC will conduct inspections to verify that nuclear power plants have put appropriate strategies in place to mitigate beyond-design-basis accidents.

In the past six months, both of the industry's National Response Centers – one in Phoenix, Arizona and one in Memphis, Tennessee – opened their doors. Both centers contain emergency diesel generators, pumps, hoses, and other backup equipment that can be delivered to any site within 24 hours. The centers are being managed by an industry group, the Strategic Alliance for FLEX Emergency Response (SAFER), which also maintains two control centers to coordinate equipment deliveries. Last summer, the NRC observed and evaluated two simulated exercises SAFER conducted to demonstrate that the centers could meet their commitments to deliver equipment quickly and safely. In one exercise, emergency equipment was sent by truck from Memphis to the Three Mile Island Nuclear Station in Pennsylvania. In the other, equipment was airlifted from Phoenix to the Surry Power Station in Virginia. SAFER has secured a contract with Federal Express for truck and aircraft shipments, and is coordinating with the Federal Aviation Administration to ensure that aircraft can have access to otherwise restricted airspace in an emergency. Thus far, the NRC is satisfied that SAFER has used the information gained from these exercises to ensure that the industry's approach would be effective if called upon.

This additional capability to address beyond-design-basis events, such as large earthquakes or floods, provides the most significant safety improvement that the NRC has required as a result of the lessons learned from Fukushima.

Consistent with our regulatory practices, the NRC is conducting a rulemaking that will adopt the requirements already imposed in the March 2012 Order. The NRC staff has consolidated into a single effort the mitigating strategies rulemaking, the Emergency Response Capabilities rulemaking, and codification of portions of other Japan Near-Term Task Force (NTTF) recommendations that are already being addressed as part of the Mitigating Strategies Order. Also included are implementation of other NTTF recommendations related to on-site emergency actions, and other actions already being implemented by industry. These rulemaking efforts were consolidated into a single Mitigation of Beyond-Design-Basis Events

rulemaking due to the interrelated nature of the activities. The NRC staff is on track to provide its proposed rule to the Commission for review by early 2015. After that review is completed, it will then be issued for public comment. The rulemaking remains on schedule to be completed by 2016.

Seismic and Flooding Reevaluations

The NRC continues to make good progress in reviewing seismic hazard reports for licensees in the central and eastern United States. Through this process, we have identified approximately 35 sites with new seismic hazard estimates that exceed the previously evaluated hazard and for which further seismic risk analysis may be necessary. As we had previously informed this Committee, in order to ensure a coordinated and efficient staff review of the reports, the NRC categorized plants according to the size of their estimated hazard risk increase. The staff also is preparing to review "expedited approach" submittals due later this month from licensees whose hazard estimate required further seismic analysis. These licensees are required to inform the NRC about interim steps they have taken to identify and implement seismic-related upgrades to certain safety-significant equipment at their sites by 2016.

The three licensees located west of the Rocky Mountains are required to complete their seismic hazard reevaluations by March 2015, and the NRC staff is prepared to thoroughly review them when they are submitted.

It is important to emphasize that all nuclear power plants in the United States continue to operate safely. All plants have been designed and constructed with safety margins to withstand ground motion associated with a potential earthquake exceeding their original design bases. The seismic hazard reevaluations will enable both the NRC and licensees to better understand seismic issues associated with individual nuclear power plant sites based on the most up-to-

date scientific information available. The NRC will require safety enhancements as appropriate to address seismic risks that are higher than previously estimated.

The NRC is also continuing its review of reevaluated flooding hazards, for which plants were divided into three categories based on the complexity of the analysis and other factors. The staff is reviewing the reevaluated flooding hazards for plants that the new seismic hazard estimates exceed the previously evaluated hazard, and began issuing assessments of the licensees' reports in July. Other licensees are required to submit their reevaluated hazard assessments by March 2015. I should note that the NRC granted extensions to certain licensees that needed data from the U.S. Army Corps of Engineers regarding upstream dam failures or that needed to analyze complex watersheds.

Similar to the seismic hazard reevaluations, the NRC is working with those licensees whose site flooding hazard reevaluation results exceeded their current design basis and is conducting inspections to ensure that they are implementing appropriate interim safety enhancements. These licensees must perform an integrated assessment to reassess their flood protection and mitigation capabilities within two years of submitting the hazard reevaluation results to identify whether any further enhancements are necessary.

The NRC is also performing on-site inspections to ensure that the interim actions that licensees have taken are appropriate. Some of the on-site inspections have been completed while others are ongoing. The NRC will continue to review the interim actions as flood hazard reevaluation reports are received.

Emergency Preparedness Communication and Staffing

In addition to the on-site emergency response capabilities rulemaking, which, as described above, has been combined with the mitigation strategies rulemaking into the Mitigation of Beyond-Design-Basis Events rulemaking, the staff issued a letter to licensees

addressing prolonged station blackout conditions affecting multiple units. The NRC's work to assess licensees' substantial progress in addressing this issue is ongoing.

Spent Fuel Pool Instrumentation

The Enhanced Spent Fuel Pool Instrumentation Order required licensees to install enhanced instrumentation to monitor the water levels in spent fuel pools. This work is closely related to licensees' efforts to implement the Mitigating Strategies Order. Licensees are currently in the process of meeting this requirement in accordance with their refueling outage schedules. They had previously submitted plans to the NRC detailing how they intended to address the order, and the NRC's input on these plans has informed their implementation. The NRC is inspecting licensees' progress, and some reactors are already in compliance. The NRC staff will be conducting inspections and issuing safety evaluations for each licensee, and will conduct thorough post-compliance inspections after all licensees are in full compliance with the order.

Reliable Hardened Vents

The NRC ordered licensees with boiling water reactors with Mark I and II containment types to install reliable hardened vents. This order was subsequently revised to require that licensees ensure these vents are severe accident-capable. As a result of this new requirement, certain licensees requested, and were granted, extensions for the aspects of their work on the Mitigating Strategies Order that related to containment venting. The NRC is currently reviewing integrated plans and conducting audits of licensee progress towards compliance with the first phase of the order. By June 2015, the NRC staff plans to issue interim staff evaluations to all applicable licensees. Licensees must then submit their integrated plans for the second phase – design and installation of venting capability from the containment drywell under severe accident conditions, or, alternatively, developing and implementing a reliable containment venting

strategy that makes it unlikely that a licensee would need to vent from the drywell during a severe accident - by the end of 2015 in compliance with interim staff guidance.

The Commission also directed the NRC staff to undertake a rulemaking to consider additional filtration strategies for boiling water reactors with Mark I and II containments to enhance their ability to vent containment without releasing radioactive material during an accident. The staff is currently developing the regulatory basis for a rulemaking in this area.

National Academy of Sciences Study

As directed by Congress, the NRC issued a grant to the National Academies of Science (NAS) to assess the causes of the Fukushima accident and lessons learned that could enhance nuclear safety and security at U.S. facilities. The NRC staff is currently reviewing the report, which NAS issued in July 2014, and will inform the Commission of its assessment of the study's findings and its plans to address them in the near future.

Longer-Term Actions Associated with Fukushima Lessons Learned

Our primary focus is on the highest-priority, most safety-significant enhancements to maximize the safety impact to the nuclear power plants. The agency will complete the most safety-significant enhancements on or ahead of the five-year goal.

Over the coming months and years, we will gain additional insights from implementation of the highest-priority actions, and the decommissioning activities at the Fukushima Dai-ichi site. As NRC staff with critical skills are freed up from the highest-priority and most safety-significant Fukushima work, we will focus our efforts on the remaining lessons learned activities, and we will disposition the remaining recommendations from the Near-Term Task Force.

The NRC continues to interact with our licensees and interested members of the public as we move forward to implement these Fukushima safety enhancements. We have held more than 150 public meetings over the past three years to keep the public apprised of our activities.

The NRC is mindful that we must take a careful and deliberate approach to this work to prevent these regulatory actions from distracting us or the industry from day-to-day nuclear safety and security priorities, and to avoid unintended consequences. As with the NRC's response to previous events, such as the September 11, 2001 terrorist attacks, we remain cognizant that a change in one system has the potential to adversely affect another system if not considered holistically.

The NRC continues to receive regular reports on the efforts to remediate the Fukushima site and makes use of this information to help identify potential lessons learned for U.S. reactors. The NRC is also maintaining an awareness of the activities of other federal and state agencies in monitoring and sharing information with the public about the very low levels of radioactive materials that scientists have now identified off the coast of the western U.S.

DECOMMISSIONING

The NRC has shifted its oversight at San Onofre Nuclear Generating Station (SONGS) Units 2 and 3, Kewaunee, and Crystal River Unit 3, to focus on decommissioning. In the past few months, the NRC and these licensees have taken a number of important steps in this direction. For example, Southern California Edison submitted its Post-Shutdown Decommissioning Activities Report (PSDAR) for the SONGS facility in September. The report included information about the estimated cost associated with decommissioning the two units and a plan for managing spent fuel. In October, as required by our regulations, the NRC held a public meeting in California to hear from interested parties about the PSDAR and answer questions. The staff also accepted written comments from the public.

The SONGS PSDAR indicated that the licensee intends to pursue the DECON method for decommissioning the facility; that is, promptly removing or decontaminating all components and structures contaminated by radioactive material.

Southern California Edison has formed a Community Engagement Panel with members of local government, public interest groups, the business community, and academia to advise the licensee on the ongoing decommissioning process. NRC supports this type of community engagement and has participated in some meetings to communicate the NRC's regulatory role to the Panel.

All of the plants undergoing decommissioning have requested certain amendments to their licenses and certain exemptions from the NRC's regulations – which were written primarily for operating reactors – that reflect the impending reduction in risk that will occur when fuel is permanently removed from these reactors. For example, Dominion Energy Kewaunee has requested, and been granted, exemptions from NRC requirements to maintain a 10-mile emergency planning zone and offsite radiological emergency plans. However, the NRC denied a separate request from Kewaunee for exemptions from certain NRC physical security regulations because the licensee had not adequately justified the reductions. Similar requests from SONGS and Crystal River, as well as Vermont Yankee, which will soon permanently cease operations, are still being evaluated by the NRC. The NRC staff reviews each request with a careful focus on individual circumstances at each site and whether the exemption would provide an adequate level of protection.

Though there has been significant attention paid to the sites that have most recently begun the decommissioning process, 17 other nuclear power reactors are in various stages of the decommissioning process. Since 2000, ten power reactors have been successfully decommissioned. The NRC remains committed to maintaining rigorous oversight at all of these facilities as they move through the decommissioning process.

NEW CONSTRUCTION

Construction of the new reactor units at Plant Vogtle in Georgia and V.C. Summer in South Carolina continues to progress under NRC oversight. Major sections of the primary

containment vessels at Summer Unit 2 and Vogtle Unit 3 are being set in place. Construction and installation of structural modules continues. A significant milestone was recently reached at Vogtle Unit 3 when the module that includes the chemical and volume control system and the passive core cooling system was placed in containment.

The NRC staff continues to provide oversight of module fabrication and other construction activities at the sites to ensure that all identified quality issues are corrected and that the plants are being constructed in accordance with the approved design.

The NRC also continues to oversee construction at Watts Bar Unit 2 in Tennessee. The NRC staff's review of the Tennessee Valley Authority's (TVA) Operating License Application for Watts Bar Nuclear Plant Unit 2, while mostly complete, is still in progress. Construction inspections and inspections of operational readiness remain on-track to support upcoming licensing decisions. The NRC staff continues to document its findings in supplements to the safety evaluation report, and construction inspection reports to ensure that TVA has met applicable regulatory requirements. Currently, the staff is working toward issuing a decision on an operating license in mid-2015.

In October, the agency issued the final rule to certify the Economic Simplified Boiling Water Reactor (ESBWR) design. That brings to five the number of new reactor designs that have been certified by the NRC, including the ABWR, System 80+, AP 600, and AP 1000.[1] The NRC is currently reviewing two combined license applications referencing the ESBWR design. The NRC also continues to review other design certification, combined license, and early site permit applications. Additionally, we anticipate the submission of the first design certification applications for small modular reactors in 2016.

[1] System 80+ is no longer valid as of June 20, 2012; and AP600 will not be valid after January 24, 2015.

CONTINUED STORAGE RULE AND GENERIC ENVIRONMENTAL IMPACT STATEMENT

In August 2014, after a two year rulemaking process that included extensive public engagement, the Commission approved the NRC final rule on the environmental effects of continued storage of spent nuclear fuel and its supporting generic environmental impact statement (GEIS), which became effective in October, 2014. The rulemaking took into consideration more than 33,000 public comments.

The rule adopts the findings of the GEIS, which analyzes the environmental impact of storing spent fuel beyond the licensed operating life of nuclear reactors over a short-term timeframe of 60 years, a long-term timeframe of 100 years after the initial 60 years, and indefinitely. The GEIS found no significant impacts for any of these time periods.

The implementation of the Continued Storage rule enables the NRC to complete several reactor licensing actions that had been suspended pending the outcome of this rulemaking.

YUCCA MOUNTAIN

In keeping with the Commission's direction, the NRC staff continues its work on the Safety Evaluation Report (SER) on the proposed repository at Yucca Mountain. In October 2014, the staff issued Volume 3 of the report, which is its technical analysis of the period after a repository at Yucca Mountain – if licensed and ultimately constructed – would be permanently sealed. The staff is scheduled to issue the remaining volumes - Volume 2 (Repository Safety Before Permanent Closure), Volume 4 (Administrative and Programmatic Requirements), and Volume 5 (License Specifications) -- by January 2015; they will be released as they are completed. The Commission will provide further direction to staff on completing the tasks of making documents from the Licensing Support Network publicly-available, and issuing a Yucca Mountain environmental impact statement using the agency's remaining Nuclear Waste Funds.

Completion of the SER is the next important step in a long and complex licensing process. Many other steps would remain if the licensing process were to continue. Among

other things, the adjudicatory proceeding associated with the construction authorization would recommence sometime after issuance of the SER. The adjudication would involve the reinstatement and maintenance of the Licensing Support Network (or its functional equivalent), resolution of approximately 300 pending contentions challenging the license application, resolution of any new contentions, Commission appellate activities, and completion of the Commission's supervisory review of the application.

SOURCE SECURITY

Radioactive source security has been, and continues to be, a top priority for the NRC. The NRC collaborates with the 37 Agreement States and domestic and international agencies on a variety of initiatives to make risk-significant radioactive sources even more secure and less vulnerable to malevolent use.

Immediately following the events of September 11, 2001, the NRC, working with other Federal and State agencies, prioritized actions to enhance the security of radioactive sources and facilities. At that time, the NRC disseminated a number of security advisories to NRC and Agreement State licensees, recommended specific actions to enhance security, addressed potential threats, and communicated general threat information. The urgency revealed by the threat and facility security assessments made it essential for the NRC to remove any security gaps by issuing immediately-effective Orders, rather than undertaking a more time-consuming rulemaking process.

In 2005, the Energy Policy Act expanded the NRC's authority to ensure the security and control of additional risk-significant materials, and mandated the development of a national registry of radioactive sources. Accordingly, in 2007, the NRC and Agreement States issued additional security Orders to comply with the Act.

The Energy Policy Act also established an interagency task force on radiation source protection and security under the lead of the NRC to provide recommendations to the President

and the Congress relating to the security of domestic radiation sources. This task force has to date submitted reports to the President and Congress in 2006, 2010 and 2014. The most recent report, while providing continuous improvement recommendations, did not identify any gaps related to radiation source security in the United States.

Recognizing the need to enshrine the Orders in regulations, the NRC commenced rulemaking activities related to source security. The 2013 rule (10 CFR Part 37), which incorporates pragmatic security approaches and interfaces with the NRC's existing safety rules, is an optimized mix of performance-based and prescriptive requirements that allow a licensee to develop a security program for risk-significant material with measures specifically tailored to their facilities. Licensee compliance with the rule was required by March 19, 2014; Agreement State licensee must fulfill compatible requirements by March, 2016.

The NRC radioactive source security program has been the subject of two recent Government Accountability Office (GAO) audits, the first focused on U.S. medical facilities, and the more recent focused on industrial settings. Unfortunately, both audits pre-dated the implementation of the expanded 10 CFR Part 37 regulations, and thus focused only on the NRC security requirements that were issued to licensees by Orders.

The NRC is committed to monitoring and assessing the effectiveness of the Part 37 requirements to determine whether any additional security enhancements are necessary. After the completion of this review, the NRC advocates the conduct of another GAO audit related to the effectiveness of the requirements of 10 CFR Part 37 for NRC and Agreement State licensees.

ENSURING EFFICIENT USE OF RESOURCES

Despite receipt of a late appropriation and future budget uncertainty, the NRC executed $1.1 billion of FY 2014 current and prior year funds, including Nuclear Waste Funds, and it recovered $931 million in license and annual fees of its FY 2014 new budget authority. As of

September 30, 2014, the NRC had $34.2 million in prior year fee-based funds, $4.8 million in Nuclear Waste Funds and approximately $6.3 million in other special use funds available as carryover funding. Under the current FY 2015 Continuing Resolution, the NRC is able to meet all safety and security mission requirements and has sufficient remaining unobligated Nuclear Waste Fund resources for the remaining Commission approved Yucca Mountain license application review activities.

The NRC continues to be prudent in expending agency resources and to carefully scrutinize all budget requests in order to conduct the agency's mission in an efficient and cost-effective manner. The NRC has also taken further steps to address the large fee increases for power reactor licensees in FY 2014. The staff has launched an agency effort to fully understand and maximize staff productive hour rates. Additionally, to further ensure fairness and equity in fee billing, the NRC has engaged an independent firm to conduct a study and provide recommendations on other fee allocation methods, and we plan to conduct a public meeting early in calendar year 2015 to address out-of-scope public comments received on the FY 2014 Fee Rule.

The Commission has directed the NRC staff to take a hard look at how to increase our flexibility and resiliency so that we can adapt more quickly to a changing environment and still ably address tomorrow's unanticipated challenges. The staff is currently working both internally and externally to analyze a range of scenarios that may affect the workload and activities of the agency over the next five years and anticipate commensurate changes to necessary NRC staff skill sets and resources. The objective of this initiative is to develop recommendations corresponding to each scenario to enable the agency to ensure it can effectively, efficiently, and flexibly meet its safety and security mission under any circumstances. The work of our staff's

team and that of the National Academy of Public Administration, whom we have asked for assistance and assessment, is ongoing.

UNDERSTANDING THE CUMULATIVE EFFECTS OF REGULATION

The Atomic Energy Act requires the NRC to provide reasonable assurance of adequate protection of public health and safety and promote the common defense and security in its regulatory activities, and the requirements the NRC imposes are intended to meet this mandate. We recognize that important safety and security enhancements will be most effective if necessary regulatory measures are prioritized appropriately so that licensees can maintain focus on the most safety-significant issues and activities. The NRC has had enhancements to the rulemaking process in place since 2011 to better address the cumulative effects of agency decision-making.

In particular, we are interacting closely with various groups, including industry, government, and members of the public, to ensure that we understand and manage the impacts on licensees of regulatory initiatives and activities that are being implemented concurrently. We are reviewing implementation timelines for new or revised regulations, the priority associated with each action, and the availability of critical skills to complete implementation.

The NRC has also engaged the operating reactor industry to perform "case studies" reviewing regulatory cost and schedule estimates. In addition, we are working with other parts of the regulated community and with our Agreement State regulatory partners to assess and control cumulative effects.

A LOOK AHEAD

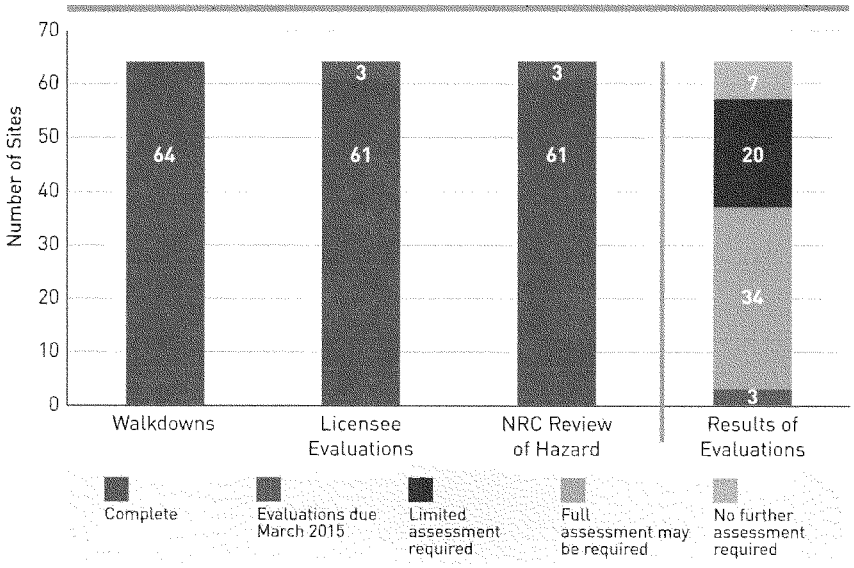
In summary, the NRC is fully engaged in our mission of protecting public health and safety, promoting the common defense and security of our Nation, and protecting the environment. We will continue to focus on:

- Ensuring safe and secure day-to-day operations at all licensed facilities;
- Completing additional safety-significant work on post-Fukushima lessons learned;
- Completing the Safety Evaluation Reports and other activities for the proposed repository at Yucca Mountain using remaining Nuclear Waste Funds;
- Overseeing construction activities at the new Plant Vogtle, V.C. Summer, and Watts Bar 2 reactors;
- Overseeing decommissioning activities at SONGS, Kewaunee, Crystal River-3, Vermont Yankee, and other decommissioning sites;
- Boosting the effectiveness, efficiency, performance, and agility of the agency; and
- Continuing to strengthen our close cooperation with international and interagency partners.

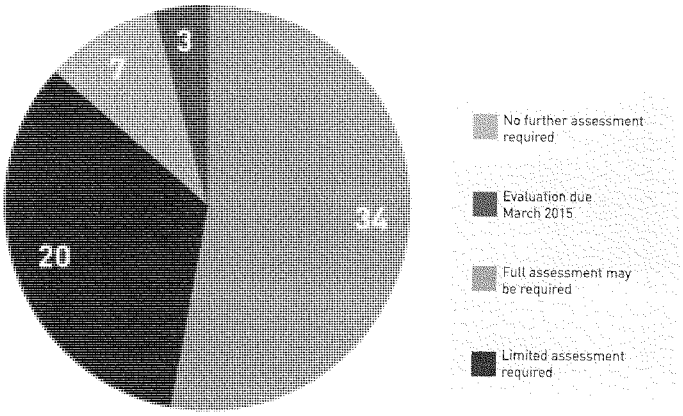
I have been proud to be the Chairman of the NRC over the past two and a half years, and sincerely appreciate the dedication and work of all the men and women at the NRC.

Chairman Boxer, Ranking Member Vitter, Chairman Whitehouse, Ranking Member Sessions, thank you for the opportunity to appear before you today; I would be pleased to answer your questions.

Seismic Hazard Reevaluation Progress
(Total sites: 64)

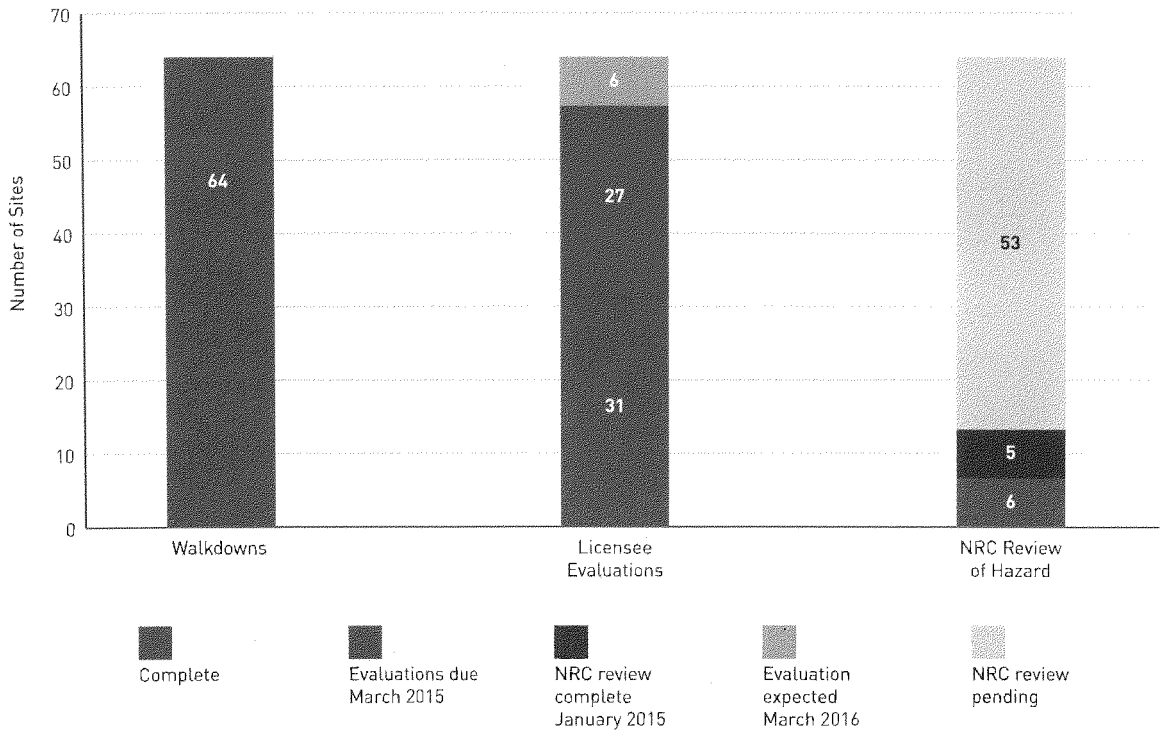


Seismic Hazard Reevaluation Results
(Total sites: 64)

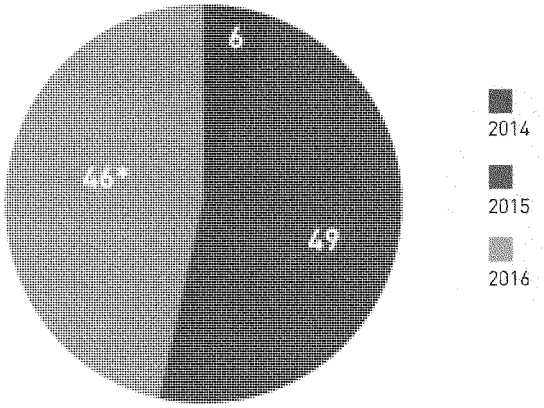


Flooding Hazard Reevaluation Progress

(Total sites: 64)

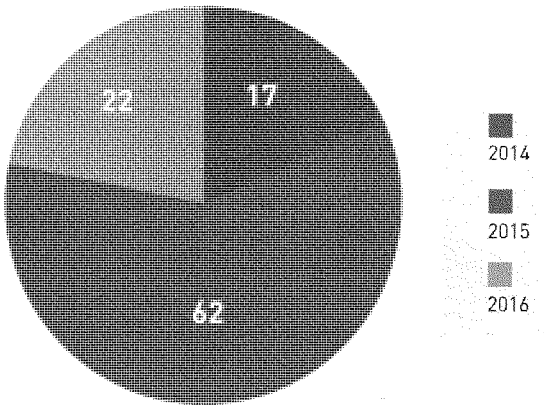


Mitigating Strategies Equipment: Full Compliance
(Total units: 101)



*Ten units will have all the required equipment and connections in place, but will not be in full legal compliance with the Mitigating Strategies Order until they are in compliance with the Severe Accident Capable Vent Order in 2017-2018.

Spent Fuel Pool Instrumentation: Full Compliance
(Total units: 101)



The Honorable Senator Boxer

QUESTION 1. **Please provide un-redacted copies of all documents requested on September 18, 2014 by Friend of the Earth (FOE) via a Freedom of Information Act (FOIA). These documents relate to information that was made publicly available by the NRC and PG&E on September 10, 2014 about (1) the NRC's "Final Decision" on NRC former Diablo Canyon Power Plant senior resident inspector Dr. Michael Peck's dissenting professional opinion (DPO) and (2) the PG&E Central Coastal California Seismic Imaging Project Report ("CCCSIP Report"), on earthquake faults around the Diablo Canyon Nuclear Plant.**

ANSWER.

The documents are enclosed.

The Honorable Senator Boxer

QUESTION 2. **Please also confirm that no documents that are responsive to the FOE FOIA have a) been withheld entirely b) been deleted or destroyed following the FOE FOIA or c) been deleted or destroyed prior to the FOE FOIA. If responsive documents have been withheld entirely, please provide a list and brief description of each such document and the reason it was withheld. If responsive documents have been deleted or destroyed please fully describe these materials and the reasons why they were deleted or destroyed, as well as your efforts to retrieve backed up copies thereof.**

ANSWER.

Four documents were withheld in their entirety from Friends of the Earth under FOIA exemption (b)(5) because they contained pre-decisional and deliberative information. The specific documents withheld were: 1) A draft *Diablo Canyon in the News* by staff in the NRC's Office of Public Affairs; 2) Diablo Canyon Power Plant Differing Professional Opinion Key Messages; 3) A draft NRC Letter to the Editor; and 4) 9/30/14 draft Talking Points: State Report. These four documents are being provided to the Committee as part of the response to Question 1. No records responsive to Friends of the Earth's FOIA request have been deleted or destroyed. The FOIA request is still open and, to date, the requester has received two interim responses.

The Honorable Senator Boxer

QUESTION 3. **There are several laws that direct Agency record retention policy, NRC's Management Directive 3.53[1] describes the manner in which NRC should comply with these requirements. Are you aware of any direction given (be it written, in a meeting, or phone call) by any NRC employee to any other NRC employee(s) that called for, directed or suggested the deletion or destruction of documents related in any way to seismic safety or licensing issues at Diablo Canyon? If so, please provide all details of such direction. I urge you to remind NRC employees of the requirements contained in NRC's Management Directive 3.53.**

ANSWER.

I am not aware of any direction or suggestion given by any NRC employee to delete or destroy documents. While I can assure you that NRC employees are mindful of Management Directive 3.53, I have asked the Executive Director for Operations to remind them of their responsibilities under the Directive.

[1] http://pbadupws.nrc.gov/docs/ML0711/ML071160026.pdf

The Honorable Senator Boxer

QUESTION 4. **Please provide a list of all equipment modifications or replacements made to the Diablo Canyon Power Plant for which a concurrent analysis of Hosgri earthquake and Loss of Coolant Accident (LOCA) should have been conducted under NRC's 50.59 regulations, the date on which such modification or replacement was completed and whether the specified analysis had been performed by that date. Please also indicate whether there were any changes to the original analyses and if there were, please provide a description of and reason for the changes and the date on which they were completed.**

ANSWER.

Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting, in part, that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board (Licensing Board) presiding over Pacific Gas and Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion predictions. In view of its adjudicatory role, the Commission cannot address matters in litigation. Because your question largely relates to matters in litigation pending before both the Commission and the Licensing Board, the Commission cannot comment further on the issue at this time, but would be pleased to discuss the matters further following the completion of the adjudications. In the interim, and to the extent that your concerns can be addressed now, the NRC staff would be pleased to work with your staff to identify materials that are responsive to your request.

The Honorable Senator Boxer

QUESTION 5. **Please describe NRC's role in overseeing and validating the outcome of PG&E's Licensing Basis Verification Project (LBVP), which will cost an estimated $133 million and is described on PG&E's webpage as a project that "will review, validate, and reconcile the Current Licensing Basis (CLB) for DCPP...In order to ensure regulatory compliance, PG&E reviews all proposed changes to the DCPP facility against the FSAR and the CLB... The LBVP will produce a reconstituted FSAR and licensing basis with enhanced CLB retrievability to support ongoing and future compliance of DCPP activities with its NRC approved licensing basis. The LBVP will perform a review and evaluation of the licensing, design and analysis changes from the original FSAR to the present. Based on the results of that review, the LBVP will identify, consolidate and reconcile any inconsistencies in the CLB."**

ANSWER.

As Pacific Gas and Electric Company (PG&E) stated at a September 22, 2010, public meeting, its Licensing Basis Verification Project (LBVP) was established to ensure the Current Licensing Basis (CLB) is clear and to identify potentially deficient evaluations of changes, tests, and experiments made under 10 CFR 50.59. Through the program, PG&E plans to: complete applicable licensing basis reviews, system reviews, component design basis report reviews, and electronic database upgrades; to implement a CLB search tool; and to correct licensing basis deficiencies that do not require prior NRC approval. PG&E anticipates that the current phase of the LBVP review will result in PG&E submitting License Amendment Requests (LARs) and initiating design changes.

The NRC's oversight of the LBVP includes review and sample inspections of any physical changes to the facility, and sample inspection of PG&E's written evaluations that provide the bases for any determination that a change, test, or experiment does not require a license amendment pursuant to 10 CFR 50.59(c)(2). Routine periodic and sample inspections are performed by NRC regional inspection staff, as are more-detailed, but less frequent, baseline inspections, such as component design basis inspections (CDBIs) (e.g., Inspection Report 2013007 (Agencywide Documents Access and Management System accession number ML13234A516)). The inspection reports document the NRC's findings and, when appropriate, how findings are treated under the NRC Enforcement Policy.

When the licensee determines that an LAR is required, the NRC reviews the request and either issues an amendment to the license or denies the LAR. The NRC's review and decision on LARs submitted by PG&E could extend beyond PG&E's completion of the LBVP.

The Honorable Senator Boxer

QUESTION 6. **During the hearing, you stated that the reason why PG&E withdrew its license amendment request for Diablo Canyon was "that we provided guidance when we required them after Fukushima to do a new seismic hazard reevaluation. So that's why they withdrew that license amendment request." Please respond yes or no: Is doing this seismic hazard evaluation a requirement of PG&E's operating license? Does the completion of this evaluation automatically deem PG&E to be in compliance with its licensing requirements?**

ANSWER.

In accordance with a March 2012 letter issued to Pacific Gas and Electric Company (PG&E) under 10 CFR 50.54(f), "Conditions of Licenses," that was sent to all reactor licensees, PG&E is required as a condition of its operating license to complete a seismic hazard reevaluation at Diablo Canyon using both modern methods and updated information, along with an assessment of the plant's ability to cope with the reevaluated hazard to determine if additional regulatory action by the NRC is appropriate. PG&E's seismic hazard reevaluation is due to the NRC in March 2015. This is part of several studies related to the seismicity of this site.

There is presently pending before the Commission a petition to intervene and request for hearing by Friends of the Earth. In its petition to intervene, FOE asserts that regulatory commitments PG&E made in its request to withdraw License Amendment Request 11-05 propose, in effect, (1) to amend the license without an opportunity for a public adjudicatory hearing called for by the Atomic Energy Act and NRC regulations, and (2) to allow PG&E to continue operating Diablo Canyon without complying with conditions in its operating license requiring assurance that safety-related elements will remain functional in the event of an

earthquake. Because your second question relates to matters in litigation pending before the Commission, and in view of its adjudicatory role, the Commission cannot comment further on the question at this time but would be pleased to discuss it further following the completion of the case.

The Honorable Senator Boxer

QUESTION 7. **During the hearing, you stated that PG&E is "in compliance with their license" for DCPP. Please provide me with a) your legal basis, along with any supporting documents, for making this statement and b) a copy of the materials NRC's Region IV and headquarters staff prepared for you on this topic and on the question of whether PG&E had complied with NRC's 50.59 regulations prior to the hearing.**

ANSWER.

I would like to clarify the statement that I made during the hearing. I recognize your question seeks to understand the basis for my statement that the NRC staff has concluded that Diablo Canyon Power Plant, Units 1 and 2, are in compliance with their operating licenses. As part of my preparation for the hearing, I reviewed pre-existing materials prepared by NRC subject-matter experts.

I note, however, that Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting, in part, that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board (Licensing Board) in a matter concerning Pacific Gas and Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion predictions. In view of its adjudicatory role, the Commission, as a collegial body, cannot address matters in litigation.

Because your question relates to matters in litigation pending before both the Commission and the Licensing Board, the Commission cannot comment further on the issue at this time but would be pleased to discuss the matters further following the completion of the adjudications. In the interim, the Commission recommends arranging a briefing on this topic with NRC's subject-matter experts and having them provide the Committee with documents that support the staff's analysis to date.

The Honorable Senator Boxer

QUESTION 8. **Please provide me with a copy of NRC's communications plan for responding to inquiries related to a) whether PG&E is in compliance with its seismic licensing requirements and b) whether PG&E complied with its 50.59 requirements to do a concurrent assessment of the Hosgri earthquake and LOCA loads when it replaced reactor equipment such as the steam generators or reactor vessel heads.**

ANSWER.

A copy of the latest version of the NRC's Diablo Canyon Communications Plan is attached. For information on the specific issues raised in Question 8, see pages 79-82 of the plan. Please note that the Diablo Canyon Communications Plan is an Official Use Only, non-public document. We respectfully request that you retain it as non-public.

The Honorable Barbara Boxer

QUESTION 9. **When you were asked during the hearing to describe morale at the NRC, you stated that "I think things are much improved from when I arrived at the agency" and that "I think things are calmer."**

a) For each of the three years prior to your arrival and for each year since you have been there, in what place has NRC been ranked (among its peer agencies) in the annual Best Places to Work compilation of data obtained from the Federal Employee Viewpoint Survey?

Answer.

When I arrived at the NRC in July 2012, the agency was going through a tumultuous time in which relationships within the Commission, and between the staff and the Commission, were strained. At the time, I pledged to work closely with my fellow Commissioners and to approach my job as Chairman in a collaborative and collegial manner. Since that time, the Commission has developed a productive, respectful, and collegial working relationship, and we have sustained an environment of open communication. This is also the case with regard to Commission and staff engagement. I believe the NRC is operating well, even as we address challenges and identify areas for improvement to make us a more effective and efficient regulator. In that vein, "I think things are much improved from when I arrived at the agency" and that "things are calmer" now.

I believe that the Federal Employee Viewpoint Survey (FEVS) and the associated Best Places to Work results provide for healthy competition among Federal agencies to continuously improve and enhance the workplace for Federal employees In my view, the top performing

agencies will fluctuate as agencies continue to focus on improvement. I am proud that the NRC has remained among the top-ranked agencies over the last several years, and I commend those agencies that have worked to improve their scores. This noted, in the spirit of continuous improvement, the NRC leadership continues to assess the FEVS data for areas that warrant further attention. The information you requested on FEVS and the Best Places to Work results is below.

Best Places to Work - Federal Employee Viewpoint Survey		
Year	NRC Overall Rank	Number of Agencies Ranked
2014	6	25
2013	4	23
2012*	3	22
2011	2	33
2010	1	32
2009	1	30

**In 2012, a new mid-sized agency category was added for those agencies with 1,000-14,999 employees; large agencies being defined as those with 15,000 or more employees. NRC was placed in the new mid-sized category in 2012. Prior to 2012, there were only two categories (large and small); large agencies being defined as those with more than 2,000. At that time, NRC was in the large category.*

b) For each of the three years prior to your arrival and for each year since you have been there, please indicate how many non-concurring opinions were filed (and how many signatories were listed on each such opinion) and how many differing professional opinions were filed (and how many signatories were listed on each such opinion).

Answer.

The NRC has two formal processes for raising concerns – the Non-Concurrence Process (NCP) and the Differing Professional Opinion (DPO) Program. The NCP allows employees to document their concerns early in the decision-making process and provide them with proposed

staff positions and other documents to be forwarded with the position as the documents move through the management approval chain. The DPO Program is a separate, more formal process that allows employees and contractors to have their differing views on established, mission-related issues considered by the highest level managers in their organizations. I am a strong supporter of both the NCP and the DPO Program to raise concerns. I believe they are an important and valuable part of the decision-making and management review process. The information you request on the NCP and DPO Program is below.

Non-Concurrences	
No. of Cases	**No. of Signatories on Each Case**
2009 *7 cases involving a total of 7 signatories*	
7	1
2010 *13 cases involving a total of 13 signatories*	
13	1
2011 *19 cases involving a total of 21 signatories*	
18	1
1	3
2012 *11 cases involving a total of 12 signatories*	
10	1
1	2
2013 *15 cases involving a total of 25 signatories*	
10	1
1	2
3	3
1	4
2014 *12 cases involving a total of 46 signatories*	
6	1
1	2
1	3
1	5
1	8
1	10
1	12

DPOs	
No. of Cases	**No. of Signatories on Each Case**
2009 *1 cases involving a total of 2 signatories*	
1	2
2010 *1 cases involving a total of 4 signatories*	
1	4
2011 *2 cases involving a total of 2 signatories*	
2	1
2012 *3 cases involving a total of 4 signatories*	
2	1
1	2
2013 *2 cases involving a total of 3 signatories*	
1	1
1	2
2014 *3 cases involving a total of 3 signatories*	
3	1

The Honorable Senator Boxer

QUESTION 10. **Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe it is operating within its seismic licensing requirements? Why or Why not?**

ANSWER.

Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board (Licensing Board) in a matter concerning Pacific Gas and Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion predictions. In view of its adjudicatory role, the Commission cannot address matters in litigation. Because your question relates to matters in litigation pending before both the Commission and the Licensing Board, the Commission cannot comment further on the issue at this time but would be pleased to discuss the matters further following the completion of the adjudications.

The Honorable Senator Boxer

QUESTION 11. **If you do believe that DCPP is operating within its seismic licensing requirements, why is PG&E currently engaged in a Licensing Basis Verification Project (LBVP), which will cost an estimated $133 million and is described on PG&E's webpage[3] as a project that "will review, validate and reconcile the Current licensing Basis (CLB) for DCPP... In order to ensure regulatory compliance, PG&E reviews all proposed changes to the DCPP facility against the FSAR and the CLB... The LBVP will produce a reconstituted FSAR and licensing basis with enhanced CLB retrievability to support ongoing and future compliance of DCPP activities with its NRC approved licensing basis. The LBVP will perform a review and evaluation of the licensing, design and analysis changes from the original FSAR to the present. Based on the results of that review, the LBVP will identify, consolidate and reconcile any inconsistencies in the CLB."**

ANSWER.

Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board presiding over Pacific Gas and Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion predictions. In view of its adjudicatory role, the Commission cannot address matters in litigation. Because your question relates to matters in litigation pending before both the Commission and the Licensing

[3] https://www.pge.com/regulation/GRC-2014-Phase1/Testimony/PGE/2012/GRC-2014-Phase1_Test_PGE_20121115_254326.pdf

Board, the Commission cannot comment further on the issue at this time but would be pleased to discuss the matters further following the completion of the adjudications.

The Honorable Senator Boxer

QUESTION 12. **Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe that PG&E has complied with NRC's 50.59 regulations that require it to have performed a concurrent analysis of Hosgri earthquake and Loss of Coolant Accident (LOCA) when replacing reactor equipment such as the steam generators or reactor vessel head?**

ANSWER.

Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board (Licensing Board) presiding over Pacific Gas and Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion predictions. In view of its adjudicatory role, the Commission cannot address matters in litigation. Because your question relates to matters in litigation pending before both the Commission and the Licensing Board, the Commission cannot comment further on the issue at this time but would be pleased to discuss these matters further following the completion of the adjudications. In the interim, and to the extent that your concerns can be addressed now, the NRC staff subject matter experts would be pleased to meet with your staff to provide information that is responsive to your question.

The Honorable Senators Boxer and Markey

QUESTION 13. During the hearing, the document drafted by you and sent to NRC's Mark Satorius and Margaret Doane entitled, "Strengthening the NRC Enforcement Process by Enhancing Procedural Fairness" was discussed. As you know, when we wrote the Commission on October 9 urging that this document be rescinded, NRC's spokesperson told reports that "Specific to their call for rescinding a reorganization of the Office of Investigations, we can affirm that no such reorganization plan exists, nor has one been contemplated." However:

a. The document states that the review of the NRC enforcement process should "ensure that appropriate resources are devoted to investigations that are most safety and security significant", which could, if this proposal were implemented, limit the types of investigations that NRC's Office of Investigations (OI) could undertake because resources might not be provided for some investigations.

b. The document states that the review of the NRC enforcement process should "develop procedures for assigning technical staff to support investigation which promote the objectivity and independence of the investigation", which could, if this proposal were implements, limit the technical expertise that could be available to OI.

c. The document states that the review of the NRC enforcement process should "ensure that all referrals to the Department of

Justice on behalf of the NRC are shared with and reviewed by OGC," which would represent a departure from current OI practice.

d. The document directs OGC to "conduct a 'lessons learned' review of the Exelon Decommissioning Fund investigation and enforcement action from the legal perspective to determine whether changes to the allegations review and investigation report review processes are required in terms of how legal advice and guidance is provided to the staff," even though the NRC Inspector General is currently (and was, at the time this memo was prepared) investigating allegations related to OGC's conduct related to the same investigation and enforcement action.

e. The document directs NRC OGC "to provide legal advice, guidance and a recommendation on the need for a timely and thorough technical and legal analysis of facts and evidence in the case, including all contact with counsel for the target or subject of the investigation and information provided in the pre-enforcement conference, to fully inform a final agency decision on whether to take enforcement action, particularly where escalated enforcement has been recommended by OI," and that this direction, if implemented, would represent a departure from current OI practice.

In response to questions about this document at the hearing, you stated that "Never and nowhere in that memo will you find any contemplation of any reorganization of the Office of Investigations."

Do you agree that a proposal that would limit the type of investigations that OI could undertake, limit the technical resources that are available to support OI's investigations, and alter the manner in which OI is directed to interact with and report to OGC throughout the course of an investigation could be described as a reorganization of OI's mission?

ANSWER.

There is not now and, during my tenure on the Commission, there has not been a proposal to reorganize the Office of Investigations, limit its budget, or otherwise change the duties of the Office.

A strong, effective enforcement process is critical to the Commission's ability to enforce its regulations and thereby fulfill its mission to protect human health and safety and the environment, and to ensure the security of its licensed facilities. As an agency with a critical public safety mission, we must be open to – and focused on – reflecting critically on our performance and applying lessons learned as may be appropriate.

The enforcement process consists of a number of NRC program and regional offices that are the direct responsibility of the Executive Director for Operations. The Office of the General Counsel is integral to the enforcement process, but – while serving the whole Agency – is responsible directly to the Commission. The Commission has not undertaken a holistic and detailed examination of the Agency's enforcement process, and the interface of the various component parts, since the enforcement process was structured in its current form more than two decades ago. As such, I believe an earnest and timely review to gain insights into any

specific or systemic improvements that could be made to our enforcement process is necessary and consistent with the Agency's commitment to continuous improvement.

The document you reference appears to be a sensitive, non-public, preliminary draft memorandum that I shared with my colleagues on the Commission at that time and a select few senior agency leaders for review and comment, a practice called for by our Internal Commission Procedures. The process of receiving comments was just under way when I received the October 9, 2014 letter from the Committee. Since the Committee's letter contained allegations regarding the purpose for the initiative, the matter has been taken up by the NRC's Inspector General for review.

The Honorable Senators Boxer and Markey

QUESTION 14. **Do you agree that it was appropriate to direct OGC to conduct a "lessons learned" review of an OI investigation when the NRC IG is still investigating multiple referrals of OGC personnel because of their alleged misconducts during that very same OI investigation?**

ANSWER.

The Commission has not undertaken a holistic and detailed examination of the Agency's enforcement process, and the interface of the various component parts, since the enforcement process was structured in its current form more than two decades ago. As such, I believe an earnest and timely review is necessary and consistent with the Agency's commitment to continuous improvement in order to gain insights into any specific or systemic improvements that could be made to our enforcement process. This review, if undertaken, should be the responsibility of the Executive Director for Operations, with assistance provided by the Office of the General Counsel.

Consistent with our Internal Commission Procedures, I provided a sensitive, non-public, preliminary draft of a tasking memorandum on the conduct of a review of the NRC's enforcement process to my then-Commission colleagues and to a select few senior staff leaders for review and comment. These senior leaders requested, and I approved, sharing the preliminary draft with the leaders of the offices with subject matter expertise in the enforcement process. The benefit of taking this approach is to ensure that all potentially participating offices have an opportunity to provide input before a draft tasking memorandum is finalized and issued to the staff. The process of receiving comments was under way when I received the October 9, 2014 letter from the Committee. Since this letter contained allegations regarding the purpose for the draft tasking memorandum, the matter has been taken up by the NRC's Inspector

General for review. A tasking memorandum initiating a review of the NRC's enforcement process has not yet been finalized.

The Honorable Senators Boxer and Markey

QUESTION 15. **The NRC staff has indicated that the Commission may soon prepare a supplemental Environmental Impact Statement (EIS) for the proposed Yucca Mountain project. Will the Commission reevaluate the no action alternative in the supplemental EIS? If not, please provide an explanation why the no action alternative in the EIS is adequate.**

ANSWER.

Following the *Aiken County* decision directing the agency to resume the licensing proceeding, the Commission has directed the completion, if possible, of an EIS supplement associated with post-closure impacts of the repository on groundwater, using remaining appropriated funds from the Nuclear Waste Fund.

Reevaluation of the "no action" alternative is not part of the environmental matter that the NRC staff is currently considering. The final repository EIS for Yucca Mountain contains numerous statements and analyses with which participants in the licensing proceeding may disagree. The appropriate forum in which participants in the proceeding may pursue questions about already addressed environmental matters such as this one is before the Atomic Safety and Licensing Board, should the adjudication resume.

The Honorable Senator Markey

QUESTION 1. **During the hearing, I asked you whether any of you disagree as a general matter that requiring both flood protection and flooding response measures would provide a higher level of safety than flooding response measures alone. Only Commissioner Baran responded clearly to that question. I ask for each of the rest of you to provide a clear response.**

ANSWER.

The NRC establishes requirements for the design and operation of commercial nuclear power plants to ensure that they introduce no undue risk to public health and safety. These requirements are intended to both minimize events that challenge plant safety systems and to mitigate them should they occur. The requirements help to prevent escalation of events, including flooding, into accidents with the potential to release radioactive materials into the environment. Requirements to minimize events that challenge plant safety systems include those related to plant design, inspection, and maintenance of equipment, and protection of plant equipment from internal and external hazards. Requirements to mitigate events that challenge plant safety systems prevent core damage, and limit the release of radioactive materials include those related to plant design features, plant procedures, and strategies to address beyond-design-basis external events. The NRC currently requires and will continue to require measures for both flood protection and flood mitigation and will assess the appropriate selection or balancing between proposed alternatives using existing agency and government-wide policies and guidance for assessing and making regulatory decisions.

The Honorable Senator Markey

QUESTION 2. **During the hearing, I noted the statutory requirement for NRC to provide me with responses to my requests for information and documents that have not been responded to. In particular, I noted the Commission's non-responsiveness to my letters regarding the "Job Shadow" program. Do you support the provision of the documents I have requested on this and other matters, yes or no? If not, what is your legal basis for refusing to agree to provide them to me?**

ANSWER.

As we articulated at the December 3rd hearing, this was not an NRC program. We renew our offer to provide an agency briefing to you or your staff on this matter.

The Honorable David Vitter

QUESTION 1. **As the Event Inquiry report on SONGS did not identify any alleged wrongdoing by the licensee, what, if any, action is the NRC taking to address the OIG report conclusions on the performance of the NRC staff?**

ANSWER.

The recent Office of the Inspector General (OIG) Event Inquiry (OIG Case No. 13-006) into the NRC oversight of Southern California Edison's application of the 10 CFR 50.59 process for the steam generators replacements in SONGS Units 2 and 3 identified three findings that the staff is actively reviewing. The staff is evaluating appropriate response actions to OIG's findings and plans to incorporate these into its ongoing SONGS lessons-learned activities. The staff plans to document its disposition of the Event Inquiry in its official lessons-learned report due to the NRC Executive Director for Operations in March 2015.

The Honorable Mike Crapo

QUESTION 1. **Idaho National Laboratory, in my hometown of Idaho Falls, is in the process of restarting the Transient Test Reactor, also known as TREAT. This reactor will be able to conduct transient testing of fuels, or how fuels would perform in an accident scenario. Is the NRC aware of TREAT and DOE's program to develop accident tolerant fuels?**

a) Would the NRC consider utilizing TREAT for some of its testing needs?

ANSWER.

The NRC staff has close relationships with their counterparts at the Idaho National Laboratory (INL) and is aware of INL's activities and capabilities. The staff has had discussions with INL about the capabilities of TREAT and its potential restart. The NRC staff will continue regular communications with INL and the Department of Energy (DOE) staff regarding TREAT's capabilities, restart schedule, and potential use for transient testing of fuel. The NRC staff is aware that the fuels to be tested include accident tolerant fuel (ATF) designs that are being developed by DOE and its partners.

UPDATED: Rev. 1 (11/26/2014)

Communications Plan – Diablo Canyon Power Plant Topics of Interest

Purpose

This communication plan describes the methods and resources that NRC staff will use to communicate with internal and external stakeholders regarding the Diablo Canyon Power Plant (DCPP) seismic history and ongoing seismic evaluations being conducted in response to the Japan Lessons Learned Near-Term Task Force recommendations. This plan also provides key messages concerning NRC current and historical actions and decisions concerning seismic issues involving DCPP to be used by staff.

Additionally, as applicable to current questions raised by DCPP stakeholders, this communications plan integrates key messages related to spent fuel/dry cask storage and waste confidence (primarily by referencing other active communication plans).

This communications plan will be continuously evaluated for the need to update key messages, and a full review/update will be evaluated approximately once per calendar quarter.

NOTE: Although this communication plan is marked as OUO-SII, all sections marked as "Key Messages" and "Questions and Answers" are releasable to the public.

Summary of Background Seismic Information and Assessments

Pacific Gas & Electric (PG&E) proposed 0.2g ground acceleration for an Operating Basis Earthquake (OBE) and 0.4g ground acceleration for a Safe Shutdown Earthquake (SSE) in its construction permit applications in 1967 and 1968. (Note: PG&E uses the terms Design Earthquake and Double Design Earthquake when referring to the OBE and SSE, respectively.) After construction permits were issued, during the Atomic Energy Commission's and NRC's review of information submitted to support operating licenses, new information became available as a result of offshore seismic surveys. These surveys identified the Hosgri fault, approximately 3.5 miles offshore of the DCPP site. After assessing information provided by PG&E and the U.S. Geological Survey (USGS) during the operating license review, and making design and construction modifications to reflect the more current information, NRC issued operating licenses for the two units in 1984 and 1985. The OBE and SSE remained 0.2g and 0.4g, respectively.

However, DCPP was required to have additional seismic protection that would automatically initiate reactor shutdown if ground acceleration during a seismic event exceeded the OBE and SSE, and PG&E was required to re-evaluate the seismic design basis for DCPP. PG&E was also required to evaluate the plant's response to ground motion of 0.75g, a value believed to bound the expected ground motion resulting from an earthquake occurring along the Hosgri fault. PG&E established its Long Term Seismic Program (LTSP) to guide additional seismic evaluations and updated the Final Safety Analysis Report to incorporate the results of its LTSP study. PG&E concluded that DCPP Units 1 and 2 could withstand ground motion up to 0.75 g.

In 2008, PG&E notified the NRC about the newly discovered Shoreline fault zone. PG&E completed characterization of the Shoreline and other local earthquake faults in January 2011.

On October 20, 2011, PG&E submitted a license amendment request for approval to revise the current licensing basis, as described in the Updated Final Safety Analysis Report and Technical Specifications, to provide requirements for the actions, evaluations, and reports necessary when PG&E identifies new seismic information relevant to the design and operation of DCPP.

The NRC completed its independent review of the new seismic information and documented the results in a Research Information Letter (RIL) issued on October 10, 2012, which was subsequently communicated to PG&E two days later. NRC concluded that maximum ground motion at the site from a seismic event along the Shoreline fault is bounded by previous analyses of potential seismic events, including analyses of the Hosgri fault and the LTSP ground motion response spectra.

Specifically the October 12, 2012, letter indicated that PG&E was to evaluate new seismic information in accordance with the process outlined in the March 12, 2012, 50.54(f) request for information issued to all operating reactors, and provided further guidance that the ground motion response spectrum that is developed should be reviewed against the Double Design Earthquake (OBE) spectrum at DCPP.

Therefore, the October 12, 2012, letter in conjunction with the March 12, 2012, 50.54(f) request for information provides a process for assessing new seismic information at Diablo Canyon and rendered the portion of the October 20, 2011, PG&E license amendment in this area unnecessary. In a letter dated October 25, 2012, PG&E provided the basis for withdrawing its October 20, 2011, license amendment request. The staff accepted the withdrawal of the license amendment in a letter dated October 31, 2012.

PG&E is currently performing a seismic hazard update through a SSHAC Level 3 process. The resulting site-specific probabilistic seismic hazard analysis will be used to respond to the NRC's March 2012 50.54(f) request for information letter.

Key Messages

- Although the original OBE and SSE values of 0.2g and 0.4g were specified as part of the design basis (calculation) in 1968, the 0.75g Hosgri event was incorporated in the licensing basis (along with the OBE and SSE) prior to issuance of the DCPP units' operating licenses in 1984 and 1985.
    - Upon discovery of the Hosgri fault (1971), PG&E reanalyzed and significantly upgraded the structures, systems, and components to accommodate the postulated ground motion values (up to 0.75g) from the Hosgri fault.
    - The NRC staff reviewed and accepted PG&E's revised seismic analysis in the Supplement to Safety Evaluation Report 7 (SSER 7) in 1978.
    - The Advisory Committee on Reactor Safeguards (in 1978) and Atomic Safety Licensing Board (in 1979) subsequently reviewed the licensee's and NRC staff analyses of the revised seismic impact and as-constructed tests and analyses (including the 0.75g value associated with the Hosgri event). Both the ACRS and ASLB concluded that the revised seismic design basis was appropriately conservative and there was reasonable assurance that both units could be operated at full power without undue risk to the health and safety of the public.

- The NRC performed an independent deterministic analysis of new seismic information provided by PG&E in 2011 relating to the Shoreline fault. NRC's conclusions are documented in Research Information Letter (RIL) 12-01, dated October 10, 2012 (publically available in ADAMS ML121230035). NRC determined that the maximum ground motion expected at DCPP from a seismic event occurring along the Shoreline fault would be bounded by previous analyses of expected ground motion for seismic events associated with the Hosgri fault and PG&E's Long Term Seismic Program (LTSP) ground motion response spectra.

- In addition to analysis of information relating to the Shoreline fault, NRC analyzed new information relating to increases in expected ground motion for seismic events occurring along the Los Osos and San Luis Bay faults. Ground motion at DCPP from seismic events along these faults is also bounded by prior analyses of expected ground motion for seismic events associated with the Hosgri fault and PG&E's LTSP ground motion response spectra.

- In March 2012, NRC requested all U.S. nuclear power plants to re-evaluate plant specific seismic hazards in response to the Japan Lessons Learned Near-Term Task Force recommendations.[1] The results of PG&E's re-evaluation of seismic hazards for DCPP will include identification of any changes in seismic risks (due to new information identified during more recent seismic surveys) and a comparison to the current plant seismic design basis. This evaluation is to be submitted to NRC by March 2015. If the updated seismic hazards exceed the current SSE (the value that NRC directed PG&E to use for comparison), PG&E has indicated they will complete an expedited seismic evaluation process by January 2016 and a full seismic risk analysis by June 2017. Plant modifications, if required, would likely be completed in the 2018 timeframe.

- The expectation that the seismic issues will take some years to resolve at DCPP is not a safety concern. The NRC has followed the progress of PG&E's seismic re-evaluation process since the beginning. The NRC will continue to evaluate seismic data to ensure our understanding of the seismic hazard is informed and that there is no new challenge to safety.

- The NRC continues to conclude Diablo Canyon is built to safely withstand the effects of a Hosgri earthquake and that the plant would protect the public and the environment. The reasons for this are laid out in the RIL.

- On September 10, 2014, PG&E released its report to the State of California in response to California Assembly Bill 1632 which required, in part, an assessment of the potential vulnerability of DCPP to a major disruption due to a seismic event. Regarding this report (a.k.a., the AB-1632 Report):

[1] *See NRC letter, dated March 12, 2012, issued to all power reactor licensees "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident." (http://pbadupws.nrc.gov/docs/ML1205/ML12053A340.pdf)*

- NRC Resident Inspectors and Region IV staff initially reviewed the licensee's corrective action process assessment of new preliminary information concerning DCPP seismic and licensing bases. The licensee's information indicates reasonable assurance of public health and safety after a seismic event.

  PG&E's evaluation of the new seismic information, as documented in the report, concludes that the ground motions resulting from the faults discussed in the report (i.e., Shoreline, Hosgri, San Simeon, Los Osos, and San Luis Bay) continue to be bounded by the Hosgri analysis that was used during licensing of the plant.

- The NRC staff conducted a review of the new information in the AB-1632 report in accordance with the NRC's inspection process and documented the review in Inspection Report 2014-008 (to be issued in early December 2014). The NRC staff did not identify any findings or violations associated with this review. The NRC determined that the results of the AB1632 report, in consideration of the past evaluations of the Hosgri spectrum, indicate considerable design margin exists for functionality of structures, systems and components (SSCs), and as such there continues to be a reasonable assurance of operability relative to the plant SSCs should a seismic event occur.

- PG&E will incorporate the findings from AB 1632 report into their upcoming March 2015 probabilistic seismic hazard analysis as part of the NRC's post-Fukushima activities. The NRC believes this more rigorous analysis will provide the most accurate assessment of faults affecting the DCPP.

Background Documents

The following documents are not attached, but are available electronically:

Research Information Letter (RIL) 09-01, "Preliminary Deterministic Analysis of Seismic Hazard at Diablo Canyon NPP from Newly Identified Shoreline Fault," April 8, 2009

Licensee letter to NRC: "Report on the Analysis of the Shoreline Fault Zone, Central Coast California to the USNRC,"ADAMS ML110140400, January 7, 2011

Task Interface Agreement (TIA) 2011-010, "Concurrence on Diablo Canyon Seismic Qualification Current Licensing and Design Basis," August 1, 2011

TIA 2012-012, "Revised Response to Task Interface Agreement –Diablo Canyon Seismic Qualification Current Licensing and Design Basis, IA 2011-010 (TIA 2012-012) (TAC NOS. ME9840 and ME9841)," November 19, 2012

RIL 2012-01, "Confirmatory Analysis of Seismic Hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone," September 19, 2012 (ML121230035)

AB-1632 Report, "Diablo Canyon Units 1 and 2, Central Coastal California Seismic Imaging Project, Shoreline Fault Commitment," September 10, 2014 (ML14260A106)

Non-Concurrences & Differing Professional Opinions

Background

The former SRI at the Diablo Canyon Power Plant (DCPP) submitted non-concurrence papers (NCPs) in January 2011 and January 2012, followed by a Differing Professional Opinion (DPO) in July 2013 detailing a disagreement with the NRC about how new seismic information should be compared to the plant's current seismic license requirements. DPO 2013-02 restated the issues presented in NCP 2012-01 and added a concern that a license amendment was needed incorporate the Shoreline fault into Diablo Canyon's FSAR as described in the RIL 12-01 cover letter. The added concern was that the NRC did not review or take action on the Los Osos and San Luis Bay faults. In accordance with Management Directive 10.159, a DPO Ad Hoc Review Panel was established to review the DPO submittal, meet with DPO submitter, and issues a DPO report including conclusions and recommendations regarding disposition of the issues presented in the DPO. The panel completed its report in May 2014 and a decision on the DPO was rendered in letter dated May 29, 2014, to the DPO submitter. The DPO submitter appealed the decision to the EDO in accordance with the NRCs DPO process. The EDO completed his consideration of the DPO appeal on September 9, 2014, concluding that he was in agreement with the original decision.

The purpose of this communication plan is to provide key messages associated with the EDO's decision on the DPO appeal and public release of the DPO Case File.

Key Messages:

1. NRC strives to establish and maintain an environment that encourages all NRC employees and contractors to raise concerns and differing views promptly without fear of reprisal through various mechanisms. The free and open exchange of views or ideas conducted in a non-threatening environment provides the ideal forum where concerns and alternative views can be considered and addressed in an efficient and timely manner that improves decision making and supports the agency's safety and security mission.
2. The NRC appreciates members of the staff bring issues like this to its attention
3. The NRC encourages the use of non-concurrences and the Differing Professional Opinion (DPO) process
4. The NRC reviews all non-concurrences and DPOs thoroughly and in accordance with agency guidance (MD 10.158, MD 10.159) and believes that this is a healthy and necessary part the regulatory process
5. The NRC believes that, in the end, all of our regulatory decisions are better because of this process
6. The NRC does not tolerate retaliation against employees who engage in our processes for raising differing views (i.e., Open Door Policy, NCP, and DPO Program).
7. Persons serving on the DPO Panels are independent of the issues raised in the DPO
8. Upon disposition of the DPO via a Director's decision, the DPO submitter has appeal rights to the EDO
9. While the DPO is under review or appeal, NRC is prohibited from engaging in discussions with external stakeholders regarding the specifics of the of the DPO submittal

10. After the EDO's decision on the appeal, the DPO submitter can request that the DPO Case File be made public. Management performs a review consistent with agency policies to support discretionary release. Regarding the DPO for Diablo Canyon, the NRC has been and will continue to be as open and scrutable as possible while protecting the privacy rights of the individual
11. The NRC does not know the source of the public release of the Diablo Canyon DPO submittal prior to the EDO rendering a decision on the appeal
12. The NRC can, however, comment on a few aspects of the DPO appeal review
    - A Director's Decision has been made and the DPO appeal to the EDO has been finalized
    - The EDO and the DPO submitter have both agreed that the issues raised in the DPO do not present an immediate safety concern for Diablo Canyon
    - The NRC has sought permission from the DPO submitter to allow the DPO case file to be made publicly available and the DPO submitter has agreed
    - The DPO case file was made publicly available on September 10, 2014, following the EDO's appeal decision
13. Regarding the operational status of Diablo Canyon Power Plant, Units 1 and 2
    - The plant remains within its approved design and licensing basis
    - There are no current operability concerns resulting from the DPO
    - The recent earthquake in the Napa Valley did not reach Diablo Canyon – it was neither felt nor detected

Background Documents

[NON-PUBLIC] Non-concurrence NCP 2011-103, dated November 7, 2011

Non-concurrence NCP 2012-01, dated January 26, 2012 [publically available in ADAMS]

Differing Professional Opinion 2013-02, dated July 18, 2013
[Complete DPO Case File, dated September 9, 2014, is publically available in ADAMS - ML14252A743]

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Audience/Stakeholders

Internal

Allegations Coordinator
Office of Public Affairs (OPA)
Office of Congressional Affairs (OCA)
Office of Federal and State Materials and Environmental Management Programs (FSME)
Office of Nuclear Regulatory Research (RES)
Office of Nuclear Security and Incident Response (NSIR)
Office of Nuclear Material Safety and Safeguards (NMSS)
Office of General Counsel (OGC)
Office of the Inspector General (OIG)
Office of the Executive Director of Operations (OEDO)
Office of the Advisory Committee on Reactor Safeguards (ACRS)
Office of New Reactors (NRO)
Office of Nuclear Reactor Regulation (NRR)
Regions
Commission

External

General Public

San Luis Obispo Mothers for Peace (http://mothersforpeace.org/)

The Alliance for Nuclear Responsibility (http://a4nr.org)

Friends of the Earth (http://www.foe.org)

U.S. Congressional representatives for the area around DCPP:
- Senator Dianne Feinstein
- Senator Barbara Boxer
- Representative Lois Capps (CA-24th)

State and local Government agencies, including:
- California Governor's Office of Emergency Services,
- California Public Utilities Commission,
- California Independent Peer Review Panel (IPRP),
- California Energy Commission, and
- California Coastal Commission.

Industry groups (e.g., Nuclear Energy Institute)

Communication Team

The primary responsibility of the communication team is to ensure that it conveys a consistent, accurate, and timely message to all stakeholders. The team consists of the project management, technical, and communication staff named below.

Team Member	Position	Organization	Telephone
Troy Pruett	Division Director (Acting)	RIV/DRP	817-200-1291
Wayne Walker	Branch Chief	R-IV/DRP/RPB-A	817-200-1148
Ryan Alexander	Sr. Project Engineer	R-IV/DRP/RPB-A	817-200-1195
Thomas Hipschman	Sr. Resident Inspector - DCPP	R-IV/DRP/RPB-A	805-595-2354
John Reynoso	Resident Inspector - DCPP	R-IV/DRP/RPB-A	805-595-2354
Thomas Farnholtz	Branch Chief	RIV/DRS/EB1	817-200-1243
Jon Ake	Senior Seismologist	RES/DE/SGSEB	301-251-7695
Mike Markley	Branch Chief	NRR/DORL/LPLIV	301-415-5723
Eric Oesterle	DCPP Project Manager	NRR/DORL/LPLIV	301-415-1014
Scott Burnell	Public Affairs Officer	OPA	301-415-8204
Jenny Weil	Congressional Affairs	OCA	301-415-1691
Angel Moreno	Congressional Affairs	OCA	301-415-1697
Victor Dricks	Public Affairs Officer	RIV	817-200-1128
Lara Uselding	Public Affairs Officer	RIV	817-200-1519
Bill Maier	State Liaison Officer	RIV	817-200-1267
Elaine Keegan	License Renewal	NRR/DLR	301-415-8517
Cathy Kanatas	Attorney	OGC	301-415-2321
Nick DiFrancesco	Japan Lessons Learned	JLD	301-415-1115

Communications Tools

The communication team may and have used any of the following tools to communicate with our stakeholders:

Internal Briefings
The communication team will conduct internal briefings as required to keep internal stakeholders informed of activities and messages.

Public Meetings
In May 2009, a town hall public meeting was conducted in San Luis Obispo, California, to discuss the Shoreline Fault. In September 2010, a two-day public workshop was conducted in San Luis Obispo, California, to present topics of interest regarding seismic issues. In January 2011, a public meeting was conducted in San Luis Obispo, California, between DCPP licensee representatives and NRC staff to discuss the results of the Shoreline Fault Zone report. In November 2012, the NRC held a public meeting to discuss the results of its RIL in which the staff determined that the new SFZ is bounded by the Hosgri.

In December 2013, Region IV held a public meeting to discuss our annual assessment DCPP's performance in 2012 through mid-2013, and a similar meeting was held in May 2014 to discuss our annual assessment for the entire 2013 inspection year. During both these meetings, the staff provided status relative to DCPP's actions to date in response to the post-Fukushima actions, including the seismic and flooding reevaluation activities, and the mitigating strategies and spent fuel pool instrumentation orders.

Information Availability
The staff has placed publically available documents regarding seismic issues at the DCPP in ADAMS. Presentation materials and videos of all public meetings have been posted on the public NRC web site.

Press Releases/Meeting Notices
Issuance of press releases regarding key decisions and actions relative to DCPP will be considered by the Region as needed and consistent with OPA guidance. The most recent press release issued for DCPP announced the annual (2012) assessment public meeting in San Luis Obispo on December 18, 2013. A meeting notice for the next annual assessment meeting (for CY2013), held May 22, 2014, in San Luis Obispo was issued.

Past & Present Activities for Communicating with Stakeholders

	Activity / Report / Document Title (ADAMS/Reference number, as appropriate)	**Lead Office**	**Date**
1	Submitted 50.72 notification with an operability assessment to the NRC (Event Number: 44675)	PG&E	November 21, 2008
2	FAQ developed	Region IV	November 26, 2008
3	Summary of tsunami hazard (ML090820140 and ML083400496)	RES	December 8, 2008

	Activity / Report / Document Title (ADAMS/Reference number, as appropriate)	Lead Office	Date
4	Action Plan submitted to the NRC (ML090720505)	PG&E	December 17, 2008
5	The NRC concluded the Action Plan and schedule are reasonably complete and comprehensive in scope for this study. (ML090820113)	NRR	January 5, 2009
6	Issue summary of results of a deterministic seismic hazard assessment in a Research Information Letter (ML090330278)	RES	April 8, 2009
7	Presentation of more definitive results during a Seismological Society of America meeting. NRC staff members plan to attend.	USGS and PG&E	April 9, 2009
8	Issue a safety evaluation regarding the operability of DCPP based on a deterministic hazard assessment and a preliminary review of the tsunami hazard by RES.	NRR DE & DORL	April 30, 2009
9	Complete an operability evaluation of potential ground deformation	PG&E	April 30, 2009
10	Support a town-hall meeting, conducted by Region IV, in which the Shoreline Fault is expected to be discussed.	NRR, NRO, & RES	May 28, 2009
11	Meeting with PG&E to discuss status	PG&E	January 5, 2010
12	PG&E to submit Secondary Rupture Hazard Analysis	PG&E	February 29, 2010
13	NRR/ Division of Operating Reactor Licensing (DORL) to submit Research Assistance Request for review of Secondary Rupture	NRR	April 29, 2010
14	Meeting with RES, NRO, and NRR/DORL to discuss User Need Request to determine future actions regarding the Shoreline Fault	NRR	March 29,2010
15	RES to provide confirmatory review of secondary rupture analysis	RES	July 31, 2010
16	RES to review Evaluation of Shear-Velocity at the Independent Spent Fuel Storage Installation (ISFSI)	RES	July 31, 2010
17	Brief the Chairman on the status of the Shoreline Fault	NRR	August 11, 2010
18	Seismic Workshop in San Luis Obispo	Region IV	September 8 and 9, 2010
19	Complete seismicity studies	PG&E	December 2010
20	Complete geophysical studies	PG&E	December 2010
21	Complete geologic studies	PG&E	December 2010

	Activity / Report / Document Title (ADAMS/Reference number, as appropriate)	Lead Office	Date
22	Complete Shoreline Fault source characterization for integration into final report.	PG&E	December 2010
23	Complete ground motion studies to be integrated into final report.	PG&E	December 2010
24	Meeting on LTSP Amendment	NRR/ DORL	December 9, 2010
25	Interim reports will not be complete until PG&E integrates all data into final report; therefore, interim reports will not be submitted to stakeholders for review until all data are integrated into final report in December.	NRR/DE	January 2011
26	Complete final Shoreline report	PG&E	January 2011
27	Research User Need Request to support review of Final Shoreline Report and update RIL 09-001	NRR/ DORL	January 4, 2011
28	Regional Meeting in California to discuss final Shoreline Fault zone report	Region IV	January 19, 2011
29	Second Meeting on LTSP Amendment	NRR/ DORL	January 26, 2011
30	Third Meeting on LTSP Amendment	NRR/ DORL	March 2011
31	LTSP Amendment submittal (LAR 11-05)	PG&E	October 20, 2011
32	The NRC held an annual assessment meeting and discussed seismic at Diablo	RIV	June 2011
33	The NRC issued the RIL	NRR	October 10, 2012
34	Regional Meeting in California to discuss NRC's review of the Shoreline Fault	Region IV	November 28, 2012
35	Regional Meeting in California to discuss annual performance assessment for CY 2012 (Note – this meeting was held late in 2013 when the govt. shutdown resulted in cancellation of planned meeting 10/16/2013)	Region IV	December 18, 2013
36	Written response to questions posed by U.S. Senate Environmental & Public Works subcommittee staff	NRR (w/ OCA)	Late January 2014
37	Regional Meeting in San Luis Obispo to discuss annual performance assessment for CY 2013	Region IV	May 22, 2014
38	Diablo Canyon issued the AB-1632 seismic report to the state of California	NRR/JLD	September 10, 2014
39	NRC Blog "The Latest Chapter in Diablo Canyon's Seismic Saga"	RIV & OPA	September 12, 2014
40	COMMUNICATIONS PLAN – DIABLO CANYON POWER PLANT TOPICS OF INTEREST (Rev. 0)	RIV & HQ	October 1, 2014

	Activity / Report / Document Title (ADAMS/Reference number, as appropriate)	Lead Office	Date
41	SRM 14-0033, PUBLIC RELEASE OF REPORT, "A PRELIMINARY NUMERICAL STUDY OF THE HAZARD FROM LOCAL LANDSLIDE TSUNAMI SCENARIOS AT THE DIABLO CANYON SITE IN CENTRAL CALIFORNIA"	SECY	November 5, 2014
42	Written response to questions posed by U.S. Senate Environmental & Public Works subcommittee staff	NRR, RIV (w/ OCA)	November 5, 2014
45	COMMUNICATIONS PLAN – DIABLO CANYON POWER PLANT TOPICS OF INTEREST (Rev. 1) [Incorporates Ocean PAR Q&A, Sewell Report Release Decision, Answers to Senate EPW Questions, & AB-1632 Inspection Report]	RIV & HQ	November 26, 2014
43	Inspection Report 2014-502 – Includes Preliminary White EP finding & Associated SL III Violation; Choice Letter	RIV/DRS	ETA December 1, 2014
44	Inspection Report 2014-008 – Focused Baseline Inspection Report (Assessment of the PG&E Operability Determination associated with the information in the AB-1632/CCCSIP Report to the State of California)	RIV with NRR/DE Input	ETA NLT December 12, 2014

List of Applicable Acronyms and Abbreviations

2-D/3-D	Two-Dimensional/Three-Dimensional (relative to seismic mapping studies)
ACRS	NRC's Advisory Committee on Reactor Safety
ASLB	NRC's Atomic Safety and Licensing Board
ASW	DCPP Auxiliary Salt Water System
CLB	Current Licensing Basis
CRADA	PG&E – USGS Cooperative Research and Development Agreement
DCNPP or DCPP	Diablo Canyon (Nuclear) Power Plant
DDE	Double Design Earthquake (DCPP specific term, equivalent to SSE)
DE	Design Earthquake (DCPP specific term, equivalent to OBE)
DGEIS	Draft Generic Environmental Impact Statement
DPO	Differing Professional Opinion
GMC	Ground Motion Characterization (relative to SSHAC process)
HE	Hosgri Event (i.e., seismic event occurring on the Hosgri fault)
IPRP	Independent Peer Review Panel (multi-agency panel of seismic hazard specialists established by the California Public Utilities Commission)
LAR	License Amendment Request
LBVP	DCPP's Licensing Basis Verification Project
LTSP	PG&E's 1991 Long Term Seismic Program
NCP	Non-Concurrence Paper
NEPA	National Environmental Policy Act
NTTF	NRC's Japan Lessons Learned Near Term Task Force
OBE	Operating Basis Earthquake
PG&E	Pacific Gas & Electric
PGA	Peak Ground Acceleration
RG	Regulatory Guide
RIL	Office of Research Information Letter
RIS	Regulatory Information Summary
SER / SSER	Safety Evaluation Report / Supplement to Safety Evaluation Report
SFZ	Shoreline Fault Zone
SMA	Seismic Margin Analysis
SPRA	Seismic Probabilistic Risk Analysis
SRI	Senior Resident Inspector
SRP	Standard Review Plan
SSC	Systems, Structures, and/or Components
SSC	Seismic Source Characterization (relative to SSHAC process)
SSE	Safe Shutdown Earthquake
SSHAC	Senior Seismic Hazard Analysis Committee
TIA	Task Interface Agreement
TS	Technical Specification
U/FSAR	Updated/Final Safety Analysis Report

Timeline of Seismic Issues at DCPP

4/12/62	Initial version of 10 CFR 100 was issued (revised in 1996)
Prior to 1969	The original seismic study included geological and seismic investigations to validate the acceptability of the site. This included regional studies and detailed offshore investigations, including trenching, core drilling and geological mapping near the site. During this review, 10 CFR 100 was in the early stages of development, and the concepts of SSE and OBE were still being developed.
2/23/69	Construction permit issued for Unit 1. PG&E concluded, and the AEC concurred, that the earthquake design bases for Diablo Canyon would be a peak horizontal ground acceleration (PGA) of 0.4g for safety-related structures (DDE) and a PGA of 0.2g for operational-related structures (DE). These seismic design criteria were based on consideration of two design-basis earthquakes: a magnitude 7.25 earthquake on the Nacimiento fault 20 miles from the site, and a magnitude 6.75 aftershock at the site associated with a large earthquake on the San Andreas fault. It was also concluded that there was no surface displacement hazard in the site vicinity. This conclusion was based on the absence of any displacement of the 80,000 year-old and 105,000 year-old marine terraces underlying the site area.
12/9/70	Construction permit issued for Unit 2
2/20/71	Final version of 10 CFR 50, Appendix A, General Design Criteria, was issued
1971	Oil company geoscientists discovered an offshore fault zone, calling it the East Boundary Fault Zone. This zone later became known as the Hosgri fault.
11/13/73	Initial version of Appendix A to 10 CFR 100 was issued (further revised in 1977)
1973	Regulatory Guide (RG) 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," was issued. The RG allowed more damping to be used in seismic evaluations than had previously been used in the DE and DDE at Diablo Canyon. PG&E used the RG 1.61 values in the Hosgri evaluation and did not revise the DE or DDE.
1/10/77	Revision of Appendix A to 10 CFR 100 was issued
6/3/77	PG&E submitted their Hosgri Report. This evaluation used the latest regulatory guidance, including 10 CFR 100, Appendix A. The new guidance from the NRC was not used to revise the DE and DDE.
1977	The Hosgri analysis was accepted by the NRC and documented in SER 34.
5/26/78	NRC staff documents a significant portion of its review of PG&E's Hosgri Report and seismic reevaluation in Supplement No. 7 to the SER (SSER 7). In particular, SSER 7 notes "we [NRC staff] require that the plant design be shown

to be adequate for the Hosgri event and the applicant is proceeding with the work necessary to demonstrate this."

Timeline of Seismic Issues at DCPP (cont'd)

7/14/78	ACRS Letter to the Commission notes "The Applicant's analyses and tests related to the reevaluation of the structural and mechanical components for the Hosgri event have been subjected to an unprecedently intensive and comprehensive review by the NRC Staff...." However, the ACRS also noted that "the theory and analyses of earthquake and seismic wave generation, of seismic wave transmission and attenuation, and of soil-structure interaction are in a state of active development. The Committee recommends that the seismic design of Diablo Canyon be reevaluated in about ten years taking into account applicable new information."
11/15/78	NRC staff issues Supplement No. 8 of the SER (SSER 8) which includes a conclusion that "matters related to seismic design have now been resolved as discussed in this supplement. In part, the resolutions are based on requirements that we have stated." [The stated requirements included the design, analysis, and construction activities completed by PG&E in addressing the potential ground motion from an earthquake on the Hosgri fault.]
9/27/79	The Atomic Safety Licensing Board (ASLB) issues "...a Partial Initial Decision in this operating license proceeding, concluding that... (2) the Diablo Canyon plant will be able to withstand any earthquake that can reasonably be expected to occur on the Hosgri fault ...."
11/2/84	Operating license was issued for Unit 1. In response to the ACRS recommendation for PG&E to conduct a seismic reevaluation after approximately 10 years, the license contained License Condition 2.C.(7) requiring the licensee to perform further assessments of the seismic sources and ground motions applicable to DCPP, beyond that considered in the development of the Hosgri Event (HE). The Long Term Seismic Monitoring Program (LTSP) was developed by PG&E in response to License Condition 2.C(7).
8/25/85	Operating license was issued for Unit 2.
1989	Diablo Canyon submits their LTSP Report.
June 1991	The NRC reviewed and accepted the results of the LTSP, as documented in SSER-34. The SSER included the following statement in Section 1.4: "The staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis plus the Hosgri evaluation basis, along with the associated analytical methods, initial conditions, etc."
1992	The PG&E – USGS Cooperative Research and Development Agreement (CRADA) was created to improve rapid earthquake notifications and develop new geosciences data and advanced analysis methods leading to reducing earthquake risks in PG&E's service territory in northern and central California (including ongoing research and review of DCPP and nearby region).

Timeline of Seismic Issues at DCPP (cont'd)

12/11/96	Revision of 10 CFR 100 was issued
2006	A new phase of the CRADA is implemented and includes both a large set of new field studies and the application of new advanced seismological techniques to small magnitude recorded earthquakes.
11/14/08	PG&E notified the NRC of a potential line of epicenters about one mile offshore from the plant. This was followed up on 11/21/08 with Event Notification No 44675. This line of epicenters became known as the Shoreline Fault Zone.
Dec 2008	Using the LTSP methods, PG&E completes a seismic margin assessment which demonstrates that the Shoreline Fault is bounded by the Hosgri evaluations.
4/8/09	The NRC issued Research Information Letter (RIL) 09-01, "Preliminary Deterministic Analysis of Seismic Hazard at Diablo Canyon NPP from Newly Identified Shoreline Fault." This independent study of potential impacts concluded adequate seismic margin exists for the Shoreline Fault.
1/2/10	Public meeting between NRC and PG&E was held to discuss what was known about the Shoreline fault.
Jan 2010	PG&E submitted a progress report on the Shoreline Fault Action Plan.
Sept 2010	The NRC sponsored a seismic workshop in San Luis Obispo, CA, to help inform the public about seismic evaluations and design. Independent seismic experts were invited to make presentations.
Sept 2010	DCPP SRI becomes aware that the PG&E preliminary results show peak ground acceleration for the Shoreline Fault is in excess of the values used in the DDE.
Oct 2010	DCPP SRI questions PG&E on the capability/operability of SSCs to withstand the Shoreline Fault acceleration using the DE/DDE evaluation method.
Dec 2010	PG&E concluded that no operability evaluation was needed to compare the Shoreline Fault ground acceleration to the DE/DDE evaluations. PG&E believed that they had documented that the LTSP had contained new seismic information and the NRC had allowed PG&E to address it through a seismic margin assessment and seismic PRA.
1/7/11	PG&E issued the results of their seismic evaluation in the Shoreline Report: "Report on the Analysis of the Shoreline Fault Zone, Central Coast California to the USNRC," (ADAMS ML110140400). This report included deterministic evaluations for the Shoreline, Los Osos, and San Luis Bay earthquake faults, as well as probabilistic hazard calculations. The licensee concluded that each of these faults were bounded by the existing LTSP.

Timeline of Seismic Issues at DCPP (cont'd)

6/3/11	Region IV submits Technical Interface Agreement (TIA) memorandum 2011-010 posing questions needed to help resolve seismic operability evaluation issues involving Diablo Canyon's use of the Hosgri and LTSP methods as the only bounding design basis conditions for newly identified faults.
8/1/11	TIA 2011-010 was issued by NRR. The TIA concluded that, "New seismic information developed by the licensee is required to be evaluated against all three of the seismic design basis earthquakes and the assumptions used in the supporting safety analysis as described in the UFSAR. Comparison to the LTSP by itself is not sufficient to meet this requirement." **(NOTE: This TIA has been superseded by TIA 2012-012 dated November 19, 2012)**
9/18/11	NRC issues Inspection Report 05000275;323/201104.
10/20/11	In response to the operability evaluation violation in Inspection Report 05000275; 323/2011002, PG&E submitted a license amendment request (LAR) related to the Shoreline fault and methods of seismic evaluation.
11/23/11	PG&E initially commits to use the SSHAC Level 3 process to perform a probabilistic seismic hazard assessment. PG&E SSHAC Level 3 plan revised in July 2012 to reflect the NRC's evaluation request in March 2012 pursuant to the 10 CFR 50.54(f) letter. Once completed (anticipated March 2015), the PG&E SSHAC Level 3 study will update/replace the PG&E LTSP.
11/29/11	PG&E conducts SSHAC workshop #1 in San Luis Obispo, CA. The workshop is open to the public and presentations are posted on PG&E's website. NRC seismologists attend the workshop as observers. This workshop was for both the Seismic Source Characterization (SSC) and Ground Motion Characterization (GMC) portions of the SSHAC study. However, later they would decide to combine their GMC workshops with SONGS (SCE) and Palo Verde (APS). As such, the consortium ultimately re-conducted GMC SSHAC workshop #1, so this workshop essentially became SSC SSHAC workshop #1 for DCPP.
12/15/11	The NRC's Branch Chief for DCPP discussed the LAR with PG&E.
Feb 2012	Issuance of RIL 12-01 is delayed to support the agency's seismic and flooding 50.54(f) letter effort. An NRC inter-office agreement was reached to require PG&E to submit the results of the seismic hazard reevaluation in terms that compare the 50.54(f) letter results to the Diablo Canyon DDE.
03/12/12	50.54(f) Request for Information letters are issued for seismic and flooding hazard reevaluations. PG&E was specifically requested to report the seismic results by comparing them to the DDE (the SSE-equivalent for DCPP).
May 2012	Issuance of RIL 12-01 is delayed until assumptions concerning shear wave travel in generic vs. site-specific material are verified.

Timeline of Seismic Issues at DCPP (cont'd)

10/12/12	NRC issued RIL 2012-01. The cover letter stated that the NRC has concluded that the Shoreline fault was considered to be a lesser included case of the Hosgri event, and should be documented as such in the UFSAR.
Sept - Oct 2012	Internal NRC discussions occurred about the acceptability of the LAR under the acceptance review criteria. The NRC staff believed that PG&E thought they were asking for an administrative clarification by trying to get the HE declared as the SSE, however doing so would actually require a major review using the latest SRP criteria. DORL asks the RIV Branch Chief to discuss this difference with PG&E.
10/25/12	Diablo Canyon withdraws the LAR submitted in October 2011.
11/6/12	PG&E conducts SSC SSHAC workshop #2 in San Luis Obispo, CA. The workshop is open to the public and presentations are posted on PG&E's website. NRC seismologists attend the workshop as observers.
11/9/12	NRC held a meeting to discuss the results of RIL 2012 and concluded that ground shaking from the Shoreline fault earthquake scenarios are less than the Hosgri and LTSP ground motions for which the plant was previously evaluated.
11/19/12	NRC issued TIA 2011-010, "Revised Response to Task Interface Agreement – Diablo Canyon Seismic Qualification Current Licensing and Design Basis, TIA 2011-010 (TIA 2012-012) (TAC NOS. ME9840 and ME9841)"
11/27/12	PG&E completes seismic walkdowns for accessible areas required by 50.54(f) letter (ML123330362, ML123330375)
11/28/12	NRC held a public meeting in San Luis Obispo to help inform the public about the results of RIL 2012-01. Twenty-three NRC personnel from multiple offices were in attendance to explain different aspects, including post-Fukushima actions.
3/19/13	PG&E, Southern California Edison (San Onofre), and Arizona Power Service (APS - Palo Verde) jointly conduct GMC SSHAC workshop #1 in Oakland, CA. The workshop is not open to the public but presentations are posted on the Southwestern US Ground Motion Characterization Project website. NRC seismologists attend the workshop as observers.
June 2013	PG&E completes seismic walkdowns (including inaccessible areas) required by 50.54(f) letter.
June 2013	NRC completes inspection of seismic walkdown efforts.
Oct 2013	PG&E and APS jointly conduct GMC SSHAC workshop #2 in Berkeley, CA. The workshop is open to the public and presentations are posted on the Southwestern US Ground Motion Characterization Project website. NRC seismologists attend the workshop as observers.

Timeline of Seismic Issues at DCPP (cont'd)

March 2014	PG&E conducts SSC SSHAC workshop #3 in San Luis Obispo, CA. This workshop was open to the public, and was the final planned SSC SSHAC workshop.
March 2014	PG&E and APS jointly conducted GMC SSHAC workshop #3 in Berkeley, CA. This workshop was open to the public, and was the final planned GMC SSHAC workshop.
09/10/14	PG&E submits the AB-1632-mandated report "Central Coastal California Seimic Imaging Project" (CCCSIP) to State of California (IPRP to review). A copy is provided to NRC for review.

Future Events:

NLT 12/12/14	Region IV issues Inspection Report 2014-008 documenting the inspection of the operability determination evaluation completed by the PG&E associated with the AB-16320-mandated CCCSIP report.
March 2015	PG&E due to submit ground motion response spectrum to the NRC in response to March 2012 50.54(f) request. Current information from the SSHAC process supports the expected conclusion that the new ground motion response spectrum will be bounded by the original HE ground motion response spectrum.
June 2017	PG&E due to submit the results of the new Seismic PRA to the NRC in response to 50.54(f) request.

Design/Initial Licensing Basis Questions (DE/DDE/Hosgri/Tsunami)

1. **When was the Hosgri fault identified?**

   1971. During geological investigations in support of the DCPP operating license applications, oil company geoscientists discovered a major zone of faulting a few miles off shore. When the DCPP Final Safety Analysis Report (FSAR) was initially submitted for NRC review in 1973, it briefly described the offshore fault zone, calling it the East Boundary Fault Zone. The zone became known as the Hosgri fault.

2. **How was the Hosgri fault addressed in the licensing and design of DCPP?**

   Although the original OBE and SSE values of 0.2g and 0.4g were specified as part of the design basis (calculation) in 1968, the 0.75g Hosgri event was incorporated in the licensing basis (along with the OBE and SSE) prior to issuance of the DCPP units' operating licenses in 1984 and 1985.

   Upon discovery of the Hosgri fault (1971), PG&E reanalyzed and significantly upgraded the structures, systems, and components to accommodate the postulated ground motion values (up to 0.75g) from the Hosgri fault.

   The NRC staff reviewed and accepted PG&E's revised seismic analysis in the Supplement to Safety Evaluation Report 7 (SSER 7) in 1978.

   The Advisory Committee on Reactor Safeguards (in 1978) and Atomic Safety Licensing Board (in 1979) subsequently reviewed the licensee's and NRC staff analyses of the revised seismic impact and as-constructed tests and analyses (including the 0.75g value associated with the Hosgri event). Both the ACRS and ASLB concluded that the revised seismic design basis was appropriately conservative and there was reasonable assurance that both units could be operated at full power without undue risk to the health and safety of the public.

   (See Questions #4 & #5 below for additional specifics.)

3. **How are the design basis earthquakes defined? How are they different?**

   Each design basis earthquake is defined in terms of a peak ground acceleration and a corresponding response spectrum that is constructed of peak accelerations at various frequencies. The peak ground accelerations for each of the three design basis earthquakes are:

   DE: 0.2g
   DDE: 0.4g
   HE: 0.75g

   The DE response spectrum is enveloped by the DDE response spectrum at all frequencies, and the DDE response spectrum is enveloped by the HE response spectrum at all frequencies. In addition to the magnitudes of the spectra being different, the shapes of the spectra are also different. This is due to differences in how the response spectra were

developed as well as differences in the hypothetical earthquake that each design basis level is based on. Generally speaking, the response spectra were constructed based on modified versions of similar real earthquakes, normalized to the desired peak ground acceleration. Specific real earthquake records were carefully selected for the construction of each response spectrum, due to the fact that the magnitude of the earthquake and the distance from the site will cause the response spectra to peak at different frequencies.

4. Is it accurate to state that the DCPP operating license defines the DDE to be the SSE?

Yes. For the Diablo Canyon, the Double Design Earthquake (DDE) is equivalent to the Safe Shutdown Earthquake (SSE). During initial licensing of the Diablo Canyon site, two design basis earthquakes (ground motion) were established. The operating basis earthquake (OBE) represents the ground motion reasonably expected during the lifetime of the plant. At DCPP, this is called the Design Earthquake (DE), and is 0.2g. The safe shutdown earthquake is defined as having twice the acceleration of the operating basis earthquake to ensure safety margin. At DCPP, this is called the Double Design Earthquake, and is 0.4g. Pacific Gas and Electric (PG&E, the licensee) was required to show that all equipment necessary for continued operation without undue risk to the health and safety of the public would withstand the OBE/DE (i.e., remain functional), and that all safety-related equipment needed to safely shut the plant down and maintain a safe shutdown condition would withstand the SSE/DDE.

The licensee obtained the construction permits for both Diablo Canyon units and had begun plant construction before it became aware of the Hosgri fault, located offshore. The fault was studied in detail as part of a collaborative research program between PG&E and the U.S. Geological Survey (USGS). The NRC worked with the USGS office to ensure that the seismic hazard was properly characterized. This effort determined that the Hosgri fault could produce up to 0.75g ground motion at the Diablo Canyon site (called the Hosgri Evaluation, or HE). However the frequency of such a large earthquake was far smaller than what is considered under the safe shutdown earthquake requirements (i.e., unlikely to occur during the life of the plant), thus, it was categorized as an extreme event that was beyond the intent of the SSE requirements. However, the NRC did not grant authorization to operate the plant until the additional external hazard presented by the Hosgri fault was adequately addressed. PG&E addressed the issue by demonstrating that the plant equipment needed to safely shut down the plant and maintain a safe shutdown condition could also withstand 0.75g ground motion. This effort required re-evaluation, testing, and plant modifications beyond the approved DDE seismic design bases, and provided additional margin. This aspect of the design and licensing basis is unique to Diablo Canyon.

5. Is it accurate to state that the SSE/DDE requires the licensee to ensure that this type of earthquake would not damage the reactor pressure boundary components (which are needed to ensure the cooling water can cool the core while the reactor is shut down) using ASME code acceptance limits as per 10 CFR 50.55a?

Yes, the reactor pressure boundary components, and all safety-related equipment needed to safely shut the plant down and maintain a safe shutdown condition, must be able to withstand the SSE/DDE. At Diablo Canyon, this was demonstrated through a combination of calculations and tests. Because the ASME, Section III requirements for design of pressure boundary components and supports were not mandated by 10 CFR 50.55a until the mid-1980's, the acceptance criteria for DCPP rely on a combination of the ASME Code

and ANSI Code for piping, applicable at the time of initial licensing, that provide an equivalent level of safety assurance as required by 10 CFR 50.55a.

In addition, during the licensing of Diablo Canyon, PG&E demonstrated that all structures, systems and components that are required to remain functional following a DDE/SSE would also remain functional during a postulated HE event (0.75g). In most cases, following extensive plant upgrading, each component met the same standard for the HE as it had under the SSE. In a limited number of cases, the NRC approved alternative Code criteria; thus these components still meet the applicable Code. The limited cases were individually approved and specifically documented in the NRC's safety evaluation report. The NRC's approach and conclusions were also independently reviewed by the Advisory Committee on Reactor Safeguards (ACRS), and the Atomic Safety and Licensing Board (ASLB). The ACRS reviewed the NRC staff criteria utilized in the seismic re-evaluation of DCPP for the postulated Hosgri event and concluded that "...the staff's approach leads to an acceptable level of safety for DCPP." The ASLB held hearings on the DCPP seismic issues, and in a partial decision issued September 27, 1979, the ASLB concluded "...the Diablo Canyon plant will be able to withstand any earthquake that can reasonably be expected to occur on the Hosgri fault".

6. **Is it accurate to state that meeting the SSE/DDE also means that the licensee has to test and model some of the other reactor's structures, systems and components (SSCs) to ensure they can withstand the sort of shaking that could be caused by the SSE/DDE?**

   Yes, licensees are required to demonstrate through modeling, testing, and evaluation that specific structures, systems, and components are seismically qualified up to the DDE/SSE. As discussed in the answer to Question 5, this same rigor was also required for Diablo Canyon up to the HE (0.75g) design basis for the same equipment.

7. **Is it accurate to state that NRC did not require the licensee to meet all of the requirements of the SSE/DDE when it came to its Hosgri earthquake analysis (and that this is basically what you sent in the documents)?**

   No. The functional requirements remained the same, and were met. As indicated in the answer to Question 5, although a limited number of components relied on alternative Code acceptance criteria to demonstrate functionality up to the HE, those components still meet the applicable Code.

8. **What size tsunami is the plant designed/built to withstand?**

   The design basis tsunami is 35 feet. The DCPP site sits atop a coastal bluff, 85 feet above sea level, decreasing its vulnerability to a tsunami hazard. The only safety-related system that has components within the projected sea wave zone is the Auxiliary Saltwater (ASW) System. The ASW pump motors are housed in watertight compartments within the intake structure. The intake structure is designed with an elevated air intake (48 feet) so that the ASW pumps can operate during the design combination of a tsunami and storm wave run up.

Long Term Seismic Program (LTSP) Questions

1. **Why is there a LTSP?**

   In 1984 the NRC issued the operating license for Diablo Canyon Unit 1. The license included License Condition 2.C.(7) which required further assessment of the seismic sources and ground motions applicable to DCPP, beyond that considered in the development of the Hosgri Event. The LTSP was developed by PG&E in response to this NRC mandated License Condition.

2. **What is the Long Term Seismic Program (LTSP)?**

   The LTSP is a "seismic margin analysis" included as an original plant license condition. The LTSP addressed concerns at the time the plant was licensed; including uncertainty related to the Hosgri Fault. This license condition required PG&E to develop and implement the program to reevaluate the seismic design bases used for the DCPP.

3. **Did the NRC accept and approve use of the LTSP at Diablo Canyon?**

   In 1985 Diablo submitted the LTSP to the NRC. The LTSP included updated information on seismic hazard curves and a new deterministic ground motion response spectrum, governed by a Richter Magnitude 7.2 earthquake on the Hosgri Fault. The implementation of the LTSP included a deterministic seismic margin assessment and a seismic probabilistic risk assessment/seismic hazard analysis.

   In 1991 the NRC documented acceptance of the LTSP results in SSER-34. The LTSP used much more modern techniques than had been used for the DE and the DDE. The LTSP methods were consistent with the Hosgri event review method. Section 1.4 of SSER 34 stated, "The staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis plus the Hosgri evaluation basis, along with the associated analytical methods, initial conditions, etc." As part of the close-out of License Condition No. 2.C.(7), PG&E committed to maintain the LTSP .

4. **What is the difference between the Hosgri method and the LTSP method?**

   The LTSP was derived using the Hosgri event. The LTSP uses seismic response data in a statistical model that is 16% more conservative than the Hosgri event. New seismic data bounded by the LTSP model is well below the Hosgri evaluation method.

5. **Was Diablo Canyon's sole use of the LTSP appropriate for evaluating the Shoreline Fault?**

   No. In August 2011, the NRC issued TIA 2011-010. The TIA stated: "New seismic information developed by the licensee is required to be evaluated against all three of the seismic design basis earthquakes and the assumptions used in the supporting safety analysis as described in the FSARU. Comparison to the LTSP by itself is not sufficient to meet this requirement.

Following issuance of the TIA, the NRC documented a violation for the failure to perform an operability evaluation in NRC Report 05000275; 323/201105. The violation has low safety significance because NRC reviews concluded the Hosgri event bounds the Shoreline fault.

TIA 2012-012 was issued on November 19, 2012. This TIA superseded TIA 2011-010 and identified that the Shoreline scenario should be considered a lesser included case under the Hosgri evaluation and that the licensee should update the FSAR , as necessary.

The NRC's independent evaluation, documented in RIL 12-01, concluded that there is very little evidence that the Shoreline fault has ever been active. While its size was used to create a worst reasonable case ground motion curve, the region shows only some symptoms of a fault. There is no evidence that there is slippage, which would indicate this was an active fault in the past. Therefore, it is reasonable to bound the Shoreline fault by the LTSP/Hosgri method.

Shoreline Fault Questions

1. **When was the Shoreline Fault identified?**

   November 2008. PG&E notified the NRC of a potential line of epicenters about one mile offshore from the plant. This was followed up on 11/21/08 with Event Notification No 44675. This line of epicenters became known as the Shoreline Fault Zone.

2. **Where is the Shoreline fault located?**

   The closest segment of the Shoreline fault is located about 600 meters (1970 feet) southwest of the Power Block (the reactors) and 300 meters (985 feet) southwest of the Intake Structure.

3. **What are the characteristics of the Shoreline fault?**

   Studies conducted in 2009 and 2010 concluded that the Shoreline fault is a right-lateral strike slip fault, approximately 23 kilometers (14.3 miles) in length, with a slip rate between 0.2 and 0.3 millimeters per year. The closest segment of the fault is located about 600 meters southwest of the Power Block (the reactors) and 300 meters southwest of the Intake Structure.

   The studies also updated information on other faults in the region. The licensee concluded that predicted ground motions from the Hosgri fault have decreased and predicted ground motions from earthquakes on the Los Osos and San Luis Bay fault zones have increased.

4. **What method was used to evaluate the Shoreline fault?**

   In November 2008 Diablo Canyon used the LTSP method to evaluate the Shoreline Fault. The analysis demonstrated that the Shoreline Fault was bounded by the Hosgri Fault. The Shoreline Fault has not been evaluated using the DE/DDE method.

   In November 2012, the NRC concluded that it was appropriate to treat the Shoreline fault as a special case, and that using the same methods and criteria as was used for the LTSP/Hosgri, this case was bounded by the LTSP/Hosgri evaluation. This was because the Shoreline Fault frequency and peak ground acceleration at the plant were shown to be less than what LTSP/Hosgri would produce at the plant.

5. **Has the NRC evaluated the Shoreline Fault?**

   In April 2009 the NRC issued Research Information Letter (RIL) 09-01, "Preliminary Deterministic Analysis of Seismic Hazard at Diablo Canyon NPP from Newly Identified Shoreline Fault." This was an independent study of potential impacts of the Shoreline Fault. The NRC concluded that adequate seismic margin existed and the plant was safe to operate.

   The NRC concluded that it was appropriate to use the same methods and criteria as was used for the LTSP/Hosgri to evaluate the Shoreline fault. This was because the Shoreline

Fault frequency and peak ground acceleration at the plant were below what LTSP/Hosgri would produce at the plant.

Oct 2012 NRC issued RIL 2012-01 which evaluated the PG&E Shoreline Fault which indicated deterministically, the predicted ground motions were bound by LTSP and Hosgri ground motions.

6. Was Diablo Canyon's sole use of the LTSP appropriate for evaluating the Shoreline Fault?

No. The design and licensing basis for Diablo Canyon included two different evaluation methods with two different acceptance criteria which could be considered bounding. The licensee could not use the method that had been used to evaluate and accept the Hosgri event without the NRC agreeing that this was appropriate for new seismic information. No blanket set of rules was created from the original review that could be used without the NRC involvement.

In August 2011, the NRC issued TIA 2011-010. The TIA stated: "New seismic information developed by the licensee is required to be evaluated against all three of the seismic design basis earthquakes and the assumptions used in the supporting safety analysis as described in the FSARU. Comparison to the LTSP by itself is not sufficient to meet this requirement.

Following issuance of the TIA, the NRC documented a violation for the failure to perform an operability evaluation in NRC Report 05000275; 323/201105. The violation has low safety significance because NRC reviews concluded the Hosgri event bound the Shoreline fault.

The NRC's independent evaluation, documented in RIL 2012-01, concluded that there is very little evidence that the Shoreline fault has ever been active. While its size was used to create a worst reasonable case ground motion curve, the region shows only some symptoms of a fault. There is no evidence that there is slippage, which would indicate this was an active fault in the past. Therefore, it is reasonable to bound the Shoreline fault by the LTSP/Hosgri method.

7. Is there a threat of a tsunami from an earthquake occurring on the Shoreline fault zone?

No. PG&E's final report on the Shoreline fault zone indicates that the faulting mechanism is principally a right-lateral strike-slip. It is highly unusual for strike-slip faulting to cause a sizable tsunami. Most seismically induced tsunamis result from reverse faulting events, which have the capacity to cause rapid vertical displacement of the sea floor.

8. Why are they safe to operate?

Diablo Canyon has completed an operational evaluation to show the plant is safe to operate. The NRC reviewed and agreed the evaluation indicates the plant is safe to withstand earthquake hazards. Based on what the NRC has independently verified and detailed in RIL 2012-01, PG&E has completed an operational assessment in place to show that the plant is built to withstand the most severe expected ground motion at the site. If new information suggests the facility is not safe the NRC would take immediate action to resolve the issue.

9. Why is the NRC allowing Diablo Canyon to operate when experts inside and outside the NRC believe the Shoreline Fault represents a threat to the plant and serious questions have been raised regarding whether the facility meets NRC's license requirements?

When the NRC set out to perform an independent assessment of the Shoreline Fault we put together a team of NRC seismic experts as well as a team of consultants from outside the agency to ensure that we had the right expertise to perform the analysis and that the resulting document would be technically defensible. Our independent deterministic analysis of the Shoreline Fault determined that the ground shaking at the plant site that could result from earthquakes on the Shoreline Fault is bounded by the larger ground motions that could result at the plant site from earthquakes on the Hosgri fault. Based on the NRC's independent analysis of the fault displacements and ground motions from the Shoreline Fault, and the conclusion that these ground motions are less than those used in the Hosgri evaluation, the Shoreline Fault does not pose a new safety hazard to the Diablo Canyon Power Plant.

The former NRC senior resident inspector has questioned how the Shoreline Fault fits within the seismic design and licensing basis of Diablo Canyon, and the November 2013 Union of Concerned Scientists report echoes this concern. The NRC has determined that the ground motions from the Shoreline Fault should be considered a lesser included case under the Hosgri event, which the plant was evaluated for during original licensing.

The Hosgri evaluation was a major effort undertaken at the time of Diablo Canyon's licensing and underwent an extensive review by NRC seismic experts as well as consultants from outside the agency. For the Hosgri evaluation, PG&E performed a new set of calculations for equipment that was needed to safely shutdown the plant, they took out electrical cabinets and shake table tested them again to a higher level, and in cases where equipment could not meet the Hosgri level, plant modifications were made. Specifically, the turbine building required extensive modification, above ground outdoor water storage tanks were also modified significantly, and other major modifications were performed on the fuel handling building crane, turbine building cranes, electrical equipment, and the diesel fuel oil transfer system. Both the ASLB and the ACRS performed extensive reviews of the NRC's unique approach to the Hosgri Evaluation, and agreed with the staff's results. The plant was evaluated and licensed for the Hosgri ground motions; therefore the facility does meet NRC's license requirements.

10. Is it accurate to state that generally speaking, when a licensee does not meet its license requirements, there are 3 typical options: 1) NRC can order the reactor to shut down until the license requirements are met, 2) NRC can approve a set of mitigation measures the licensee could take that would satisfy the license requirements, or 3) NRC can approve a license amendment to alter the requirements of the license?

The options listed are valid approaches that could be used to address a licensee's failure to meet a requirement, but there are many other avenues available that licensees and NRC could consider to restore compliance and ensure that safety and security are maintained. NRC licensees are ultimately responsible for ensuring the safe operation of the plant and for meeting all the applicable requirements, and they have an obligation to recognize and address safety problems and potential non-compliances. If a licensee is not meeting those requirements, they must evaluate the issue and determine its safety significance, and take timely and appropriate corrective action to ensure adequate safety is maintained and to restore compliance. It should be recognized that not all departures from NRC requirements involve an impact to safety. There are substantial safety margins and redundancy built into nuclear power plants.

Many potential paths to resolution are built into the NRC's regulations or specified in the licenses and technical specifications. Some provide very specific actions the licensee must take, including shutting the reactor down if the issue cannot be resolved quickly, while others provide flexibility to identify and consider possible options. Depending on the situation and its significance, the NRC also has a number of enforcement options available (such as issuing violations, civil penalties, and Orders) if a licensee is not meeting its regulatory requirements. These options are described in the enforcement guidance listed on NRC's Enforcement web page at http://www.nrc.gov/about-nrc/regulatory/enforcement.html. The NRC Enforcement Policy describes the process NRC uses to assess and disposition violations of NRC requirements to ensure that NRC's enforcement actions properly reflect the significance of the violations.

Regardless of the resolution path followed, the NRC will take whatever action is necessary to ensure that adequate protection of public health and safety is maintained.

11. Is it accurate to state that NRC has not done any of the options listed in Question 11 (above) for DCPP to address NRC's own conclusion that the reactor has likely not met its SSE/DDE license requirements when it considers the ground shaking that could be caused by Shoreline earthquake?

No. As discussed below, the NRC has concluded that the existing DCPP design basis is sufficient to withstand ground motions from the Shoreline fault, and DCPP remains capable of withstanding ground shaking associated with the design characteristics approved for the DDE/SSE. The NRC has not identified a safety issue at Diablo Canyon in this case.

Shortly after PG&E notified the NRC of the potential for a new fault (later referred to as the Shoreline Fault), it provided the NRC with sets of initial scientific data and information related to the hypothesized fault. Based on this initial information, the NRC staff immediately performed a preliminary review of possible implications of the Shoreline fault to the DCPP to determine if an immediate safety concern existed. The NRC continued to review new data and information on the Shoreline fault resulting from a collaborative effort between the U.S. Geological Survey and PG&E.

The NRC's October 12, 2012, letter to PG&E provided, in part, a summary of the results of NRC's independent assessment (which included independent external experts) of the licensee's January 7, 2011 Shoreline Fault analysis report (the detailed assessment is in NRC's Research Information Letter (RIL) 12-01 "Confirmatory Analysis of Seismic Hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone"). The licensee's report provided NRC with new geological, geophysical, and seismological data on the Shoreline fault, obtained using up-to-date methods and technologies. The NRC's independent assessment determined that the Shoreline fault could create ground motion lower than the ground motion for which the plant had previously been evaluated (i.e., the 0.75g, HE). As such, the NRC's October 12, 2012, letter concluded that the existing design basis for the plant is sufficient to withstand ground motions from the Shoreline fault.

State of California Seismic Report (AB-1632/CCCSIP)

Note: This section is excerpted from the "Communications Plan – Diablo Canyon Power Plant Topics of Interest State of California Seismic Report" dated 9/10/14, as updated through 11/26/2014.

The updated information is predicisional pending completion and issuance of Inspection Report 2014-008 by Region IV (estimated issuance no later than December 12, 2014).

Background

California Assembly Bill 1632 (Blakeslee, Chapter 722, Statutes of 2006) directs the California Energy Commission to assess the potential vulnerability of California's largest baseload power plants, Diablo Canyon Power Plant and San Onofre Nuclear Generating Station to a major disruption due to a seismic event or plant aging; to assess the impacts of such a disruption on system reliability, public, safety, and the economy; to assess the costs and impacts from nuclear waste accumulating at these plants; and to evaluate other major issues related to the future role of these plants in the state's energy portfolio. The licensee has used the most state of the art methodologies using 2D and 3D mapping to compile this report. This is a different and more extensive data set than what was used for the 2011 Shoreline Fault evaluation.

The purpose of this communication plan is to provide key messages associated with the public release of this report.

Key Messages

- NRC Resident Inspectors and Region IV staff looked at the licensee's corrective action process assessment of new preliminary information concerning DCPP seismic and licensing bases. The licensee's information indicates reasonable assurance of public health and safety after a seismic event.

  PG&E's evaluation of the new seismic information, as documented in the report, concludes that the ground motions resulting from the faults discussed in the report (i.e., Shoreline, Hosgri, San Simeon, Los Osos, and San Luis Bay) continue to be bounded by the Hosgri analysis that was used during licensing of the plant.

- The NRC staff completed a review of the new information provided in the report in accordance with the NRC's inspection process, and documented it in Inspection Report 2014-008 (to be issued in early December 2014). The NRC staff did not identify any findings or violations associated with this review. The NRC determined that the results of the AB1632 report, in consideration of the past evaluations of the Hosgri spectrum, indicate considerable design margin exists for functionality of structures, systems and components (SSCs), and as such there continues to be a reasonable assurance of operability relative to the plant SSCs should a seismic event occur.

- PG&E will incorporate the findings from Bill 1632 report into their upcoming March 2015 probabilistic seismic hazard analysis as part of the NRC's post-Fukushima activities. The NRC believes this more rigorous analysis will provide the most accurate assessment of faults affecting the DCPP.

Questions and Answers

1. **What is the impact of this new information on seismic design and licensing of DCPP? Has the licensee entered this new information into the corrective action program and performed an operability evaluation?**

   In accordance with the guidance in the October 12, 2012, letter transmitting RIL 2012-001, PG&E has entered the new preliminary seismic information into their corrective action program. The results of the study are used to assess the impact on the current design and licensing basis of DCPP.

   In response to the NRC's review of the January 2011 Shoreline Fault Report, PG&E made the following commitment to the NRC:

   "If during PG&E's ongoing collection of seismic data, new faults are discovered or information is uncovered that would suggest the Shoreline fault is more capable than currently believed, PG&E will provide the NRC with an interim evaluation that describes actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the evaluations requested in the NRC staff's March 12, 2012, request for information (Reference 2)." Reference 2 is NRC letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012.

   NRC Resident Inspectors, and Region IV staff looked at the licensee's documentation in their corrective action process assessing new preliminary information concerning DCPP seismic and licensing bases. The licensee's information did not indicate there is an immediate threat to public health and safety nor did it call into question the ability of SSCs to perform their specified safety functions or necessary and related support functions.

   In addition, the NRC staff's review of the new seismic information in the report notes that PG&E's evaluation concludes that the faults discussed in the report (i.e., Shoreline, Hosgri, San Simeon, Los Osos, and San Luis Bay) continue to be bounded by the Hosgri analysis that was used during licensing of the plant.

   The NRC reviewed the new information provided in the report to the State of California including the Shoreline Fault characteristics, and the updated characteristics associated with the soil properties near the site. As to be documented in Inspection Report 2014-008 (to be issued in early December 2014), the NRC staff did not identify any findings or violations associated with this review. The NRC determined that the results of the AB1632 report, in consideration of the past evaluations of the Hosgri spectrum, indicate considerable design margin exists for the functionality of structures, systems and components (SSCs), and as such there continues to be a reasonable assurance of operability relative to the plant SSCs should a seismic event occur.

2. Has DCPP provided the seismic report to the NRC?

Yes, in accordance with the guidance in the October 12, 2012, letter transmitting RIL 2012-001, PG&E has provided the information to the NRC on September 10, 2014. In addition, the report was also provided to address license renewal issues (see question 8).

3. What does the new report state?

The new report includes information obtained from 2-dimensional and 3-dimensional high energy and low-energy seismic surveys both onshore and offshore of the DCPP site. The report provides more details on the regional faults, including more precise readings and additional data points where previously there were gaps. While a lot of the information from the previous Shoreline Fault report of 2011 was confirmed, some of the new data suggests the following:

- Reduced slip rate on the Hosgri Fault Zone and the Shoreline Fault Zone
- Postulated connection of the Hosgri and the San Simeon faults which could result in a longer, larger, but more infrequent earthquake
- The unique geometry involved with intersecting the Hosgri Fault and the Shoreline Fault Zone results in an extension of a few kilometers, but with a lower frequency of occurrence
- Extension of the Shoreline Fault zone southern segment
- The new data does not alter the assessment of the closest approach of the Shoreline fault to DCPP which is 600 meters from the power block and 300 meters from the intake structure. Because the Shoreline fault is considered to be somewhat longer, potential earthquakes could also occur farther from the plant.
- Updated analysis for the San Luis Bay, and Los Osos faults

The report concludes that the ground motions for the Hosgri and LTSP evaluations continue to bound potential ground motions from the regional faults, including the Shoreline Fault, San Luis Bay, Los Osos, San Simeon and Hosgri. The DCPP continues to operate safely within the seismic margin they were designed to withstand.

4. How will the AB 1632 seismic report be coordinated with the 50.54(f) required submittal in March 2015?

PG&E plans to incorporate the findings from Bill 1632 report into their ongoing analysis required by the NRC Post-Fukushima task force recommendations due in March 2015. The NRC believes this more rigorous analysis will provide the most accurate assessment of faults affecting the DCPP.

(If pushed on any "unknowns" in the report: If necessary, actions could include orders to halt operations if new information suggests there is an immediate safety concern. The NRC will fulfill its mandate to protect public health and safety).

(If asked what things the plant has done since Fukushima: It is important to note that DCPP is an industry leader in implementing FLEX which was a post-Fukushima industry initiative to

have extra equipment available remotely in the event of a beyond design basis event).

5. **Why is the report "final" for the state but "preliminary" for the NRC?**

   For the State, the report is final. For the NRC, this information is expected to be incorporated into the more comprehensive 50.54(f) analysis due to the NRC in March 2015. However, because the licensee must notify the NRC of any new seismic info, they have shared this report and an initial operability evaluation showing why the plant is safe to continue to operate. PG&E's evaluation of the new seismic information, as documented in the report, concludes that the ground motions resulting from the faults discussed in the report (i.e., Shoreline, Hosgri, San Simeon, Los Osos, and San Luis Bay) continue to be bounded by the Hosgri analysis that was used during licensing of the plant.

6. **Why didn't the NRC discover the length of the faults when it did its seismic review of the Shoreline fault in 2011 prior to issuing the RIL?**

   California Assembly Bill 1632 (Blakeslee, Chapter 722, Statutes of 2006) directs the California Energy Commission to assess the potential vulnerability of California's largest base-load power plants, Diablo Canyon Power Plant and San Onofre Nuclear Generating Station, to a major disruption due to a seismic event or plant aging; to assess the impacts of such a disruption on system reliability, public safety, and the economy; to assess the costs and impacts from nuclear waste accumulating at these plants; and to evaluate other major issues related to the future role of these plants in the state's energy portfolio. The licensee has used the most state-of-the-art 2D and 3D geophysical mapping techniques, which are commonly used in offshore petroleum resource exploration. These techniques provide higher-resolution data than what was available to characterize the Shoreline Fault in the 2011 report.

   The NRC has requested licensees of operating nuclear power reactors to submit a seismic hazard reevaluation using up-to-date methodologies and analyses which is due for DCPP in March 2015.

7. **What is the impact of this new information on seismic design and licensing of DCPP?**

   Based on the preliminary results of the studies that are under review, PG&E determined that the Shoreline Fault Zone may be capable of producing somewhat larger earthquakes than considered in the January 2011 Shoreline report. The NRC staff is independently assessing PG&E's determination. The process outlined in the 50.54(f) letter includes a detailed analysis of new seismic information (including shoreline faults and other faults around the plant). PG&E is scheduled to provide this assessment in the March 2015 time frame.

   The NRC staff completed its review of the licensee's operability determination associated with the new AB1632 report, and as documented in Inspection Report 2014-008, the NRC staff did not identify any findings or violations associated with this review. The NRC determined that the results of the AB1632 report, in consideration of the past evaluations of the Hosgri spectrum, indicate considerable design margin exists for the functionality of structures, systems and components (SSCs), and as such there continues to be a reasonable assurance of operability relative to the plant SSCs should a seismic event occur.

The staff will continue to review the information in the final results of the new data from the more rigorous analysis to be completed by March 2015 associated with the 50.54(f) request for information. The NRC staff will take appropriate regulatory action up to and including issuing Orders to ensure safe operation of the plant.

8. Will the Report be considered in the License Renewal Process?

Yes. In addition to the report being developed to address California Assembly Bill 1632, PG&E is providing the report to the State of California as part of the State of California coastal zone consistency certification associated with the license renewal for DCPP. The State of California coastal zone consistency certification is considered by the NRC during the license renewal environmental review process. In addition, the Staff will be reviewing the report to see how, if at all, it is relevant to the Staff's license renewal review. There is a contention related to the Shoreline fault and its consideration in the facility's severe accident mitigation alternatives analysis that is admitted in the license renewal proceeding (see ML14224A320; See CLI-11-11).

9. Why did the NRC send a letter to the licensee reconfirming the 50.54(f) request for information?

The NRC's October 12, 2012, letter required the licensee to provide to the NRC any new seismic information that indicated the presence of new fault(s) or suggested that the capability of the Shoreline fault was greater than previously evaluated. In addition, this same letter indicated that the NRC would use that new seismic information to independently assess whether the new fault(s) or new information related to the Shoreline fault challenges or changes the staff's current position that the motions associated with the Shoreline fault are at or below those levels of HE and LTSP ground motions previously evaluated. The NRC performed an independent assessment as discussed in the October 12, 2012, letter and did this in support of Inspection Report 2014-008. The staff believed that it was prudent to inform the licensee of the results of this independent assessment since those results would determine whether any regulatory actions may have been warranted based on a challenge to the NRCs position on ground motions. Based on those results, the NRC determined and communicated to the licensee that there were no challenges or changes to the staff position and that no alternative regulatory actions to those currently required by the 50.54(f) request for information were necessary.

Los Osos and San Luis Bay Faults

1. **Did the licensee and NRC evaluate the Los Osos and San Luis Bay Faults?**

   Yes. The Los Osos and San Luis Bay Faults are also near Diablo Canyon. They were studied and reported to the NRC as part of the LTSP. These faults were mentioned in PG&E's January 2011 Shoreline Report for comparison, though no new data on these faults was presented.

   The NRC reviewed these faults under its review of the LTSP, and concluded they were bounded by the Hosgri event and there was no specific need to discuss them in the Updated Final Safety Analysis Report.

Research Information Letter (RIL) Questions

1. **What is a RIL?**

   RILs are documents issued by the Office of Nuclear Regulatory Research (RES) to the NRC Regulatory and Regional Offices that summarize, synthesize, and/or interpret significant research information, provide new or revised information, and discuss how that information may be used in regulatory activities. RIL's allow NRC Regulatory Offices or Regional Offices to readily understand what new information has been obtained, and the significance of that information for current and future licensing reviews or other regulatory activities.

2. **What is the purpose of RIL 2009-001?**

   Research Information Letter (RIL) 2009-001 was issued on April 8, 2009. RIL 2009-001 was initiated for RES to complete an independent analysis of the Shoreline Fault.

   In RIL 2009-001, the NRC concluded that the seismic-loading levels predicted for a maximum magnitude earthquake on the Shoreline fault were below those levels for which the plant was previously analyzed in the LTSP.

3. **What is the purpose of RIL 2012-01?**

   Research Information Letter 2012-01 was issued on September 19, 2012. RIL 2012-01 was initiated for RES to complete an independent analysis of seismic hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone.

   The NRC's independent evaluation, documented in RIL 2012-01, concluded that there is very little evidence that the Shoreline fault has ever been active. While its size was used to create a worst reasonable case ground motion curve, the region shows only some symptoms of a fault. There is no evidence that there is slippage, which would indicate this was an active fault in the past. Therefore, it is reasonable to bound the Shoreline fault by the LTSP/Hosgri method.

4. **Now that the RILs have been issued, is PG&E done with its studies?**

   No. PG&E has performed additional studies including three-dimensional (3-D) marine and two-dimensional (2-D) onshore seismic reflection profiling, additional potential field mapping, Global Positioning System monitoring, and the feasibility of installing an ocean bottom seismograph network. These activities are being used to further refine the characterization of those seismic sources and ground motions most important to the DCPP: the Hosgri, Shoreline, Los Osos, and San Luis Bay fault zones and other faults within the Southwestern Boundary zone. PG&E are performing seismic and flooding walkdowns per the March 2012 50.54(f) request from the NRC. The results from PG&E's actions will be due in March 2015.

Release of Sewell Report, "A Preliminary Numerical Study of the Hazard from Local Landslide Tsunami Scenarios at the Diablo Canyon Site in Central California"

UPDATED 10/30/2014

Background (replaced in entirety with this revision)

The purpose of this communication plan is to support the public release of the following report in response to Freedom of Information Act (FOIA) request 2014-0467:

- "A Preliminary Numerical Study of the Hazard from Local Landslide Tsunami Scenarios at the Diablo Canyon Site in Central California," dated November 22, 2003. ADAMS package ML14276A548 contains the November 22, 2003, Draft Tsunami Report, a March 27, 2004, Center for Nuclear Waste Regulatory Analysis (CNWRA) letter transmitting the report to the staff and a February 27, 2006, staff assessment of the report.

This communication plan supplements the Diablo Canyon communications plan dated October 1, 2014, which can be found in ADAMS at Accession No. ML14274A224. Page 37 of this communication plan contains a discussion regarding the November 22, 2003, report. The portion of the October 1, 2014, communication plan related to the November 22, 2003, report has retained and integrated into this revised Q&A section. Although the majority of the information in the October 1, 2014, communication plan is relevant, the October 1, 2014, communication plan is based on the November 22, 2003, report itself not being publicly available. The October 1, 2014, communication plan recognized that the documents below were publicly available at the time:

- A January 17, 2006 letter transmitting the Seismic Issues Technical Advisory Group's evaluation of the November 22, 2003, report (ADAMS Accession No. ML060170138)

- A February 27, 2006, letter documenting the staff's disposition of the November 22, 2003, report (ADAMS Accession No. ML060460441)

In previous responses to Freedom of Information Act requests and in responses to Congressional inquiries the staff had withheld the November 22, 2003, report from public disclosure based on the information being predecisional. These documents include:

- In response to FOIA/PA-2011-0118, FOIA/PA-2011-0119, FOIA/PA-2011-0120, (ADAMS Accession No. ML13183A466)

- In an e-mail response dated June 12, 2014, to Mr. David Weisman of the Alliance for Nuclear Responsibility (ADAMS Accession No. ML14191A100)

- In an August 8, 2014, letter to Senator Boxer from Eugene Dacus, Acting Director NRC's Office of Congressional Affairs dated August 8, 2014 (ADAMS Package Accession No. ML14232A137).

In a letter dated October 10, 2014 (i.e., COMSECY-14-0033) (ADAMS Accession No. ML14281A006) the NRC staff requested approval from the Commission of it's proposal to release the November 22, 2003 study. As discussed in COMSECY-14-0033, even though the report did not contribute to the NRC's decision regarding the Diablo Canyon ISFSI and was considered preliminary, the staff has reassessed its previous basis for withholding the information and now plans to make the report accessible to the public in response to FOIA 2014-0467. As part of its reassessment the staff considered that since the issuance of the November 22, 2003, draft Diablo Canyon tsunami report and the 2004 Indian Ocean tsunami, the staff has completed several efforts to update tsunami hazard guidance. The table found in Attachment 2 to this communication plan shows the NRC staff's tsunami hazard guidance documents and activities for the last several years. To place the November 22, 2003, draft report in context the also intends to release the following documents in response to FOIA 2014-0467:

- A memorandum dated March 17, 2004, from the Center for Nuclear Waste Regulatory Analyses (CNWRA), "Tsunami Hazard Study for the Diablo Canyon Site in Central California," (ADAMS Accession No. ML050450106). This memorandum forwards the report to the NRC and states that CNWRA has not formally reviewed the report nor does the CNWRA accept the report. The memorandum states in part that "...the methodology is beyond state of the art, the uncertainties too large, and the results too speculative to be considered in current licensing decisions."

- A memorandum dated November 17, 2005, from Andrew Murphy to Michele Evans and Eugene Imbro, "Transmittal of Seismic Issues Technical Advisory Group Evaluation of Tsunami Hazard Report and Tsunami Hazard Research Plan," (ADAMS Package Accession No. ML053210413)

An August 7, 2014, news article provides the history on the draft Diablo Canyon tsunami report including the NRC's decision to not release the draft report. The article can be found at the following link:

http://www.newtimesslo.com/cover/11288/diablo-and-the-deep-blue-sea-a-shelved-nrc-tsunami-study-is-generating-new-interest-11-years-later/

Original Background (10/1/2014 Revision)

In March of 2004, as part of the review for the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) license review, the Center for Nuclear Waste Regulatory Analysis (CNWRA, a division of Southwest Research Institute), transmitted to the NRC a Tsunami Hazard Study that applied to the Diablo Canyon site. Within the scope of the CNWRA review of the Diablo Canyon ISFSI application, a CNWRA contractor, Dr. Robert Sewell, developed a draft report (the "Sewell Report") on the potential for landslide tsunamis impacting the site. The report postulated wave elevations from potential landslide tsunami scenarios that could exceed the current licensing basis tsunami height for Diablo Canyon.

CNWRA did not endorse Dr. Sewell's work, but did transmit the report to the NRC to inform the NRC of developments in the landslide generated tsunami area of study. The Sewell Report was reviewed by the Seismic Issues Technical Advisory Group (SITAG) in the NRC's Office of Research. In November 2005, the SITAG review concluded that the tsunami scenarios

contained in the Sewell Report were based on rudimentary modeling with little geologic and geotechnical data. SITAG further concluded that the study should not be used in any licensing actions.

In February 2006, the Office of Nuclear Reactor Regulation's (NRR's) Division of Engineering terminated further consideration of the Sewell Report, based on NRC participation in other cooperative government reviews of tsunami hazards under the President's Office of Science and Technology Policy (OTSP). NRR concluded that the OTSP effort would provide a more technically credible forum to broaden the NRC's understanding of tsunamis and inform efforts to reassess the tsunami design criteria in the Standard Review Plan. The design basis tsunami for DCPP considers distantly-generated tsunamis and locally-generated tsunamis. The design basis tsunami is the greater of these tsunamis and is 34.6 feet. Additionally, DCPP sits atop a coastal bluff, 85 feet above sea level, decreasing its vulnerability to a tsunami hazard.

The intake structure auxiliary salt water pump room vents are extended with steel snorkels to prevent seawater ingestion due to splash-up during the design flood event and is thus ensured of operation during extreme tsunami drawdown and combined tsunami and storm wave conditions. The only safety-related system that has components within the projected sea wave zone is the auxiliary salt water system. The auxiliary salt water pump motors are housed in watertight compartments within the intake structure. These compartments are designed for a combination tsunami-storm wave activity to elevation +48 feet MLLW (+45.4 feet MSL). The massive concrete intake structure ensures that the pumps remain in place and operate during extreme wave events. The intake structure is arranged to provide redundant paths for seawater to the pumps, ensuring a dependable supply of seawater.

A 2011 staff overview of Diablo Canyon (http://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML111290158) includes reference to a 2010 PG&E report on updated tsunami hazards (http://peer.berkeley.edu/tsunami/tasks/task-1-tsunami-hazard-analysis/), part of an academic review of California tsunami hazard.

After identification of the Shoreline fault in 2008, PG&E determined that the tsunami hazard threat from Shoreline is relatively small since it is a strike-slip fault rather than a reverse fault and therefore is not expected to exceed the design basis. The NRC performed an evaluation of the tsunami hazard and an independent deterministic seismic hazard analysis of the fault based on information provided by the licensee to confirm DCPP's conclusions regarding safe operation.

After the earthquake and tsunami in Japan on March 11, 2011, the NRC issued in March 2012 a request for information (also known as a 50.54(f) letter) requesting each nuclear power plant to re-evaluate the flooding hazard at their site, including tsunami. This re-evaluation is due from DCPP in March 2015. DCPP was given 3 years to respond due to the technical complexities involved in their re-evaluation.

Key Messages

- The NRC did not publicly release the draft report for two reasons:

  1. Although the staff considered the report during the licensing of DCPP Independent Spent Fuel Storage Installation (ISFSI), it did not form the basis for any licensing action

2. The draft report was considered preliminary and its conclusions based on limited data and methods

- The design basis tsunami for DCPP considers distantly-generated tsunamis and locally-generated tsunamis. The design basis tsunami is the greater of these tsunamis and 34.6 ft. Additionally, DCPP sits atop a coastal bluff, 85 ft above sea level, decreasing its vulnerability to a tsunami hazard

- The NRC licensed DCPP independent spent fuel storage installation based on its conclusion that the probable maximum tsunami flooding at the proposed ISFSI was adequately addressed by PG&E, based on the licensee's assessment of more recent tsunami information in the area, as well as the much higher elevations of the ISFSI site and transporter route relative to the previously analyzed hazard for the power plant. This conclusion was reached with full consideration of this report.

- The NRC is continuing to re-evaluate the tsunami hazard. After the earthquake and tsunami in Japan on March 11, 2011, the NRC issued in March 2012 a request for information (also known as a 50.54(f) letter) requesting each nuclear power plant to re-evaluate the flooding hazard at their site, including tsunami. This re-evaluation is due from DCPP in March 2015. DCPP was given 3 years to respond due to the technical complexities involved in their re-evaluation.

- DCPP's ability to withstand large waves and the maximum wave height at the intake structure were determined through extensive and detailed scaled model wave testing. The only safety-related components within the project sea wave zone (auxiliary salt water system) are protected from tsunami effects.

- The staff has recently reassessed its previous determination to withhold the November 22, 2003, draft report because the passage of time and subsequent NRC staff actions (as discussed in the table found in the attachment of this document) have made it unlikely that release of this report will result in any foreseeable harm and is therefore releasing it in response to a recent Freedom of Information Act (FOIA) request.

Questions and Answers

1. **Why is the staff releasing the report now when it previously withheld the report?**

   The staff has recently reassessed its previous determination to withhold the November 22, 2003, draft report because the passage of time and subsequent NRC staff actions (as discussed in the table found in the attachment of this Q&A) have made it unlikely that release of this report will result in any foreseeable harm and is therefore releasing it in response to a recent Freedom of Information Act (FOIA) request.

2. **Why did the NRC initially decide to not release the draft report to the public?**

   The NRC did not release the report for two reasons. First, although considered during the licensing of DCPP ISFSI, it did not form the basis for that licensing action. Second, the draft report was considered preliminary and its conclusions based on limited data and methods.

3. **What has the NRC done to evaluate the report?**

The NRC was assisted by experts from the Center for Nuclear Waste Regulatory Analyses (CNWRA) in performing a comprehensive safety and technical review of PG&E's license application for an ISFSI. The CNWRA, in turn, contracted the services of Dr. Robert Sewell specifically to assess PG&E's application with respect to tsunami hazards.

The NRC and CNWRA concluded that the probable maximum tsunami flooding at the proposed ISFSI was adequately addressed by PG&E, based on PG&E's assessment of more recent tsunami information in the area, and the much higher elevations of the ISFSI site and transporter route relative to the previously analyzed hazard for the power plant.

The CNWRA assessed the information in Dr. Sewell's report upon receiving it in November 2003. The report was forwarded for NRC's consideration in March 2004, after CNWRA had completed its review of the DCPP ISFSI application. Both the principal investigator for the CNWRA, an expert geologist and seismologist, and the NRC determined that the findings in the report were too speculative to be considered in current licensing decisions, but that they might warrant further review by the NRC. In February 2005, the NRC staff initiated further review of the report, consistent with its efforts to assess the December 2004 tsunami in southeast Asia. In May 2005, the NRC directed that a special review of the report be performed by NRC seismic experts. That group reached its preliminary conclusions on Dr. Sewell's report in November 2005, and completed its evaluation in January 2006.

4. **Why did it take the NRC group of seismic experts from SITAG so long to review the report?**

The NRC group made an initial assessment of the hazard and the credibility of the report and determined that a 6 to 12 month review time frame was appropriate in consideration of NRC's other high priority safety and regulatory issues currently under development. The preliminary assessment was completed in November 2005, with revisions in January 2006.

5. **Was the concern about the tsunami hazard potential at DCPP related to the December 2004 earthquake and tsunami in Sumatra and the Indian Ocean?**

No. The study of the potential tsunami hazard was performed during the licensing of the proposed ISFSI at the DCPP site, prior to the 2004 event in the Indian Ocean. In response to the tsunami in Sumatra and the Indian Ocean, PG&E initiated its own study of the tsunami threat to DCPP. A 2011 staff overview of Diablo Canyon (http://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML111290158) includes reference to a 2010 PG&E report on updated tsunami hazards (http://peer.berkeley.edu/tsunami/tasks/task-1-tsunami-hazard-analysis/), part of an academic review of California tsunami hazard.

Following the earthquake and tsunami in Japan on March 11, 2011, the NRC issued a demand for information letter (also referred to as a 50.54(f) letter) in March 2012 requesting information from each nuclear power plant regarding the current flooding hazard at the site, using the most up-to-date methodologies. DCPP's response to this letter is due March 12, 2015. DCPP was given three years to complete this re-evaluation due to the technical complexities involved at their site.

6. Are coastal nuclear facilities safe today from the tsunami threat?

Yes, the coastal nuclear facilities are safe from the threat of tsunamis. The NRC has licensed a number of nuclear facilities on the US Pacific, Atlantic, and Gulf coasts. These facilities include commercial nuclear reactors, ISFSI's, and research and test reactors (RTR's). The NRC has determined that public health and safety continue to be maintained for these facilities.

The NRC design philosophy for natural phenomena hazards, such as tsunamis, is based on consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area with sufficient margin for limited accuracy, quantity, and period of time for which the historical data have been accumulated. Existing nuclear facilities were licensed consistent with this design philosophy.

In general, facilities located along the Pacific coastline are more likely to be impacted by tsunamis due to the more frequent occurrence of large earthquakes along the margins of the Pacific Ocean. Deep ocean trenches off the coasts of Alaska, the Kuril Islands, Japan, and South America are well known for their large earthquakes and as potential sources for Pacific-wide tsunamis. The most recent damaging tsunami along the Pacific coast was caused by the 1964 magnitude 9.2 Alaskan earthquake with a wave height of 21 ft recorded in Crescent City, CA (located in far Northern California near the Oregon stateline), far from DCPP. Tsunamis generated by local sources, such as submarine landslides, also have the potential to impact coastal sites. The design of nuclear facilities along the Pacific coast was based on historical tsunami information and considered both local and distant tsunami sources as well as local onshore and offshore topography. Hence the facilities have been designed for the largest recorded tsunami effect with additional safety margins.Therefore, the NRC staff believes that there continues to be adequate protection of public health and safety from the tsunami threat to nuclear facilities on the Pacific coastline.

The design basis tsunami for DCPP considers distantly-generated tsunamis and locally-generated tsunamis. The design basis tsunami is the greater of these tsunamis and 34.6 ft. Additionally, DCPP sits atop a coastal bluff, 85 ft above sea level, decreasing its vulnerability to a tsunami hazard. DCPP's ability to withstand large waves and the maximum wave height at the intake structure were determined through extensive and detailed scaled model wave testing. The only safety-related components within the project sea wave zone (auxiliary salt water system) are protected from tsunami effects.

7. Has NRC assessed the potential impact of a tsunami, as predicted by Dr. Sewell, on the DCPP and public safety?

The NRC's assessment of potential tsunami hazard is ongoing and the DCPP response to the 50.54(f) letter is due March 2015. However, the NRC has concluded that the tsunami scenarios described by Dr. Sewell in the report are based on preliminary data and analysis and should not be used as a basis for any licensing action. NRC continues to evaluate the potential tsunami hazard for coastal nuclear facilities to ensure the most up to date scientific information is assessed and properly considered.

8. **What is the NRC doing to address any generic implications for coastal sites other than DCPP?**

   Following the March 11, 2011 earthquake and tsunami in Japan, the NRC issued a 50.54(f) letter requiring each nuclear plant to re-evaluate their flooding hazards, including tsunami. The NRC used criteria to prioritize each site's response due date, ranging from 2013 to 2015. Once the NRC receives the response, experts will evaluate the data to determine if additional action is required.

9. **Has NRC discussed the results of their review of the report with Dr. Sewell and has he responded to NRC's comments?**

   The NRC has discussed the findings with the NRC's contractor CNWRA, who subcontracted the study to Dr. Sewell.

10. **If the NRC was dissatisfied with the draft report it received from Dr. Sewell, why didn't it return the report to him and require he make the changes necessary to address the staff's concerns?**

    The CNWRA did not endorse this report and provided it to the NRC for information (see Q&A 2).

    After the SITAG's findings that the report's conclusions were based on limited data and methods, the NRC determined that it would be more effective to spend its resources participating in several ongoing initiatives to reassess tsunami hazards sponsored by NOAA, USGS, and the White House Office of Science and Technology Policy, rather than further reviewing or revising Dr. Sewell's report.

    Following the March 11, 2011 earthquake and tsunami in Japan, the NRC issued a 50.54(f) letter requiring each nuclear plant to re-evaluate their flooding hazards, including tsunami. The NRC used criteria to prioritize each site's response due date, ranging from 2013 to 2015. Once the NRC receives the response, experts will evaluate the data to determine if additional action is required.

11. **What actions has the NRC taken to ensure it is correct in addressing the areas it used to discount Dr. Sewell's report?**

    A 2011 staff overview of Diablo Canyon (http://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML111290158) includes reference to a 2010 PG&E report on updated tsunami hazards (http://peer.berkeley.edu/tsunami/tasks/task-1-tsunami-hazard-analysis/), part of an academic review of California tsunami hazard.

    Following the March 11, 2011 earthquake and tsunami in Japan, the NRC issued a 50.54(f) letter requiring each nuclear plant to re-evaluate their flooding hazards, including tsunami. This re-evaluation must be completed using current methodologies and data. Therefore, the re-evaluation, when received in March 2015, will address these areas. The NRC will then review and evaluate this response and determine what, if any, actions are needed.

12. How has the tsunami hazard been changed based on the identification of the Shoreline fault?

After identification of the Shoreline fault in 2008, PG&E determined that the tsunami hazard threat from Shoreline is relatively small since it is a strike-slip fault rather than a reverse fault and there is not expected to exceed the design basis. The NRC performed an evaluation of the tsunami hazard and an independent deterministic seismic hazard analysis of the fault based on information provided by the licensee to confirm DCPP's conclusions regarding safe operation.

13. Why hasn't anything been done with this report post-Fukushima?

After the SITAG's findings that the report's conclusions were based on limited data and methods, the NRC determined that the report should not be used as a basis for any licensing action.

However, following the March 11, 2011 earthquake and tsunami in Japan, the NRC issued a 50.54(f) letter requiring each nuclear plant to re-evaluate their flooding hazards, including tsunami. This re-evaluation must be completed using current methodologies and data. Therefore, the re-evaluation, when received in March 2015, will address these areas. The NRC will then review and evaluate this response and determine what, if any, actions are needed.

Attachment – List of Tsumani Guidance Documents, Workshops, and Publications That Have Been Issued Since the November 22, 2003, draft Diablo Canyon Tsunami Report

Update	Guidance Document	Reason for Update
March 2007	NUREG-0800, "Standard Review Plan," (SRP) Section 2.4.6, "Probable Maximum Tsunami Hazards," Revision 3 (ADAMS Accession No. ML070160659)	To address the needs identified in NUREG-0800, "Standard Review Plan" the agency formed a tsunami research program.
August 22, 2008	U.S. Geological Survey (USGS) updated report to the NRC, "Evaluation of Tsunami Sources with the Potential to Impact the U.S. Atlantic and Gulf Coasts"	The NRC tasked USGS to prepare an evaluation of tsunami sources and their probability to impact U.S. coasts along the Atlantic and Gulf of Mexico.
March 2009	NUREG/CR-6966, "Tsunami Hazard Assessment at Nuclear Power Plant Sites in the United States of America - Final Report (ADAMS Accession No. ML091590193)	Describes the tsunami phenomenon with the focus on its relevance for hazard assessment at nuclear power plant sites.
2009 to 2011	The following publications were issued and workshops were held: • 2009 - Publication of special edition of *Journal of Marine Geology* (Vol. 264, Issues 1-2) dedicated to NRC funded USGS research on landslide-based hazard including probabilistic tsunami hazard analysis (PTHA) • 2011 - MIT/Woods Hole NRC/USGS PTHA Workshop Report, "Landslide Tsunami Probability," (ADAMS Accession No. ML12272A130) • 2011 - USGS Open Report 2010-1239, "Identification of Tsunami Deposits in the Geologic Record: Developing Criteria Using Recent Tsunami Deposits" • 2011 - USGS Open Report 2010-1172, "Database of Recent Tsunami Deposits" • 2011 - NRC participates in the International Atomic Energy Agency Extrabudgetary Programme of the International Seismic Safety Centre (ISSC EBP). This is a series of technical study projects supported by Member State institutions that collaboratively contribute to enhance seismic safety and safety against external hazards at nuclear installations. The NRC co-chairs two working groups in the tsunami safety area: • WG5-1 Tsunami Hazard • WG5-2 Tsunami Design and PSA	
January 4, 2013	JLD-ISG-2012-06, "Guidance for Performing a Tsunami, Surge, or Seiche Hazard Assessment" (ADAMS Accession No. ML12314A412)	This interim staff guidance (ISG) was issued to describe to stakeholders methods acceptable to the NRC staff for performing a tsunami, surge, or seiche hazard assessment for external flooding as described in the NRC's March 12, 2012, request for information that was sent pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.54(f) (ADAMS Accession No. ML12053A340).

Non-concurrence and DPO Questions

Refer to "Communications Plan – Diablo Canyon Power Plant Topics of Interest Differing Professional Opinion and Appeal" for most current information.

NOTE: General FAQs on the DPO Program are included on the DPO Web site (look under Employee Resources—Employee Concerns.

1. Was the former DCPP SRI reassigned because he filed two non-concurrences?

No. The former DCPP SRI was not reassigned. He applied for an instructor position in his area of expertise at the NRC's technical training center in Chattanooga, TN, at about the time he submitted his non-concurrence in accordance with the Non-Concurrence Process described in MD 10.158. He was competitively selected for this sought-after position, and reported to his new assignment in September 2012. Resident inspector assignments are limited to 7 years to ensure objectivity. It is common for resident inspectors to apply for their next job when a desirable position comes open.

2. When were the non-concurrences filed?

Two non-concurrences were filed by the DCPP SRI.

11/7/11. The DCPP SRI submitted NCP 2011-103, on inspection report 05000275; 323/201104.

1/26/12. The DCPP SRI submitted NCP 2012-01, on inspection report 05000275; 323/201105.

3. What were the non-concurrences?

Both non-concurrences involve the same subject; regulatory actions in response to the discovery of the Shoreline Fault.

NCP 2011-103 was filed by the DCPP SRI on the basis that no violation was issued (as he had submitted in the draft report) related to operability evaluation of the Shoreline fault in Report 2011-04. NCP 2011-103 was dispositioned finalizing the violation in IR 2011-05 issued on 2/14/12. (The employee requested that the NCP be non-public.)

NCP 2012-01 was filed by the DCPP SRI because the SRI believed the violation in NRC IR 2011-05 should be for an inadequate operability evaluation of the Shoreline Fault rather than not doing an operability evaluation until June 2012. The SRI believed the facility should be shutdown or the license amended to reflect the Shoreline fault. NCP 2012-01was discussed with NRC stakeholders representing NRR/DE, NRR/DORL, RIV, and RES. NCP 2012-01 was dispositioned as a multi-office staff position which concluded that a violation for having no operability evaluation from January 2011 to June 2011 existed because the licensee completed the RIS 2005-020 immediate (interim) operability evaluation in June 2011. Additionally, the offices involved in NCP 2012-01 acknowledged that a final operability evaluation could not be completed by the licensee until the NRC decided what requirements and methods should be applied to new seismic information. At the time of Inspection Report 2011-05 issuance it was expected that the requirements and methods

would be addressed in a License Amendment Request that was under consideration. However, by 3Q/2012, enough progress had been made on RIL 2012-01 for NRR and RES to conclude that the LTSP method of analysis used in the immediate operability assessment was sufficient to evaluate the Shoreline fault and that the Shoreline Fault should be considered a lesser included case of the Hosgri event. (The employee supported public release of the NCP ADAMS ML121A173.)

4. **When was the DPO filed?**

July 18, 2013. The former DCPP SRI filed Differing Professional Opinion (DPO) 2013-02 associated with the regulatory response following the discovery of the Shoreline Fault.

NRC employees are encouraged to file a DPO if they believe an agency decision is in error. The DPO process is in keeping with the agency's open and collaborative working environment.

5. **What is the DPO?**

DPO 2013-02 restated the issues presented in NCP 2012-01 and added a concern that a license amendment was needed incorporate the shoreline fault into Diablo Canyon's FSAR as described in the RIL 12-01 cover letter. The added concern was that the NRC did not review or take action on the Los Osos and San Luis Bay faults.

6. **What is the status of the DPO?**

A decision on the DPO was issued by the Office Director for NRR on May 29, 2014 consistent with the NRC's process included in MD 10.159. The DPO submitter appealed this decision to the EDO on June 23, 2014, and the appeal was thoroughly evaluated by the EDO and decision on the appeal was rendered on September 9, 2014.

As part of the agency's open and collaborative work environment, the NRC has established the DPO program as a means for employees to have their concerns reviewed by high level managers. The DPO Program is a formal process that allows all employees and contractors to have their differing views on established, mission-related issues considered by the highest level managers in their organizations, i.e., Office Directors and Regional Administrators. The process also provides managers with an independent, three-person review of the issue (one person chosen by the employee). After a decision is issued to an employee, he or she may appeal the decision to the Executive Director for Operations (or the Chairman for those offices reporting to the Commission).

7. **Will the decision regarding the DPO be made public?**

The DPO Case File was made publicly available and is available in ADAMS (ML14252A743).

The NRC supports openness and will include a summary of the disposition of the DPO in the Commission's Weekly Information Report included on the NRC Web site (see Commission Documents under the Document Collections in the NRC Library). The DPO submitter was contacted regarding the EDO's decision on the DPO appeal and has

communicated support for the public release of the DPO Case File (with appropriate redactions). The DPO Case File was made publicly available after the EDO's DPO appeal decision (on September 9, 2014).

8. Was the SRI wrongfully reassigned after filing two non-concurrences and a DPO?

No. As noted in Q&A #1 above, the SRI applied for and was selected to a highly sought instructor position at the NRC's Technical Training Center. The NRC does not tolerate retaliation for engaging in the NCP or the DPO Program and both MDs reiterate this policy and direct employees to resources in the event they believe that they have been retaliated against.

9. Would the DPO panel's conclusions or the DPO appeal decision change based on the new seismic information found in the State of California report?

PG&E, the licensee for Diablo Canyon, is providing a report to the State of California that includes the results of its most recent evaluation of the seismic hazards for the Diablo Canyon facility. The report was provided to the State of California on September 10, 2014, and a copy was also provided to the NRC. Prior to performing a detailed review of this report, the NRC is not able to ascertain whether the new seismic information contained in the report would change the DPO panel's conclusions or the DPO appeal decision. The NRC understands that PG&E plans to incorporate the findings from this report into their ongoing probabilistic seismic hazards analysis required by the NRC Post-Fukushima task force recommendations that are due in March 2015. The NRC believes this more rigorous analysis will provide the most accurate assessment of faults affecting the DCPP. In addition, the NRC staff's review of the new seismic information in the report notes that PG&E's evaluation concludes that the ground motions resulting from the faults discussed in the report (i.e., Shoreline, Hosgri, San Simeon, Los Osos, and San Luis Bay) continue to be bounded by the Hosgri analysis that was used during licensing of the plant.

NRC Resident Inspectors and Region IV staff looked at the licensee's corrective action process assessment of new preliminary information concerning DCPP seismic and licensing bases. The licensee's information indicates reasonable assurance of public health and safety after a seismic event.

The NRC staff will review the new information provided in the report in accordance with the NRC's inspection process. The NRC will take additional regulatory action as appropriate if the new information associated with the Faults around DCPP cause NRC to question PG&E's conclusions.

10. Timeline of Events associated with the NCPs and DPO:

11/7/11	DCPP SRI submits Non-Concurrence NCP 2011-103. The SRI non-concurs on Inspection Report 05000275; 323/2011004 because the proposed violation involving the Shoreline Fault operability evaluation was not issued.
11/9/11	NCP 2011-103 is dispositioned by Region IV. The operability evaluation issue was documented as an Unresolved Item in Inspection Report

05000275; 323/2011002 and dispositioned as a violation in Inspection Report 05000275; 323/2011005.

4Q/2011	The DCPP SRI continues to question the enforcement action associated with the Shoreline Fault operability evaluation. Several meetings between multiple NRC offices are conducted to discuss the Shoreline Fault.
1/26/12	DCPP SRI submits NCP 2012-01, non-concurring on inspection report 05000275; 323/201105. The SRI believed the violation in NRC Report 2011-05 should be for an inadequate operability evaluation of the Shoreline Fault rather than not doing an operability evaluation until June 2012. The SRI believed the facility should be shutdown or the license amended to reflect the Shoreline fault. (ADAMS Accession Number ML12151A173).
Feb 2012	DCPP SRI applies for instructor position vacancy at the Technical Training Center (TTC).
Feb 13, 2012	Response to NCP 2012-01 issued. NCP 2012-01 was discussed with NRC stakeholders representing NRR/DE, NRR/DORL, RIV, and RES. NCP 2012-01 was dispositioned as a multi-office staff position which concluded that a violation for having no operability evaluation from January 2011 to June 2011 existed because the licensee completed the RIS 2005-020 immediate (interim) operability evaluation in June 2011. Additionally, the offices involved in NCP 2012-01 acknowledged that a final operability evaluation could not be completed by the licensee until the NRC decided what requirements and methods should be applied to new seismic information. At the time of Report 2011-05 issuance it was expected that the requirements and methods would be addressed in a License Amendment Request that was under consideration. However, by 3Q/2012, enough progress had been made on RIL 2012-01 for NRR and RES to conclude that the LTSP method of analysis used in the immediate operability assessment was sufficient to evaluate the Shoreline fault and that the Shoreline Fault should be considered a lesser included case of the Hosgri event. (ADAMS Accession Number ML12151A173).
02/12-07/13	RIV management frequently encourages the DCPP SRI to submit a Differing Professional Opinion (DPO) during several discussions involving seismic issues.
May 2012	DCPP SRI is selected for instructor position at the Technical Training Center (TTC).
Sept 2012	The (now former) DCPP SRI reports to the TTC as a training instructor.
7/18/13	Former SRI submits a DPO regarding the agency's regulatory actions associated with the Shoreline Fault.
8/2/13	DPO 2013-002 was assigned to NRR for an independent review.

9/3/13	Director, NRR establishes a DPO Ad Hoc Review Panel (DPO Panel) for DPO 2013-002 with three NRC staff members who have been independent of the initial concerns raised by the former DCPP SRI.
4/3/14	DPO Panel completes its review of DPO 2013-002 and submits its report to the Director, NRR.
5/29/14	Director, NRR issues his decision on DPO 2013-002 by memo to the former DCPP SRI.
6/23/14	Employee submits DPO appeal.
6/27/14	Director, NRR provided Statement of Views on contested issues in appeal.
7/7/14	DPO appeal package provided to EDO for disposition and decision.
8/25/14	Associated Press article released discussing the DPO.
9/9/14	EDO renders final decision regarding DPO. DPO submitter agrees to public release of DPO. DPO Case File made publicly available.

RIS 2005-20, 2013-005, and Operability Evaluation Questions

1. **What is a RIS?**

   A RIS is a Regulatory Issue Summary. Regulatory issue summaries are used to (1) communicate and clarify NRC positions on regulatory matters, (2) inform the nuclear industry of opportunities for regulatory relief, (3) communicate NRC endorsement of industry guidance, (4) provide guidance on the scope of information that should be provided in licensing applications, and (5) request the voluntary participation of the nuclear industry in NRC-sponsored pilot programs or the voluntary submittal of information. A RIS does not communicate new or revised NRC requirements.

2. **How does the RIS apply to failures to meet design requirements (e.g.; General Design Criteria (GDC))?**

   RIS 2013-005 restated the NRC's position regarding operability evaluations for nonconforming conditions related to design and licensing requirements. The failure to meet GDC, as described in the licensing basis (e.g., nonconformance with the Current Licensing Basis (CLB) for protection against flooding, seismic events, tornadoes) should be treated as a nonconforming condition and is an entry point for an operability determination if the nonconforming condition calls into question the ability of SSCs to perform their specified safety function(s) or necessary and related support function(s). If the licensee determination concludes that the Technical Specification (TS) SSC is nonconforming but operable or the necessary and related support function is nonconforming but functional, it would be appropriate to address the nonconforming condition through the licensee's corrective action program.

   If the licensee's evaluation concludes that the TS SSC is inoperable, then the licensee must enter its TS Action Statement and follow the applicable required actions.

3. **Can the licensee have a nonconformance with requirements and still operate?**

   Yes. RIS 2005-20, Revision 1, "Revision to NRC Inspection Manual Part 9900 Technical Guidance, 'Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety,'" describes the actions licensees must take to evaluate nonconforming conditions.

   For the Shoreline fault, the NRC issued a violation for Diablo Canyon's failure to perform an operability evaluation. The licensee completed the evaluation and the NRC concluded that the guidance in RIS 2005-20 had been met. In particular:

   The use of the LTSP was appropriate to characterize and bound the faults as part of the operability evaluation process. Additionally, the LTSP had already been reviewed by the NRC and is consistent with the Hosgri evaluation method which is included in the UFSAR. It is expected that final corrective actions will involve an update to the UFSAR that describes current seismic information and how new seismic information will be evaluated.

Enforcement Questions

1. **Did the NRC issue any violations involving the Shoreline Fault?**

   Yes. Inspection Report 2011-05 documented a violation for the failure to perform an operability evaluation of the Shoreline fault.

2. **What corrective actions did Diablo Canyon take in response to the violation?**

   Diablo Canyon completed an operability evaluation for the Shoreline fault which met the guidance in RIS 2005-020. Diablo Canyon submitted a LAR to clarify the UFSAR; however, the LAR has since been withdrawn. Diablo Canyon is currently performing seismic evaluations to support their response to the NRC's March 2012 50.54(f) letter.

Current Licensing Questions

1. **What are the Current Seismic Qualification Design Basis requirements at DCPP?**

The DCPP units are designed to comply with the "General Design Criteria for Nuclear Power Plant Construction Permits," published in July 1967, in that the Units 1 and 2 construction permits were issued in February 1969 and December 1970, respectively. These requirements pre-date the General Design Criteria which were included in Appendix A to Part 50, General Design Criteria for Nuclear Power Plants that went into effect in 1971. As such, DCPP is considered a "Pre-GDC" plant.

However, the DCPP FSAR describes how the 1967 General Design Criteria for Construction Permits are intended to meet the NRC General Design Criteria published in Appendix A to 10 CFR Part 50 in 1971. Specifically, the FSAR indicates that:

> "The DCPP Units 1 and 2 designs conform to the intent of Criterion 2 [published in 1971]. The components, structures and systems important to safety have been designed to accommodate without loss of capability the most severe natural phenomena recorded for the site and surrounding areas with appropriate combinations of postulated accidents and natural phenomena. The importance of the safety functions of the various items has been considered."

Appendix A to Part 50, General Design Criteria for Nuclear Power Plants, *Criterion 2, "Design bases for protection against natural phenomena,"* requires that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena, such as earthquakes, without loss of capability to perform their safety functions. Criterion 2 also states that design bases for these structures, systems, and components shall reflect:

- Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated,

- Appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and the importance of the safety functions to be performed.

The requirements of 10 CFR 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," (first published in 1962, and revised in 1977 and 1996) establish design basis earthquakes for nuclear power plants:

- *Operating Basis Earthquake* - That earthquake which could reasonably be expected to affect the plant site during the operating life of the plant; it is that earthquake which produces the vibratory ground motion for which those features of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public are designed to remain functional.

- *Safe Shutdown Earthquake* - That earthquake based upon an evaluation of the maximum earthquake potential which produces the maximum vibratory ground motion for which certain structures, systems, and components are designed to remain functional.

During initial licensing of the Diablo Canyon site, the specific definitions of OBE and SSE were still under development. Instead two design basis earthquakes were established for DCPP. The operating basis earthquake (OBE) represents the ground motion reasonably expected during the lifetime of the plant. At DCPP, this is called the Design Earthquake (DE), and is 0.2g. The safe shutdown earthquake is defined as having twice the acceleration of the operating basis earthquake to ensure safety margin. At DCPP, this is called the Double Design Earthquake, and is 0.4g.

PG&E obtained the construction permits for both Diablo Canyon units and had begun plant construction before it became aware of the Hosgri fault, located offshore. The fault was studied in detail as part of a collaborative research program between PG&E and the U.S. Geological Survey (USGS). The NRC worked with the USGS office to ensure that the seismic hazard was properly characterized.

This effort determined that the Hosgri fault could produce up to 0.75g ground motion at the Diablo Canyon site (called the *Hosgri Evaluation*, or HE). However the frequency of such a large earthquake was far smaller than what is considered under the safe shutdown earthquake requirements (i.e., unlikely to occur during the life of the plant), thus, it was categorized as an extreme event that was beyond the intent of the SSE requirements.

However, the NRC did not grant authorization to operate the plant until the additional external hazard presented by the Hosgri fault was adequately addressed. PG&E addressed the issue by demonstrating that the plant equipment needed to safely shut down the plant and maintain a safe shutdown condition could also withstand 0.75g ground motion. This effort required re-evaluation, testing, and plant modifications beyond the approved DDE seismic design bases, and provided additional margin. This aspect of the design and licensing basis is unique to Diablo Canyon.

[See Q&As for "Design/Initial Licensing Basis Questions" for additional background]

2. Did Diablo Canyon submit a license amendment request for the Shoreline Fault?

Yes. Diablo Canyon submitted a license amendment request (LAR) on October 11, 2011. PG&E wanted the NRC to approve using the Hosgri/LTSP method as the only method for evaluating new seismic information (including the Shoreline fault) and for approval of a method to combine LOCA and seismic loads.

In December 2011, the licensee discussed the LAR with the Region IV Branch Chief for Diablo Canyon. PG&E stated that the LAR was changed to ask for the Hosgri event to become the safe shutdown earthquake. PG&E believed that the NRC had previously decided this point because the NRC had concluded that Hosgri was the SSE. NRR/DORL subsequently confirmed that pre-application meetings in mid-2011 had not included discussion of the HE as the SSE.

3. **Did the NRC accept PG&E's amendment request for the Shoreline Fault?**

   PG&E withdrew the amendment request on October 25, 2012.

   During the NRC acceptance review the NRC noted that PG&E had not submitted all of the information needed to review the Hosgri method against the Standard Review Plan (SRP) requirements.

4. **Why was the LAR withdrawn?**

   The PG&E in its October 25, 2012 letter withdrawing the LAR stated the following reasons for their request:

   > "Due to the issuance of the NRC Letter, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated March 12, 2012 (Reference 2), and the issuance of NRC Letter, "Diablo Canyon Power Plant, Units Nos. 1 and 2 - NRC Review of Shoreline Fault," dated October 12,2012 (Reference 3), PG&E no longer has a need for approval of [the LAR]."
   >
   > "Reference 2 defines an evaluation process for newly identified seismic information for all nuclear power plants in the United States of America. Therefore, PG&E no longer requests the NRC's review of a plant specific evaluation process for new seismic information."

   In Reference 2 as noted above, the NRC issued a 50.54(f) Request for Information letter to all power reactor licensees requiring a seismic hazard re-evaluation. The NRC specifically required PG&E to compare the results of this re-evaluation to the DDE. The NRC expects that the seismic re-evaluation at Diablo Canyon will yield results very similar to the LTSP results, because the methods and data are similar.

5. **Did the NRC allow PG&E to bypass Diablo Canyon seismic licensing requirements?**

   No. All seismic hazard information collected to date has been evaluated by the NRC. The NRC concluded that the Hosgri analysis completed in 1973 (as part of the initial station FSAR) bounds all of the seismic information involving the Shoreline, Los Osos, and San Luis Bay faults.

6. **I heard NRC's Cliff Munsen say to the California Energy Commission that the NRC expects Diablo will exceed its DDE once it completes this ongoing seismic review. What does it mean when the NRC says they will exceed their DDE? What changes will the plant be required to make? If none, why not?**

   The Hosgri and DDE are separate methods for evaluating seismic information. As a result of the 50.54(f) letter review the NRC expects that Diablo Canyon will select a single method consistent with the already NRC reviewed LTSP for evaluating new seismic information.

7. When will Diablo Canyon's FSAR reflect the correct seismic information?

In accordance with the March 2012 50.54(f) letter, the seismic re-evaluation and follow-up actions will be conducted in two phases:

> *Phase 1: Issue 10 CFR 50.54(f) letters to all licensees to request that they reevaluate the seismic hazards at their sites using updated seismic hazard information and present-day regulatory guidance and methodologies and, if necessary, to request they perform a risk evaluation. The evaluations associated with the requested information in this letter do not revise the design basis of the plant.*
>
> *Phase 2: Based upon the results of Phase 1, the NRC staff will determine whether additional regulatory actions are necessary (e.g., update the design basis and SSCs important to safety) to provide additional protection against the updated hazards.*

Diablo Canyon's initial response to complete the seismic hazard risk evaluation is due by March 2015. Diablo Canyon's updated seismic risk assessment (Seismic PRA), if assigned a high priority, will be due no later than April 2018.

However, as noted relative to Phase 2, the NRC staff will determine whether or not additional regulatory actions, such as updating the FSAR, will be required of the licensee. Therefore, at this time it cannot be definitely stated whether or not the Diablo Canyon FSAR will be required to be updated specifically to reflect the results of the seismic re-evaluation.

8. When does the FSAR need to be updated with new seismic information?

Generally, per the requirements of 10 CFR 50.71(e), all reactor licensees are required to periodically update the FSAR to reflect, in part, all safety analyses and evaluations performed by the licensee in support of approved LARs or in support of conclusions that changes did not require a license amendment in accordance with 10 CFR 50.59(c)(2). The FSAR is required to be evaluated for updates approximately every 24 months, depending on the station specific refueling cycles.

However, as discussed in Q&A #7 above, after PG&E submits its seismic hazard risk evaluation in March 2015, the NRC staff will determine whether or not additional actions, including submission of a LAR and/or updating the FSAR, will be required by the licensee as specific result of the seismic hazard re-evaluation. Therefore, at this time it cannot be definitely stated when, or if, the Diablo Canyon FSAR will be required to be updated specifically to reflect the results of the seismic re-evaluation.

50.54(f) Questions

1. **When was the 50.54(f) letter issued?**

   March 2012.

2. **What is the purpose of the seismic 50.54(f) letter?**

   Diablo Canyon is being required to reevaluate the seismic hazards at their site. This reevaluation uses both modern methods and updated information. Additionally, Diablo Canyon is required to provide an assessment of the plant's ability to cope with the reevaluated hazard. The NRC will use this information to determine if additional regulatory action is appropriate.

3. **When is Diablo required to provide a response?**

   No later than March 2015.

4. **What actions will be required following the NRC's review of Diablo's response?**

   For facilities in the Western United States, within approximately 30 days of receipt of the last submittal, the NRC will determine the acceptability of the licensee's proposed risk evaluation approach and priority for completion. At the latest this would be April 2015.

   If the NRC assigns a high priority Diablo Canyon will need to complete their risk evaluation over a period not to exceed 3 years from the date of the prioritization. At the latest this would be April 2018. If assigned a lower priority, the risk evaluation would need to be completed by April 2019.

5. **Doesn't Diablo Canyon already have a Seismic PRA? If so, why is their completion date April 2018?**

   The March 12, 2012 orders (http://pbadupws.nrc.gov/docs/ML1205/ML12053A340.pdf) state that "Within 3 years of the date of this information request, each WUS addressee is requested to submit a written response consistent with the requested information, seismic hazard evaluation, items 1 through 7 above."

   Therefore by March 2015, DCPP must submit a written response documenting their seismic hazard evaluation up to selecting of a risk evaluation approach. The two approaches that could be used are Seismic Margin Analysis (SMA) or Seismic PRA (SPRA). DCPP has committed to performing a SPRA using the new ground motion spectra. Later in the March 2012 order, it states, "For hazard reevaluations that the NRC determines demonstrate the need for a higher priority, addressees are requested to complete the risk evaluation ... over a period not to exceed 3 years from the date of the prioritization." Since DCPP will be completing the SPRA, this statement in the order applies, and thus DCPP's due date for completion in early 2018.

6. Why is it expected to take several years to complete the review?

The expectation that the seismic issues will take some years to resolve at DCPP is not a safety concern. The NRC has followed the seismic re-evaluation process since the beginning at DCPP. The NRC will continue to evaluate seismic data to ensure our understanding of the seismic hazard is informed and that there is no new challenge to safety.

By following the rigorous NRC-approved process, which will take several years. It is expected that PG&E will produce a single seismic hazard analysis for NRC review using the latest available methods. If approved by the NRC, these results can then be used to clarify the Diablo Canyon seismic licensing basis.

7. What is SSHAC? What is SSHAC Level 3?

10 CFR 100.23, paragraphs (c) and (d) require that the geological, seismological, and engineering characteristics of a site and its environs be investigated in sufficient scope and detail to permit an adequate evaluation of the Safe Shutdown Earthquake (SSE) Ground Motion for the site. In addition, 10 CFR 100.23, paragraph (d)(1), "Determination of the Safe Shutdown Earthquake Ground Motion," requires that uncertainty inherent in estimates of the SSE be addressed through an appropriate analysis such as a probabilistic seismic hazard analysis (PSHA).

In response to these requirements, in 1997, the NRC published NUREG/CR-6372, "Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and the Use of Experts." Written by the Senior Seismic Hazard Analysis Committee (SSHAC), the NUREG provides guidance regarding the manner in which the uncertainties in PSHA should be addressed using expert judgment.

The SSHAC Level 3 process uses a panel of independent experts to study all available seismic data, identify the need for new data, and use the latest seismic analysis tools to develop a Seismic Source Characterization (SSC) and Ground Motion Characterization (GMC) in creating a risk-informed seismic hazard estimate (i.e. the PSHA). The NRC was intimately involved in the development of this formal methodology. This is a new method that did not exist at the time of licensing for the current generation of nuclear power plants, but is now required for applicants seeking a new reactor license.

8. Why is the NRC giving the Western U.S. plants more time (than the Central and Eastern U.S.) to complete their seismic reevaluation when the seismic risks in the Western U.S. are greater?

A typical SSHAC Level 3 study (which is the process being used by all of the plants in the U.S. to perform a seismic hazard reevaluation) takes 3 - 4 years.

The SSHAC study produces the seismic hazard models that are needed to perform the seismic reevaluation. When Fukushima occurred, the Central and Eastern US plants (CEUS) were in the middle of conducting a SSHAC Level 3 study sponsored by the NRC, DOE, and EPRI, so when the 50.54(f) letters went out the CEUS already had the models they needed to perform the seismic reevaluation, which is why we gave them a shorter period of time to respond to the 50.54(f) letter.

The Western U.S. does not have a regional model like the CEUS – so the NRC required all Western U.S. plants to complete a SSHAC Level 3 study in order to develop site-specific seismic hazard models. The Western U.S. plants were given three years to complete the SSHAC study and their seismic reevaluations. This is a significant amount of work to complete in three years and is realistically the fastest timeline that the Western U.S. plants would be able to adhere to while still following the rigorous requirements of a SSHAC Level 3 study.

9. Why does the NRC believe it is ok to wait until 2016 or later for safety improvements to be in place?

The NRC has established reasonable schedules for nuclear power plants to comply with the Orders and requests for information. We expect many nuclear power plants will achieve compliance ahead of the established schedules and will closely monitor each plant's progress through the required six-month status updates.

The Near Term Task Force (NTTF) report concluded that with the current regulatory approach and the current plant capabilities, the sequence of events which occurred at the Fukushima accident are unlikely to occur in the United States. While the NRC concluded that the NTTF recommendations would enhance safety, the staff determined that none of the NTTF report findings identified an imminent hazard to the public health and safety. As such, continued safe operation of nuclear power plants is warranted while the safety improvements required by the orders are implemented.

10. Why did the NRC approve industry's request for a six month extension in submitting the Central and Eastern U.S. seismic reevaluations?

The seismic hazard reevaluations for the Central and Eastern U.S. (CEUS) were originally due in September 2013. The NRC approved a six month extension in order for industry to update the ground motion model, as this effort incorporates a significant amount of new information and data for CEUS seismic hazards. The CEUS ground motion model was developed from 2002-2004 with updates in 2006 and now updates in 2013. (The seismic source characterization model was developed from 2008-2011). The updated ground motion model should ultimately yield more accurate results. The reevaluations for the CEUS are now due in March 2014.

11. Why is PG&E conducting new seismic studies?

The ongoing seismic studies that PG&E is conducting right now are being conducted as a new chapter in their Long Term Seismic Program as well as in response to the California Energy Commission's AB 1632 Report, which specifically recommended enhanced 2-D and 3-D seismic studies. With the NRC's issuance of the 50.54(f) letter, which in part requires re-evaluation of seismic hazard using current NRC guidance, the technical integration team of the SSHAC study has been empowered to take all of the information from these seismic studies, analyze it, and evaluate it in terms of the seismic hazard assessment. So the data collected from the various seismic studies and surveys will be fed into the SSHAC study and hazard re-evaluation as part of PG&E's response to the 50.54(f) letter.

12. In an October 12, 2012, letter to Diablo Canyon, the NRC states that "The NRC recognizes that using the DDE as the basis of comparison will most likely result in the Shoreline fault and the Hosgri earthquake being reported as having greater ground motion than the SSE."

Is it accurate to state that this means that the licensee has not shown that it meets the requirements in its license that the reactor and its safety systems be capable of withstanding the ground shaking associated with the DDE/SSE earthquake using the methods specified in the SSE/DDE?

No. The quoted statement is referring to a comparison the NRC requested licensees make in a March 12, 2012 request for information. The NRC's March 12, 2012 letter requested PG&E to perform a re-evaluation of the seismic hazards at the DCPP site, using the NRC-approved SSHAC Level 3 method. The request for information, issued in response to recommendations of the Near-Term Task Force review of the accident at the Fukushima Dai-ichi nuclear facility, requests the licensee to compare the results of its seismic re-evaluation using the latest methods to the current seismic design basis (the DDE for Diablo Canyon) and as-built design margins. The NRC specifically requested that licensees compare the results of their seismic re-evaluation to the DDE/SSE to ensure that the information received from every nuclear power plant was comparable across the industry.

The March 12, 2012 letter specifically recognized that the new seismic data obtained through the NRC-specified process may result in higher ground motion when compared to the DDE/SSE, and lays out a process that licensees and NRC will follow in such situations. The quoted statement recognized that the DCPP seismic licensing and design basis is unique in that it includes the DE, the DDE, and the much larger HE ground motion. The NRC expects PG&E to include the Hosgri and Shoreline faults in its re-evaluation, and in its comparison of the new seismic information against the DDE. The October 12, 2012 letter continues by stating that "...it is appropriate to include these scenarios, along with any new seismic information that may be developed, in the risk-informed, performance-based [Ground Motion Response Spectra] GMRS and then follow the process set forth in the March 12, 2012, request for information, to determine whether any additional regulatory action is needed." It makes sense that including the much larger Hosgri fault and the Shoreline fault in the re-evaluation will likely result in a seismic hazard that exceeds the DDE, even after accounting for the low frequency of occurrence of such a large earthquake.

The NRC's request in no way reflects negatively on the level of safety assurance provided by the current design basis and actual construction of US plants. The results will not invalidate the original analyses. Instead, they are intended to be used to assess the current level of seismic safety across the entire industry by taking advantage of advances in seismic evaluation techniques and much more seismic data, and to determine whether further regulatory action is needed. For example, if new information is uncovered that would suggest the Shoreline fault is more capable than currently believed, the NRC expects that the licensee will provide an evaluation that describes actions DCPP has taken or plans to take to address the higher seismic hazard relative to its design basis. The NRC staff will independently assess the new information and determine if it changes the staff's current position that ground motion associated with the Shoreline fault is at or below the HE.

13. What specific seismic studies is PG&E conducting?

In general there are two types of data. There is data that can help you better characterize the seismic sources (faults) and there is data that can help you better characterize the ground motions (shaking at the site).

Specific new studies being conducted by PG&E for seismic source characterization (most have already occurred):

- Onshore 2D/3D Seismic Reflection Surveys
- Onshore Geologic Mapping
- Onshore Light Detection and Ranging (LiDAR) Mapping (topographic mapping)
- Offshore Multi Beam Echo Sounds (MBES) Mapping (of the sea floor)
- Offshore 2D/3D Low Energy Seismic Reflection Surveys
- Potential Field Mapping (gravity and magnetic surveys)

Specific new studies being conducted by PG&E for ground motion characterization:

- Ocean Bottom Seismometers
- New seismic station near power block to record small earthquakes
- Finite Fault Simulations and Dynamic Rupture Models (working with various research groups including the Southern California Earthquake Center – SCEC and the Pacific Earthquake Engineering Research Center - PEER)

14. What is the status of the 3D mapping?

PG&E has completed low-energy two-dimensional (2D) and three-dimensional (3D) seismic mapping, along with high-energy 3D seismic on-shore mapping. The issue is with the offshore high-energy 3D mapping. In order to perform the offshore high-energy 3D testing, PG&E needed to obtain 12 permits from State and Federal agencies. In November 2012, the California Coastal Commission rejected the permit request for the high-energy 3D offshore mapping.

PG&E indicated in the Central Coastal California Seismic Imaging Project (CCCSIP) Report to the State of California (a.k.a., AB 1632 Report) issued on September 10, 2014, that "[we have] concluded that the offshore 3D HESS [High Energy Seismic Surveys – offshore high energy 3D mapping] study is not necessary because other geophysical and seismicity data and analytical assumptions were used to address the objectives of the offshore 3D HESS studies."

15. Why did the Coastal Commission reject the permit?

The seismic surveys rely on the use of air guns to generate high energy acoustic pulses capable of passing through ocean waters and penetrating from six to nine miles into the seafloor. The key Coastal Commission issue of concern was the project's significant and unavoidable impacts to marine resources. Specifically, seismic surveys are among the very loudest anthropogenic underwater sound sources and can cause disturbance, injury, and loss of a large number of marine species due to air gun noise. The California Coastal

Commission ultimately denied the permit application due to the potential detrimental effects to marine mammals and other wildlife in the area.

Tier 3 Expedited Transfer of Spent Fuel to Dry Cask Storage

[Excerpted from OPA Communications Plan for Sept. 18, 2013 Public Meeting]

Key Messages

1. The NRC is following a well-established decision-making process to evaluate whether regulatory action might be needed to reduce the amount of spent fuel being stored in storage pools (i.e., expediting the transfer of spent fuel to dry cask storage). The consideration of various factors – including possible benefits and possible costs – is consistent with the NRC's handling of previous issues and with the general regulatory decision-making process throughout the federal government.

2. The purpose of the spent fuel pool study was to evaluate the differences in potential accident consequences associated with a high density and low density spent fuel pool in order to help inform decision-makers about whether regulatory action might be needed to require reductions in the amount of spent fuel stored in pools. It is acknowledged that the study involved a detailed evaluation of an individual plant and focused on a seismic event as the initiator of a loss of pool inventory. The wider decision-making process utilized the results of this study, the results of other studies, and engineering judgment to expand the insights of the spent fuel pool study to other plant and pool designs, including consideration of other potential accident initiators.

3. The NRC continues to believe that spent fuel pools and dry casks both provide adequate protection of the public health and safety and the environment. Therefore there is no pressing safety or security reason to mandate earlier transfer of fuel from pool to cask. Spent fuel pool safety is continuing to be enhanced through additional requirements for mitigating beyond-design basis events in spent fuel pools, enhanced spent fuel pool instrumentation, improved emergency preparedness, and robust security requirements to deter and respond to terrorist attacks.

Questions and Answers

1. **The spent fuel pool study was deficient in that it looked at a single initiator at a single plant.**

   The SFPS was an input to the broader evaluation of the costs/benefits related to a possible generic requirement to transfer spent fuel. The broader decision-making process utilized the results of this study, the results of other studies, and engineering judgment to expand the insights of the spent fuel pool study to other plant and pool designs, including consideration of other potential accident initiators.

2. **The spent fuel pool study was deficient in that it did not address partial drain down scenarios.**

   The staff performed an analysis of the reference pool structural response and determined that, if any leakage developed, the leakage would most likely occur at the bottom of the pool walls. The study did not analyze a partial drain down because leak locations with the potential to result in this end state were not predicted by the staff's structural analysis of the reference pool. The broader evaluation contained in the regulatory analysis included conservative assumptions for the frequency and magnitude of radioactive material releases

that would encompass events where the pool only partially drains and the remaining water impedes air cooling of the assemblies.

3. **The spent fuel pool study was deficient in that it does not address security events.**

   The study modeled a beyond-design basis seismic event and the resultant loss of pool integrity. Concerns regarding the loss of pool integrity due to an attack by armed adversaries were studied after the terrorist attacks of September 11, 2001. As mentioned in the comments on the spent fuel pool study, some of these evaluations involved sensitive information and therefore are not available for public review. The lack of a publicly available study using the best available simulation tools was a reason for performing the spent fuel pool study. The NRC remains constantly aware of the capabilities of potential adversaries and threats to facilities, material, and activities, and we focus on physically protecting and controlling spent fuel to prevent sabotage, theft, and diversion. Some key features of these protection programs include intrusion detection, assessment of alarms, response to intrusions, and offsite assistance when necessary. There have also been no known or suspected attempts to sabotage spent fuel casks or storage facilities. The NRC responded to the terrorist attacks on September 11, 2001, by promptly requiring security enhancements for spent fuel storage, both in spent fuel pools and dry casks.

4. **The spent fuel pool study and regulatory analysis does not provide an actual comparison of the risks between spent fuel pools and dry cask storage.**

   Spent fuel pools and dry casks provide for safe storage of spent fuel. The designs of both the spent fuel pool and storage cask provide robust protection for the stored fuel such that only rare, high-energy events could challenge the safe storage of fuel. Nevertheless, the SFPS includes a comparison of the relative consequences of events that damage these structures and produce a radioactive material release. The comparison is provided in Chapter 10 of the SFPS.

5. **Describe the path forward on how the NRC will determine whether or not to require the expedited transfer of spent fuel.**

   The NRC staff expects to issue the spent fuel pool study in October 2013 and it will include a description of the comments received and the staff's disposition of those comments. Also in October 2013 – on about October 11 – the NRC staff will provide the Commission with a paper[2] describing the broader regulatory analysis for various reactor and fuel pool designs.

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[2] *COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" was issued on 11/12/2013.*

The staff recommendation in the paper is as follows:
"The staff's assessment concludes that the expedited transfer of spent fuel to dry cask storage would provide only a minor or limited safety benefit, and that its expected implementation costs would not be warranted. Therefore, the staff recommends that no further generic assessments be pursued related to possible regulatory actions to require the expedited transfer of spent fuel to dry cask storage and that this Tier 3 Japan lessons-learned activity be closed."

That paper will also be the subject of a meeting with the ACRS on October 3. It is our intent to make the paper available to the public as soon as it gets the necessary management review – which we expect will be next week. Finally, the Commission will make its decision, which is likely to follow a Commission Meeting on this topic which is currently scheduled for November 21. The Commission could decide to either instruct the staff to do more studies of this issue or to stop further work and allow current regulations to stand as they are.

However, as of the date of this communication plan, the Commission has not completed its vote on this paper, nor issued a Staff Requirements Memorandum.

DCPP Licensing Basis Verification Project (LBVP)

[From Licensee Status Briefing in August 2012 & Updated in Sept. 2013 for new RA briefing]

Purpose

The primary purpose of the Licensing Basis Verification Project (LBVP) is to perform an objective evaluation to determine if the DCPP licensing basis has been adequately maintained, and to correct any identified deficiencies. Additional goals are to provide an enhanced FSAR with clear current licensing basis (CLB) defined for plant personnel, and to enhance knowledge transfer of the Diablo Canyon Power Plant Current Licensing Basis.

Objectives

1. Evaluate facility and analysis changes since completion of Amendment 85 of the original FSAR in 1980 through the current revision of the FSAR update
2. Evaluate the adequacy of the 10 CFR 50.59 evaluations
3. Determine and document DCPP's committed compliance with 10 CFR 50, Appendix A, "General Design Criteria and Division I Regulatory Guides for Power Reactors.
4. Correct any licensing basis deficiencies discovered.
5. Correct any deficiencies in the licensing basis searchable document databases.
6. Improve the current licensing basis full-text search capabilities.
7. Perform component design basis reviews of eight selected systems, after the completion of the licensing basis verification and correction of any deficiencies in these systems.
8. Provide an updated tool to aid in operability determinations.

Who Is Involved with the LBVP?

PG&E Oversight with work done by Chicago Bridge and Iron (CB&I – formerly Shaw, Stone & Webster), partnered with Westinghouse (DCPP NSSS Supplier). CB&I has the lead. Westinghouse is responsible for various FSAR sections including Accident Analysis Chapter 15, RCS, RHR, Reactor, and others.

- Phase I (February – October 2010)
  Phase I of the LBVP reviewed and evaluated design and analysis changes to the Component Cooling Water (CCW) and Auxiliary Feedwater (AFW) systems.
- Phase II (September 2010 – 2015)
  Phase II of the LBVP is evaluating all the remaining licensing basis changes. The methodology of Phase II will be to adjust to the revised scope based on the Phase I

findings, lessons learned, and recommendations, all of which was addressed in the Phase I summary Report.

Licensing Basis Reviews (signed off by PG&E):

Establish the licensing basis requirements (e.g., General Design Criteria, Reg. Guides, Generic Letters, etc.) along with the source documents (PG&E specific commitments in letters, etc.). Draft FSAR revision with licensing basis requirements. LBR reviewed internally by PG&E and by an Independent Review Board.

System Reviews

Following the LBR, validate the licensing basis requirements and FSAR implementation into plant documents (design documents, procedures, WCAPs, drawings, calculations). Finalize FSAR/DCM revisions. FSAR revisions will include identification of the source and implementing documents. System Review reviewed internally by PG&E and by an Independent Review Board.

Component Design Basis Reviews: (8 systems chosen):

Status

- Component Cooling Water - complete
- 230-kV System - complete
- 500-kV System - complete
- Emergency Diesel Generator – in progress
- Auxiliary Feedwater System - finished following the LBR and System Review
- Auxiliary Salt Water System - finished following the LBR and System Review
- SSPS System - finished following the LBR and System Review
- Residual Heat Removal - finished following the LBR and System Review

Corrective Action Program Update

Over 1000 SAP Notifications have been initiated to date. Six potential LARs being reviewed by PG&E staff.

Enhanced FSAR Update

The FSARU Enhancement is a synthesis of three other licensing bases document sets:

- The Safety Evaluation Report and its supplements
- NRC letters to PG&E
- And PG&E letters to the NRC.

Current schedule

DCPP committed to the NRC to complete the LBVP by 12/31/2015. Completion clarified in document DCL-12-003 as follows: Completion of LBVP Phase II includes completion of applicable licensing basis reviews, system reviews, component design basis report reviews, electronic database upgrades, implementation of new current licensing basis search tools, and correction of licensing basis deficiencies that do not require prior NRC

approval. In addition, completion of LBVP Phase II includes submittal of License Amendment Requests (LARs) and initiating design changes. The completion of the design changes and the receipt of approved LARs will extend beyond the completion date of December 31, 2015.

NRC Conclusions (as of Sept. 2013)

1. The licensee is performing a good review of their Licensing Basis.
2. They are identifying and correcting errors.
3. They continue to evaluate and improve the LBVP process
4. The process is not perfect. The NRC is still identifying problems with Licensing Basis Documents and how the licensee implements their licensing basis.
5. The Summer 2013 Component Design Basis Inspection (Inspection Report 2013-007) noted a significant improvement in Licensing Basis Documents at the site.

Continued Storage Rule (formerly "Waste Confidence")

Refer to "Publication of the Continued Storage Rule and NUREG-2157 Generic Environmental Impact Statement (Waste Confidence)" (ML13152A756), maintained by NMSS, for the most current information.

The "key messages" in the subject Communications Plan and the following Q&As noted are likely to be of particular interest to DCPP stakeholders (page number in NMSS communication plan indicated):

Page 6:
- What is Continued Storage? Why was Waste Confidence renamed Continued Storage?
- What is the purpose of the Continued Storage rulemaking?
- Why didn't you consider this on a site-by-site basis? How can this be analyzed on a generic basis?

Page 7:
- Why didn't the NRC consider shutting down all nuclear power plants and stopping all licensing as an alternative to the Continued Storage rulemaking?

Page 8:
- If the NRC is extending the timeframe of safe storage, how is that not de facto on site disposal?
- Does the Commission still have reasonable assurance about the safety of spent fuel storage?

Page 9:
- How can the NRC allow nuclear waste to be stored in dry casks that are *known* to fail? How can the NRC have confidence in casks that have been proven to fail?
- How was NEPA implemented for Continued Storage?

Page 10:
- Where are the comments I submitted on the Waste Confidence draft GEIS and proposed rule and what is the NRC doing with them?

Public Cancer Risks

Refer to "Communications Plan: Analysis of Cancer Risks in Populations Living Near Nuclear Facilities – Phase 2 Pilot Studies" (ML13274A664), maintained by RES, for the most current information.

The following Q&As noted are likely to be of particular interest to DCPP stakeholders (page number in RES communication plan indicated):

Page 9:
- Q1. Why has the U.S. Nuclear Regulatory Commission (NRC) asked the National Academy of Sciences (NAS) to conduct this study now?
- Q3. Which seven sites will be included in the pilot study?
- Q4. Which additional nuclear facilities could be included in the study?

Page 10:
- Q6. Does the NRC suspect that cancer mortality rates are elevated around nuclear power plants?
- Q7. How can I be sure that the nuclear power plant is not causing cancer? If I lived near a power plant, how might I be exposed to radiation? For example, if my house is 2 miles away from a reactor, am I being exposed whenever I am at my house?

Page 11:
- Q11. I live near a nuclear power plant and my husband died of cancer. Will this study prove that living near the plant caused the cancer?
- Q14. Why do some local cancer studies around some nuclear plants show increased cancer rates and some show no increase?

Page 12:
- Q17. What will the NRC do if the results indicate an increase in cancer risk in some populations that live near a specific nuclear facility?

Page 13:
- Q21. How does the NRC ensure the validity of the licensee's reporting of off-site doses and environmental monitoring results?

Page 15:
- Q23. Where can the public find more information on the study?

Protective Action Recommendations for Areas of the Ocean
UPDATED 11/25/2014

NOTE: The related inspection report and choice letter will be issued on December 1, 2014. Prior to that date, the information below is predecisional.

Goal

This plan describes the strategy and steps the NRC will use to communicate internally and to external stakeholders about the proposed White finding for not having processes in place for issuing PARs for areas of the ocean. The key messages are primarily for use in communicating to the public, news media, and other stakeholders. The finding and background information are described below.

Key Messages

- The licensee made changes to the NRC approved Emergency Plan resulting in not having processes in place for issuing PARs for areas of the ocean. This happened because they did not follow the prescribed regulatory process.
- The NRC believes there is reasonable assurance that the licensee would have made an appropriate PAR if projected radiological conditions warranted a PAR over the ocean area of the EPZ even though the guidance for making a PAR over the ocean had been inappropriately removed from their procedures.
- NRC continues to believe that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. The changes that the licensee made do not affect that conclusion; though Diablo Canyon should have recognized that the changes were not in compliance with the emergency planning standards in regulations and required NRC approval.
- The individuals responsible for making protective action recommendations are highly trained and qualified individuals. During drills and evaluations during the time period in question, these individuals routinely practice making protective action recommendations appropriately.
- The licensee recommends protective actions to local and state officials, who then make the actual call about what protective actions the public will take.
- The county had procedures in place that included evaluating the ocean for evacuation.
- Therefore, at no time was the public going to be allowed to stay in an area that had the potential for radioactivity if an event had occurred.
- This is a preliminary determination, is still undergoing evaluation through our processes, and is subject to change upon further review.

Background

In November 2005, Diablo Canyon Power Plant revised its emergency plan without prior NRC approval. This change removed a table used to assist in making protective action recommendations to the offsite authorities during an emergency event. The change resulted in developing protective action recommendations directly from specific protective action zones, which did not explicitly identify the ocean areas. Therefore, this change to the emergency plan reduced the effectiveness of the plan and required NRC approval prior to implementation. This issue is currently being evaluated using our enforcement policy and significance determination process. An apparent Severity Level III violation has been identified associated with a preliminary White finding, but that is subject to change following further review.

Intended Audiences and Stakeholders

External

Members of the Public
Pacific Gas & Electric Company
Local Governments and Agencies
Local Elected Officials
Federal Emergency Management Agency, Region IX
Federal Emergency Management Agency, Headquarters
Public Interest Groups
Media
Nuclear Industry and the Nuclear Energy Institute
U.S. Senate and Congressional Staff

Internal

Region IV Office of Regional Administrator (ORA)
Region IV Division of Reactor Safety (DRS)
Office of Nuclear Security and Incident Response (NSIR)
Office of Nuclear Reactor Regulation (NRR)
Office of Public Affairs (OPA)
Office of Enforcement (OE)
Office of the General Counsel (OGC)
Office of Congressional Affairs (OCA)
Office of the Executive Director of Operations (OEDO)
The Commission
Regions I-II-III

Communications Team

Tony Vegel, Division Director, DRS
Jeff Clark, Deputy Division Director, DRS
Mark Haire, Branch Chief, DRS/PSB1
Wayne Walker, Branch Chief, DRP/A (or acting BC)
Robert Kahler, Branch Chief, NSIR
Bill Maier, Region IV Regional State Liaison Officer
Victor Dricks, Senior Public Affairs Officer, Region IV

Communication Tools

External Stakeholder

- Phone calls to Pacific Gas & Electric and Nuclear Energy Institute
- Phone calls to FEMA HQ and Region IX.
- Phone calls to the State and local officials, Senate and Congressional representatives, and public interest organizations.

Internal Stakeholders

- Walk-around, EDO Daily Notes, or Commissioner Assistant Notes to inform the Commission and OEDO.
- E-mails from Communication Team members to NRC offices and regions.

Communication Timeline

The timeline of activities with internal and external stakeholders is as follows when it is decided to issue inspection report:

Time Sequence	Communication Activity	Responsible Organization/Individual
1	Develop and distribute communications plan	Region IV DRS
2	Inspection report issuance pending	Region IV DRS
3	Region IV - ORA, OPA Regions I, II, & III NRC HQs – NSIR	Region IV DRS
4	NRC HQs – NRR, OE, OGC, OCA, OEDO	NSIR
4	The Commission	OEDO
4	NRC HQs – OPA	Region IV OPA
5	Notify PG&E of pending issuance of inspection report	Region IV DRS
6	Notify Region IV DRS when above notifications complete	All responsible communication team members
7	Issue Inspection Report	Region IV DRS
8	Notify Local Governments and Agencies, Local elected officials, State agencies and FEMA Region IX	Region IV SLO
9	Notify U.S. Senate and Congressional Staff	OCA

Time Sequence	Communication Activity	Responsible Organization/Individual
10	Notify FEMA HQs, NEI	NSIR
11	Notify Public Interest Groups, Media, members of the public	Region IV OPA

Anticipated Timelines

External Stakeholders

November 2014	Advise local jurisdictions when the inspection report containing the Apparent SLIII/White finding is issued	Region IV RSLO
December 2014	Respond to external questions as needed	Region IV RSLO, Public Affairs Officers

No specific public meetings, government-to-government meetings, or other outreach activities have currently been identified in connection to this issue.

Internal NRC

October 17, 2014	Exit with Licensee on the White finding	Region IV DRS
December 1, 2014	Issue Inspection Report 05000275,323/2014502 with the Apparent SLIII/White finding	Region IV DRS

Anticipated Questions and Answers

Q1. Should PG&E have obtained NRC permission prior to making this change to their Emergency Preparedness plan?

Yes. They should have recognized that the change to their emergency response plan implementing procedures was a reduction in effectiveness and required NRC approval before being implemented.

Q2. What is the significance of this violation of NRC regulations?

The NRC uses its Significance Determination Process to determine in a consistent manner the significance of violations. This apparent Severity Level III violation has been determined to be a finding of preliminarily low to moderate (white) safety significance.

Q3. Has this change to PG&E affected safety?

The NRC does not believe that the day-today operational safety of the plant has been affected. The only safety impact identified with this violation concerns Diablo Canyon's

ability to issue protective action recommendations for areas over the ocean; a low population area. Also, the default actions planned by local authorities for plant emergencies would have resulted in automatic evacuations of ocean areas within 5 miles of the plant. In addition, Diablo Canyon's dose projection software still would have indicated if conditions existed (radioactive release and wind direction out over the ocean) that warranted evacuation of the public in ocean areas, and Diablo Canyon's staff would likely have recognized the need to issue protective action recommendations for areas over the ocean. Therefore, the NRC has confidence that the public located in the transient low-populations zones on the ocean near the plant would have been protected. However, since Diablo Canyon's procedures did not specifically address the areas over the ocean (as they were required to do), the NRC considers this lack of procedural guidance a performance deficiency of low to moderate significance (white).

Q4. The change to the emergency plan was implemented in 2005. Why did it take until now to identify this issue? Why wasn't it identified earlier?

Licensees are required to request NRC approval when they make a change to their emergency plans that decreases the effectiveness of those plans. In this case, Diablo Canyon did not identify this issue as a decrease in effectiveness and therefore did not request NRC approval. NRC reviews, on a sampling basis, changes made by licensees that do not require prior approval; however, the NRC did not identify this issue during its sampling review of the licensee's changes. The NRC also conducts periodic inspections on site to evaluate, on a sampling basis, the licensee's emergency preparedness program. Although the NRC did not identify this issue at its earliest opportunity, the NRC did identify this issue during a biennial inspection.

Q5. How did the NRC discover that Diablo Canyon had made this change to the emergency plan implementing procedures?

During a routine biennial inspection under the NRC's, "Maintenance of Emergency Preparedness" inspection procedure, the inspectors questioned why the licensee's PAR procedure did not include the ocean. Upon further review, the inspectors determined that the licensee had changed their procedure without NRC approval in 2005.

Q6. Are the "highly qualified individuals" discussed above the same ones who made this change? If they are, then how can the public trust that these individuals would make the correct protective action recommendation?

The licensee employs many highly qualified individuals in all levels of its organization. During an event, emergency directors make decisions on protective action recommendations based on input from dose projection software, the assessment of highly trained subject matter experts, and the procedural guidance in their emergency plan. In addition, state and local officials as well as NRC inspectors provide independent review of the conditions and the licensee's decisions regarding protective action recommendations to ensure the public is adequately protected. There is significant review and oversight of emergency decisions during events.

Q7. Drills and exercises were performed between 2005 and now. Why wasn't this issue identified during these exercises before now? Are there any specific examples of drills in which the licensee DID make a protective action

recommendation that included the ocean?

Most drills and exercises simulate an accident that includes a plume over populated land areas because those are the areas of greatest concern. We did not identify any exercises where the licensee simulated a plume over the ocean.

Q8. What confidence can the public have in PG&E?

The NRC does not believe that PG&E's actions in this instance reflect on the company's current ability to make other appropriate emergency plan changes. The 50.54(q) process is one among many analysis processes used at the site, each one of which having unique decision criteria. Most of these processes have been properly applied and reached appropriate conclusions. Although PG&E failed to identify the need for the NRC to review this change before it was implemented, the NRC believes the failure is unlikely to significantly affect safety. The affected emergency response procedures had no effect on day-to-day plant operations or safety.

Q9. What other changes to the Diablo Canyon EP plan is PG&E considering?

Diablo Canyon has taken significant corrective actions to ensure their change process does not repeat this error. There are not currently any changes being implemented that would decrease the effectiveness of their emergency plan. Diablo Canyon follows the approved processes for making changes and submits those changes to the NRC within 30 days of implementation if it is determined that no reduction in effectiveness of the emergency plan occurs. If the licensee finds that the change is a reduction in effectiveness of the emergency plan it must seek approval from the NRC prior to implementation.

Q10. How come the public doesn't get to weigh in on these kinds of decisions that could impact public health or safety?

These kinds of changes should not impact public health or safety. Of those that are identified to impact public health or safety (that reduce the effectiveness of the emergency plan), they are required to be submitted for NRC review and approval prior to implementation.

Q11. What does PG&E have to do in response to the violation?

All violations are required to be corrected by a licensee. Diablo Canyon has corrected this violation and instated process changes to prevent recurrence. All corrective actions are subject to review during future inspections.

Q12. Why doesn't the enforcement action bring into question the NRC's prior determination of reasonable assurance?

The NRC determined that reasonable assurance existed that Diablo Canyon could, and would, take the actions necessary to protect the health and safety of the public in the event of a radiological emergency at the time the plant was licensed. The NRC partially based this conclusion on a finding by FEMA that offsite plans and capabilities were

adequate to implement necessary protective measures. Both the NRC and FEMA have determined that reasonable assurance continued to exist by regular evaluation of emergency preparedness programs and the direct observation of onsite and offsite capabilities during drills and exercises. The NRC considers that reasonable assurance continues to exist as long as Diablo Canyon remains capable of implementing all of the sixteen emergency planning functions listed in 10 CFR 50.47(b), and none of those functions are significantly degraded. In this particular case, although the procedures for issuing protective action recommendations did not include areas of the pacific ocean, which violated the requirements of planning standard 50.47(b)(10), the NRC does not believe that it significantly degraded Diablo Canyon's ability to implement the planning standard function of issuing protective action recommendations in general. The licensee was still capable of issuing protective action recommendations even though its procedures did not list a specific protective action zone for the ocean.

Q13. Why did the NRC issue the violation?

The non-compliance issue is focused on the licensee's failure to maintain the emergency plan. They failed to follow the prescribed regulatory process for making emergency plan changes resulting in a degraded emergency planning standard for issuing protective action recommendations for areas of the ocean.

Senate EPW Committee Questions on Hosgri + LOCA

UPDATED 11/5/2014

In response to five questions (in **bold text** below) presented to the NRC by a staff member supporting the Senate Environmental and Public Works Committee (Michal Freedhoff), NRR and Region IV developed the following answers. The information below are the Q&As as provided verbatim to OCA on 11/5/2014.

The following background was provided by the Office of Congressional Affairs in an email dated September 11, 2014, that provided the 5 questions below and provided the following preface from the inquiring staff member from Senator Markey's office:

> *"My questions relate to the 50.59 process used when PG&E replaced major equipment like their steam generators, reactor coolant system and vessel heads. According to NRC 50.59 rules, PG&E should have had to analyze the new equipment using a concurrent Hosgri plus LOCA scenario. Publicly available documents indicate that a reason why NRC told PG&E to withdraw the LAR was that they had not yet completed the analysis of the LOCA plus Hosgri scenario. So that raises some very significant questions."*

The NRC staff believes that Senator Markey's staff is referring to the withdrawal of PG&E License Amendment Request (LAR) 11-05 which was submitted to the NRC via PG&E Letter DCL-11-097, dated October 20, 2011. PG&E withdrew LAR 11-05 via letter DCL-12-108, dated October 25, 2012 (details associated with the withdrawal of the LAR are provided in the response to Question 2 below). The NRC staff believes that the publicly available documents, including the PG&E submittal and withdrawal of LAR 11-05, mentioned above by the Senator's staff are contained in the response to Freedom of Information Act request FOIA/PA No. 2014-0065. These documents can be found at:
http://pbadupws.nrc.gov/docs/ML1335/ML13354B966.html.

1. **Is my read of the licensee's 50.59 obligations to consider Hosgri plus LOCA [loss of coolant accident] when it undertook major systems modifications like SG [Steam Generator] replacement accurate?**

   Yes. The Diablo Canyon UFSAR provides a discussion of the stress analysis evaluation criteria for the reactor coolant pressure boundary in Section 5.2.1.14, "Stress Analysis for Faulted Condition Loadings (DDE and LOCA)", and Section 5.2.1.15, "Stress Analysis for Faulted Condition Loadings (Hosgri)". In addition, Tables 5.2-6 and 5.2-8 specify the loading combinations and acceptance criteria for primary equipment and supports. None of these sections and tables required consideration of Hosgri seismic loads plus LOCA loads. At the time in which the licensee was planning for and implementing the steam generator and reactor vessel head replacement projects (through first decade of the 2000s), the licensee used these tables and did not consider that there was a requirement to evaluate Hosgri seismic loads plus LOCA loads. The requirement to consider Hosgri seismic loads plus LOCA was included in the PG&E Hosgri Evaluation Report. The Hosgri Evaluation Report is included by reference in Section 5 of the Diablo Canyon UFSAR. As such, the licensee should have identified as part of its 10 CFR 50.59 screening process that Hosgri seismic loads plus LOCA loads

analyses were required to be updated for both the replacement steam generators and reactor vessel head replacement projects.

The licensee identified the failure to update the Hosgri seismic plus LOCA load analyses as part of their Licensing Basis Verification Program (LBVP) in May 2011. [The licensee self-initiated the LBVP in 2010 to perform an objective evaluation to determine if the Diablo Canyon licensing basis had been adequately maintained, and to correct any identified deficiencies.] As required by the licensee's corrective action program (CAP), an operability assessment of the non-conforming condition was performed in May 2011. The operability assessment concluded that the reactor coolant systems for both DCPP units remained operable for the Hosgri seismic loads plus LOCA loads condition.

NRC staff evaluated the licensee's operability assessment and did not identify concerns with the licensee's operability assessment results. This inspection was documented as an operability assessment sample in Inspection Report 2011-003 (issued in early August 2011).

The NRC staff continues to review and inspect the licensee's ongoing activities to ensure compliance with NRC safety requirements, including the requirements of 10 CFR 50.59. An example of this, is the review of the September 2014, PG&E Seismic Report submitted to the State of CA and to the NRC, with updated seismic information on several earthquake faults. The NRC's initial review of the report did not identify any immediate safety concerns. Presently, the NRC is evaluating the licensee's new operability determination to ensure that there are no challenges to the reasonable assurance of adequate protection.

2. Is my assumption that PG&E did not do so, based on the reasons why the LAR was withdrawn, also accurate?

As previously noted, PG&E submitted License Amendment Request (LAR) 11-05 to the NRC via PG&E Letter DCL-11-097, dated October 20, 2011. In this request, the licensee proposed to do the following:

> *(1) clearly define an evaluation process for newly identified seismic information and incorporate ongoing commitments associated with the Long Term Seismic Program (LTSP) into the UFSAR;*
> *(2) clarify, consistent with the NRC Supplemental Safety Evaluation Report 7, that the 1977 Hosgri earthquake (HE) is the equivalent of DCPP's safe shutdown earthquake, as defined in 10 CFR 100, Appendix A; and*
> *(3) use the square-root-of-the-sum-of squares (SRSS) method for the evaluation of load combinations of seismic with loss-of-coolant accident (LOCA).*

In its letter to the NRC dated October 25, 2012 (ADAMS No. ML12300A105), PG&E voluntarily withdrew LAR 11-05. PG&E identified in this letter that because the NRC's March 12, 2012, 50.54(f) letter[3] related to Fukushima Near Term Task Force

[3] "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident" ADAMS Accession No. ML12053A340. (As a result of the NRC's review of the Fukushima Dai-Ichi

recommendations defined an evaluation process for newly identified seismic information for all nuclear power plants in the United States, PG&E no longer had a need for NRC to review and approve a plant specific evaluation process for new seismic information pertaining to Diablo Canyon. PG&E's October 25, 2012, letter does not attribute the reason for withdrawing LAR 11-05 to the licensee's ongoing CAP evaluation for Hosgri seismic plus LOCA load combinations, and the NRC does not have a basis for concluding otherwise.

3. **Did NRC simply not seek to validate whether the licensee had met their 50.59 obligations when these major systems modifications were undertaken?**

The NRC performed sample-based inspections of the reactor vessel head and steam generator replacement projects. Inspection reports related to the steam generator replacements include: (Docket Nos. 50-275 and 50-323) IR 2007-005, IR 2008-002, IR 2008-003, IR 2008-005, IR 2008-006, IR 2009-002, IR 2009-003, IR 2009-005, and IR 2009-009. Inspection reports related to DCPP replacement reactor vessel heads include IR 2009-005 and IR 2010-005. The NRC inspection reports referenced above may be accessed on NRC's public webpage at the following link: http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/listofrpts_body.html.

As documented in NRC inspection report 2009-005, the NRC issued a violation associated with 10 CFR 50.59 requirements. The inspection report identified a Severity Level IV non-cited violation of 10 CFR 50.59, after the licensee failed to obtain prior NRC approval to use a new seismic evaluation method relative to the damping factors used for the reactor vessel head replacement.

The NRC was not aware of the licensee's failure to include Hosgri seismic loads plus LOCA loads relative to the replacement steam generators and reactor vessel heads until it was identified by the licensee in May 2011. As discussed in Question 1, when the NRC became aware of this issue, we evaluated the licensee's operability assessment. The NRC did not identify concerns with the licensee's operability assessment results, and no findings or violations were issued.

4. **Why, when NRC determined that the LOCA plus Hosgri analysis had not been done yet, did it not revisit the 50.59 compliance question for those major systems modifications?**

The NRC was not aware of the licensee's failure to include Hosgri seismic loads plus LOCA loads relative to the replacement steam generators and reactor vessel heads until it was identified by the licensee in May 2011. When the NRC became aware of this issue, we evaluated the licensee's operability assessment. The NRC did not identify concerns with the licensee's operability assessment results, and no findings or violations were issued.

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accident, the NRC issued a letter on March 12, 2012, to all reactor licensees requesting information regarding re-evaluations of seismic and flooding hazards. The NRC provided generic guidance on an approach to be used by licensees for performing the seismic hazard re-evaluations.)

The NRC was aware that the licensee planned to submit a License Amendment Request (LAR 11-05) to update seismic information. As described in Question 2, the license amendment request was withdrawn following issuance of the NRC's March 12, 2012, 50.54(f) letter request. The NRC did not pursue the licensee-identified 10 CFR 50.59 concern in 2011, because there was no immediate safety concern, and the licensee was processing this through its corrective action program. Updates to the facility licensing basis were also expected to occur as part of the license amendment or 50.54(f) review process.

5. Is it thus accurate to conclude that every reactor in California has had major system modifications that failed to properly consider the question of whether the modifications satisfied NRC's safety requirements?

When major system modifications are performed at nuclear power plants, the NRC staff performs a sampling of the modifications based on the safety significance and performs inspections in accordance with a variety of special inspection procedures, most notably: Inspection Procedure (IP) 50001 "Steam Generator Replacement Inspection"; IP 71111.18 "Plant Modifications", and; IP 71007 "Reactor Vessel Head Replacement Inspection." These inspections ensure that the NRC safety requirements are satisfied, including the requirements of 10 CFR 50.59. For the Diablo Canyon reactor vessel head and steam generator replacement modifications, the inspections results are available in reports (Docket Nos. 50-275 and 50-323) IR 2008-006, IR 2009-002, IR 2009-006, and IR 2010-005.

In addition, it is important to note, while this response is focused on questions related to Diablo Canyon's application of 50.59 to major plant modifications, the NRC has an ongoing effort to review lessons learned from the SONGS replacement steam generator effort. As part of that lessons learned activity, the NRC is looking at its 50.59 process to determine whether any enhancements should be made. Currently, the recommendations include enhancements for training on performing 50.59 reviews, 50.59 inspections, 50.71(e) reviews, and vendor oversight. The NRC anticipates issuing its lessons-learned report in March 2015, following review by the ACRS.

Senator BOXER. Thank you.

We will turn to Commissioner Svinicki. We are going to take a little time off because the Chairman went over. We will go a minute and a half per commissioner because we have votes coming shortly. Sorry to do this.

Go ahead.

Ms. SVINICKI. Thank you, Chairman Boxer, Ranking Member Vitter and members of the committee.

In the interest of the Senate's voting schedule, may I request just to submit my statement for the record?

Senator BOXER. Of course. Without objection.

Ms. SVINICKI. Thank you.

[The prepared statement of Ms. Svinicki follows:]

PREPARED STATEMENT
OF KRISTINE L. SVINICKI, COMMISSIONER
UNITED STATES NUCLEAR REGULATORY COMMISSION
BEFORE THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

DECEMBER 3, 2014

Thank you, Chairman Boxer, Ranking Member Vitter, and members of the Committee, for the opportunity to appear before you today at this oversight hearing on NRC's implementation of actions to enhance and maintain nuclear safety. The Commission's Chairman, Dr. Allison Macfarlane, in her statement on behalf of the Commission, has provided a comprehensive description of key agency accomplishments and challenges in carrying out NRC's important mission of protecting public health and safety and promoting the common defense and security of our Nation.

The NRC continues to implement safety-significant lessons learned from the Fukushima accident in accordance with established agency processes and procedures, while also maintaining our focus on ensuring the safe operation of nuclear facilities and the safe use of nuclear materials across the country. The current period of implementation of Fukushima-related Tier 1 regulatory actions – a set of complex, interrelated actions lasting several years – will require discipline and focus from the NRC staff as they review and process an extremely high volume of regulatory submittals and inspect the implementation of these requirements at licensee sites. At the same time, the agency will be carrying out a set of complex rulemaking activities related to Fukushima actions. In short, demanding work continues before us.

I am confident, however, that the NRC's dedicated and professional staff members are up to the task of meeting these challenges, as they have proven, time and again, over the course of the agency's history. I would also like to thank Chairman Macfarlane for her leadership during this period, and to wish her and her family well as she departs the Commission in the coming weeks and moves on to new opportunities.

I appreciate the opportunity to appear today and look forward to your questions. Thank you.

Environment and Public Works Committee Hearing
December 3, 2014
Follow-Up Questions for Written Submission

Senator Barbara Boxer to Commissioner Kristine L. Svinicki

QUESTION 1.
Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe it is operating within its seismic licensing requirements? Why or why not?

ANSWER:
Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. Because your question relates to matters in litigation pending before the Commission, and in view of the Commission's adjudicatory role, it would be inappropriate for me to comment further on the issue until the completion of the adjudication.

QUESTION 2.
If you do believe that DCPP is operating within its seismic licensing requirements, why is PG&E currently engaged in a Licensing Basis Verification Project (LBVP), which will cost an estimated $133 million and is described on PG&E's webpage[1] as a project that "will review, validate and reconcile the Current Licensing Basis (CLB) for DCPP...In order to assure regulatory compliance, PG&E reviews all proposed changes to the DCPP facility against the FSAR and the CLB...The LBVP will produce a reconstituted FSAR and licensing basis with enhanced CLB retrievability to support ongoing and future compliance of DCPP activities with its NRC approved licensing basis. The LBVP will perform a review and evaluation of the licensing, design and analysis changes from the original FSAR to the present. Based on the results of that review, the LBVP will identify, consolidate and reconcile any inconsistencies in the CLB."

ANSWER:
Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. Because your question relates to matters in litigation pending before the Commission, and in view of the Commission's adjudicatory role, it would be inappropriate for me to comment further on the issue until the completion of the adjudication.

[1] https://www.pge.com/regulation/GRC-2014-Phase/Testimony/PGE/2012/GRC-2014-Phase1_Test_PGE_20121115_254326.pdf

QUESTION 3.
Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe that PG&E has complied with NRC's 50.59 regulations that require it to have performed a concurrent analysis of Hosgri earthquake and Loss of Coolant Accident (LOCA) when replacing reactor equipment such as the steam generators or reactor vessel head?

ANSWER:
Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission relating at least in part to this question. Because your question relates to matters in litigation pending before the Commission, and in view of the Commission's adjudicatory role, it would be inappropriate for me to comment further on the issue until the completion of the adjudication.

Senators Barbara Boxer and Edward J. Markey to Commissioner Kristine L. Svinicki

QUESTION 4.
During the hearing, the document drafted by Chairman Macfarlane and sent to NRC's Mark Satorius and Margaret Doane entitled "Strengthening the NRC Enforcement Process by Enhancing Procedural Fairness" was discussed. As you know, when we wrote the Commission on October 9 urging that this document be rescinded, NRC's spokesperson told reporters that "Specific to their call for rescinding a reorganization of the Office of Investigations, we can affirm that no such reorganization plan exists, nor has one been contemplated." However:

a. The document states that the review of the NRC enforcement process should "ensure that appropriate resources are devoted to investigations that are most safety and security significant," which could, if this proposal were implemented, limit the types of investigations that NRC's Office of Investigations (OI) could undertake because resources might not be provided for some investigations.
b. The document states that the review of the NRC enforcement process should "develop procedures for assigning technical staff to support investigations which promote the objectivity and independence of the investigation", which could, if this proposal were implemented, limit the technical expertise that could be available to OI.
c. The document states that the review of the NRC enforcement process should "ensure that all referrals to the Department of Justice on behalf of the NRC are shared with and reviewed by OGC," which would represent a departure from current OI practice.
d. The document directs NRC OGC to "conduct a 'lessons learned' review of the Exelon Decommissioning Fund investigation and enforcement action from the legal perspective to determine whether changes to the allegations review and investigation report review processes are required in terms of how legal advice and guidance is provided to the staff," even though the NRC Inspector General is currently (and was, at the time this memo was prepared) investigating allegations related to OGC's conduct related to the same investigation and enforcement action.
e. The document directs NRC OGC "to provide legal advice, guidance and a recommendation on the need for a timely and thorough technical and legal analysis of facts and evidence in the case, including all contact with counsel for the target or subject of the investigation and information provided in the pre-enforcement conference, to fully inform a final agency decision on whether to take enforcement action, particularly where escalated enforcement has been recommended by OI," and that this direction, if implemented, would represent a departure from current OI practice.

In response to questions about this document at the hearing, Chairman Macfarlane stated that "Never and nowhere in that memo will you find any contemplation of any reorganization of the Office of Investigations."

Do you agree that a proposal that would limit the type of investigations that OI could undertake, limit the technical resources that are available to support OI's investigations, and alter the manner in which OI is directed to interact with and report to OGC throughout the course of an investigation could be described as a reorganization of OI's mission?

ANSWER:
Former Chairman Macfarlane has stated that she did not propose to reorganize the Office of Investigation (OI), limit its budget, or change the duties of that office. This is consistent with my understanding.

QUESTION 5.
Do you agree that it was appropriate to direct OGC to conduct a "lessons learned" review of an OI investigation when the NRC IG is still investigating multiple referrals of OGC personnel because of their alleged misconduct during that very same OI investigation?

ANSWER:
As former Chairman Macfarlane noted in response to the Committee, no examination of the effective interface of the various component elements of NRC's enforcement program has been undertaken at NRC in over two decades. It is my understanding that, as a general matter, the fact that individuals within an office are alleged to have engaged in misconduct subject to the Inspector General's review would not preclude the entire organization from participating in an assessment of the underlying activity.

QUESTION 6.
On what date were you (or your staff) first made aware of this document, and who made you or your staff aware of it? When did you first receive a copy?

ANSWER:
I am informed by my legal counsel that he was first made aware of this document through a telephone call from Chairman Macfarlane's legal counsel on September 19, 2014. He received a copy on Monday, September 22, 2014.

QUESTION 7.
The NRC staff has indicated that the Commission may soon prepare a supplemental Environmental Impact Statement (EIS) for the proposed Yucca Mountain project. Will the Commission reevaluate the no action alternative in the supplemental EIS? If not, please provide an explanation why the no action alternative in the EIS is adequate.

ANSWER:
Following the *Aiken County* decision directing the agency to resume the licensing proceeding, the Commission has directed the completion, if possible, of an EIS supplement associated with post-closure impacts of the repository on groundwater, using remaining appropriated funds from the Nuclear Waste Fund. Reevaluation of the "no action" alternative is not part of the environmental matter that the NRC staff is currently considering. The final repository EIS for Yucca Mountain contains numerous statements and analyses with which participants in the licensing proceeding may disagree. The appropriate forum in which participants in the proceeding may pursue questions about already addressed environmental matters such as this one is before the Atomic Safety and Licensing Board, should the adjudication resume.

Senator Edward J. Markey to Commissioner Kristine L. Svinicki

QUESTION 1.
During the hearing, I asked you whether any of you disagree as a general matter that requiring both flood protection and flooding response measures would provide a higher level of safety than flooding response measures alone. Only Commissioner Baran responded clearly to that question. I ask for each of the rest of you to provide a clear response.

ANSWER:
The NRC establishes requirements for the design and operation of commercial nuclear power plants to ensure that they introduce no undue risk to public health and safety. These requirements are intended both to minimize transients and to mitigate them should they occur. The requirements help to prevent escalation of events, including flooding, into accidents with the potential to release radioactive materials into the environment. Requirements to minimize plant transients include those related to plant design, inspection, and maintenance of equipment, and protection of plant equipment from internal and external hazards. Requirements to mitigate transients, prevent core damage, and the release of radioactive materials include those related to plant design features, plant procedures, and strategies to address beyond-design-basis external events. The NRC currently requires and will continue to require measures for both flood protection and flood mitigation and will assess the appropriate selection or balancing between proposed alternatives using existing agency and government-wide policies and guidance for assessing and making regulatory decisions.

QUESTION 2.
During the hearing, I noted the statutory requirement for NRC to provide me with response to my requests for information and documents that have not been responded to. In particular, I noted the Commission's non-responsiveness to my letters regarding the "Job Shadow" program. Do you support the provision of the documents I have requested on this and other matters, yes or no? If not, what is your legal basis for refusing to agree to provide them to me?

ANSWER:
As was articulated in oral testimony at the Committee's hearing, this was not an NRC program. The NRC staff continues to be available to provide an agency briefing to you or your staff on this matter.

Senator David Vitter to Commissioner Kristine L. Svinicki

QUESTION 1.
I would like to clarify why no one had an issue with your nomination by asking you to briefly describe:

Your educational background prior to becoming a member of this commission.
Your professional background prior to becoming a member of this commission.

ANSWER:
I received a bachelor's degree in nuclear engineering from the University of Michigan. Prior to joining the Commission, I worked as a nuclear engineer and policy advisor at the state and Federal levels of government. I spent over a decade as a staff member in the United States Senate as an advisor principally on issues of nuclear weapons programs and policies, nuclear waste management, energy, science and technology. Prior to that, I worked as a nuclear engineer at the U.S. Department of Energy at both its Washington, DC Headquarters and its Idaho Operations Office. Prior to DOE, I served as an energy engineer for the State of Wisconsin. My full professional biography can be found on the NRC homepage.

QUESTION 2.
Even though your agency was under a court order to do so, I want to commend the Commission for completing Volume 3 of the Yucca Mountain Safety Evaluation Report (SER).

In the SER your staff found that DOE's design for the repository at Yucca Mountain meets the NRC's safety requirements for one million years, standards for individual protection, human intrusion, and groundwater protection.

I realize that, for this project to go forward, DOE needs funds to support its license application and the NRC will require funds to continue its licensing process. In August, NRC reported that you are on schedule and on cost to complete the remaining volumes of the SER by January 2015.

a. If the commission is on track to complete the remaining volumes by January, can you be more specific as to when we can expect to receive them?
b. I also understand that, after the completion of the SER, the Commission would normally move to an adjudication phase. Senator Murray recently wrote you and asked. Do you have an estimate for how much funding you expect would be necessary to complete the adjudication phase?
    a. If not for the entire adjudication, what is a reasonable estimate for fiscal year 2015?
c. I understand the DOE no longer intends to update the environmental impact statement (EIS) on Yucca Mountain. Can the NRC complete that supplementary EIS?

ANSWER:

a. Volume 4 of the Safety Evaluation Report (SER) was published on December 18, 2014. Volumes 2 and 5 of the SER were published on January 29, 2015.

b. The NRC advised the Congressional Appropriations Committees, by letter dated August 29, 2014, that the agency estimates $330 million would be necessary to complete the Construction Authorization licensing proceeding for the Yucca Mountain repository. The estimate consists primarily of the resources necessary

to conduct the adjudicatory phase but also includes resources required for Commission review and related activities to reach a final decision on the construction authorization application.

c. The NRC has the authority to prepare a supplement to DOE's repository EIS to address topics identified for supplementation in the NRC staff's Adoption Determination Report issued in September 2008. The Commission directed the staff to plan to develop and issue an EIS supplement but not to begin until the Yucca Mountain SER is substantively complete and the staff assesses the remaining NWF funds and its proposed plans for the EIS supplement. Development of the supplement that addresses specific groundwater issues is contingent upon Commission direction and sufficient remaining funds to complete the action. The Commission expects to make a decision on whether to supplement the EIS in the near future.

QUESTION 3.

Earthquake safety drew increased attention in 2011 after a tsunami triggered by a powerful earthquake disabled safety systems that resulted in the accident in Japan. Although it was flooding from the tsunami rather than shaking from the earthquake itself that led to the accident, the NRC folded its ongoing review of seismic safety into its post-Fukushima recommendations for U.S. reactors. The agency asked companies that operate nuclear energy facilities to re-evaluate seismic safety at their sites using the latest models and methodologies. Industry is now using the jointly developed 2012 seismic source model along with an updated ground motion model to calculate new probabilistic estimates of ground motions at the commercial nuclear power plants east of the Rocky Mountains.

Although these studies are still under way, initial analysis indicates that the seismic hazard decreased for some sites and increased somewhat for others. The seismic hazard curves are probabilistic estimates of ground motion the site could experience, but they do not provide information about how the plant would perform under those circumstances—

a. What implications the revised hazard estimates may have for plant safety?
b. What is the greatest seismic hazard expected to be generated by a fault near Diablo Canyon?
c. Is the plant design to withstand that greatest expected seismic hazard?
d. Is Diablo Canyon in compliance with NRC safety and operability requirements when it comes to seismic hazards?

ANSWER:

a. For those sites east of the Rocky Mountains where the seismic reevaluations have identified a hazard level that exceeds the plant's current design basis, the staff is following a multi-step process to assess the implications the revised hazard may have for plant safety. First, as documented in a May 9, 2014, letter, the NRC staff reviewed a March 12, 2014, fleet-wide study that estimated seismic risk and provided a discussion of the inherent seismic design margins for structures, systems, and components (SSCs). The staff also reviewed each licensee's plant-specific discussion of the new hazard, which was provided as part of the revised hazard submittal. The May 9, 2014, letter documents the staff's independent review and provides the staff's basis for concluding that these plants can continue to operate safely while additional evaluations are conducted.

The next step in the reevaluation process is for licensees with seismic reevaluations that showed hazards that exceeded the plant's current licensing basis to provide an additional evaluation that shows their plant's earthquake risk remains acceptable and is consistent with the fleet-wide study of seismic risks discussed above. The results of this interim evaluation process (also referred to as the expedited seismic evaluation process) will evaluate and reinforce certain core cooling systems and components, if necessary, to ensure plants can continue to operate safely. The NRC will review these interim evaluations to confirm that those plants do not need immediate regulatory action to ensure that they can be safely operated while they conduct more detailed probabilistic seismic risk evaluations.

b-d. Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting in part that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. Because your questions relate to matters in litigation pending before the Commission, and in view of the Commission's adjudicatory role, it would be inappropriate for me to comment further on the issue until the completion of the adjudication.

Senator Mike Crapo to Commissioner Kristine L. Svinicki

QUESTION 1.
Idaho National Laboratory, in my hometown of Idaho Falls, is in the process of restarting the Transient Test Reactor, also known as TREAT. This reactor will be able to conduct transient testing of fuels, or how fuels would perform in an accident scenario. Is the NRC aware of TREAT and DOE's program to develop accident tolerant fuels?

a. Would the NRC consider utilizing TREAT for some of its testing needs?

ANSWER:
The NRC technical staff has ongoing working relationships with technical staff at the Idaho National Laboratory (INL) and remains informed of INL's activities and capabilities. In this vein, the NRC staff has had discussions with INL about the restart of TREAT and its capabilities for transient testing of fuel. The NRC staff intends to continue this dialogue, including discussions on the testing of accident tolerant fuel designs that are currently under development by DOE and industry partners.

Senator BOXER. Now we will turn to Commissioner Ostendorff.

STATEMENT OF WILLIAM C. OSTENDORFF, COMMISSIONER, U.S. NUCLEAR REGULATORY COMMISSION

Mr. OSTENDORFF. Thank you, Chairman Boxer, Ranking Member Vitter and members of the committee.

Regarding lessons learned from Fukushima, the NRC and industry have made significant progress. We determined these activities must be accomplished without haste, the Tier I activities that are most safety significant.

Several licensees as noted by the Chairman have already complied with the mitigating strategies order. These modifications will be subject to NRC inspection to ensure appropriate implementation followed by codification and a rulemaking.

As I reflect on the work that has been completed by the agency and industry and the activities that still remain, I am proud of the agency's reliance on solid principles of science, engineering and risk management.

I appreciate this committee's oversight role and I look forward to your questions.

Thank you.

[The responses of Mr. Ostendorff to questions for the record follow:]

Committee on Environment and Public Works
December 3, 2014
Follow-Up Questions for Written Submission

Questions for Commissioner Ostendorff
The Honorable Barbara Boxer

QUESTION 6.

On what date were you (or your staff) first made aware of this document, and who made you or your staff aware of it? When did you first receive a copy?

ANSWER.

My staff was first made aware of this document on September 22, 2014. Susan Vrahoretis, Legal Counsel for former Chairman Macfarlane, provided this document to my staff. I first received a copy on September 22, 2014.

Committee on Environment and Public Works
December 3, 2014
Follow-Up Questions for Written Submission

Questions for Commissioner Ostendorff
The Honorable David Vitter

QUESTION 1.

The NRC is funded in a unique manner. It receives an appropriation from the General Fund of the Treasury each year and then imposes, by rule, a fee on its licensees that recovers 90 percent of the amount appropriated.

In recent years, we've seen the total amount appropriated to the NRC increase significantly; up 60 percent in the last decade - it's now over $1 billion/year. At the same time, there are less reactors operating, fewer new reactors being licensed than we anticipated, very little work on the Yucca Mountain license application, and a large number of your materials licenses are now being overseen by agreement states.

a) **There are now almost 4,000 employees at the NRC. It seems to me that, because of the large number of materials licenses now overseen by agreement states, the limited work being done on Yucca Mountain, and the fewer than expected new reactors under construction, that the work we expected just isn't there. Frankly, I think that's why, as work has declined, overhead costs have gone up so dramatically; it's now almost half the budget.**

i. **Do you have an estimate of how many staff the NRC needs several years from now - three or five years from now for example?**

ANSWER.

While the NRC does not currently have a future estimate of the number of staff needed several years from now, the NRC is currently undertaking an extensive effort (Project Aim 2020) to enhance the agency's ability to plan and execute its mission while adapting in a timely and effective manner to a dynamic environment. This effort will provide an initial projection or "aim point" for the workload expected five years in the future and, in turn, will provide essential information to determine staffing needs. The Commission anticipates receiving the Project Aim 2020 recommendations from the staff in January 2015.

ii. **Will you commit to take steps to ensure that you are employing just the number of people necessary to perform the agency's work?**

Committee on Environment and Public Works
December 3, 2014
Follow-Up Questions for Written Submission

ANSWER.

The NRC is committed to take steps to ensure that we are employing the right number of people with the right skills at the right time and with the flexibility to adapt quickly to a changing environment. This is evidenced by the extensive effort being undertaken by the agency (Project Aim 2020) that is focused on the resilience, flexibility, and preparedness of the NRC to accommodate a range of futures. The projected composition and size of NRC's workforce will need to be refined annually to accomplish the agency's mission.

Committee on Environment and Public Works
December 3, 2014
Follow-Up Questions for Written Submission

Questions for Commissioner Ostendorff
The Honorable David Vitter

QUESTION 2.

Earthquake safety drew increased attention in 2011 after a tsunami triggered by a powerful earthquake disabled safety systems that resulted in the accident in Japan. Although it was flooding from the tsunami rather than shaking from the earthquake itself that led to the accident, the NRC folded its ongoing review of seismic safety into its post-Fukushima recommendations for U.S. reactors. The agency asked companies that operate nuclear energy facilities to reevaluate seismic safety at their sites using the latest models and methodologies. Industry is now using the jointly developed 2012seismic source model along with an updated ground motion model to calculate new probabilistic estimates of ground motions at the commercial nuclear power plants east of the Rocky Mountains.

Although these studies are still under way, initial analysis indicates that the seismic hazard decreased for some sites and increased somewhat for others. The seismic hazard curves are probabilistic estimates of ground motion the site could experience, but they do not provide information about how the plant would perform under those circumstances—

a) What implications the revised hazard estimates may have for plant safety?

ANSWER.

For those sites east of the Rocky Mountains where the seismic reevaluations have identified a hazard level that exceeds the plant's current design basis, the staff is following a multi-step process to assess the implications the revised hazard may have for plant safety. First, as documented in a May 9, 2014, letter, the NRC staff reviewed a March 12, 2014, fleet-wide study that estimated seismic risk and provided a discussion of the inherent seismic design margins for structures, systems, and components (SSCs). The staff also reviewed each licensee's plant-specific discussion of the new hazard, which was provided as part of the revised hazard submittal. The May 9, 2014, letter documents the staff's independent review and provides the

staff's basis for concluding that these plants can continue to safely operate while additional evaluations are conducted.

The next step in the reevaluation process is for licensees with seismic reevaluations that showed hazards that exceeded the plant's current licensing basis to provide an additional evaluation that shows their plant's earthquake risk remains acceptable and is consistent with the fleet-wide study of seismic risks discussed above. The results of these interim evaluations (also referred to as the expedited seismic evaluation process) were received in December 2014 (with the exception of Cooper Nuclear Station which was granted an extension). The NRC is currently reviewing these interim evaluations to confirm that those plants do not need immediate regulatory action to ensure that they can be safely operated while they conduct more detailed probabilistic seismic risk evaluations.

b) What is the greatest seismic hazard expected to be generated by a fault near Diablo Canyon?

c) Is the plant designed to withstand that greatest expected seismic hazard?

d) Is Diablo Canyon in compliance with NRC safety and operability requirements when it comes to seismic hazards?

ANSWER (to b), c), and d)).

Friends of the Earth (FOE) has filed a petition to intervene and request for hearing before the Commission asserting, in part, that faults near the Diablo Canyon facility are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. FOE also has filed a hearing request before the Atomic Safety and Licensing Board (Licensing Board) presiding over Pacific Gas & Electric Company's (PG&E) pending license renewal application for Diablo Canyon, in which FOE disputes PG&E's ground motion

predictions. In view of its adjudicatory role, the Commission cannot address matters in litigation. Because your question largely relates to matters in litigation pending before both the Commission and the Licensing Board, the Commission cannot comment further on the issue at this time, but would be pleased to discuss it further following the completion of the adjudications.

Senator BOXER. Thank you so much, Commissioner.

We will now turn to Commissioner Baran.

STATEMENT OF JEFF BARAN, COMMISSIONER, U.S. NUCLEAR REGULATORY COMMISSION

Mr. BARAN. Chairman Boxer, Ranking Member Vitter and members of the committee, thank you for the opportunity to appear today before the Environment and Public Works Committee.

Since I started on the Commission in October, it has been a privilege to work with my fellow commissioners. Together, we bring a diversity of experience and perspectives to our deliberations.

On a personal note, I want to publicly say that I deeply appreciate the warm welcome they have given me. I believe we are all working very well together and building productive, collegial relationships.

It has been a busy time at the Commission. We have held commission meetings on a number of topics, including Watts Bar 2 Unit licensing, small modular reactors, NRC's international activities and Project Aim 2020, which is NRC's effort to appropriately match resources to workload and increase the agility and efficiency of the agency.

I have also met with a broad range of stakeholders, including the Nuclear Energy Institute, the American Nuclear Society, NRDC and the Union of Concerned Scientists. I have had the opportunity to meet the senior leadership of many of NRC's licensees at the annual MPO CEO's conference.

I also recently visited Watts Bar Units 1 and 2 and look forward to touring additional NRC-regulated facilities in the near future.

I remain committed to bringing an open-minded and thoughtful approach to the policy and adjudicatory issues pending before the Commission such as decommissioning plant licensing exemptions, staff guidance for the use of qualitative factors and cost benefit analysis, updates to the Force-on-Force Inspection Program and the examination of NRC's foreign ownership and control standards.

These are complex issues but I am confident that the Commission has the positive working relationships and wide range of experience needed to successfully address them.

Thank you.

[The responses of Mr. Baran to questions for the record follow:]

Environment and Public Works Committee Hearing
December 3, 2014
Follow-Up Questions for Written Submission

Questions for Baran

Questions from:

Senator Barbara Boxer

1) Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe it is operating within its seismic licensing requirements? Why or why not?

This question is currently being litigated before the agency. Friends of the Earth has filed a petition to intervene and request for hearing asserting in part that faults near the Diablo Canyon facility (in docket nos. 50-275, 50-323) are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. Friends of the Earth also has filed a hearing request before the Atomic Safety and Licensing Board (ASLBP No. 10-900-01-LR-BD01) in a matter concerning PG&E's pending license renewal application for Diablo Canyon, in which Friends of the Earth disputes PG&E's ground motion predictions.

2) If you do believe that DCPP is operating within its seismic licensing requirements, why is PG&E currently engaged in a Licensing Basis Verification Project (LBVP), which will cost an estimated $133 million and is described on PG&E's webpage[1] as a project that "will review, validate and reconcile the Current licensing Basis (CLB) for DCPP... In order to ensure regulatory compliance, PG&E reviews all proposed changes to the DCPP facility against the FSAR and the CLB... The LBVP will produce a reconstituted FSAR and licensing basis with enhanced CLB retrievability to support ongoing and future compliance of DCPP activities with its NRC approved licensing basis. The LBVP will perform a review and evaluation of the licensing, design and analysis changes from the original FSAR to the present. Based on the results of that review, the LBVP will identify, consolidate and reconcile any inconsistencies in the CLB."

Please refer to the answer to question 1.

3) Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe that PG&E has complied with NRC's 50.59 regulations that require it to have performed a concurrent analysis of Hosgri earthquake and Loss of Coolant Accident (LOCA) when replacing reactor equipment such as the steam generators or reactor vessel head?

The NRC staff is currently examining this question. Moreover, this question is currently being litigated before the agency. Friends of the Earth has filed a petition to intervene and request for hearing asserting in part that faults near the Diablo Canyon facility (in docket nos. 50-275, 50-323) are capable of producing an earthquake with ground acceleration that exceeds the limits in the plant's current licensing basis. Friends of the Earth also has filed a hearing request before the Atomic Safety and Licensing Board (ASLBP No. 10-900-01-LR-BD01) in a matter concerning PG&E's pending license renewal application for Diablo Canyon, in which Friends of the Earth disputes PG&E's ground motion predictions.

[1] https://www.pge.com/regulation/GRC-2014-Phase1/Testimony/PGE/2012/GRC-2014-Phase1_Test_PGE_20121115_254326.pdf

Questions from Senators Barbara Boxer and Edward J. Markey

4) During the hearing, the document drafted by Chairman Macfarlane and sent to NRC's Mark Sartorius and Margaret Doane entitled "Strengthening the NRC Enforcement Process by Enhancing Procedural Fairness" was discussed. As you know, when we wrote the Commission on October 9 urging that this document be rescinded, NRC's spokesperson told reporters that "Specific to their call for rescinding a reorganization of the Office of Investigations, we can affirm that no such reorganization plan exists, nor has one been contemplated." However:
   a. The document states that the review of the NRC enforcement process should "ensure that appropriate resources are devoted to investigations that are most safety and security significant," which could, if this proposal were implemented, limit the types of investigations that NRC's Office of Investigations (OI) could undertake because resources might not be provided for some investigations.
   b. The document states that the review of the NRC enforcement process should "develop procedures for assigning technical staff to support investigations which promote the objectivity and independence of the investigation", which could, if this proposal were implemented, limit the technical expertise that could be available to OI.
   c. The document states that the review of the NRC enforcement process should "ensure that all referrals to the Department of Justice on behalf of the NRC are shared with and reviewed by OGC," which would represent a departure from current OI practice.
   d. The document directs NRC OGC to "conduct a 'lessons learned' review of the Exelon Decommissioning Fund investigation and enforcement action from the legal perspective to determine whether changes to the allegations review and investigation report review processes are required in terms of how legal advice and guidance is provided to the staff," even though the NRC Inspector General is currently (and was, at the time this memo was prepared) investigating allegations related to OGC's conduct related to the same investigation and enforcement action.
   e. The document directs NRC OGC "to provide legal advice, guidance and a recommendation on the need for a timely and thorough technical and legal analysis of facts and evidence in the case, including all contact with counsel for the target or subject of the investigation and information provided in the pre-enforcement conference, to fully inform a final agency decision on whether to take enforcement action, particularly where escalated enforcement has been recommended by OI," and that this direction, if implemented, would represent a departure from current OI practice.

   In response to questions about this document at the hearing, Chairman Macfarlane stated that "Never and nowhere in that memo will you find any contemplation of any reorganization of the Office of Investigations."

   Do you agree that a proposal that would limit the type of investigations that OI could undertake, limit the technical resources that are available to support OI's investigations, and alter the manner in which OI is directed to interact with and report to OGC throughout the course of an investigation could be described as a reorganization of OI's mission?

The draft tasking memo predated my joining the Commission, and I have not had the opportunity to thoroughly discuss the elements of that document with the appropriate offices as a result of the ongoing Inspector General investigation. I would like to reserve judgment on characterizing the draft tasking memo until I understand the facts and hear the perspectives of the relevant offices.

5) Do you agree that it was appropriate to direct OGC to conduct a "lessons learned" review of an OI investigation when the NRC IG is still investigating multiple referrals of OGC personnel because of their alleged misconduct during that very same OI investigation?

As I stated in answering the prior question, the draft tasking memo predated my joining the Commission, and I have not had the opportunity to thoroughly discuss the elements of that document with the appropriate offices as a result of the ongoing Inspector General investigation. I would like to reserve judgment on the draft direction to OGC until I understand the facts and hear the perspectives of the relevant offices. As a general matter, I think contentious issues involving multiple offices within an agency are best resolved through a cooperative approach that includes all of the relevant offices. Alternatively, independent third parties are often effective in looking objectively at contentious issues and offering options for improving future practices.

6) On what date were you (or your staff) first made aware of this document, and who made you or your staff aware of it? When did you first receive a copy?

I became aware of the draft tasking memo upon reading Sen. Markey's October 9, 2014, letter to Chairman Macfarlane. However, I was not on the Commission at that time. I believe I first read the draft during my first week as a Commissioner.

7) The NRC staff has indicated that the Commission may soon prepare a supplemental Environmental Impact Statement (EIS) for the proposed Yucca Mountain project. Will the Commission reevaluate the no action alternative in the supplemental EIS? If not, please provide an explanation why the no action alternative in the EIS is adequate.

I understand that the Chairman separately will submit an answer to this question on behalf of the Commission.

Questions from:

Senator Edward J. Markey

1) During the hearing, I noted the statutory requirement for NRC to provide me with responses to my requests for information and documents that have not been responded to. In particular, I noted the Commission's non-responsiveness to my letters regarding the "Job Shadow" program. Do you support the provision of the documents I have requested on this and other matters, yes or no? If not, what is your legal basis for refusing to agree to provide them to me?

Because your request regarding the "Job Shadow" program predated my tenure on the Commission, I did not participate in NRC's response to your letters. However, as a general matter, I believe that NRC's oversight committees and the Members of those committees should receive the information that they request. If particularly sensitive documents are requested, there should be discussions between the Commission and the Committee (or Member) about how to provide the Committee (or Member) the information the Committee (or Member) needs to fulfill its important oversight function.

Questions from:

Senator David Vitter

1. Please describe:
    a) Your educational background prior to becoming a member of this commission.
    b) Your professional background prior to becoming a member of this commission.

I received a J.D. from Harvard Law School in 2001. In 1998, I received a B.A. and M.A. in political science from Ohio University.

From 2009 to 2014, I served on the House Energy and Commerce Committee staff, where one of my primary areas of responsibility was oversight of NRC. My most recent position was Democratic Staff Director for Energy and Environment. From 2003 to 2009, I served as counsel to the House Oversight and Government Reform Committee. From 2001 to 2003, I was a law clerk for Judge Lesley Wells in the U.S. District Court for the Northern District of Ohio.

For Commissioner Baran Regarding Answers to Questions for the Record Submitted For His Original Nomination Hearing on 9/11/2014.

2. **Post-Fukushima** – Commissioner Baran, after your September confirmation hearing, I submitted a list of questions for the record. On at least 20 of those questions, you provided either non-responsive, incomplete, or evasive answers. For example, consider my QFR #50, which asked: "On May 19, 2014, the Commission acted on an NRC staff recommendation regarding three specific recommendations arising out of the Near-Term Task Force Report... The three staff recommendations were approved by the Commission even though the NRC staff also acknowledged that these changes 'are not needed to maintain safety of nuclear power reactors.'" I asked whether you agreed with the action taken by the Commission. You deferred answering on the basis that you had "not reviewed this vote and would reserve judgment until I have done so." Almost three months have passed. Can you answer my question now?

Although I did not benefit from the deliberations on this matter, the Staff Requirements Memorandum resulting from the vote appears to articulate a reasonable approach. I agree with the Commission that the NRC staff should evaluate the current status of implementation of the most risk or safety significant voluntary industry initiatives and verify that these initiatives are being adequately implemented. I look forward to reviewing the upcoming staff paper on the Risk Management Regulatory Framework and reevaluating the improvement activities recommended by staff in that context.

3. **Qualitative Factors** – Commissioner Baran, you and Commissioner Burns were confirmed at the same time in September. It was interesting to compare your responses to my QFRs with the answers we received to the same questions from Commissioner Burns. For example, in response to my QFR #51, you wrote: "In my view, it is generally appropriate to thoughtfully consider both quantitative and qualitative factors when analyzing the costs and benefits of a proposed regulatory action." Your view seems to treat both kinds of factors on equal footing, which would seem to be a drastic departure from prior NRC practice. However, in response to an identical question, Commissioner Burns seemed less enthusiastic about the use of qualitative factors, stating: "As a general matter, regulatory decisions may reflect a variety of relevant consideration including ***quantitative analysis and other scientific and engineering evaluations***. This does not exclude qualitative analysis in decision-making, but I would want to examine the concerns Commissioner Magwood had as well as the views of other Commissioners in understanding the concerns over the proper role of such analysis." Commissioner Baran, please explain how you

will approach qualitative factors in NRC regulatory analyses in general, and in backfit contexts, in particular.

As I stated during the December 3, 2014, hearing, the Commission is currently considering whether the NRC staff should update the agency's cost-benefit guidance to assist the staff in better articulating how it uses qualitative factors. I think that updating the guidance on qualitative factors could be helpful to NRC's analysts and improve the clarity, transparency, and consistency of the agency's regulatory and backfit analyses.

It is well-established that regulatory analysis "must take into account benefits and costs, both quantitative and qualitative." Executive Order 12866 explains, "Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider." Office of Management and Budget Circular A-4 reiterates that "[a] complete regulatory analysis includes a discussion of non-quantified, as well as quantified benefits and costs." NRC's regulatory and backfit analyses have been consistent with the approach described in Executive Order 12866 and Circular A-4 for decades.

4. **Backfit** –QFR #45 asked you to describe your understanding of the NRC's backfit rule and its role in NRC licensing and regulatory functions. In response, you simply stated: "*In brief, under the backfit rule, as I understand it, unless a required modification to an existing facility is necessary for adequate protection, the benefits of the required modification must exceed the costs.*" The backfit rule is an important part of the NRC's overall approach to addressing changes to facilities that might occur after the facility's license has been issued, and it seems that your definition downplays its significance and fails to capture the full implications and contours of this important rule. For example, your interpretation ignores that the NRC may only impose a backfit where the modification provides a "***substantial increase*** in the overall protection of the public health and safety or the common defense and security…," except in circumstances where the regulatory change is "necessary to ensure … adequate protection." 10 C.F.R. 50.109(a)(3) (emphasis added). In addition, the backfit rule requires that the "direct and indirect costs of implementation for that facility are justified in view of this increased protection." *Id.*
    i. Please more fully describe your current understanding of the backfit rule and its role in the NRC licensing and regulatory functions.
    ii. Also, please explain how you interpret the phrase "substantial increase" as it is used in the backfit rule, as well as your understanding of when the "adequate protection" exception should apply.

My understanding is that the NRC's backfitting regulations restrict what new requirements or staff interpretations of existing regulations can be imposed on certain regulated entities. In determining whether it may impose a new requirement or interpretation on a licensee, NRC determines whether one of the three exceptions to the backfit rule applies. The three exceptions, which are in 10 CFR 50.109(a)(4) for operating reactors, are for: action necessary to bring the facility into compliance with the license or the regulations; action necessary to ensure that the facility provides adequate protection of the public health and safety or common defense and security; and action that involves defining or redefining the level of adequate protection. If the backfitting does not meet one of these exceptions to the backfit rule, then the NRC may impose the backfitting only if the backfit analysis demonstrates: (i) that there is a substantial increase in the public health and safety or common defense and security; and (ii) that the direct and indirect costs of implementation are justified in view of the increased protection. In addition, the Commission will require backfitting of a facility if it determines such regulatory action is necessary to ensure that a facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security.

I interpret the phrase "substantial increase" consistently with how the Commission defined that term when proposing the backfit rule in 1985, where it stated that substantial means "important in a large amount, extent or degree."

5. QFR #6 asked whether "you think nuclear power plants are being operated safely in the United States today." You evaded answering that question directly. Please answer.

The performance of each of the 100 operating commercial reactors is unique. Individual plant performance summaries are publicly available on the NRC website. There are currently 94 plants in the two highest performance categories of the Reactor Oversight Process Action Matrix. Five plants are currently in the degraded cornerstone column of the Reactor Oversight Process Action Matrix and one plant continues to be evaluated by an NRC oversight panel to coordinate the agency's regulatory activities.

6. QFR #7 asked how you would "handle a situation in which you were asked to approve a licensing action that complied with all the applicable regulatory requirements but you believe approving is not the best course of action for the NRC" as a policy matter. You evaded answer that question specifically. Please answer whether your policy views would ever override NRC laws and regulations in making a determination in a voting matter.

My policy views inform my voting on policy issues, but, as I stated previously, I will evaluate each licensing application on the merits and apply the relevant statutory and regulatory requirements.

7. QFR #13, asked you to provide a list of nuclear power plants that you have visited along with the date of the visit and a brief description of the nature of the visit and meetings that occurred there. You responded that you had visited one nuclear power plant—a tour of the Calvert Cliff's Nuclear Station on June 20, 2014. Please update your list with additional site visits since that time.

On November 17, 2014, I visited Watts Bar Units 1 and 2. Unit 1 is an operating reactor. TVA is completing construction of Unit 2. I look forward to visiting additional NRC-regulated facilities in the near future.

8. QFR #15, asked you to provide a list of all organizations (with an interest in law, policy, energy or environmental issues, nuclear power, nuclear waste, nuclear safety, or related matters) of which you are or have been a member. You responded by identifying, among others, the Harvard Environmental Law Society (HELS). On November 19, 2014, the President of HELS (with other members) recently filed suit against Harvard to compel divestiture of its endowment's assets related to oil, coal, and natural gas investments. The brief filed against Harvard cited a "moral duty . . . to stop profiting from environmental destruction." It does not appear that the lawsuit was filed in the name of HELS or by any person acting in an official capacity with HELS.
   - Are you a current member of HELS?
   - Do you support these actions by members of HELS?
   - Do you believe educational institutions have a moral obligation to refuse endowment funds from, or to divest assets related to, U.S.-based energy companies?

I am not currently a member of the Harvard Environmental Law Society, the members of which are law students. I am not familiar with the lawsuit referenced in the question and have no opinion about it.

9. QFR #17, noted that it appears that you will be the least experienced person ever to serve on the NRC. You "respectfully disagree[d]" with that assessment. A review of the list of current and

past NRC commissioners reveals two lawyers who, like you, became NRC members after serving as congressional staff: James Asseltine (NRC member from 1982-1987) and James Curtiss (NRC member from 1988-1993), both of whom served on Senate EPW Committee staff. However, both of these NRC members also served previously as lawyers within the NRC itself. All other former Hill staff who became NRC members had either (a) degrees in physics, nuclear engineering, nuclear chemistry, or nuclear astrophysics; (b) commanded a nuclear submarine; or (c) practiced law in the private sector. Please explain your basis for disagreeing with my assessment of your level of experience relative to other previous NRC members. Please identify any prior NRC member who you believe had less relevant experience than you.

As I explained previously, my substantial policymaking and legal experience have prepared me to serve as a Commissioner, which is primarily a policymaking, rulemaking, and adjudicatory position.

10. QFR # 21 asked you to identify the person or persons who has most significantly shaped and informed your views on nuclear power and nuclear safety. You did not answer the question. Please provide a response that answers the specific question.

There is no single individual (or set of individuals) who I can point to as most significantly shaping or informing my views. Generally, I prefer to gather information from a variety of sources before forming an opinion about an issue.

11. QFR # 22 asked you to identify those books you have read or studied extensively on the topic of nuclear power or nuclear safety. You said you have read "numerous books" on those topics. Please identify as many as you can and a general estimate of when you read them.

A non-exhaustive list of the books and reports on these topics I have read in recent years includes the report of the Blue Ribbon Commission on America's Nuclear Future, the NWTRB's *Experience Gained from Programs to Manage High-Level Radioactive Waste and Spent Nuclear Fuel in the United States and Other Countries*, Rand's *Managing Spent Nuclear Fuel: Strategy Alternatives and Policy Implications*, J. Samuel Walker's *The Road to Yucca Mountain*, the National Research Council's *Medical Isotope Production Without Highly Enriched Uranium*, and Judy Pasternak's *Yellow Dirt*. In addition, over the years, I have read a significant number of NRC, DOE, DNFSB, GAO, and IG reports regarding nuclear safety and security.

12. Please review your response to QFR #25. Please explain how you reconcile your commitment to "abide by any applicable requirements" governing the release of NRC-related information with your commitment to "enhance transparency" and "openness". Please answer his specific question: Do you agree to not release NRC documents or information to third parties (including the media, members of Congress or their staff, environmental groups, or other entities) except as otherwise required by law and NRC rules, policies, and guidelines?

I disagree with the premise of this question. I think there are many situations in which information is not *required* to be disclosed by law or regulation but where the agency is *permitted* to disclose information and would do so in order to enhance transparency.

13. QFR #26, asked whether you agree with Dr. Jaczko's views as reported in an article in the New York Times dated April 8, 2013. Dr. Jaczko had suggested that all 104 U.S. nuclear reactors should be phased-out and replaced. You evaded answering this question directly. However, Commissioner Burns was asked the same question, and he answered directly: "I do not hold that position." Do you agree with Dr. Jaczko's view, as described in that article? Like Commissioner Burns, will you say that you do not hold that position?

I do not hold that position.

14. QFR #27, asked whether you agreed with President Obama and Secretary Moniz that nuclear power should play an important role in the nation's electric generation mix. You evaded a direct answer. Please respond directly.

I want to be careful how I answer this question because NRC's role is to be a nuclear safety regulator, not a promoter of nuclear power or to set general energy policy. I would observe though that nuclear power is low-carbon, baseload power. NRC is responsible for having an efficient, effective process for licensing new reactors and ensuring that all licensed reactors in the U.S. operate safely.

15. QFR #27, asked: "Even regardless of concerns related to climate change, do you believe nuclear energy should play an important role in providing electric generation for the nation?" You evaded a direct answer. Please respond directly.

Please refer to the answer to question 14.

16. QFR #29 asked whether, in your view, federal law preempts state laws regarding nuclear safety and the licensing and decommissioning of nuclear power plants. You evaded a direct answer. Please respond directly.

My understanding is that federal law preempts state law for radiological health and safety issues for the licensing and decommissioning of nuclear power plants. Apart from radiological health and safety issues, the states continue to have an important role to play in the decommissioning process, and I look forward to continued engagement with my fellow Commissioners, the NRC staff, states, and other stakeholders regarding the appropriate role of state participation in the decommissioning process.

17. In response to QFR #29 and #30, you stated that you want to take a "fresh look" at the NRC's decommissioning process. Please explain what you mean by "fresh look" and which specific areas you believe merit reconsideration and changes.

I think that the NRC staff should proceed with rulemaking to take a fresh look at decommissioning. In my view, the rulemaking should address and seek public comment on the following issues: the appropriateness of maintaining the three existing options for decommissioning and the timeframes associated with those options; the advisability of requiring a licensee's Post-Shutdown Decommissioning Activity Report to be approved by NRC; the appropriate role of state and local governments and non-governmental stakeholders in the decommissioning process; emergency planning and the advisability of a graded approach to emergency preparedness; security and safeguards; financial assurance and insurance; and staffing and training.

18. QFR #31 asked you to list all public speeches or presentations you have made concerning nuclear energy, nuclear safety, spent nuclear fuel/nuclear waste, Yucca Mountain, or other issues of relevance to the work of the NRC, and to provide copies (written, audio, or video) of any such speeches or presentations. In response, you only listed one event: a panel at the NBCSL conference in December 2012. It is our understanding that the title of the panel was "Nuclear Energy 360: Secure Families and Safe Communities in the Wake of Fukushima Daiichi." You stated that you do not have a copy of any audio or video of your remarks, but it would seem that a copy would be available through the event organizers. Have you asked the event organizers for an audio, video, or transcription of your remarks at this event? If not, please do so and provide it to the EPW minority committee staff for review.

I have not contacted the event organizers as I do not believe the event was recorded or transcribed.

19. QFR #32 asked you to provide a copy and transcript of your presentation at the Energy Storage Conference in June 2014. You responded that you do not have a copy. Have you asked the event organizers for a copy and transcript, along with any video or audio? If not, please do so and provide it to the EPW minority committee staff for review.

I have not contacted the event organizers as I do not believe the question and answer session was recorded or transcribed.

20. Given your prior affiliation with the NRDC, in QFR #35 I asked whether you agree with NRDC's views on nuclear power. You evaded a direct answer. Please familiarize yourself with NRDC's position on nuclear power, as embodied in their commercial nuclear power position paper, and state whether you agree with their views.

My understanding is that NRDC has views on a wide range of nuclear issues. I am not familiar with all of those views so I cannot say whether I agree or disagree with them. I approach the issues before the Commission with an open mind and an interest in hearing the views of a diverse range of stakeholders.

21. QFR #45 asked you to describe your understanding of the NRC's backfit rule and its role in NRC licensing and regulatory functions. In response, you simply stated: "In brief, under the backfit rule, as I understand it, unless a required modification to an existing facility is necessary for adequate protection, the benefits of the required modification must exceed the costs." The backfit rule is an important part of the NRC's overall approach to addressing changes to facilities that might occur after the facility's license has been issued, and it seems that your definition downplays its significance and fails to capture the full implications and contours of this important rule. For example, your interpretation ignores that the NRC may only impose a backfit where the modification provides a "substantial increase in the overall protection of the public health and safety or the common defense and security...," except in circumstances where the regulatory change is "necessary to ensure ... adequate protection." 10 C.F.R. 50.109(a)(3) (emphasis added). In addition, the backfit rule requires that the "direct and indirect costs of implementation for that facility are justified in view of this increased protection." Id. Please more fully describe your current understanding of the backfit rule and its role in the NRC licensing and regulatory functions. Also, please explain how you interpret the phrase "substantial increase" as it is used in the backfit rule, as well as your understanding of when the "adequate protection" exception should apply.

Please refer to the answer to question 4.

22. In your response to QFR #40, you asserted that "as a general matter" you think "it is important for Commissioners to receive the information they need to perform their functions. I am curious as to why you would place the condition "as a general matter" in that context. You used the same phrase when answering QFR #43. What exceptions, if any, do you think apply to the chairman's obligation to keep the other commissioners fully informed of all matters and to not control the flow of information to the other commissioners?

According to the Internal Commission Procedures, "The Chairman and the Executive Director for Operations, through the Chairman, are responsible for ensuring that the Commission is fully and currently informed about matters within its functions ... The Chairman shall ensure prompt and full delivery of original information with any changes thereto, including draft SECYs and COMs. This does not include

preliminary information for development of proposals within the scope of Reorganization Plan Section 2(b)."

23. QFR #46, asked whether you are familiar with the NRC guidance to staff on the use of Probabilistic Risk Assessment (PRA). He also asked about your view of PRA and how it should be used in NRC licensing and regulatory functions. You did not provide a substantive response. Please provide a response answering this question.

I have reviewed the Commission's Final Policy Statement on the use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities, which forms the basis for guidance to the NRC staff. I agree with the Policy Statement that the use of probabilistic risk assessment should be used in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy.

24. QFR #47, asked whether the NRC is considering ways to address the cumulative effects of regulations. Please explain whether you believe there are legitimate concerns regarding the cumulative effects of NRC rules, orders, and other agency directives and actions on licensees. Please explain your view of how the NRC should evaluate and address these cumulative effects.

According to the NRC staff, there are times when it can be beneficial to adjust schedules for rulemaking comments or implementation to avoid overlapping deadlines. The staff is preparing a paper on the topic of cumulative effects of regulation for presentation to the Commission in March 2015. I want to review that paper and hear from the staff and stakeholders before forming an opinion.

25. QFR #48, asked: "On April 24, 2014, the Commission voted on a policy paper by NRC staff pertaining to financial assurance requirements for merchant plants. Do you agree or disagree with the Commission's determination in that matter?" You responded by "reserve[ing] judgment" until you had an opportunity to review the votes on that matter. Please respond to the question.

I think it is reasonable to take public comment on this issue through a rulemaking process, as the Commission directed in the referenced Staff Requirements Memorandum. I look forward to reviewing the proposed rule and public comments.

26. QFR #49, asked about the NRC's post-Fukushima process. You responded that "it is important for Post-Fukushima lessons learned to be implemented expeditiously" and that the Commission should look for "opportunities to accelerate progress." Please explain what you meant in that response and whether it means you would support changes to the current schedule for NRC post-Fukushima actions.

NRC is taking a range of post-Fukushima actions, which were prioritized by the Commission. There are different schedules associated with the various actions. My view is that the lessons learned should be implemented expeditiously but also in a thoughtful manner that provides an opportunity for public participation. Those are important factors that I would consider in evaluating any Fukushima-related policy or scheduling questions presented to the Commission.

27. In response to QFR #50, which asked about a decision by the NRC on May 19, 2014, regarding recommendations arising out of the Near-Term Task Force Report, you deferred answering on the basis that you had "not reviewed this vote and would reserve judgment until I have done so." Please respond to the questions in Vitter QFR #50.

Please refer to the answer to question 2.

28. In response to QFR #51, you wrote: "In my view, it is generally appropriate to thoughtfully consider both quantitative and qualitative factors when analyzing the costs and benefits of a proposed regulatory action." Your view seems to treat both kinds of factors on equal footing, which would be a drastic departure from prior NRC practice. However, in response to an identical question, Commissioner Burns seemed less enthusiastic about the use of qualitative factors, stating: "As a general matter, regulatory decisions may reflect a variety of relevant consideration including quantitative analysis and other scientific and engineering evaluations. This does not exclude qualitative analysis in decision-making, but I would want to examine the concerns Commissioner Magwood had as well as the views of other Commissioners in understanding the concerns over the proper role of such analysis." Please explain how you will approach qualitative factors in NRC regulatory analyses in general, and in backfit contexts, in particular.

Please refer to the answer to question 3.

29. It appears that your response to QFR #56 is internally inconsistent. On one hand, you wrote: "I do not believe there would be an obstacle to notifying Congress within 24 hours of a decision to exercise emergency authority." Yet, on the other hand, you also wrote in the same response that it was not misleading for Rep. Waxman to assert that H.R. 3132 (which requires notification to Congress "not later than 24 hours after" the chairman declares a specific emergency exists) would have "prevented the NRC Chairman from exercising emergency powers until certain actions were taken." Please reconcile these two inconsistent positions.

The responses were consistent. I do not believe there would be an obstacle to notifying Congress within 24 hours of a decision to exercise emergency authority. However, as drafted, the bill did more than require notification within 24 hours. It also prevented the Chairman from exercising emergency powers "unless and until" such notification to the Commission, Congress, and the public occurred.

Questions from:

Senator Mike Crapo

1. Idaho National Laboratory, in my hometown of Idaho Falls, is in the process of restarting the Transient Test Reactor, also known as TREAT. This reactor will be able to conduct transient testing of fuels, or how fuels would perform in an accident scenario. Is the NRC aware of TREAT and DOE's program to develop accident tolerant fuels?
   a) Would the NRC consider utilizing TREAT for some of its testing needs?

I understand that the Chairman separately will submit an answer to this question on behalf of the Commission.

Senator BOXER. Thank you so much, Commissioner.

Commissioner Burns.

STATEMENT OF STEPHEN G. BURNS, COMMISSIONER, U.S. NUCLEAR REGULATORY COMMISSION

Mr. BURNS. Thank you, Chairman Boxer, Ranking Member Vitter and members of the committee. It is a pleasure to appear before you today.

As many of you know, I first started at the NRC as a junior attorney back in the late 1970s. I would not have imagined I would be sitting before you today as a commissioner.

The mission of the agency remains as vitally important today as it was then. The protection of public health and safety and the common defense and security against the potential hazards posed by radiological materials is a critically important task and one to which I have committed my entire career.

The NRC also has a responsibility to ensure that its decisions are based on sound legal and technical footing and are transparent to all stakeholders.

Over the past few years, I have spent outside the NRC and the international community and that has allowed me to take stock of the agency. I continue to believe it is one of the finest organizations in our Government.

I can say from the perspective of the international community that the NRC is enormously respected and is often looked to for technical and policy leadership.

However, acknowledging the agency's high caliber should not be understood to mean that we cannot improve. We all recognize that the climate in which the agency operates has changed over the last number of years. It is our obligation to be agile in responding to changes in that environment.

In closing, I thank the committee for their continue support of the NRC and the opportunity to appear here today.

I look forward to answering any questions you may have.

Thank you.

[The responses of Mr. Burns to questions for the record follow:]

Environment and Public Works Committee Hearing
December 3, 2014
Follow-Up Questions for Written Submission – Stephen G. Burns

The Honorable Barbara Boxer:

1. *Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safety, do you believe it is operating within its seismic licensing requirements? Why or why not?*

   ANSWER: Friends of the Earth (FOE) has filed two hearing requests that relate at least in part to this question. In this light, it would be inappropriate for me to comment further on the issue at this time but would be pleased to discuss the matters further following the completion of the adjudications.

2. *If you do believe that DCPP is operating within its seismic licensing requirements, why is PG&E currently engaged in a Licensing Basis Verification Project (LBVP), which will cost an estimated $133 million and is described on PG&E's webpage as a project that "will review, validate and reconcile the Current Licensing Basis (CLB) for DCPP. In order to ensure regulatory compliance, PG&E reviews all proposed changes to the DCPP facility against the FSAR and the CLB. The LBVP will produce a reconstituted FSAR and licensing basis with enhanced CLB retrievability to support ongoing and future compliance of DCPP activities with its NRC approved licensing basis. The LBVP will perform a review and evaluation of the licensing, design and analysis changes from the original FSAR to the present. Based on the results of that review, the LBVP will identify, consolidate and reconcile any inconsistencies in the CLB.*

   ANSWER: It is my understanding that Pacific Gas and Electric Company stated at a September 22, 2010 public meeting that its Licensing Basis Verification Project was established to ensure the current licensing basis is clear and to identify potentially deficient evaluations of changes, tests and experiments made under 10 CFR 50.59.

3. *Separate and apart from whether you believe that the Diablo Canyon Power Plant (DCPP) is operating safely, do you believe that PG&E has complied with NRC's 50.59 regulations that require it to have performed a concurrent analysis of Hosgri earthquake and Loss of Coolant Accident (LOCA) when replacing reactor equipment such as the steam generators or reactor vessel head?*

   ANSWER: Friends of the Earth (FOE) has filed two hearing requests that relate at least in part to this question. In this light, it would be inappropriate for me to comment further on the issue at this time but would be pleased to discuss the matters further following the completion of the adjudications.

The Honorable Barbara Boxer and Edward J. Markey

1. *During the hearing, the document drafted by Chairman Macfarlane and sent to NRC's Mark Satorius and Margaret Doane entitled "Strengthening the NRC Enforcement Process by Enhancing Procedural Fairness" was discussed. As you know, when we wrote the Commission on October 9 urging that this document be rescinded, NRC's spokesperson told reporters that "Specific to their call for rescinding a reorganization of the Office of Investigations, we can affirm that no such reorganization plan exists, nor has one been contemplated." However:*

    a. *The document states that the review of the NRC enforcement process should "ensure that appropriate resources are devoted to investigations that are most safety and security significant," which could, if this proposal were implemented, limit the types of investigations that NRC's Office of Investigations (OI) could undertake because resources might not be provided for some investigations.*

    b. *The document states that the review of the NRC enforcement process should "develop procedures for assigning technical staff to support investigations which promote the objectivity and independence of the investigation", which could, if this proposal were implemented, limit the technical expertise that could be available to OI.*

    c. *The document states that the review of the NRC enforcement process should "ensure that all referrals to the Department of Justice on behalf of the NRC are shared with and reviewed by OGC," which would represent a departure from current OI practice.*

    d. *The document directs NRC OC to "conduct a 'lesson learned' review of the Exelon Decommission Fund investigation and enforcement action from the legal perspective to determine whether changes to the allegations review and investigation report review processes are required in terms of how legal advice and guidance is provided to the staff," even though the NRC Inspector General is currently (and was, at the time this memo was prepared) investigating allegations related to OGC's conduct related to the same investigation and enforcement action.*

    e. *The document directs NRC OGC "to provide legal advice, guidance and a recommendation on the need for a timely and thorough technical and legal analysis of facts and evidence in the case, including all contact with counsel for the target or subject of the investigation and information provided in the pre-enforcement conference, to fully inform a final agency decision on whether to take enforcement action, particularly where escalated enforcement has been recommended by OI," and that this direction, if implemented, would represent a departure from current OI practice.*

In response to questions about this document at the hearing, Chairman Macfarlane stated that "Never and nowhere in that memo will you find any contemplation of any

reorganization of the Office of Investigations."

Do you agree that a proposal that would limit the type of investigations that OI could undertake, limit the technical resources that are available to support OI's investigations, and alter the manner in which OI is directed to interact with and report to OGC throughout the course of an investigation could be described as a reorganization of OI's mission?

ANSWER: Chairman Macfarlane has stated that she did not propose to reorganize the Office of Investigations (OI), limit its budget, or change the duties of that office. Although OI should be independent in the sense that it has the tools and flexibility to pursue investigations of allegations of wrong-doing, OI's authority to enter into investigations is not without limits. Investigations, for example, must be within the scope of the NRC's legal regulatory authority. Of course, whether or not an allegation of wrong-doing is within that scope may not be obvious at the outset of an investigation, so OI should have the ability to pursue such investigations when there is doubt. Good coordination and communication among OI, the NRC technical staff, and the OGC can contribute to the effectiveness of the investigative and enforcement program.

2. *Do you agree that it was appropriate to direct OGC to conduct a "lesson learned" review of an OI investigation when the NRC IG is still investigating multiple referrals of OGC personnel because of their alleged misconduct during that very same OI investigation?*

ANSWER: I do not have a basis to comment on whether this would be appropriate or not. Since joining the Commission in early November, I have not received any information about the history of the referenced investigation or any investigations of OGC personnel by the inspector general. The proposed review described in the draft memorandum has not to my knowledge been directed. However, as a general matter, the fact that individuals within an office are alleged to have engaged in misconduct subject to the Inspector General's review would not preclude the entire organization from participating in an assessment of the underlying activity.

3. *On what date were you (or your staff) first made aware of this document, and who made you or your staff aware of it? When did you first receive a copy?*

ANSWER: I recall being first made aware that such a document existed in early October before I joined the Commission in connection with the letter sent by Senators Boxer and Markey to the NRC. After I was sworn in as Commissioner, a copy of the draft tasking memo was provided to my Chief of Staff by Chairman Macfarlane's Chief of Staff on or about November 14, 2014. My Chief of Staff immediately provided it to me after he received it.

4. *The NRC staff has indicated that the Commission may soon prepare a supplemental Environmental Impact Statement (EIS) for the proposed Yucca Mountain project. Will the Commission reevaluate the no action alternative in the supplemental EIS? If not, please provide an explanation why the no action alternative in the EIS is adequate.*

ANSWER: Please see Chairman Macfarlane's answer to Senators Boxer and Markey Question 15.

The Honorable Senator Edward J. Markey

1. *During the hearing, I asked you whether any of you disagree as a general matter that requiring both flood protection and flooding response measures would provide a higher level of safety than flooding response measures alone. Only Commissioner Baran responded clearly to that question. I ask for each of the rest of you to provide a clear response.*

   ANSWER: It is difficult to answer this question in absolute terms. The appropriate combination of regulatory strategies to provide reasonable assurance of adequate protection of public health and safety is a fact-specific inquiry. There may be certain instances in which imposing both preventive and "response measures" may result in a higher level of safety. But by the same token, there might be other instances in which requiring "response measures" on top of preventive measures or vice-versa might not result in any significant additional safety benefit. The issue regarding the appropriate regulatory solution for addressing licensee reevaluation of flooding hazards is currently before the Commission for decision and I have not taken a position on this matter. However, I can say that it is my preliminary understanding that the staff's recommendation with respect to this matter would not result in licensees solely relying on "response measures" to address flooding if the Commission were to adopt it.

2. *During the hearing, I noted the statutory requirement for NRC to provide me with responses to my requests for information and documents that have not been responded to. In particular, I noted the Commission's non-responsiveness to my letters regarding the "Job Shadow" program. Do you support the provision of the documents I have requested on this and other matters, yes or not? If not, what is your legal basis for refusing to agree to provide them to me?*

   ANSWER: Please see Chairman Macfarlane's answer to Senator Markey Question 2.

The Honorable Mike Crapo

1. *Idaho National Laboratory, in my hometown of Idaho Falls, is in the press of restarting the Transient Test Reactor, also known as TREAT. This reactor will be able to conduct transient testing of fuels, or how fuels would perform in an accident scenario. Is the NRC aware of TREAT and DOE's program to develop accident tolerant fuels?*

    a. *Would the NRC consider utilizing TREAT for some of its testing needs?*

ANSWER: Please see Chairman Macfarlane's answer to Senator Crapo Question 1.

Senator BOXER. Thank you. We have covered our panel. Thank you all for being succinct.

I am going to go last so I am going to start with Senator Carper, go to Senator Fischer, then Markey, Whitehouse and each of you will have 6 minutes rather than 5.

Senator CARPER. Thank you, Madam Chair.

Welcome everyone, especially our two new members. Mr. Burns, it is good to see you. Mr. Baran, congratulations and welcome aboard. Chairwoman Macfarlane, thank you so much for your willingness to serve on the NRC and to serve at a difficult and tumultuous time in the history of the Commission and to provide the leadership that helped to steady the ship and, as you leave, to put us on a better course. We thank you for that.

As you know from our earlier conversations, and my colleagues know, I am one who thinks a lot about morale, work force morale. I chair the Senate Committee on Homeland Security and Governmental Affairs. We have jurisdiction over the Department of Homeland Security which, although not a very old agency, has had a history of not very good morale.

The new Secretary, Jeh Johnson and Deputy Secretary Ale Mayorkas are working hard, with a lot of good people there, to turn that around and we are trying to help them.

I would start, Madam Chair, by asking a little bit about the morale. NRC has historically had among the top rated morale as one of the best places to work within the Federal Government. When you think about the morale, the work force and the people when you became Chairman and today, is it the same, is it better, is it worse?

Ms. MACFARLANE. I think things are much improved from when I arrived at the agency. The folks there are fantastic. They are like a family. They come and stay, they are there, they work there for decades. They are really dedicated to the mission of the agency.

Senator CARPER. Why do you think it has gotten better?

Ms. MACFARLANE. Why do I think it has gotten better?

Senator CARPER. Yes.

Ms. MACFARLANE. I think things are calmer. The Commission is working very collaboratively, very well and I think that trickles down.

Senator CARPER. When you think back to what you have been able to accomplish, you went through a list of accomplishments, as you prepare to leave and turn over the leadership to a new Chair, what are some of the to do's that have to be at the top of a to do list?

Ms. MACFARLANE. Thanks for that. I think important to remember for the new chairman would be to make sure that when you are considering whatever issues, internal or policy issues, listen to as many viewpoints as possible and understand the full range of views on an issue, that you use the agency staff. The staff is a fantastic resource and is to be relied upon.

In the end, make your decisions data-driven. I have always tried to make my decisions data-driven. I think that is very important.

I would hope that the future chairman would continue the collegial behavior that we have been able to demonstrate at the Commission.

Senator CARPER. Last year, along with Senators Sessions, Barrasso and Cardin, we sent a letter to the Commission. I know you get a lot of letters but this was one encouraging the NRC to streamline the licensing process for dry cast storage. Could you give an update on this issue, please?

Ms. MACFARLANE. I think we are working well on our licensing process for dry cast storage. We have licensed many cast designs and continue to do so. I think that is going quite well. Further detail, I will take for the record.

Senator CARPER. All right, thank you.

Another question for you, is the NRC on track to issue the final rules dealing with station blackout? I think you may have mentioned this but I am not sure, and strengthening emergency operating procedures and severe accident management.

I think these are expected to go final by 2016?

Ms. MACFARLANE. Yes.

Senator CARPER. If not on track, why not? How are we doing there?

Ms. MACFARLANE. We are doing well on that. We are on track with that rulemaking.

Senator CARPER. If you were to give some advice to these new commissioners coming onboard, how long have you served on the Commission now, 3 years?

Ms. MACFARLANE. Two and a half.

Senator CARPER. It seems like 3.

Ms. MACFARLANE. Maybe 4 or 5.

Senator CARPER. It hasn't been that long since you sat in their seats, but what advice would you have for them as new members of the Commission?

Ms. MACFARLANE. Again, I would encourage them to really think broadly about all the issues that face us and to develop and have good staffs to support them, that has been essential for my own work, to be broad minded and engage not just internally with folks in the agency but outside the agency as well. That is a real important part of our mission.

Senator CARPER. I would say to our new members, the Chairman mentioned having good staff. I have always tried to surround myself with people smarter than me. My wife says it is not hard to find them. That is always good advice.

Give us a quick update, if you will, on how we are doing in this country with respect to modular reactors? Give us a little update on that, please.

Ms. MACFARLANE. Sure. We are working well in terms of talking with the potential small modular reactor designers. We are working on developing design-specific guidelines for the small modular reactor design certification applications as they come in.

None has come in yet. We are expecting the first one in 2016. Right now it is a wait and see game.

Senator CARPER. Tell us what you will be doing next and how your service here will better inform you for the challenges that lie ahead for you.

Ms. MACFARLANE. I am going back to the university. I am going to George Washington University where I will direct the Center for International Science and Technology Policy.

Certainly, what I have learned over the past 2 to 3 years has been essential and will inform all the research that I do in the future.

Senator CARPER. Good luck and thank you very much for your service.

Ms. MACFARLANE. Thank you.

Senator BOXER. Thank you very much, Senator.

We will turn to Senator Fischer.

Senator FISCHER. Thank you, Madam Chairman.

Thank you all for being here today.

Commissioner Baran, at your September 9 confirmation hearing, I asked you about the use of qualitative factors. You responded that it is "important in some cases to consider qualitative factors but it must be done carefully."

Could you explain in the inherent limitations and concerns associated with using those qualitative factors in the context of the backfit analyses, and would you agree that it is incorrect to suggest that the NRC staff should have that flexibility in the use of qualitative factors and NRC regulatory analyses and backfit analyses?

Mr. BARAN. Senator, the issue of qualitative factors and whether the guidance for staff related to qualitative factors should be updated is an issue pending before the Commission right now. The focus of the staff paper before us is not whether qualitative factors should be used or whether they should be used more often than they are now.

The question posed by that staff paper is does it make sense as part of the staff's overall, multi-year effort to update the overall cost-benefit guidance, and should they as part of that effort update the sections related to the use of qualitative factors?

The staff recommendation is that it would be useful to provide tools and methodologies to the staff to better articulate when qualitative factors are used, how are they being used, when are they being used, why are they being used so that decisionmakers and anyone reading a staff paper is going to be able to understand very clearly that analysis and why qualitative factors were used in it.

Historically and under both OMB and NRC guidance, both quantitative and qualitative factors are used. Qualitative factors tend to be used in cases where there either isn't enough data to do a quantitative analysis or there aren't developed methodologies to do it.

I think there is no question that the guidance from NRC at NRC now and more broadly places a premium on quantitative analysis, but there are times you cannot capture everything with quantitative, so there is a long history of also turning to qualitative factors and having a combined analysis.

Senator FISCHER. When you have facilities that are already licensed, don't you think the numbers-based analysis is the way to go on that? How much flexibility do you think is appropriate to use with qualitative factors, especially on facilities that are already licensed?

Mr. BARAN. I understand your question as it relates to the backfit rule. I think for backfit or for other purposes, it is going to be important to consider all the relevant factors. That is what the guidance says now both from OMB and from NRC. That means

looking at both the relevant quantitative factors and the relative qualitative factors.

If there are important factors that cannot be captured quantitatively, it is important that decisionmakers consider those as well. Again, there is the question pending before us now of should we update the guidance. Should staff update the guidance to provide the staff members doing this analysis at NRC with additional guidance about how to go about that and make sure whatever the analysis is, that it is being done in a transparent way so the decisionmakers, whether the Commission or others, can look at that and understand what has been done.

Senator FISCHER. You said you are in the process now of staff updating the guidance. Do you support that update. Specifically what does that mean to you? When you say updating guidance, what is that?

Mr. BARAN. There is a broad effort, which will take multiple years to update the overall cost benefit analysis guidance the agency has. The staff has kind of a plan to work on that over the next several years.

I think right now the guidance doesn't even use the terms cost and benefits but uses other terms. I think that effort makes a lot of sense to update the guidance and make sure we have something that benefits from our years of experience on that.

The more narrow question currently before us is should we approve the staff's recommendation to update the portion of the guidance related to the use of qualitative factors. I haven't actually voted on that yet, but my sense is it probably does make sense to have good, updated guidance with the latest methodologies and a process laid out for how are these used, when are these used and how do you explain that to people so that when a paper comes to the Commission, we have an understanding, not just what is the ultimate recommendation but how was that derived.

Senator FISCHER. Thank you.

Dr. Macfarlane, thank you for your service. I so appreciate you serving the people of this country and the very important position you are in. I wish you well in the future.

In August 2014, the NRC staff paper acknowledges, "NRC guidance directs the NRC staff to quantify benefits and costs and propose regulatory action to the extent possible."

Would you agree that whenever it can be done that the NRC staff should focus on that quantitative factor in reaching decisions?

Ms. MACFARLANE. The NRC does focus on the quantitative factors in reaching many of these decisions but nonetheless, there are often qualitative factors that are also important in considerations.

I think some of the quantitative factors considered, they themselves, are not necessarily fully quantitative like the price of the cost of a human lung.

Senator FISCHER. Thank you.

Thank you, Madam Chair.

[The prepared statement of Senator Fischer follows:]

STATEMENT OF HON. DEB FISCHER,
U.S. SENATOR FROM THE STATE OF NEBRASKA

Chairman Boxer and Ranking Member Vitter, thank you for holding today's hearing. I would like to thank the Commissioners and witnesses for being here and sharing your time with us today.

Chairman Macfarlane, I want to wish you the best as you prepare to leave the NRC. Thank you for your work in restoring collegiality at the Commission and for your frankness to Congress on NRC matters. It is truly appreciated.

I am always pleased to have the opportunity to talk about Nebraska's unique 100 percent public power system and the important role that nuclear energy plays in keeping Nebraska's electricity rates among the lowest in the entire country. We are grateful for the safe and productive operation of Nebraska's nuclear power plants and uranium mining facilities. We are also mindful of the tremendous impact that NRC actions and policies have on these operations.

As we meet today to discuss NRC's implementation of task force recommendations and other actions to enhance and maintain nuclear safety, I hope we can focus on the Commission's principles of good regulation—independence, openness, efficiency, clarity, and reliability.

It is critical that NRC decisionmaking is based on objective, reliable information. Deliberate and disciplined cost-benefit analyses are needed to ensure that regulatory requirements yield valid, identifiable safety benefits. We must improve the accuracy of cost estimates and critically examine the use of qualitative factors to justify changes that are not truly cost-beneficial.

We on this committee are very conscious of and concerned with the President's Climate Action Plan, which could seriously jeopardize the reliability and affordability of Americans' electricity. At a time when our energy landscape is changing so drastically, we are especially concerned with any actions that could undermine access to dependable, affordable, baseload nuclear power. With so much at stake, we must have a Nuclear Regulatory Commission that provides regulatory stability and pursues justified, defensible safety improvements.

I look forward to our discussion of these important issues at today's hearing.

Thank you.

Senator BOXER. Thank you.

Senator Markey.

Senator MARKEY. Thank you, Madam Chair.

Experts agree that the Fukushima meltdowns could have been prevented if the reactors had been protected against the tsunami threats that they were known to face.

The 2011 Fukushima Near-Term Task Force report recommended that reactor operators use modern science to predict the amount of flooding that might occur at each reactor and then upgrade safety equipment to prevent such a flood from causing damage.

I have received documents that have not been publicly released yet that I request be made a part of the record, that say that NRC staff agreed with a Nuclear Energy Institute request to eliminate this key Fukushima Task Force recommendation.

The NRC staff recommended that NRC no longer require reactor upgrades to prevent flooding but only an increased ability to respond to potential floods.

That is a lot like your doctor telling you not to get a flu shot because he can just treat you once you get the flu, expecting you not to point out that thousands of Americans die of the flu each year.

Fifteen senior NRC employees, including one who was actually an author of the Fukushima Task Force report, have filed formal disagreements with the NRC staff paper. One of these documents said that even though the proposal would save the industry money, it would gut this post-Fukushima safety recommendation.

My first question is, do any of you disagree that requiring both flood protection and flooding response measures would provide a

higher level of safety than flooding response measures only. Madam Chairman.

Ms. MACFARLANE. This issue has just come before the Commission, so I doubt that any of my colleagues, I certainly haven't had time to digest it, to look at this issue, so I would request that we take this one for the record.

Senator MARKEY. Why don't I let the others mention it? I asked a general question. I will go with you first, Commissioner Baran.

Mr. BARAN. I haven't had a chance to review the paper yet, but I agree with your general point that it is important to both prevent a problem and have the ability to respond to it.

Senator MARKEY. Thank you.

Commissioner.

Ms. SVINICKI. Senator Markey, the question you have posed is the core disagreement between the technical experts who differ and the staff recommendation that the Commission officially received. I am still exploring to understand the points of departure between the two viewpoints.

Senator MARKEY. Again, do any of you disagree that prevention and response is better than just response?

Commissioner.

Mr. OSTENDORFF. Senator Markey, I appreciate the question. As the Chairman noted, it is before the Commission. I will just tell you that on Friday of this week, Commissioner Burns and I are meeting with non-concurring staff to better understand their viewpoints.

I know the rest of the Commission, when their schedules permit, will be doing the same to better understand where they are coming from on this. It is an important issue.

Senator MARKEY. Commissioner.

Mr. BURNS. The basic principle of both prevention and mitigation is I think fundamental in our regulatory system. As Commissioner Ostendorff said, we are going to be briefed on the paper and the robust exchange of views we are having on it.

Senator MARKEY. Do any of you disagree that NRC staff should work together to resolve the disagreement by the 15 senior NRC employees before it submits the proposal to you for a vote? Do any of you disagree with that?

Ms. MACFARLANE. Senator, we have at our agency processes that allow our staff to formally disagree with senior management, which I think is actually one of the strengths of our agency, that we have put in place over the past few years these formal processes, the non-concurrence process and the differing professional opinions process.

Senator MARKEY. Right now you have three senior managers who are in disagreement. I would strongly recommend to you that you get that resolved before it comes up to the Commission.

Ms. MACFARLANE. I will tell you my practice, and I know this is true of Commissioner Ostendorff.

Senator MARKEY. I have just one more question I have to ask. I just give you that as my recommendation. I know you will be gone and again, I thank you for your service but I think the Commission has to resolve these issues.

Last year, last year language I authored was enacted to require NRC to provide non-public documents to Congress after NRC attempted to change its policy in a way that would have automatically denied most congressional requests.

The agency is still refusing to comply with this law. For example, five members of the Chinese military were recently indicted on charges of hacking into U.S. company systems in 2010 and 2011 and stealing nuclear reactor trade secrets from Westinghouse.

At the very same time these thefts occurred, Westinghouse was hosting dozens of unescorted Chinese personnel at U.S. nuclear reactors for months.

You have refused to provide to me a meaningful response to my letters. Your staff even told mine that you would provide no additional information, even though other members of your staff have told my staff that the FBI has no objection to your doing so.

I have been made aware of many NRC meetings, letters and presentations about this Chinese program. I have also learned that NRC security staff recommended an increase in security requirements for the Chinese nationals but others at NRC rejected the suggestion. Yet, you provided one of these materials to me in violation of the law.

The law requires NRC to provide non-public documents to Congress. Does each of you agree to follow the law and to fully respond to any of my outstanding requests about this Chinese compromise of the security at nuclear facilities in the United States?

Madam Chairman.

Ms. MACFARLANE. Senator, with regard to this particular situation, we did learn about this program. We actually checked and ensured that the licensees were following our security regulations. We found that the licensees had granted limited access and we verified that the licensees followed our requirements.

Senator MARKEY. Will you provide the non-public documents to me, to the committee, so that we can examine them?

Ms. MACFARLANE. We will have to take that back.

Senator MARKEY. Again, you are in violation of the law if you do not provide that information to the committee. We have a right to know what the relationship between Westinghouse and these Chinese who are gaining access to the nuclear facilities in the United States is. Will you provide that information to the committee and to my office?

Ms. MACFARLANE. Senator, we did ensure that these folks followed our regulations.

Senator MARKEY. That is not the question I am asking you.

Senator BOXER. The question is either yes or no. Could you do it because his time is running out? I have to turn to Senator Barrasso.

Ms. MACFARLANE. I am happy on this particular situation to provide you the information you need. We will provide you briefings on this topic. We are happy to do that.

Senator MARKEY. But you will not provide the documents, is that what you are saying?

Ms. MACFARLANE. We are happy to engage with you and engage with this committee.

Senator MARKEY. That is just unacceptable.

Senator BOXER. I just think this point is unbelievable, that we cannot get a simple yes or no to a request for documents that we are entitled to that you swore that you would give to us when you were confirmed.

Anyway, we turn to Senator Barrasso.

[The referenced documents follow:]

MEMORANDUM TO: Chairman Macfarlane
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: RELATIONSHIP BETWEEN MITIGATING STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS AND THE REEVALUATON OF FLOODING HAZARDS

This memorandum provides the Commission with information and recommendations for coordinating licensee actions to implement mitigation strategies for beyond-design-basis external events with information being gathered on reevaluated flooding hazards. In response to the March 2011 accident at Fukushima Daiichi, the Nuclear Regulatory Commission (NRC) issued Order EA-12-049, which directed power reactor licensees to develop, implement, and maintain guidance and strategies ("mitigating strategies") to maintain or restore core cooling, containment and SFP cooling capabilities following a beyond-design-basis external event. In addition, the NRC issued letters to power reactor licensees pursuant to 10 CFR § 50.54(f), which requested the licensees to reevaluate the seismic and flooding hazards at their sites using updated hazard information and current regulatory guidance and methodologies. This information was requested to support NRC decisions regarding possible regulatory actions to protect the plants from these reevaluated external hazards.

The mitigation strategies and external hazard reevaluations are not independent activities, in that the staff has previously stated that the reevaluated external hazards would inform licensee development of the mitigating strategies, which the staff proposes to reflect in the follow-on rulemaking to Order EA-12-049. The integration of some activities related to the flooding reevaluations with the development and implementation of mitigating strategies will improve the

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301-415-7490

effectiveness and efficiency of the regulatory process. The NRC staff is asking the Commission to affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazards within their mitigating strategies, which may include developing targeted or scenario-specific mitigating strategies for some events. The staff is also requesting the Commission approve integrating some activities that had been part of the flooding-related response to Recommendation 2.1 in NRC's post-Fukushima activities into the development and implementation of mitigating strategies.

Some staff expressed concerns that resulted in a non-concurrence on this memorandum, which is provided as Enclosure 3. The non-concurrence advocates requiring licensees to prepare integrated assessments describing the total plant response to the reevaluated flooding hazards instead of integrating the efforts into the development and implementation of mitigating strategies. The staff made improvements to this memorandum in response to the concerns and comments identified in the non-concurrence. The NRC staff considered a variety of factors related to potential safety benefits, timeliness of actions, and management of resources. The staff finds that integrating the activities related to flooding reevaluations and mitigating strategies is a more effective regulatory approach than those described in the non-concurrence.

BACKGROUND:

The accident at the Fukushima Daiichi nuclear plant in Japan highlighted the possibility that certain external events may simultaneously challenge the prevention, mitigation, and emergency preparedness measures that provide defense in depth protections for nuclear power plants. NRC's assessment of the lessons learned from the experiences at Fukushima Daiichi led to the conclusion that additional requirements were needed to increase the capability of nuclear power plants to address certain beyond-design-basis external events. As a result, the NRC undertook actions that imposed new requirements to enhance safety, while simultaneously asking that licensees reevaluate seismic and flooding hazards using present day standards and guidance and provide that information to the NRC.

The 10 CFR 50.54(f) letters describe a two phase approach for the NRC decisions on whether to pursue regulatory actions to increase nuclear power plant capabilities to address flooding events. During the first phase, the NRC staff is gathering information related to the reevaluation of flooding hazards, as well as assessing each licensee's proposed response(s) to those hazards. The NRC staff recognized that updated standards, models, and data might result in hazard levels for various flooding mechanisms that exceed those considered during the siting and licensing of some nuclear power plants.[1] As discussed in SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," the staff identified that certain flooding scenarios are of special concern because of potential "cliff edge" effects. Cliff edge effects introduce sharp increases in plant risk with small increases in the postulated flooding level. With this in mind, Recommendation 2.1 reevaluations were intended to help the NRC determine whether additional regulatory actions to protect against the updated

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1 During previous actions by the NRC staff to look back at external hazards after siting and licensing of a plant, the new methods sometimes identified hazard levels (for the same or similar flooding events or for newly considered flooding mechanisms) in excess of the design or licensing basis. Examples of such activities discussed in Enclosure 1 include the Systematic Evaluation Program and the Individual Plant Examinations of External Events.

hazards should be pursued (e.g., update the design basis and protect structures, systems and components (SSCs) important to safety). Licensees for operating nuclear reactors are currently submitting their reevaluated flooding hazards. Under existing plans and guidance, licensees would be expected to complete and submit integrated assessments describing the total plant response to the reevaluated hazard. The integrated assessments would include the potential impact of such events on their facilities and describe how the plant's flood protection and mitigation would maintain key safety functions for the various flooding scenarios. Under Phase 2, the staff consider regulatory decisions on whether to modify, suspend, or revoke a license based each operating plant's specific situation and in accordance with the backfit rule, 10 CFR 50.109.

Simultaneously with the reevaluation of flooding hazards, licensees were required to develop and implement improved mitigating strategies in accordance with NRC Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." Licensees are developing responsive mitigating strategies using guidance prepared by the nuclear industry and endorsed by the NRC. The primary guidance document is Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping (FLEX) Implementation Guide." The focus of these efforts is to define capabilities to protect against a variety of external hazards. The additional capabilities address plant conditions involving an extended loss of all alternating current (ac) power and challenges to the ability to remove heat from the reactor cores and spent fuel pools. As licensees have developed and implemented their mitigating strategies, the NRC has recognized that other Fukushima-related recommendations are being or could be addressed within this activity. [2]

The NRC staff and industry recognized that the relationships between the reevaluation of external hazards and the development and implementation of mitigating strategies would need to be clarified once sufficient information became available from both activities. NRC Order EA-12-049 requires nuclear power plant licensees to put in place mitigating strategies for a variety of beyond-design-basis external events, including flooding. The NRC staff plans to incorporate these requirements into NRC regulations through the mitigation of beyond-design-basis events (MBDBE) rulemaking. This approach ensures that capabilities for dealing with the beyond-design-basis flooding scenarios identified from Recommendation 2.1 activities are, at a minimum, addressed by the requirements for improved mitigating strategies. However, these efforts to better integrate Fukushima-related activities could lead to some licensees needing to modify their mitigating strategies in response to the reevaluated flooding hazards after they have implemented plant changes and procedures to comply with Order EA-12-049. There is also a possibility that circumstances at some nuclear power plants may warrant consideration of additional measures to protect against or mitigate postulated flooding scenarios. These additional measures (beyond those imposed by Order EA-12-049 and the related MBDBE rulemaking) could be pursued voluntarily by licensees or imposed by the NRC through the process defined in 10 CFR 50.109, "Backfitting."

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[2] Previous examples of integrating and consolidating Fukushima activities are described in COMSECY-13-002, "Consolidation of Japan Lessons Learned Near-Term Task Force Recommendations 4 and 7 Regulatory Activities" and SECY-14-0046, "Fifth 6-Month Status Update on Response to Lessons Learned from Japan's March 11, 2011, Great Tōhoku Earthquake And Subsequent Tsunami (Enclosure 6 - Proposal to Consolidate Post-Fukushima Rulemaking Activities)," and the related staff requirements memoranda.

DISCUSSION:

The Commission determined that reasonable assurance of adequate protection of public health and safety requires that power reactor licensees and construction permit holders develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. The agency is addressing this through Order EA-12-049 and the related MBDBE rulemaking, which impose additional regulatory requirements for licensees. As a result of the order and the expected rulemaking, licensees have been required to provide capabilities to mitigate extended losses of ac power and challenge to heat removal functions that might be caused by beyond-design-basis external events. Beyond-design-basis events have previously been incorporated into the NRC's regulations as additional risk insights became available from operating experience and analytical studies. Examples of previous instances include regulations for anticipated transients without scram (ATWS), station blackout (SBO), and loss of large areas of the plant due to explosions or fires. The NRC staff intends to use these examples and the associated regulatory processes for developing the requirements for mitigating strategies for beyond-design-basis external events.

The results of the reevaluation of the flooding hazard are important to define the attributes of the equipment and actions used for the mitigating strategies for beyond-design-basis external events. The NRC staff plans to include this requirement in the pending MBDBE rulemaking. As such, the strategies required by the MBDBE rulemaking could not be completed without information from the completed site-specific reevaluated flooding hazards. At the same time, establishing a regulatory requirement for mitigating strategies to address reevaluated flooding hazards affects the assessments and subsequent Phase 2 decision-making on possible regulatory actions that might result from the Recommendation 2.1 activities. Given the dependencies between the two activities, the staff has reviewed ongoing efforts and determined that the most effective and efficient path forward is to integrate the Phase 2 regulatory decision and the supporting integrated assessments for flooding reevaluations into the development and implementation of mitigating strategies. The integration of the activities ensures that an actual regulatory requirement addresses the reevaluated flooding hazards. It is worth noting that changing the plans for the integrated assessments and Phase 2 decisions for the flooding reevaluation has some practical impacts. The planned approach reduces the level of information to be submitted by licensees, and the integrated assessments will focus on mitigating strategies instead of more varied enhancements to protect against a range of flooding conditions. However, the NRC staff finds that the integration of the activities will provide the desired outcome in terms of meaningful and assured safety improvements. The recommended approach also provides benefits in terms of establishing regulatory clarity and stability, reducing demands on schedules and resources, and ensuring timely responses to the lessons learned from the Fukushima accident.

This memorandum and its enclosures have been prepared to clarify the NRC staff's plans to complete activities currently underway to address lessons learned from the Fukushima accident and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to describe a more integrated process. Primarily, the NRC staff intends to require that licensees' mitigating strategies address the reevaluated flooding hazards as part of the MBDBE rulemaking. The reevaluation of the flooding hazard will help define the functional requirements and reference bounds of design for the equipment and actions used for the mitigating strategies for beyond-design-basis external

events. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will reduce the need for a broader assessment of the plant response as described in the current flooding-related guidance documents. There may be circumstances where the staff concludes that the flooding reevaluations and the associated information gathered in Phase 1 of Recommendation 2.1 warrant investigating the need for additional protection or mitigation beyond that provided by mitigating strategies. In such cases, the NRC staff will consider information about the reevaluated hazards, available response times for identified scenarios, plant-specific configurations and licensing histories, and other factors to support evaluating a potential plant-specific backfit.

The current efforts to coordinate activities related to mitigating strategies and flooding reevaluations improve the efficiency and effectiveness of implementing ongoing safety improvements. The NRC staff is requesting that the Commission approve the integration of some activities that are currently part of Recommendation 2.1 (i.e., integrated assessments and Phase 2 decision-making) into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

The NRC staff has had several public meetings with the nuclear industry regarding the need to consider the reevaluated flooding hazard and possibly revise equipment or strategies to address conditions different than those considered in the implementation of Order EA-12-049. The industry recognized that the coincident performance of the flooding reevaluations and the implementation of the order would subsequently require assessing the mitigating strategies developed to address a variety of external hazards to ensure they provide capabilities sufficient to address the reevaluated flooding hazards from Recommendation 2.1. These discussions helped identify an approach to integrate mitigating strategies and the flooding reevaluations. As a general matter, licensees will assess the mitigating strategies developed to address Order EA-12-049 against the flooding scenarios from the Recommendation 2.1 reevaluations. The mitigating strategies and related equipment will be confirmed to adequately address the postulated scenario, or the licensee will revise the mitigating strategies. Changes to the mitigating strategies could involve modifications to the existing equipment and plans developed for multiple hazards or could involve developing a targeted strategy for a specific flooding scenario. The NRC staff is asking the Commission to support the planned approach by affirming that the MBDBE rulemaking needs to require mitigating strategies that are able to address the reevaluated flooding hazards developed in response the 50.54(f) letters in order to ensure reasonable assurance of adequate protection of the public health and safety.

In some cases, the newly estimated elevated flooding levels could result in significant damage to a nuclear power plant and warrant scenario-specific strategies. However, even in such extreme cases, licensees will be required by the planned MBDBE regulation to have mitigating strategies that provide capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools and to minimize the resultant release of radioactive materials to the environment. In addition to satisfying the requirements of the NRC regarding radiological health and safety concerns, the above approach provides confidence that nuclear power plants will not significantly complicate the response to and recovery from extreme natural disasters. The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site.

After the recommended integration of activities, much of the focus for the reevaluated flooding hazards will shift to assessing the capabilities for mitigating strategies. Nonetheless, insights from the flooding reevaluations may result in the NRC staff identifying other safety concerns and the need to consider additional regulatory actions beyond those being implemented by licensees in accordance with Order EA-12-049 and the related MBDBE rulemaking. The NRC staff will use established processes such as those defined in Management Directive (MD) 8.4, "Management of Facility-specific Backfitting and Information Collection" to initiate, review, and disposition these types of safety concerns. The NRC staff will also evaluate the implications of the approach for flooding described in this memorandum on seismic and other hazard reevaluations and other ongoing NRC activities.

Staff Recommendation

The staff recommends that the Commission affirm the following:

1. Licensees for operating nuclear power plants need to address the reevaluated flooding hazards from Recommendation 2.1 within their mitigating strategies for beyond design basis external events (Order EA-12-049 and related MBDBE rulemaking),

2. Licensees for operating nuclear power plants may need to develop targeted or scenario-specific mitigating strategies to prevent fuel damage in reactor cores or spent fuel pools to address some specific flooding scenarios, some of which could significantly damage the power plant site and nearby environs; and

3. The staff should integrate selected activities that are part of Recommendation 2.1 (i.e., integrated assessments and Phase 2 decision-making) into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Mark A. Satorius
Executive Director
for Operations

Enclosures:
1. Background - Design-basis Events, Design-basis Information, and External Events
2. Coordination and Clarification
3. Non-Concurrence Package 2014-010

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OFFICIAL AGENCY RECORD

Enclosure 1 – Background

Design-basis Events, Design-basis Information, and External Events

The terminology related to nuclear plant licensing and relationships between design basis, design basis events, beyond-design-basis accidents or events, and licensing basis can be difficult to follow. The complexity of the terminology has increased over the last several decades as new methodologies, such as probabilistic risk assessment (PRA), were introduced and as the U.S. Nuclear Regulatory Commission (NRC) and industry responded to specific issues or concerns (e.g., station blackout (SBO)). As explained in "A Short History of Nuclear Regulation, 1946–2009," the initial design and licensing of nuclear power plants were approached as follows:

> *Regulators using a deterministic approach simply tried to imagine "credible" mishaps and their consequences at a nuclear facility and then required the defense-in-depth approach—layers of redundant safety features—to guard against them.*

These "credible mishaps" were, in turn, used to define design-basis events, which were then used to determine the safety classification of SSCs; the contents of licensing-basis documents, such as final safety analysis reports (FSARs) and technical specifications; and supporting documents, such as plant procedures. The licensing efforts for early plants focused, therefore, on "design-basis events." Regulator and licensee attention was centered on the mitigation of anticipated operational occurrences and design-basis accidents and on ensuring that plant structures and layouts addressed design-basis external hazards such that safety-related equipment was protected and plants could proceed from operations to a safe shutdown condition following a design-basis event. [1]

The importance of "design-basis events" is, in part, because of its use within the definition of "safety-related" SSCs. The term "safety-related" is used to define requirements for the protection of SSCs from safe shutdown earthquakes (Title 10 of the *Code of Federal Regulations* (10 CFR) Part 100, "Reactor Site Criteria") and is more widely used to distinguish those SSCs warranting special treatment in terms of quality assurance, environmental qualification, inclusion in FSAR safety analyses, and applicability of various industry codes and standards. The definition of "safety-related" SSCs provided in 10 CFR 50.2, "Definitions," is as follows:

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[1] Design-basis events are defined in 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," as follows:

> Design-basis events are defined as conditions of normal operation, including anticipated operational occurrences, design-basis accidents, external events, and natural phenomena for which the plant must be designed to ensure functions (b)(1)(i) (A) through (C) of this section [see above items 1, 2 and 3 under definition of safety-related SSCs]

Safety-related structures, systems, and components means those structures, systems, and components that are relied upon to remain functional during and following design basis events to assure:

(1) the integrity of the reactor coolant pressure boundary;

(2) the capability to shut down the reactor and maintain it in a safe shutdown condition; or

(3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11 ["Determination of Exclusion Area, Low Population Zone, and Population Center Distance"] of this chapter, as applicable.

This general approach was intended to address risks to the public health and safety by identifying potential internal and external design-basis events and ensuring that plant SSCs and personnel were able to respond and prevent or limit the release of radioactive materials. Lessons learned from subsequent studies of nuclear plant risks, and operational experience led the NRC to introduce requirements for plant events and conditions beyond those included in the original licensing of nuclear power plants. An example is the requirements to better address anticipated transients without scram (ATWS) events. The NRC moved from the approach of focusing on design-basis events and adopted measures to control or reduce risks for the beyond-design-basis events added to the licensing basis for nuclear plants in the 1980s and later. The move to this approach reflects that, while the NRC is allowed under its backfit regulation to impose plant modifications to address safety concerns, if there are two or more ways to reach a level of protection that is adequate, then ordinarily the applicant or licensee is provided flexibility to choose the way that best suits its purposes. Given the ability to address safety concerns without re-defining design-basis events, the NRC has adopted more pragmatic approaches for NRC regulations and plant-specific issues since the 1980s. The NRC plans to continue this approach in addressing the reevaluation of external hazards that are underway or planned. That is; the NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events. Exceptions to this approach might be taken on a plant-specific basis if justified by the NRC evaluations performed in accordance with 10 CFR 50.109, "Backfittting."

In contrast to "design-basis events" that relate to the safety classification and special treatment requirements for plant SSCs, the term "design basis" is used in a more general manner as reflected in the following definition from 10 CFR 50.2:

> Design basis means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted 'state of the art' practices for achieving functional goals, or

(2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

From this broader definition, it is possible to have beyond-design-basis events, such as ATWS and SBO contribute to the design-basis functions of specific SSCs. Explanations and guidance related to design-basis information are provided in Appendix B to Nuclear Energy Institute (NEI) 97-04, "Design Bases Program Guidelines," which is endorsed by the NRC in Regulatory Guide (RG) 1.186, "Guidance and Examples for Identifying 10 CFR 50.2 Design Basis." NEI 97-04 describes the information usually found in plant FSARs that makes up the functional requirements and the controlling parameters chosen as reference bounds for design that help define the design basis for plant SSCs. The guidance document also defines broader topics that need to addressed within the design basis for plant SSCs. These topical design basis issues include the following:

- fire protection
- flooding (internal and external)
- tornadoes and hurricanes
- seismic criteria
- missiles (internal and external)
- separation (Hazards)
- electrical separation and independence
- single failure criteria
- pipe break criteria
- environmental qualification (electrical and mechanical)
- SBO
- ATWS

The above topical design issues include several related to external events, including flooding, and also address design features for the beyond-design-basis events of SBO and ATWS. The topical design issues are derived from the following explanation from Appendix B to NEI 97-04:

Relationship of 10 CFR 50.2 Design Bases Functions to Licensing Basis and Part 50 Requirements

10 CFR 50.2 design bases functional requirements are derived primarily from the principal design criteria for an individual facility (the minimum standards for which are set by 10 CFR Part 50 Appendix A) and NRC regulations such as the Emergency Core Cooling System, SBO and ATWS rules that impose functional requirements or limits on plant design. 10 CFR 50.2 design bases are a subset of a plant's licensing basis. While a plant's licensing basis includes all applicable requirements of Part 50, not all Part 50 requirements have corresponding 10 CFR 50.2 design bases. For example, in Appendix A, several GDC [general

> design criteria] contain requirements for fabrication, construction, testing, inspection, and quality. These are process requirements on SSCs—not requirements for the performance of intended SSC functions—and are therefore not 10 CFR 50.2 design bases.

Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," and the mitigation of beyond-design-basis events (MBDBE) rulemaking will establish regulatory requirements for functional requirements (i.e., design basis) for SSCs in terms of responding to an extended loss of electrical power and separation from the ultimate heat sink resulting from beyond-design-basis external events. The use of existing requirements and guidance, including RG 1.186, provides for an effective and efficient path forward and can be used to address possible future issues regarding establishing and controlling licensing basis information.

Figure 1 provides a representation of the relationships between various elements of the licensing basis for a nuclear power plant. An example of how the elements fit together is offered below using a hypothetical plant and an auxiliary feedwater system consisting of one train using an alternating current (ac) driven pump and one train using a turbine driven pump. Both trains are used to address anticipated operational occurrences and other design basis events involving the failure of plant equipment. Therefore, both trains are categorized as safety related equipment and are required to remain functional during the defined design basis flood. A review of the established design basis for each train would therefore include pumping capacities and other functional requirements reflected in the final safety analysis report (FSAR) as well as needed protections against external flooding hazards up to the design-basis flood. The design basis for one or both trains may also include functional requirements to address a beyond-design-basis event such as SBO. For this example, the turbine-driven train is assumed to be used within the licensee's mitigating strategies. The licensee would add a design basis requirement for the turbine-driven train to address the reevaluated flooding hazard. In accordance with existing guidance, the added measures to address the reevaluated flooding hazard would not need to be categorized as safety related. The auxiliary feedwater system is likely to have testing or inspection-related features defined within the licensing basis for the plant, but these features are not considered to be within the design basis for the system. The licensee may also establish controls or capabilities for the auxiliary feedwater system that go beyond regulatory requirements and which would captured in their own "engineering design basis."

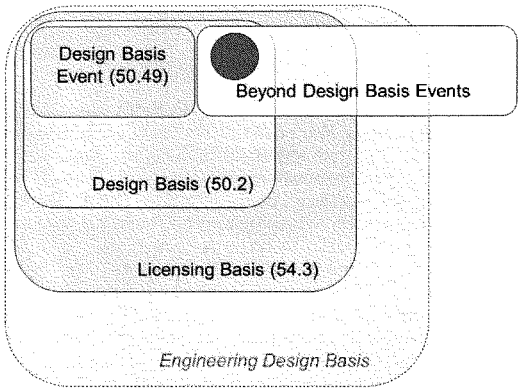

Figure 1

Scheduler constraints may require some licensees to implement changes to comply with Order EA-12-049 before flooding reevaluations for the affected plants are complete. However, the NRC staff interprets Commission direction to be that the appropriate installed and/or portable equipment and related mitigating strategies ultimately need to address the reevaluated hazards to ensure reasonable assurance of adequate protection of public health and safety. This could result in licensees needing to review and possibly modify SSCs or strategies if the flooding reevaluations result in changes to the functional requirements or reference bounds for design from those previously used to develop and implement plans for Order EA-12-049. The MBDBE rulemaking will codify these expectations consistent with the Commission's intended outcome for the regulatory requirements imposed by the order and related rulemaking.

The NRC staff has had several public meetings with the nuclear industry regarding the need to consider the reevaluated flooding hazard and possibly revise equipment or strategies to address conditions different than those considered in implementing Order EA-12-049. The industry also recognized that the coincident performance of the flooding reevaluations and implementation of the order would require assessing the flexible strategies developed to address multiple hazards to ensure they provide capabilities sufficient to address the Recommendation 2.1 reevaluated flooding hazards. These discussions have helped to clarify the relationships between the Fukushima-related activities and to support revising guidance documents for addressing the order and flooding reevaluations. As a general matter, the nuclear industry acknowledges that licensees will need to assess the mitigating strategies required by Order EA-12-049 against the flooding scenarios from the Recommendation 2.1 reevaluations. Changes to the mitigating strategies after initial implementation of Order EA-12-049 could involve modifications to the existing equipment and plans developed for multiple hazards or could involve developing a targeted strategy for specific flooding scenarios. The nuclear industry and NRC staff are revising appropriate guidance documents to incorporate the clarifications and assessments of mitigating strategies in light of the flooding reevaluations. The mitigating strategies and related

equipment will be confirmed to adequately address the reevaluated flooding scenarios as part of the activities associated with the MBDBE rulemaking.

Regulatory Requirements Related to External Hazards

The NRC and its predecessor agency, the Atomic Energy Commission, established regulatory requirements for siting and designing nuclear power plants to ensure safety-related SSCs were protected against natural hazards such as earthquakes and floods. Failure to protect SSCs important to safety from natural phenomena with appropriate safety margins has the potential to result in common-cause failures with significant consequences. The accident at Fukushima demonstrated the importance of providing measures to protect and mitigate external events. However, the approaches to evaluating external hazards have evolved over time as new information regarding site hazards and the potential consequences have become available. As a result, the licensing basis, design, and level of protection from natural phenomena differ among the existing operating reactors in the United States. Much of this variation can be attributed to the time when the plant was constructed and licensed for operation, once the issue of site selection was settled. Except as imposed by the NRC through specific regulations, orders, or license conditions, licensees are not required to assess or modify plant designs to meet new or revised standards. Nor are licensees normally requested to periodically assess possible changes to plant designs or procedures to address external hazards beyond those used in the initial plant siting and licensing decisions.

The NRC recognized these differences between plants and the need to assess early plants against the evolving standards in the 1970s following the development of the standard review plan (SRP). The agency identified potential safety issues and reviewed the early plant designs against the then-newer SRP guidance under the systematic evaluation program (SEP). The SEP included several flooding issues and resulted in some plant-specific reviews and design or procedure changes implemented by impacted licensees to address potentially higher flooding hazards. Generic Letter 95-04, "Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues," dated April 28, 1995, describes the SEP and the resolution of the issues. Many of the SEP issues were resolved by the subsequent requests for licensees to perform individual plant examinations. Supplement 4 to Generic Letter 88-20, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f)," addressed some of the flooding issues. The actions taken by licensees to address potential vulnerabilities or other flooding concerns were not subsequently incorporated into regulations or operating licenses. In recognition that the NRC's regulations do not include requirements for licensees to periodically update plant designs to newer standards, revised estimates of external hazards, or other risk insights, Generic Letter 88-20 identified that the IPEEE might lead to the following assessment:

> If NRC consideration indicates that plant design or operation could be enhanced by substantial additional protection beyond NRC regulations, appropriate enhancement will be recommended and supported with backfit analysis in accordance with 10 CFR 50.109.[2]

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[2] Backfitting is permitted only after a formal, systematic review to ensure that changes are properly justified and suitably defined. The requirements of this process are intended to ensure order,

In the 1990's, the NRC identified issues with the control of licensing basis information. The NRC staff recommended specific actions in SECY-97-036, "Millstone Lessons Learned Report, Part 2: Policy Issues," dated February 12, 1997, to improve the understanding and control of licensing basis information. In a staff requirements memorandum dated May 20, 1997, the Commission directed the staff, in part; to issue guidance for complying with requirements in 10 CFR 50.71(e) so that updated final safety analysis reports (UFSARs) reflect changes to the design bases and addresses the effects of other analyses performed since original licensing. In response, the NRC staff issued RG 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)." RG 1.181 endorsed industry guidance provided in the document NEI 98-03, "Guidelines for Updating Final Safety Analysis Reports." These guidance documents identified as "historical information" industry or other data obtained to support or develop the original plant design bases, including that relating to natural or manmade phenomena such as geography, meteorology, hydrology, geology, seismology, population density, and nearby facilities.[3] The guidance defines historical information as that information that was accurate at the time the plant was originally licensed, but is not intended or expected to be updated for the life of the plant. Even though the NRC anticipated that this information would not need to be updated during the licensed period, licensees remain obligated to inform the NRC of issues that they determine to have a significant implication for public health and safety (see 10 CFR 50.9, "Completeness and Accuracy of Information").

Two relatively recent events— the August 2011 earthquake near the North Anna Power Station nuclear plant in Virginia and the flooding of the Missouri River in June 2011 that impacted the Fort Calhoun Station nuclear plant—have led the NRC to review regulatory requirements related to external events. Both events challenged or slightly exceeded the design-basis events established for protection against natural phenomena for the two plants. Each event also involved the NRC assessing the regulatory requirements in support of decisions related to the restart of the plants. In keeping with the established agency positions, the NRC again agreed that the design-basis events used during the initial siting and licensing of these plants remain the basis for the protection of safety-related SSCs. As part of the process of gaining NRC approval for restart, the licensees for both stations did, however, improve capabilities to deal with the specific external event that had affected their facility. Licensees made changes to UFSARs or made regulatory commitments to capture the agreements within the appropriate licensing basis documents for the subject nuclear power plants.

Although licensees are not generally required to identify and address changes to external hazards to their nuclear power plants, the NRC has well-established programs to address potential safety issues identified from operating experience and hazard studies performed by

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discipline, and predictability and to optimize the use of NRC staff and licensee resources. With limited exceptions such as changes needed to ensure reasonable assurance of adequate protection of public health and safety, the NRC must determine that the proposed backfit will substantially increase the overall protection of public health and safety or the common defense and security and that the direct and indirect costs for the facility are justified in view of the increased level of protection.

3 This information is typically found in Chapter 2 of the UFSAR.

other Federal agencies. Two examples related to external hazards are Generic Safety Issue (GSI)199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants," and GSI-204, "Flooding of Nuclear Power Plant Sites Following Upstream Dam Failure." The NRC's programs include various steps to identify issues, assess the safety significance, determine needs for information collection, and evaluate possible regulatory actions. Both of these GSIs were being pursued at the time of the Fukushima accident and the NRC staff subsequently incorporated them into the broader activities related to lessons learned from that event.

The accident at the Fukushima Daiichi nuclear plant in Japan initiated additional NRC assessments of the regulatory requirements associated with protecting nuclear power plants in the United States from natural phenomena, such as large earthquakes and floods. The NRC undertook a number of actions to address lessons learned from the accident in Japan, including imposing several new requirements to enhance safety, and requiring licensees to submit information on the reevaluation of seismic and flooding hazards using present-day standards and guidance. In addition to the actions initiated by the NRC, congressional direction was provided to the agency in Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011), which requires a reevaluation of licensees' design basis for external hazards and expands the scope to include other external events, as described below:

> The Nuclear Regulatory Commission shall require reactor licensees to reevaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licensees as expeditiously as possible, and thereafter when appropriate, as determined by the Commission, and require each licensee to respond to the Commission that the design basis for each reactor meets the requirements of its license, current applicable Commission requirements and guidance for such license. Based upon the evaluations conducted pursuant to this section and other information it deems relevant, the Commission shall require licensees to update the design basis for each reactor, if necessary.

The NRC is responding to the above Congressional direction through its activities related to seismic and flooding reevaluations under the Near-Term Task Force Recommendation 2 and the required implementation of mitigating strategies. Insights from the seismic and flooding reevaluations and the ongoing activities related to implementation of Order EA-12-049 will be used to develop plans to address other external hazards (e.g., wind-related events). As previously discussed, the reevaluations of flooding and other hazards will help to define the functional requirements and reference bounds for design (i.e., design basis) that are applicable to specific SSCs used within licensees' mitigating strategies for beyond-design-basis external events. The possible performance of periodic evaluations of the risks posed to nuclear power plants by external events is being considered under a separate activity (NTTF Recommendation 2.2). The NRC staff will assess possible approaches for such periodic evaluations and make recommendations to the Commission in a future paper. The staff will also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations and related NRC activities.

Enclosure 2 – Coordination and Clarification

Licensees are currently evaluating flooding hazards using present-day standards and guidance and submitting reports to the U.S. Nuclear Regulatory Commission (NRC) in accordance with Phase 1 of the activities associated with the Near-Term Task Force's (NTTF's) Recommendation 2.1. In addition to the hazard reevaluation, licensees whose hazard exceeds the design-basis flood levels were requested to describe interim actions taken or planned that address the specific flooding issues identified by the reevaluation. The request for information and related guidance also call for affected licensees to perform an integrated assessment of the effects of higher flood levels on the nuclear power plant site. The integrated assessment was initially intended to evaluate the total plant response to the flood hazard, including the capabilities being developed and implemented as part of the mitigating strategies required by Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," considering multiple and diverse capabilities such as physical barriers, temporary protective measures, and operational procedures.

As licensees were performing their reevaluations of seismic and flooding hazards, questions arose regarding the regulatory treatment of flood levels that were potentially higher than those established as the design- or licensing-basis events for specific facilities. These questions translate to how the NRC staff would determine if regulatory actions are necessary under Phase 2 of the program and how those decisions are integrated with other Fukushima-related activities. A challenge in answering such questions is that the NRC response to the Fukushima accident involves the concurrent imposition and implementation of new requirements and the collection and assessment of information, such as the reevaluations of external hazards. The NRC staff has provided some guidance and plans regarding the decision-making process and integration of Fukushima-related activities to address specific questions during the reevaluation of external events and the implementation of mitigating strategies. The collection and assessment of information related to flooding hazards as part of the NRC's resolution of the NTTF's Recommendation 2.1 helps establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will, in many cases, improve the efficiency of the NRC's regulatory process by eliminating the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments. Where warranted, the flooding reevaluations can also to support assessments of additional regulatory actions as potential plant-specific backfits.

In keeping with the established policies that reevaluated hazards are not automatically incorporated into the licensing basis for operating reactors, but instead would be assessed in accordance with the NRC's regulation for considering new regulatory requirements (i.e., 10 CFR 50.109, "Backfitting"), the Director of the NRC's Office of Nuclear Reactor Regulation provided supplemental information in letters dated March 1, 2013, regarding flooding reevaluations and February 20, 2014, for seismic reevaluations. The letter, dated March 1, 2013, stated:

> The staff considers the flood hazard re-evaluations being performed pursuant to the 50.54(f) letter to be beyond the current design/licensing basis of operating plants. Consequently, the results of the analysis performed using present-day regulatory guidance, methodologies, and information would not generally be expected to call into question the operability or functionality of SSCs. Therefore, the results are not expected to be reportable pursuant to 10 CFR 50.72, "Immediate notification requirements for operating nuclear power reactors," and 10 CFR 50.73, "Licensee event report system." However, as with any new information that may arise at a plant, licensees are responsible for evaluating and making determinations related to operability and any associated reportability on a case-by-case basis.

and:

> Notwithstanding the preceding discussion, and as noted in the 50.54(f) letter, based upon the results of the review of the responses and other available information, the staff may impose additional requirements to protect against the re-evaluated flood hazard. As always, the safety of the operating plants is of paramount importance. The NRC staff will follow established regulatory processes, including the backfit rule, in determining whether additional requirements are warranted. Further, as with any submittal to the NRC, licensees should evaluate the content to determine if it requires special treatment (e.g., security-related, proprietary, etc.) and request the information be withheld from public disclosure, as appropriate.

As licensees and the NRC staff were assessing the reevaluations of external hazards, they were also working on the order that required the development and implementation of mitigating strategies for beyond-design-basis external events. The initial plans for the mitigating strategies allowed the use of the most recent site flood analysis because the hazard reevaluations from Recommendation 2.1 were not yet completed. However, the need for the mitigating strategies to address external hazards (especially flooding) exceeding the original design basis levels for some facilities had been recognized during discussions on implementation of Order EA-12-049 and this point was incorporated into the guidance documents. The incorporation of the beyond-design-basis external hazards into measures being taken to control risks via implementation of improved mitigating capabilities and strategies is reflected in the regulatory basis document published for the mitigation of beyond-design-basis events (MBDBE) rulemaking activity. The NRC staff described the linkage between the reevaluation of hazards and the planned requirements for mitigating strategies as follows in the published regulatory basis document:

> Since the purpose of the SBOMS [Station Blackout Mitigating Strategies (SBOMS) now referred to as MBDBE] rulemaking would be to provide mitigation capability for extreme external events, information from NTTF Recommendation 2.1 regulatory activities or other re-evaluations of site-specific hazards would be relevant and need to be addressed and could result in changes to the facility. These changes could include changes to: installed equipment; portable equipment; portable equipment connections; and/or guidance and strategies.

Consistent with Order EA-12-049 and related regulatory guidance, it is expected that the SBOMS rule would contain requirements to maintain the SBOMS capabilities, including the protection afforded the equipment consistent with any updated hazard analyses. The supporting SOC and regulatory guide would indicate that the meaning and intent of this provision would be to ensure that new information or operating experience feedback (e.g., new information about a re-evaluated hazard) that impacts the SBOMS equipment and strategies would need to be addressed, and the SBOMS strategies and equipment protection would be updated accordingly.

The relevant hazard information would be taken into account in showing that adequate time for use of portable equipment can reasonably be met as described in [Nuclear Energy Institute] NEI 12-06, Section 3.2.1.7, Principle 6, and clarified in JLD-ISG-201201's Staff Position of Section 2.1.[1] The establishment of an appropriate hazard is, therefore, an important element of the strategies that requires maintenance of mitigation capability for changes in the facility that could impact the identified time constraints. As such, the staff expects that NTTF Recommendation 2.1 activities, for licensees having re-evaluated hazards that exceed their current design basis, could have a significant impact on their SBOMS equipment and strategies. For example, the industry and the NRC are currently considering an expedited approach for the treatment of seismic issues to address NTTF Recommendation 2.1, and the result of that effort could impact the SBOMS equipment and strategies related to this rulemaking. The SBOMS rule could serve to codify the requirement for establishing and addressing re-evaluated hazards and their impact on mitigation equipment and strategies.

The completion and submittal of flooding reevaluations and the development and implementation of mitigating strategies for beyond-design-basis external events are bringing to the forefront the issue of the regulatory treatment of hazards that exceed existing design-basis flood levels. Licensees have developed interim actions and are undertaking additional analyses and plant changes to address the potential effects of beyond-design-basis natural events on equipment important to safety, and in particular on equipment used as part of the mitigating strategies associated with Order EA-12-049 and the MBDBE rulemaking. The reevaluation of flooding hazards will likely raise questions from both internal and external stakeholders regarding the mitigation of risks from water levels significantly above the original design bases for individual facilities. The NRC staff has, therefore, engaged the nuclear industry and developed a general approach for Phase 2 of Recommendation 2.1 on flooding and the process by which the flooding reevaluations and integrated assessments will be incorporated into the overall response to lessons learned from the Fukushima Daiichi accident. As discussed above, the Phase 2 activities are supporting (1) the establishment of design basis functions and

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1 NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," is the industry guidance document for implementing NRC Order EA-12-049 and was endorsed in NRC interim staff guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events."

reference bounds for design for mitigating strategies and, if warranted, (2) support for plant-specific evaluations of other possible regulatory actions (i.e., potential plant-specific backfits). The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and reference bounds for mitigating strategies is a change from existing guidance and from briefings and reports provided to the Commission. This integration of activities is an appropriate way to provide reasonable confidence that key safety functions are maintained during flooding scenarios while improving the efficiency and effectiveness of addressing lessons learned from the Fukushima accident.

The NRC staff finds that the integration of the activities will provide the desired outcome in terms of meaningful and assured safety improvements. The recommended approach also provides benefits in terms of establishing regulatory clarity and stability, reducing demands on schedules and resources, and ensuring timely responses to the lessons learned from the Fukushima accident. Primarily, the NRC staff intends to require that licensees' mitigating strategies address the reevaluated flooding hazards as part of the MBDBE rulemaking. The reevaluation of the flooding hazard will help define important attributes of the equipment and actions used for the mitigating strategies for beyond-design-basis external events. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will reduce the need for a broader assessment of the plant response as described in the current flooding-related guidance documents. There may be circumstances where the staff concludes that the flooding reevaluations and the associated information gathered in Phase 1 of Recommendation 2.1 warrant investigating the need for additional protection or mitigation beyond that provided by mitigating strategies. The current efforts to coordinate activities related to mitigating strategies and flooding reevaluations improve the efficiency and effectiveness of implementing ongoing safety improvements. The NRC staff is requesting that the Commission approve the integration of some activities that are currently part of Recommendation 2.1 (i.e., integrated assessments and Phase 2 decision-making) into the development and implementation of mitigating strategies in accordance with Order EA-12-049 and the related MBDBE rulemaking.

Establishing Design Basis Functions and Values for Mitigating Strategies SSCs

A major part of addressing the lessons learned from the Fukushima accident for nuclear power plants in the United States is the development and implementation of mitigating strategies for beyond-design-basis external events. A simplified representation of the issue and resultant mitigating strategies is provided in Figure 2-1. The figure shows how a beyond-design-basis event, such as a flooding scenario exceeding the values used to protect safety-related SSCs, can initiate a plant upset (Point 1). Nuclear power plants are designed with multiple safety systems to ensure that important safety functions, such as core cooling, are provided and protected against design-basis events (Point 2). However, postulated beyond-design-basis events can not only initiate a plant upset, but can also challenge the availability of equipment performing key safety functions (Point 3). The Fukushima accident is an example of such an event where a tsunami exceeded the established flood protection features, caused the loss of electrical power and other safety systems, and ultimately a loss of safety functions needed to maintain the integrity of the reactor core and containment structures. The mitigating strategies put in place to address such external events therefore include measures to protect some equipment from beyond-design-basis external events and thereby provide capabilities to

prevent fuel damage in the reactor core or spent fuel pool and a significant release of radioactive material from the affected plant should the site be faced with external events more severe than previously analyzed (Point 4).

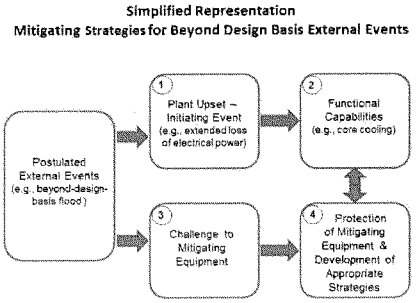

Figure 2-1

The following Figure 2-2 expands on this simple representation and includes the primary path related to ensuring mitigating strategies are developed for beyond-design-basis external events (Point 3), as well as the conditional path if consideration of additional plant-specific backfits might be warranted (Point 6). The availability of reevaluated flooding hazard information and the possible differences between reference bounds for design assumed for compliance with Order EA-12-049 and the MBDBE rulemaking are reflected in the letter "a" and "b" designations. Finally, Point 7 simply reflects that any evaluation of a potential backfit would need to consider the requirements imposed for improved mitigating strategies and the possibility that a plant-specific backfit might be addressed by enhancements to the established mitigating strategies.

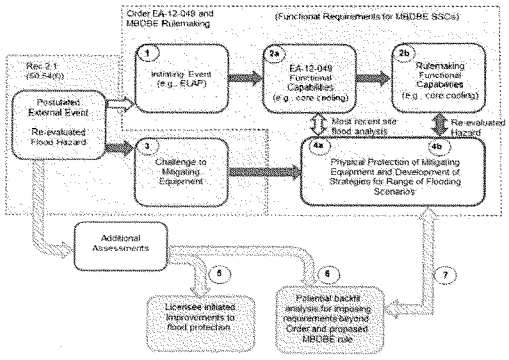

Figure 2-2

The industry and NRC staff were faced with challenges related to the schedules for implementing Order EA-12-049 and the re-evaluation of flooding hazards using present day standards and guidance. The need to develop and implement plans for mitigating strategies for beyond-design-basis external events prior to completing the reevaluation of seismic and flooding hazards led the NRC staff to accept for the purpose of Order EA-12-049 that the functional requirements for installed and portable equipment could, if other information was not available, be established at conditions associated with the most recent site flood analysis.[2] There is, however, a general consensus that the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rulemaking is that licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments. Guidance documents and the regulatory basis for the MBDBE rulemaking have included statements that the mitigating strategies are expected to address beyond-design-basis events, including the flooding reevaluations resulting from the Recommendation 2.1 requests for information. However, incorporating the flooding reevaluations and integrated assessments into the process to define functional requirements for mitigating strategies equipment may require licensees to perform additional evaluations of installed equipment, structures, and the placement of portable equipment to reconcile the mitigating strategies plans and the results from the flooding assessments.

Although much of the focus for the reevaluated flooding hazards is related to assessing the capabilities for mitigating strategies, the activities related to the flooding reevaluations may result in the NRC staff identifying safety concerns and the need to consider regulatory actions beyond those being implemented in accordance with Order EA-12-049 and the related MBDBE rulemaking. The NRC staff will use established processes such as those defined in Management Directive (MD) 8.4, "Management of Facility-specific Backfitting and Information Collection" to initiate, review, and disposition any such safety concerns. MD 6.4, "Generic Issues Program," defines the process for raising and resolving generic safety concerns.

The planned increased integration of the re-evaluation of flooding into the mitigating strategies activities will serve to enhance the plant improvements being implemented in response to the lessons learned from the Fukushima Daiichi accident. The NRC staff described in the 50.54(f) letter and related guidance an approach where Phase 1 of the flooding assessments (hazard re-evaluation, interim actions, and integrated assessment) would support a subsequent NRC decision on appropriate regulatory actions. Those regulatory actions could include requiring licensees to prevent flooding of safety-related SSCs by improving flooding protection (akin to redefining the design basis flood), requiring mitigating capabilities for cases where the availability of safety-related SSCs are challenged by flood waters, or some combination of actions to prevent or mitigate the risks from the re-evaluated flooding hazards. As discussed above, the relationship between the external hazard re-evaluations and the development of mitigating strategies

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[2] NEI 12-06 includes guidance for screening and considering external events, including flooding scenarios that states "The equipment should be stored in one or more of the following configurations: (a) Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites...."

for such events has become clearer as both activities have been developed over time, and the planned integration of the activities will support a more efficient and effective resolution of the issues. The NRC staff undertook improved coordination of the activities given that both centered on providing key safety functions during challenging external events.

The integrated assessments envisioned by the original guidance provided an opportunity for licensees and the NRC staff to gain insights into plant responses to flooding beyond testing capabilities to mitigate the event. Although the assessment of flooding hazards will now be focused primarily on the mitigating strategies capabilities (including necessary installed SSCs), the revised approach does not rule out the possibility that some licensees may perform the more detailed integrated flooding assessment as described in the current guidance documents (i.e., assessing plant impacts beyond maintaining mitigating strategy capabilities). These assessments could support licensees' consideration of asset protection measures (Figure 2.2; Point 5) or identify possible cost savings associated with traditional flood protection versus revised mitigating strategies. Detailed integrated assessments that assess flood protection and mitigation capabilities beyond Order EA-12-049 and the MBDBE rulemaking may also be undertaken if needed to support evaluating the possible pursuit of plant-specific requirements in accordance with NRC's backfit regulation. The NRC staff will, on a case-specific basis, consider information about the reevaluated hazards; available response times for identified scenarios; plant-specific configurations and licensing histories; and other factors when defining an appropriate integrated assessment of flooding scenarios to support evaluating a potential plant-specific backfit.

The NRC staff has had several public meetings with the nuclear industry regarding the need to consider the reevaluated flooding hazard and possibly modify equipment or strategies to address conditions different than those considered in the implementation of Order EA-12-049. The industry provided a framework generally consistent with that proposed by the NRC staff in terms of assessing new hazard information and evaluating mitigating strategies and related equipment to either confirm the scenario is adequately addressed or to identify possible revisions to the strategy to address the reevaluated flooding hazard. Changes to the mitigating strategies could involve modifications to the existing equipment and plans developed for a variety of external hazards or could involve developing a targeted strategy for specific flooding scenarios.

An example of revising the existing equipment and plans developed for multiple external hazards would be to raise the elevation of a connection or storage location to accommodate higher flood levels that might be calculated when using present day standards and guidance. The assessment of new hazard information would consider not only the flooding conditions but also the timing of the event in terms of the ability of a licensee to be warned of an impending flood and ability to prepare. Licensees may be able to address some flooding scenarios by taking advantage of the available warning time to shut down the plant and optimize the use of the mitigating strategies developed to address all external hazards.

It is clear that for some flooding scenarios, licensees may need to develop targeted or scenario-specific mitigating strategies to deal with events that far exceed their original design basis flood and the approaches developed for other external hazards. For example, some low-probability, but conceivable flooding scenarios could challenge a

licensee's access to many plant SSCs, including those used to mitigate most beyond-design-basis external events. A possible scenario that would require a targeted mitigating strategy is the failure of one or more major dams upstream of a nuclear plant. In addition to the expected damage to the nuclear power station, such a flooding scenario would – in and of itself - have major adverse impacts on public health and safety, regional economic activities, and other socio-economic conditions. However, measures would still be needed to ensure that the damages to the nuclear facility would not make the impact of the disaster materially worse by introducing the complexities of a large release of radioactive materials. In the event of such an unlikely, but very large flood, the goal of protecting public health and safety by providing additional capabilities to prevent damage to fuel assemblies in the reactor core and the spent fuel pool is considered acceptable.

Licensees may develop a scenario-specific plan for some postulated flooding events that would identify the necessary actions, including the orderly shutdown of the reactor, to support the unit(s) achieving and maintaining a manageable shutdown condition. The targeted strategy would address the time from initial notification throughout the period of degrading conditions, loss of access to important plant areas and equipment, and receding water levels. As appropriate, the scenario-specific mitigating strategy would include provisions to address the following:

- Facility structures (containments, reactor and fuel buildings, etc.) and key systems (e.g., reactor vessel and spent fuel pool). The targeted strategy should address possible actions to help maintain overall structural and system configurations and integrity to support achieving and maintaining a manageable shutdown condition. Configuration control can, as appropriate, rely on the ability of structures and systems to withstand the static and dynamic forces associated with an overwhelming flood or include administrative actions, such as opening flowpaths for the flood waters to travel through a building. If flood waters are expected to enter buildings, the targeted strategy should address the ability of key systems to maintain a configuration that supports a manageable shutdown condition (i.e., prevents loss of cooling to fuel assemblies in the core and spent fuel pool).

- Cooling functions. The mitigating strategies should address those measures (design characteristics, installed equipment, portable equipment, etc.) providing criticality control and cooling functions for the reactor core and spent fuel beginning with the notification of the initiating event (e.g., dam failure), throughout the plant shutdown, and ultimately achieving and maintaining a manageable shutdown condition.

- The targeted or scenario-specific mitigating strategy would identify key steps (including equipment and personnel) for the following:

    - Preparing for the arrival of the flood waters (e.g., reaching cold shutdown or refueling mode).

- Providing cooling for the reactor core and spent fuel for the range of possible flooding levels—addressing the various potential stages of losing access to plant structures and equipment.

- Maintaining a manageable shutdown condition for the range of possible flooding levels—addressing equipment (including needed fuel supplies and supporting functions), access and movement to staging areas, and personnel support (including food and water). As with other aspects of mitigating strategies, the plan should address maintaining the manageable shutdown condition using onsite portable equipment until such time as support can reasonably be expected from offsite resources.

The NRC staff is implementing the above approach as part of its activities related to Recommendation 2.1 on flooding reevaluations and Recommendation 4 on improving plant capabilities to deal with SBO events and mitigating strategies for beyond-design-basis natural events. These approaches are consistent with longstanding policies on the treatment of design-basis events and safety enhancements to address beyond-design-basis events. The integration of the reevaluated flooding hazards with the ongoing mitigating strategies activities and the related rulemaking effort provide the most effective and efficient path for the timely resolution of Fukushima-related issues and implementation of safety enhancements at nuclear power plants.

Enclosure 3

COMSECY: Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards

Non-Concurrence NCP-2014-010

NON-CONCURRENCE PROCESS
COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP), http://nrcweb.nrc.gov:8600/policy/directives/catalog/md10.158.pdf.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- [ ] Concurred
- [x] Continued to non-concur
- [ ] Agreed with some of the changes to the subject document, but continued to non-concur
- [ ] Requested that the process be discontinued

  - [ ] The non-concurring employee(s) requested that the record be non-public.
  - [x] The non-concurring employee(s) requested that the record be public.

NRC FORM 757
NRC MD 10.158
(09/2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluati	ADAMS ACCESSION NO. ML14238A616
DOCUMENT SIGNER Mark A. Satorius	SIGNER TELEPHONE NO (301) 415-1700
TITLE Executive Director for Operations	ORGANIZATION EDO
NAME OF NON-CONCURRING EMPLOYEE(S) Michelle Bensi	TELEPHONE NUMBER (301) 415-0073
TITLE Civil Engineer	ORGANIZATION NRO/DSEA/RHM1

☐ DOCUMENT AUTHOR ☐ DOCUMENT CONTRIBUTOR ☑ DOCUMENT REVIEWER ☐ ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR Christopher Cook	
TITLE Branch Chief	ORGANIZATION NRO/DSEA/RHM1

☑ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C

☐ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: ☑ PUBLIC ☐ NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)

See attached document.

Additional non-concurring employees:

Suzanne Schroer (NRO/DSRA/SPRA) non-concur via email dated 10/09/14

Marie Pohida (NRO/DSRA/SPRA)

Malcolm Patterson (NRO/DSRA/SPRA)

Valerie Barnes (RES/DRA/HFRB) non-concur via email dated 10/09/14

Joseph Kanney (RES/DRA/ETB)

Jeffery Mitman (NRR/DRA/APHB; currently on rotation to RES/DRA/PRAB) non-concur via email dated 10/09/14

David Desaulniers (NRO/DCIP)

George Lapinsky, NRR/DRA/APHB - non-concur via email dated 10/15/14

Fernando Ferrante, NRR/DRA/APHB - non-concur via email dated 10/16/14

Kenneth See, NRO/DSEA/RHM1 - non-concur via email dated 10/20/14

Jacob Philip, RES/DRA/ETB- non-concur via email dated 10/31/14

SIGNATURE	DATE 10/9/14

Section A – Reasons for Non-Concurrence and Proposed Alternatives

Several members of the working group established to address the Near-Term Task Force Recommendation 2.1 (Flooding) do not concur with the proposed COMSECY titled "Relationship between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," which was circulated for concurrence on October 7, 2014.

Congress and the Commission directed the staff to understand and address reevaluated flooding events and to consider whether changes to the design basis, or other actions, are needed to protect nuclear power plants from the hazards that flooding presents. If issued in its current form, the COMSECY would depart from the approved, systematic process that is already in place to accomplish that objective.

Moreover, the COMSECY does not recognize the importance of understanding total plant response to flooding hazards. This is not consistent with operating experience and evidence that flooding hazards are in some cases larger and more likely than was believed when plants were licensed.

Recommendation 4 of the NTTF Report ultimately resulted in strategies to mitigate the consequences of extended loss of ac power and loss of access to the ultimate heat sink as a surrogate for a beyond design basis external event. Storage and deployment considerations for external events are part of these strategies. The COMSECY presumes that the resulting enhancements will be sufficient to deal with specific flooding hazards. As a result, the COMSECY proposes to eliminate the systematic evaluation that is necessary to determine if additional regulatory actions are needed to protect a given plant from flooding hazards.

Such significant departures from the path that the staff has been following for several years call for the input and direction of the Commission.

This document describes twelve specific concerns regarding the COMSECY:

1. It departs from the intent of NTTF Recommendation 2.1.
2. It departs from previous Commission and Congressional direction.
3. It deviates from the implementation process currently established for reevaluating flooding hazards and plant response.
4. It may create regulatory inconsistencies.
5. It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted.
6. It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action.
7. It does not incorporate lessons learned from operating experience.
8. It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities.
9. It does not adequately distinguish between consequential floods and the reevaluated flood hazard.
10. It is vague in its description of "targeted mitigating strategies."
11. It is not responsive to external recommendations by regarded experts.
12. It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1.

Section A – Reasons for Non-Concurrence and Proposed Alternatives

1. Introduction

After the accident at the Fukushima Dai-ichi Nuclear Power Plant, the U.S. Nuclear Regulatory Commission (NRC) directed the staff to conduct a systematic and methodical review of its processes and regulations. This review was conducted by the Near-Term Task Force (NTTF), which developed a comprehensive set of recommendations documented in the enclosure to SECY-11-0093 (Ref. [1]). An interdisciplinary working group was established to address flooding hazards identified in NTTF Recommendation 2.1 in 2012. It was comprised of staff from several offices including individuals with expertise in hydrology, probabilistic risk assessment, engineering, and human factors. Recommendation 2.1 states:

> Order licensees to ***reevaluate*** the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis SSCs [structures, systems, and components] important to safety ***to protect against the updated hazard*** [emphasis added].

Since 2012, the members of the working group have been interacting with industry to establish an effective process for responding to Recommendation 2.1. Instead of issuing an order, the NRC issued a letter pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54, "Conditions of licenses" in March 2012 (50.54(f) letter hereafter). The 50.54(f) letter requested nuclear power plant licensees to reevaluate flooding hazards and, if the reevaluated flooding hazard is more severe than the plant's design basis, to perform an integrated assessment of total plant response to the reevaluated flood hazard.

The draft COMSECY titled "Relationship between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," which was circulated for concurrence on October 7, 2014, describes a significant change to the path forward for implementation of NTTF Recommendation 2.1 that was developed by the staff working group and industry. This document enumerates the concerns of the named working group members regarding the proposed COMSECY. These concerns are both technical and procedural.

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and "first line of defense" against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an

important contribution to implementing the lessons learned from Fukushima, their existence does *not* negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1.

The above leads to the following twelve specific concerns, which are further described in Section 2 of this document:

1. It departs from the intent of NTTF Recommendation 2.1 (Section 2.1).
2. It departs from previous Commission and Congressional direction (Section 2.2).
3. It deviates from the implementation process currently established for reevaluating flooding hazards and plant response (Section 2.3).
4. It may create regulatory inconsistencies (Section 2.4).
5. It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted (Section 2.5).
6. It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action (Section 2.6).
7. It does not incorporate lessons learned from operating experience (Section 2.7).
8. It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities (Section 2.8).
9. It does not adequately distinguish between consequential floods and the reevaluated flood hazard (Section 2.9).
10. It is vague in its description of "targeted mitigating strategies" (Section 2.10).
11. It is not responsive to external recommendations by regarded experts (Section 2.11).
12. It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1 (Section 2.12).

Finally, in Section 3,the authors of this non-concurrence propose a solution that resolves all of the concerns expressed in this paper.

2. Basis for non-concurrence

Each of the following subsections describes an important concern regarding the content of the draft COMSECY.

2.1. Deviation from the intent of NTTF Recommendation 2.1

2.1.1. Description of concern

NTTF Recommendation 2.1 is for the NRC to "[o]rder licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if

necessary, update the design basis and SSCs [structures systems and components] important to safety to protect against the updated hazards." Thus, at the core of Recommendation 2.1 is the reevaluation of flooding hazards and, if needed, updating a plant's design basis to ensure protection of SSCs important to safety. Recommendation 2.1 was implemented via the issuance of the 50.54(f) letter in March 2012, as described above. The reevaluation of flooding hazards is responsive to the first portion of Recommendation 2.1, while the integrated assessment provides the relevant information regarding plant response to support an NRC decision regarding the need to change the design or licensing basis of the plant to protect SSCs important to safety or to take other regulatory action.

In light of the intent of Recommendation 2.1, four key issues emerge regarding the COMSECY:

1. The COMSECY represents a significant departure from the intent of Recommendation 2.1.
2. The paper provides no technical or safety basis for departing from Recommendation 2.1.
3. The COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.
4. The COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.

2.1.2. Supporting information

As described above, the NTTF conducted a systematic and methodical review of the NRC regulations and processes and determined if the agency should make additional improvements to these programs in light of the events at Fukushima Dai-ichi. As a result of this review, the NTTF developed a comprehensive set of recommendations, documented in the enclosure to SECY-11-0093 (Ref. [1]). The NTTF made several important flooding-related observations in their report:

- *Evolution in understanding of hazards and consequences over time:* The NTTF observed that NRC's regulatory framework for natural hazards assessment has evolved as new information regarding hazards and their consequences has become available. Consequently, there are inconsistencies among sites with respect to the design basis for natural hazards. In the context of flooding, this has led to differences with regard to the hazards considered as well as the estimated magnitudes of those hazards.
- *Overreliance on less robust systems and strategies:* The NTTF observed that "some plants have an overreliance on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions."
- *Concern regarding cliff-edge effects:* The NTTF observed that flooding risks are of concern due to a "cliff-edge effect," in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level.

Based on the above, the NTTF concluded that it would be "**very beneficial to safety for all licensees to confirm that SSCs important to safety are adequately protected from floods**" and that "[t]his reevaluation should consider all appropriate internal and external flooding

sources..." Moreover, the NTTF observed that, due to changes in flooding hazard data and models over time, there would be a continuing benefit for operating reactors to reevaluate the implications of updated flooding hazards at appropriate intervals.

With regard to the consequences of flooding hazards, the NTTF observed the following:

> **[f]ailure to adequately protect SSCs important to safety from appropriate design-basis natural phenomena with appropriate safety margins has the potential for common-cause failures and significant consequences as demonstrated at Fukushima.**

The aforementioned insights led the NTTF to make the following recommendation:

> *Recommendation 2:* The Task Force recommends that the NRC require licensees to reevaluate and upgrade as necessary the design-basis seismic and flooding protection of SSCs for each operating reactor.

Based on Recommendation 2, the NTTF recommended that the Commission direct three actions to ensure adequate protection from natural phenomena.

> 2.1 Order licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs important to safety to protect against the updated hazards.
>
> 2.2 Initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis for SSCs important to safety to protect against the updated hazards.
>
> 2.3 Order licensees to perform seismic and flood protection walkdowns to identify and address plant-specific vulnerabilities and verify the adequacy of monitoring and maintenance for protection features such as watertight barriers and seals in the interim period until longer term actions are completed to update the design basis for external events.

As described above, NTTF Recommendation 2.1 is of particular relevance to the COMSECY.

However, the COMSECY represents a significant deviation from Recommendation 2.1. For example, the COMSECY (Enclosure 1, p. 2) states that design basis changes are *not expected* and the reevaluated hazard will instead be used to define requirements and bounds for mitigating strategies:

> [T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which most safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events.

Under the proposed path forward, consideration of the need to take actions beyond changes to mitigating strategies (e.g., updating of protection of SSCs important to safety) is only a secondary purpose. For example, the COMSECY states (Enclosure 2, p .1):

> The collection and assessment of information related to flooding hazards as part of the NRC's resolution of the NTTF's Recommendation 2.1 can be viewed as serving two

> purposes. The ***first purpose is to establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements***. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will ***reduce the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments***. Where warranted, the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits [Emphasis added].

The COMSECY does not describe the process for taking such additional actions. Moreover, sufficient information will not be available under the new proposed path to inform such a decision (Section 2.6 expands on this concern).

Table 1 provides an assessment of NRC's implementation of the key components of Recommendation 2.1, describes the staff's current implementation, and highlights potential concerns with the proposed path described in the COMSECY.

Finally, the main body of the COMSECY does not present a full-characterization of the NRC's assessment of the lessons learned from Fukushima. For example, the COMSECY (p.1) states:

> The accident at the Fukushima Daiichi nuclear plant in Japan highlighted the possibility that certain external events may simultaneously challenge the prevention, mitigation, and emergency preparedness measures that provide defense in depth protections for nuclear power plants. ***NRC's assessment of the lessons learned from the experiences at Fukushima Daiichi led to the conclusion that additional requirements were needed to increase the capability of nuclear power plants to address certain beyond-design-basis external events.*** As a result, the NRC undertook actions that imposed new requirements to enhance safety. The NRC also requested that licensees reevaluate seismic and flooding hazards using present-day standards and guidance [Emphasis added].

The characterization of lessons learned in the main body of the COMSECY does not describe the NTTF's assessment and recommendations related to the need to reevaluate seismic and flooding hazards and, if necessary, update the design basis to protect SSCs important to safety Moreover, the NTTF does not characterize these reevaluated hazards "beyond design basis." However, the NTTF did separately recommend, as part of Recommendation 4, that "NRC strengthen station blackout mitigation capability at all operating and new reactors for design-basis and beyond-design-basis external events." Within the context of Recommendation 4, the NTTF report includes the following statement:

> A beyond-design-basis flood could be established through extensive, probabilistic hazards analysis. As a practical matter, and to prevent undue delays in implementing additional SBO [station blackout] protections, the Task Force concludes that locating SBO mitigation equipment in the plant one level above flood level (about 5 to 6 meters (15 to 20 feet)) or in watertight enclosures would provide sufficient enhanced protection for this level of defense-in-depth.

The distinction between the purposes of the various recommendation is not clear in the COMSECY's description of lessons learned from the events at Fukushima.

Table 1: Key components of Recommendation 2.1, staff implementation, and concerns

Key component of NTTF R2.1	Current implementation of NTTF R2.1	Concern regarding proposed path forward
NTTF R2.1 recommends that NRC *order* licensees to reevaluate flooding hazards	Rather than issue an order related to the reevaluation of flooding hazards, a 50.54(f) letter was issued. With respect to NTTF R2.1, the letter requested the reevaluation of flooding hazards and, if the reevaluated hazard is more severe than the design basis, the subsequent performance of an integrated assessment.	The COMSECY paper describes a process wherein the implementation approach described in the 54.54(f) letter would be significantly truncated.
NTTF R2.1 recommends (if necessary) updating of the design basis	The 50.54(f) letter identified that, once all relevant information has been received in response to the 50.54(f) letter, "the NRC staff will determine whether additional regulatory actions are necessary (e.g., update the design basis and SSCs important to safety) to provide additional protection against the updated hazards."	The COMSECY does not propose updating the design or licensing basis for flooding. In fact, it essentially precludes the need for changes to the design basis. Moreover, by reducing the information that will be collected as part of licensee responses to the 50.54(f) letter under the proposed path forward described in the COMSECY, there will be a significant reduction in the information available to support regulatory decisionmaking.
NTTF R2.1 recommends that licensees *protect* against flooding hazards	The process described in the integrated assessment interim staff guidance (Ref. [2]) allows licensees to consider both the protection and mitigation capabilities of the site in responding to the reevaluated flooding hazard. Because the reevaluated hazard flooding scenarios are defined based on present-day guidance and methods, the interim staff guidance outlines a systematic process for evaluation of licensees' proposed approaches.	The COMSECY prescribes the use of mitigating strategies as the primary response to the reevaluated hazard with no protection considered for safety-related equipment unless (1) such equipment is directly associated with mitigating strategies and (2) the reevaluated hazard includes events for which there is little or no warning prior to arrival of floodwaters on site. Moreover, the COMSECY proposes a less comprehensive evaluation approach than the one described in the integrated assessment interim staff guidance (Ref. [2]).

2.2. Deviation from the previous Commission and Congressional direction

2.2.1. Description of concern

There has been clear Commission and Congressional direction regarding implementation of Recommendation 2.1. The COMSECY outlines a proposed path forward that significantly deviates from the current path for implementation of Recommendation 2.1. The following issues are observed:

1. The COMSECY does not clearly and explicitly describe the previous Commission and Congressional direction regarding the need to reevaluate flooding hazards, identify plant vulnerabilities under the new hazard, and (as needed) take further regulatory action in response to Recommendation 2.1.
2. The main body of the COMSECY does not clearly acknowledge that the proposed path forward for implementation of Recommendation 2.1 represents a significant deviation

from the previous Commission and Congressional direction regarding Recommendation 2.1.

3. The paper does not ask the Commission to vote on the change in direction that is proposed in the COMSECY.

2.2.2. Supporting information

The following description provides an overview of previous Commission and Congressional direction related to Recommendation 2.1. The current path for implementation of Recommendation 2.1 was formulated through a series of communications with the Commission and in response to Congressional direction.

SECY-11-0093 (July 2011)

In July 2011, the NTTF Report was issued as an enclosure to SECY-11-0093 (Ref. [3]). Section 2.1 summarizes the content of the report related to flooding. The staff requirements memorandum (SRM) associated with SECY-11-0093 (Ref. [1]) directed staff to engage promptly with stakeholders to review and assess the recommendations of the NTTF in a comprehensive and holistic manner for the purpose of providing the Commission with fully informed options and recommendations. As described in Section 2.1, the proposed path forward no longer meets the intent of Recommendation 2.1.

SECY-11-0124 (September 2011)

SECY-11-0124 (Ref. [4]) documents the NTTF recommendations that the staff concluded can and should be initiated without delay. The staff determined the near-term regulatory actions based on its judgment of the potential and relative safety enhancement of each of the recommendations. SECY-11-012 identified Recommendation 2.1 as a recommended near-term action. The enclosure notes the following with regarding the flooding hazards under Recommendation 2.1:

> The assumptions and factors that were considered in flood protection at operating plants vary. In some cases, the design bases did not consider the effects from the local intense precipitation and related site drainage. In other cases, the probable maximum flood is calculated differently at units co-located at the same site, depending on the time of licensing, resulting in different design-basis flood protection. The NTTF and the staff noted *that* ***some plants rely on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions***. For several sites, the staff noted that all appropriate flooding hazards are not documented in the Updated Final Safety Analysis Report. The NTTF and the staff also noted that flooding risks are of concern because of a ***"cliff-edge" effect***, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level. ***Therefore, all licensees should confirm that SSCs important to safety are adequately protected from floods*** [emphasis added].

In SECY-11-0124, staff proposed actions regarding Recommendation 2.1 for flooding:

1. Initiate stakeholder interaction to discuss application of present-day regulatory guidance and methodologies to the reevaluation of flooding hazards at operating reactors. These

methods are used for reviews of early site permit (ESP) or combined license (COL) applications.

2. Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f) to:
   - **Reevaluate site-specific flooding hazards** using the present-day methodologies.
   - Identify actions that have been taken or are planned in order to **address plant-specific vulnerabilities** associated with the updated flooding hazards.
3. Evaluate licensee responses and take appropriate **regulatory action to resolve vulnerabilities** associated with updated site-specific hazards.

In the SRM to SECY-11-0124 (Ref. [5]), the Commission approved the staff's proposed actions to implement, without delay, the NTTF recommendations as described in SECY-11-0124, with several comments. For Recommendation 2.1, the Commission provided the following comment:

> For Recommendation 2.1, when the staff issues the requests for information to licensees pursuant to 10 CFR 50.54(f) to identify actions that have been taken or are planned to address plant-specific vulnerabilities associated with the reevaluation of seismic and flooding hazards, the staff should explain the meaning of "vulnerability." The staff should inform the Commission, either through an Information Paper or a briefing of the Commissioners' Assistants, when it has developed the technical bases and acceptance criteria for implementing Recommendations 2.1, 2.3, and 9.3.

SECY-11-0124 focuses on three key components of the NRC response to Recommendation 2.1 for flooding: (1) licensees reevaluate flooding hazards using present-day guidance and methods, (2) licensees identify vulnerabilities and actions taken or planned to address those vulnerabilities, and (3) staff evaluates responses and initiates appropriate regulatory actions to resolve vulnerabilities.

In contrast to the recommendations in SECY-11-0124, the COMSECY proposes to reduce the scope of the assessment of plant response (i.e., the integrated assessment) and thus will not identify or resolve identified plant vulnerabilities. For example, the COMSECY (Enclosure 1, p. 2) states:

> Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will, in many cases, improve the efficiency of the NRC's regulatory process by ***eliminating the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments*** [emphasis added].

<u>SECY-11-0137 (October 2011)</u>

The purpose of SECY-11-0137 (Ref. [6]) was to transmit the staff's proposed prioritization of the NTTF recommendations to the Commission. SECY-11-0137 prioritized the NTTF's recommendations into three tiers. Tier 1 includes all the actions identified in SECY-11-0124 (including Recommendation 2.1) and two additional items. SECY-11-0137 also describes implementation, schedule, and resource challenges.

With regard to NTTF Recommendation 2.1 related to flooding, SECY-11-0137 states:

> The assumptions and factors that were considered in flood protection at operating plants vary. In some cases, the design bases did not consider the effects from the local intense

> precipitation and related site drainage. In other cases, the probable maximum flood is calculated differently at units co-located at the same site, depending on the time of licensing, resulting in different design-basis flood protection. The NTTF and the staff noted that ***some plants rely on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions***. For several sites, the staff noted that all appropriate flooding hazards are not documented in the Updated Final Safety Analysis Report (UFSAR). The NTTF and the staff also noted that flooding risks are of concern because of a ***"cliff-edge" effect***, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level. ***Therefore, all licensees should confirm that SSCs important to safety are adequately protected from floods*** [emphasis added].

In SECY-11-0137, the staff further concluded that Recommendation 2.1 should be considered Tier 1 because "**this recommendation would improve safety**" and sufficient resource flexibility exists. SECY-11-0137 included the following recommendations related to Recommendation 2.1:

- Interact with stakeholders to inform NRC's process for defining guidelines for the application of present-day regulatory guidance and methodologies to the reevaluation of flooding hazards at operating reactors. These present-day methods are used for reviews of early site permit (ESP) or combined license (COL) applications.
- Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f):
  - Reevaluate site-specific flooding hazards using the present-day methodologies.
  - Identify actions that have been taken or are planned to address plant-specific issues associated with the updated flooding hazards (**including potential changes to the licensing or design basis of a plant**).
- Evaluate licensee responses and take appropriate regulatory action to resolve issues associated with updated site-specific hazards.

While the language above is similar to that contained in SECY-11-0124, in the later SECY (SECY-11-0137), the concept of vulnerabilities was generalized. Importantly, specificity was added regarding potential actions to address identified issues, including potential changes to the licensing or design basis of the plant. In addition, SECY-11-0137 laid out a schedule and milestones for the implementation of Recommendation 2.1. Milestones for flooding include:

- Develop 10 CFR 50.54(f) letter
  - Stakeholder interaction and technical development
  - Develop 10 CFR 50.54(f) letter
  - Issue 10 CFR 50.54(f) letter
- Evaluate licensee responses to 10 CFR 50.54(f) letter
  - Write safety evaluation or NUREG to document staff conclusions
- Issue orders to licensees (if needed)
  - Develop regulatory basis and draft orders
  - Issue orders
- Inspection Activities
  - Develop temporary instruction

  - Conduct inspections and document results
  - Update SPAR models
- Issue letters to close out 10 CFR 50.54(f) letter and/or orders

In the SRM to SECY-11-0137 (Ref. [7]), the Commission approved the staff's proposed prioritization of the NTTF recommendations and supported action on the Tier 1 and Tier 2 recommendations, subject to the direction contained in the SRM to SECY-11-0124, and provided two comments particularly relevant to the subject of this document:

> In the absence of a fully developed justification for a proposed new requirement, the Commission finds it premature to initiate actions on the Near Term Task Force recommendations under the premise of assuring or redefining the level of protection of public health and safety that should be required as adequate in accordance with the backfit rule. The Commission will evaluate the staff's basis for imposing new requirements when documented in notation vote papers for any new requirements promulgated by orders or rulemaking.
>
> ⋮
>
> The Staff should consult with the Commission via notation vote papers before issuing any orders that would lead to a change in the design basis of licensed plants. The staff should inform the Commission 5 business days before issuing letters under 10 CFR 50.54(f) associated with the regulatory activities outlined in SECY-11-0137.

The Commission also provided comments related to several other topical areas not related to NTTF Recommendation 2.1 for flooding.

SECY-11-0137 focuses on three key components of NRC response to Recommendation 2.1 for flooding, which differ slightly from those identified in SECY-11-0124: (1) licensees reevaluate flooding hazards using present-day guidance and methods, (2) licensees evaluate actions taken or planned to address plant-specific issues (including **potential changes to the licensing or design basis of a plant**), and (3) staff evaluates responses and initiates of appropriate regulatory actions to address identified issues. SECY-11-0137 specifically refers to the issuance of orders, if needed.

In contrast to the recommendations in SECY-11-0137, the COMSECY proposes to reduce the scope of the assessment of plant response and states that the NRC does not expect to change the plant design basis or make changes to flood protection of safety-related SSCs (e.g., the COMSECY states "the NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected").

Consolidated Appropriations Act (December 2011)

On December 23, 2011, the Consolidated Appropriations Act, Public Law 112-074 (Ref. [8]), was signed into law. Section 402 of the law requires a reevaluation of licensees' design basis for external hazards, and expands the scope to include other external events, as described below:

> The Nuclear Regulatory Commission shall require reactor licensees to re-evaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licensees as expeditiously

> as possible, and thereafter when appropriate, as determined by the Commission, and require each licensee to ***respond to the Commission that the design basis for each reactor meets the requirements of its license, current applicable Commission requirements and guidance for such license***. Based upon the evaluations conducted pursuant to this section and other information it deems relevant, ***the Commission shall require licensees to update the design basis for each reactor, if necessary*** [emphasis added].

In contrast, the COMSECY explicitly states (and implies throughout) that NRC is not expecting to take any regulatory actions related to changes to the design-basis flooding hazards or flood protection of safety-related SSCs. For example, the COMSECY (Enclosure 1, p. 2) states:

> ***[t]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected.*** The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events [emphasis added].

In Enclosure 2 (p.4), the COMSECY notes the departure from existing guidance and the process described in previous communications to the Commission:

> The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and reference bounds for mitigating strategies ***is a change from existing guidance and from briefings and reports provided to the Commission*** [emphasis added].

Regarding the Consolidated Appropriations Act, the COMSECY (Enclosure 1, p. 7) states:

> The NRC is responding to the above Congressional direction through its activities related to seismic and flooding reevaluations under the Near-Term Task Force Recommendation 2.1. In addition, insights from the seismic and flooding reevaluations and the ongoing activities related to implementation of Order EA-12-049 will be used to develop plans to address other external hazards (e.g., wind-related events). As previously discussed, the reevaluations of flooding and other hazards will help to define the functional requirements and reference bounds for design (i.e., design basis) that are applicable to specific SSCs used within licensees' mitigating strategies for beyond-design-basis external events.

Thus, the COMSECY suggests that the intent of the Consolidated Appropriations Act is met by reevaluating flooding hazards and then changing the functional requirements and reference bounds for mitigating strategies. It is not clear that this was the intent of Congress when the language was added to the Consolidated Appropriations Act regarding the need to ensure the each plant "meets the requirements of its license, current applicable Commission requirements and guidance for such license" and "update the design basis for each reactor, if necessary." Moreover, the proposed path forward to responding to Congressional direction is not consistent with the way in which staff stated NRC would be addressing Congressional direction as described in previous communications with the Commission in SECY-12-0025 (see below).

<u>SECY-12-0025 (February 2012)</u>

SECY-12-0025 (Ref. [9]) provides, for Commission consideration, the NRC staff's proposed orders in response to lessons learned from the events at Fukushima. The staff recommended the Commission approve issuance of the proposed orders. The proposed orders were attached to SECY-12-0025 and staff recommended that the Commission redefine the level of protection regarded as adequate and require actions of licensees to meet that new level of protection. SECY-12-0025 provides justification for redefining the level of adequate protection.

The paper also provided, for Commission awareness, the requests for information (50.54(f) letters) that the staff planned to send to (1) reactor licensees, (2) construction permit holders, and (3) combined license (COL) holders as of March 9, 2012. Per direction in SECY-11-0137, the staff informed the Commission of the issuance of the 50.54(f) letter related (in part) to the reevaluation of flooding hazards. In SECY-12-0025, the staff noted the following:

> Under 10 CFR 50.54(f), when information is not sought to verify compliance with a facility's current licensing basis, the staff is required to prepare a reason or reasons for each information request prior to issuance to ensure that the burden to be imposed on respondents is justified in view of the potential safety significance of the issue to be addressed in the requested information. As noted in the body of the enclosed letter, ***protection of plants from natural phenomena is critical for continued safe operation of nuclear power plants***. Given that new information has been developed on natural phenomena hazards since the licensing basis of the operating plants was established, the ***staff finds that it is necessary to confirm the adequacy of the hazards assumed for U.S. plants and their ability to protect against them***. Further, the staff finds that the accident at Fukushima highlights a need to verify the adequacy of emergency planning to address a prolonged SBO and multiunit events. ***Finally, the reevaluation and related information analysis will serve to meet the NRC's obligation under the Consolidated Appropriations Act, for 2012 (PL 112-74), Section 402*** [emphasis added].

In SECY-12-0025, the staff replied to the Commission's request in the SRM to SECY-11-0124 that the staff define the term "vulnerability." The following definition was provided:

> Plant-specific vulnerabilities are those features important to safety that when subject to an increased demand due to the newly calculated hazard evaluation have not been shown to be capable of performing their intended safety functions.

The staff further noted that:

> The [above] definition [of vulnerability] is broad enough to capture both prevention and mitigation aspects and also includes features of protection such as hardware, procedures, temporary measures, and potentially available offsite resources. This definition allows the NRC staff to ***assess plant response to a natural hazard event as an integrated system*** providing consideration for all available resources. **Information *resulting from such an evaluation will help the staff decide upon the most appropriate regulatory action focusing on the most beneficial safety enhancements*** [emphasis added].

The above concept of assessing plant response as an integrated system to provide information to support regulatory evaluation of beneficial safety enhancements led to the subsequent development of the integrated assessment for external flooding. SECY-12-0025 included the 50.54(f) letter as an enclosure, which referenced the integrated assessment.

SECY-12-0025 states that staff finds it "**necessary to confirm the adequacy of the hazards assumed for U.S. plants and their ability to protect against them.**" This justified the burden of the information requested as part of the 50.54(f) letter in light of the safety significance of the issue to be address.

The SRM for SECY-12-0025 (Ref. [10]) approved the issuance of orders subject to changes and comments described in the SRM. The SRM also made several comments regarding reevaluation of seismic hazards under the 50.54(f) letter and provided additional comments on other topics. The Commission did not provide any comments related to the portions of the 50.54(f) letter related to flooding.

The judgment by the staff articulated in SECY-12-0025 is contradicted by the COMSECY paper, which proposes that, in the interest of efficiency, it is appropriate to focus on using the reevaluated hazard to define the requirements and bounds for mitigating strategies, but *not* consider a "broader assessment" of the effects of the flood event on the plant or whether it is appropriate to systematically consider improved protection of safety-related SSCs in light of the reevaluated hazard. Specifically, the COMSECY (Enclosure 2, p. 1) states:

> Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will, in many cases, improve the efficiency of the NRC's regulatory process by ***eliminating the need for a broader assessment of the plant response*** as described in current plans and staff guidance for integrated assessments [emphasis added].

As described above, SECY-12-0025 states that the current implementation process for Recommendation 2.1 addresses the requirements of the Consolidated Appropriations Act (i.e., SECY-12-0025 states: "the reevaluation and related information analysis will serve to meet the NRC's obligation under the Consolidated Appropriations Act, for 2012 (PL 112-74), Section 402"). The COMSECY proposes an alternate means of addressing the Consolidated Appropriations Act (as shown in the quote above). However, the COMSECY is not explicit about this change in path forward and does not request that the Commission vote to approve such a change.

2.3. Deviation from the current implementation process for Recommendation 2.1

2.3.1. Description of concern

The COMSECY describes a change from the implementation process for Recommendation 2.1. The following issues arise:

- The COMSECY does not, for the awareness of the Commission and external stakeholders, clearly and explicitly articulate that the COMSECY proposes a significant change to the current implementation process for Recommendation 2.1.
- The COMSECY does not clearly articulate a sound basis, technical or otherwise, for the changes to the implementation process.
- The COMSECY does not describe the consequences of the proposed changes to the implementation process (Sections 2.4 through 2.11 describe the consequences of changes to the process).

2.3.2. Supporting information

Current implementation process for NTTF Recommendation 2.1

Under the current process, Recommendation 2.1 is being implemented in two phases. Phase 1 includes the gathering of information related to the reevaluation of flooding hazards as well as the assessment of total plant response to those hazards (including evaluation of both protection and mitigation capabilities). Phase 2 involves regulatory decisionmaking based on the information gathered under Phase 1 and may include decisions related to updating the design or licensing basis of a plant. Regulatory decisions are expected to focus on whether there is reasonable confidence in the ability of plants to shut down the reactor and maintain it in that state with appropriate defense in depth for the entire flood event duration.

As mentioned above, Phase 1 of the Recommendation 2.1 implementation involves information gathering. Phase 1 was implemented by the issuance of the 50.54(f) letter. Phase 1 is implemented in two stages:

- Stage 1 – Hazard reevaluation using present-day licensing criteria
- Stage 2 – Integrated assessment of plant response to external flooding

Stage 1, "Hazard Reevaluation," consists of the reevaluation of flooding hazards using present-day guidance and methods that are used as the licensing criteria used for siting of new reactors. These criteria are considered appropriate to support reasonable assurance findings for new reactors. The reasonable assurance finding concludes that the safety of the public and environment is protected from natural hazards, consistent with General Design Criterion 2, "Design bases for protection against natural phenomena" (GDC 2). Present-day licensing criteria[1] use a limited number of deterministic, stylized event combinations to develop estimates of flooding hazards. For some sites, the flood hazard reevaluation may result in estimation of flooding hazards that are more severe than those used to establish the plant's current design basis. These sites are subsequently requested to perform an integrated assessment for external flooding under Stage 2 of Phase 1. In addition, these sites are requested to consider whether it is appropriate to implement interim actions to address the reevaluated hazard while the integrated assessment is being performed.

Stage 2, "Integrated Assessment," is a systematic, flood-specific evaluation of the total plant response to the reevaluated flooding hazards. The interim staff guidance for the integrated assessment (Ref. [2]) describes a graded approach to ensure the assessment is appropriate for the unique characteristics of a given site and commensurate with the complexity of the strategy used to respond to a flood event. Depending on site characteristics, the graded approach results in assessments that range from conventional engineering evaluations of flood protection[2]

[1] Present-day regulatory guidance is contained in Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants" (last updated in 1977, Ref. [30]) and industry consensus standards (last issued in 1992, Ref. [31]). Staff also issued two interim staff guidance documents related to dam failure (Ref. [32]) and storm surge, seiche, and tsunami (Ref. [33]) to supplement existing guidance and assist licensees in responding to the 50.54(f) letter.

[2] If licensees can demonstrate that flood protection is reliable with margin under the scenarios resulting from the reevaluated flooding hazards, no further evaluation is required.

to flood-specific mitigation[3] evaluations based on one of three available evaluation options. The three evaluation options include a scenario-based evaluation (i.e., a conservative, but primarily qualitative evaluation), a margins-type evaluation, and a full probabilistic risk assessment (PRA). In all cases, the integrated assessment systematically evaluates the total plant response using risk-informed concepts and techniques for the specific conditions associated with the reevaluated flood hazards. Under the integrated assessment, licensees can take credit for all available resources including flood protection and mitigation, as appropriate. It is important to note that the term "mitigation" under the integrated assessment is not synonymous with the mitigating strategies referred to in the COMSECY. Under the integrated assessment, mitigation may include use of strategies associated with Order EA-12-049[4] as well as alternate strategies developed specifically to respond to the reevaluated flooding hazard. The integrated assessment provides licensees with the opportunity to demonstrate the effectiveness of proposed protection and mitigation strategies for addressing the specific conditions of the reevaluated hazard as characterized by flood height, associated effects (e.g., waves, debris, sedimentation, erosion), and flood event duration (e.g., warning time and period of inundation). Thus, the integrated assessment provides a comprehensive and realistic assessment of plant capability and identifies effective safety enhancements.

Proposed site-specific responses to the reevaluated flood hazards may include enhancements to flood protection as well as use of non-traditional strategies, significant manual actions, and use of commercial grade equipment (including those proposed in response to Order EA-12-049). In exceptional circumstances, some licensees may propose strategies that intentionally defeat barriers (including secondary and primary containment as well as reactor coolant system boundaries), allow safety-related structures, systems, and components (SSCs) to flood, and rely on extensive manual actions. Although the staff expects that these strategies will be employed only in exceptional circumstances, it is important that they be rigorously evaluated in light of their use for responding to the reevaluated flood hazard. As described above, the integrated assessment requires systematic and appropriately rigorous, flood-specific evaluations thereby providing confidence that the strategies will be effective.

Phase 2, "Regulatory Decision-Making," of the current Recommendations 2.1 implementation process uses the information gathered under Phase 1 to support decisions regarding whether additional regulatory actions are needed. Recommendation 2.1 and the Consolidated Appropriations Act direct NRC staff to consider the need to change the design basis of operating reactor sites. However, if necessary and appropriate, changes to a plant's licensing

[3] In the context of the integrated assessment, mitigation capability refers to the capability of the plant to maintain key safety functions in the event that a flood protection system(s) fails (or is otherwise not available). A mitigation evaluation is only necessary if (1) a site does not have flood protection to protect against the reevaluated hazard or (2) it cannot be shown the flood protection is reliable with margin under the reevaluated flooding hazard. The term mitigation under the integrated assessment is not synonymous with the mitigating strategies referred to in the COMSECY.

[4] NEI 12-06 provides implementation guidance for mitigation strategies developed in response to Order EA-12-049. NEI 12-06 describes the objective of the strategies, which is to establish "an indefinite coping capability to prevent damage to the fuel in the reactor and spent fuel pools and to maintain the containment function by using installed equipment, on-site portable equipment, and pre-staged off-site resources."

basis may represent a more practical response. If capabilities beyond the current licensing basis are needed, then NRC staff will consider licensee commitments or evaluate the need for changes to the licensing basis using existing NRC processes in accordance with Title 10 of the *Code of Federal Regulations*, Part 50, Paragraph 109 (10 CFR 50.109), "Backfitting" (the Backfit Rule). Considerations will include the adequate protection and compliance exceptions and the cost-justified backfit. NRC staff will initiate regulatory analyses and associated backfits on a site-specific basis.

Proposed path forward described in the COMSECY

The proposed path forward outlined in the COMSECY will eliminate or significantly reduce the scope of Recommendation 2.1 Phase 1, Stage 2 activities (i.e., integrated assessment) and will eliminate or greatly reduce Phase 2. Specifically, the COMSECY (p. 3-4) states:

> The collection and assessment of information related to flooding hazards as part of the NRC's resolution of NTTF Recommendation 2.1 can be viewed as serving two purposes. ***The first purpose is to establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements***. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will ***reduce the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments***. Where warranted, the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits [emphasis added].

The COMSECY specifies that the integrated assessment will be reduced such that the flooding hazard reevaluations will serve the primary purpose of providing an input to mitigating strategies (i.e., the flood hazard reevaluation will serve to define functional requirements and reference bounds for mitigating strategies). This differs from the currently defined purpose of the hazard reevaluations, which is to support a decision related to changes to the design or licensing basis of the plant. Under the proposed path forward described in the COMSECY, flood protection or other cost-effective safety enhancements (e.g., protection of emergency diesel generators using temporary barriers to avoid reliance on FLEX strategies as the primary means to address the revaluated hazard) will not be systematically considered. Section 2.6 provides additional discussion on this topic.

The following excerpt from the COMSECY (Enclosure 2, p. 1) is another example of a statement implying changes to the "initial intent" of the integrated assessment:

> The ***integrated assessment was initially intended to evaluate the total plant response*** to the flood hazard, including the capabilities being developed and implemented as part of the mitigating strategies required by Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," considering multiple and diverse capabilities such as physical barriers, temporary protective measures, and operational procedures. It is further noted that the above excerpt implies that the integrated assessment would, be default, evaluate mitigating strategies. However, as described above, the integrated assessment first evaluates flood protection and only considers mitigation if flood protection cannot be shown to be reliable with margin [emphasis added].

In Enclosure 2 (p.4), the COMSECY explicitly acknowledges the departure from existing guidance and from briefings to the Commission:

> The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and reference bounds for mitigating strategies ***is a change from existing guidance and from briefings and reports provided to the Commission*** [emphasis added].

In further contrast to Phase 2 of the current Recommendation 2.1 implementation process, the COMSECY essentially precludes the consideration of changes to the design basis and protection of safety-related SSCs under the reevaluated hazard (based on present-day licensing criteria) by stating:

> [T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected.

Moreover, as described in Section 2.6, sufficient information will not be collected under the proposed path forward in order to fully understand the total plant response to the hazard to support a backfit analysis.

2.4. Regulatory inconsistencies

2.4.1. Description of concern

The proposed path forward may lead to several potential regulatory inconsistencies:

- The treatment of increased flooding hazards from dam failures may differ between (1) sites for which there is ongoing regulatory activity that may lead to changes in the protection of the plant or other backfits and (2) sites for which regulatory activity is not already ongoing.
- The treatment of new information about different flood mechanisms may differ. For example, NRC may treat new information about increased flooding hazards from dam failures (at some sites) differently than new information about increased flooding hazards from other mechanisms such as storm surge and local intense precipitation.

Recent regulatory activity at Oconee Nuclear Station provides an illustration of regulatory actions related to dam failure that were initiated before the events at Fukushima. Actions were taken by NRC in response to new information about flooding hazards from dam failure and resulted in documented staff concerns regarding whether the plant was adequately protected. Staff concerns resulted in the initiation of activities to build protective features at the site. In contrast to treatment of new information regarding flooding hazards at Oconee, under the proposed path forward for Recommendation 2.1 described in the COMSECY, all new hazard information would be broadly classified as "beyond design basis," without consideration of whether the design or licensing basis of the plant should be updated to protect SSCs important to safety. Instead, mitigating strategies would serve as the primary "defense" against the reevaluated hazard defined using present-day guidance and methods used to define the design basis of new reactors.

Experience with Oconee contributed, in part, to the proposal (and subsequent designation) of Generic Issue 204 related to flooding of nuclear power plants following upstream dam failure. The activities related to Generic Issue 204 as well as other site-specific regulatory activities were subsumed by the NTTF Recommendation 2.1 activities. However, the proposed path forward for NTTF Recommendation 2.1 will not provide information to support resolution of the issues subsumed by Recommendation 2.1 activities and thus they would require use of other processes to ensure resolution.

Finally, the COMSECY describes the systematic evaluation program (SEP) and invokes it as regulatory precedent. The description of the program and the resulting implications for Recommendation 2.1 is not clear and may be misleading.

2.4.2. Supporting information

A number of ongoing regulatory activities were subsumed by the implementation of NTTF Recommendation 2.1. These include activities related to site-specific regulatory actions (beyond findings under the reactor oversight process) and staff decisions related to increased flood hazards as well as Generic Issue 204. The information below describes one particular example of a site-specific regulatory action at Oconee Nuclear Station, which led to more generic actions.

Oconee Nuclear Station

There were no dam failures postulated in the original licensing/design basis of Oconee. In 2006, the NRC began asking questions regarding the adequacy of the flood protection barrier for the standby shutdown facility and concluded that the licensee had incorrectly estimated the frequency of dam failure and thus inappropriately "screened out" dam failure as a flooding hazard for the site. In June 2008, the NRC issued a request for information Oconee (ML081640244) to seek "additional information regarding external flooding of the Oconee site, including the consequences of a Jocassee Dam failure." The licensee provided a response in September 2008 (ML082750106) with additional information related to the consequences of dam failure. In April 2009, NRC issued a letter (ML09057077) stating: "Based on the NRC staff's review of the information provided by Duke to date, the NRC staff remains concerned that Duke has not demonstrated that Oconee will be adequately protected in the long term from external flooding events." In January 2010, Duke submitted a letter to the NRC (ML100210199) that describes interim compensatory measures until all site modifications have been completed. In June 2010, NRC issued a confirmatory action letter (ML101730329) associated with the interim compensatory measures and described dates by which the licensee would provide information about permanent modifications. In April 2011, Duke provided a response (ML111460063) that lists modifications, including flood protected power, a power block floodwall, and diversion features.

In the April 2011 letter, Duke noted that failure of Jocassee Dam was a "beyond design basis event." In August 2011, NRC staff issued a request for additional information (ML11174A138) requesting that Duke "[p]rovide justification for the statement in the April 29, 2011 letter that suggested the postulated failure of the Jocassee Dam is considered a beyond-design-basis event." In the reply (ML11294A341), Duke stated:

> Within the April 29, 2011 letter (Response Reference 1), the statement related to the postulated failure of the Jocassee Dam ***being beyond design basis was a historical discussion*** relative to the Updated Final Safety Analysis Report (UFSAR) Criterion 2. From a historic perspective, the failure of the Jocassee Dam was not postulated within the Oconee licensing or design basis and therefore, would have been a beyond design basis event. As discussed in previous correspondence and below, ***Duke Energy plans to incorporate external flooding resulting from a postulated Jocassee Dam failure into the Oconee licensing basis*** [emphasis added].

Recent regulatory decisionmaking at Oconee provides a relevant precedent for regulatory decisionmaking under Recommendation 2.1, which is not noted in the COMSECY.[5] As described in Section 2.5 of this paper, there are several common reasons that flooding hazards may increase under the hazard reevaluations. These include:

1. Hazard mechanisms were not considered under the design basis but are considered under the Recommendation 2.1 flood hazard reevaluations
2. Reassessment of the credibility of hazards
3. New modeling and analysis tools lead to the understanding that flood scenario parameters associated with the same events considered in the design basis for a site are more severe than previously estimated

Therefore, in the case of Oconee, an event that was not within the design or licensing basis of the site was later determined to have been "screened out" inappropriately at initial licensing (i.e., there was a reassessment of the credibility of the hazard). NRC then began taking actions over concerns that the plant was not *adequately protected* againstthat hazard. Plant actions in response include modifications to provide *protection* to the site. This differs from how the COMSECY proposes to address the reevaluated hazard only through use of mitigating strategies and perpetual designation of the reevaluated flooding hazard as beyond design basis. For example, the COMSECY states (Enclosure 1, p. 2):

> [T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events.

Generic implications

The lessons learned from Oconee led, in part, to several follow-on actions including:

- Initiation of Generic Issue 204 (GI-204) related to the potential generic safety implications of flooding of nuclear power plant sites from upstream dam failure (Ref. [11]). GI-204 was subsequently subsumed (Ref. [12]) by the activities being performed in response to the 50.54(f) letter requested in response to Recommendation 2.1.

[5] While the COMSECY does not mention the recent regulatory decisions made relative to Oconee, the COMSECY does reference the systematic evaluation program (SEP). Additional discussion of the COMSECY's characterization of the SEP is provided below.

- Issuance of Information Notice 2012-02, "Potentially Nonconservative Screening Value for Dam Failure Frequency in Probabilistic Risk Assessments" (Ref. [13]), which alerted "addressees of a potentially nonconservative screening value for dam failure frequency that originated in 1980's reference documents which may have been referenced by licensees in their probabilistic risk assessment (PRA) for external events."

Both of the above activities resulted when NRC learned that the potential for more severe safety consequences from increased flooding hazards from dam failure was generic. NRC recognized the need to potentially take further regulatory action as demonstrated by the designation of GI-204. However, as noted above, the resolution of GI-204 was subsumed by Recommendation 2.1 activities. In addition, there are other site-specific regulatory actions related to increased flooding hazards (e.g., backfits or changes to plant licensing basis) under consideration at sites such as Fort Calhoun Station and Watts Bar Nuclear Plant. These actions were initiated based on knowledge about increased flooding hazards that were estimated using the same methods that are being used under Recommendation 2.1. These site-specific activities have been subsumed into the Recommendation 2.1 activities based on the current path for implementation. Changes to the path forward for implementation of Recommendation 2.1 may require revisiting these site-specific actions outside of the Recommendation 2.1 process.

As noted previously, the path forward for NTTF Recommendation 2.1 in the COMSECY proposes to focus on evaluation of the impact of the reevaluated hazard on mitigating strategies. This narrowed focus would significantly reduce information available to the staff regarding the effects of the reevaluated flooding hazards on plants as well as information regarding the breadth of potential cost-effective safety enhancements that may be appropriate. Moreover, the proposed path forward will likely not collect a sufficient amount, nor the correct type, of information to support a conclusion regarding the need for additional regulatory action in response to increased flooding hazards. This would be inconsistent with previous treatment of information at Oconee. It would also mean that resolution of regulatory activities related to dam failure subsumed by Recommendation 2.1 for flooding activities would need to be resolved by other processes. Finally, it would lead to inconsistency in the treatment of different flooding mechanisms.

Description of the Systematic Evaluation Program

The COMSECY notes that "the licensing basis, design, and level of protection from natural phenomena differ among the existing operating reactors in the United States." The COMSECY goes on to describe the SEP:

> The NRC recognized these differences between plants and the need to assess early plants against the evolving standards in the 1970s following the development of the standard review plan (SRP). ***The agency identified potential safety issues and reviewed the early plant designs against the then-newer SRP guidance under the systematic evaluation program (SEP).*** The SEP included several flooding issues and resulted in some plant-specific reviews and design or procedure changes implemented by impacted licensees to address potentially higher flooding hazards. Generic Letter 95-04, "Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues," dated April 28, 1995, describes the SEP and the resolution of the issues. Many of the

> SEP issues were resolved by the subsequent requests for licensees to perform individual plant examinations. The flooding issues were addressed within Supplement 4 to Generic Letter 88-20, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f)." ***The actions taken by licensees to address potential vulnerabilities or other flooding concerns were not subsequently incorporated into regulations or operating licenses***[emphasis added].

The above is not clear with respect to the outcomes of the SEP and may be interpreted to mean that no changes were made to the design or licensing basis of plants as a result of the SEP. This does not comport with licensee statements regarding the SEP and effects of plant design bases. For example, in describing the design-basis flood elevations for river flooding, the Dresden Nuclear Power Station flood hazard reevaluation report (Ref. [14]) states the following:

> The current design basis is defined in the DNPS UFSAR (Dresden UFSAR) and by reference to an NRC Systematic Evaluation Program (SEP) (FRC 1982).
>
> ⋮
>
> The UFSAR (Dresden UFSAR) by reference to the SEP (FRC 1982) identifies that a flow rate of 490,000 cfs in the Illinois River at the DNPS site would result in a stillwater flood elevation of 525 feet msl. Adding wave runup to the stillwater flood elevation yields a site PMF [probable maximum flood] elevation of 528 feet msl. Safe operation of the plant during the PMF is accomplished via implementation of flood emergency procedures.
>
> By reference to the SEP, the PMF is based on a 72-hour PMP [probable maximum precipitation] storm duration. The PMP is developed using USACE [U.S. Army Corps of Engineers] guidance. The approximate 7300 square mile watershed is divided into 13 sub-basins and HEC-1 software is used to transform rainfall to runoff using calibrated hydrographs. The Standard Step Method is used to determine the water surface elevation. HEC-2 software is used to evaluate the reach of the Illinois River between the Dresden Island Lock and Dam and the confluence of the Kankakee and Des Plaines River.

In addition, the Recommendation 2.3 flooding walkdown report (Ref. [15]) for Dresden states the following:

> The design-basis flood hazard level for the Dresden site has been evaluated by the NRC as part of the Systematic Evaluation Program (SEP) Topics II-3.A, II-3.B, II-3.B.1 and II-3.C, which was completed in 1982. The results of the SEP study were presented in the Safety Evaluation Report (Enclosure 1) and Technical Evaluation Report (Enclosure 2). Based on the information provided in the SEP report, the design-basis flood hazard level is associated with the PMF, which results in a peak stillwater elevation of 524.5 ft MSL. Coincidental 2-year wind generated waves and wave run-up would increase the maximum water surface elevation to approximately 528 ft MSL. Both flood elevations are significantly above the grade elevation (517.0 ft MSL), the elevation of non-watertight openings in walls of safety-related structures (517.5 ft MSL), and the lowest sub-grade floor containing equipment important to safety (Crib House) (509.0 ft MSL).

The statements above, made by the licensee, suggest that the design basis for Dresden was updated to incorporate the results of the SEP. This differs from the implications of the COMSECY that design changes in response to new information about flood hazards are unnecessary because mitigating strategies will be available and once again demonstrates the

regulatory precedent for changing a plant's design basis in response to new information about flood hazards.

2.5. Safety conclusions are pre-judged

2.5.1. Description of concern

As described in the previous sections, Phase 1 of the implementation process for NTTF Recommendation 2.1 is intended to gather sufficient information about (1) the reevaluated flooding hazard for a site, (2) the effects of the hazard on the site, and (3) the plant's proposed response to a hazard (e.g., protection, mitigation, or some combination). This information is gathered so that NRC can ensure that plants are adequately protected and make decisions regarding safety enhancements. It is important to note the typical reasons that flooding hazards have increased as a result of the NTTF Recommendation 2.1 flood hazard reevaluations. These reasons for increase include:

1. Hazard mechanisms were not previously considered (e.g., local intense precipitation events not considered when the plant was sited are evaluated as part of the NTTF Recommendation 2.1 hazard assessment)
2. Reassessment of or new information regarding the credibility of hazards (e.g., dam failure events previously considered not credible based on an assessment of dam failure frequencies are reassessed as credible)
3. New modeling and analysis tools lead to the understanding that flood height, associated effects, or flood event duration associated with the same events considered in the design basis for a site are more severe than previously estimated (e.g., estimation of higher flood levels resulting from same dam failure events already included within the design basis)

The COMSECY proposes to truncate the current Recommendation 2.1 implementation process and focus on mitigating strategies (originally developed to provide additional defense in depth) as the first line of defense against the reevaluated flooding hazard. The COMSECY prejudges the outcomes of Phase 2 of the implementation process for NTTF Recommendation 2.1 and states that NRC does not expect to redefine the design basis for protection of safety-related SSCs. This may conflict with NRCs obligation to continually assess whether there is adequate protection of public health and safety.

2.5.2. Supporting information

The document makes several statements that pre-judge the outcomes of Recommendation 2.1 activities and the regulatory actions that may be needed as a result of the hazard reevaluations and associated integrated assessments. For example, the COMSECY states (Enclosure 1, p. 2):

> [T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected.

The above exclusion of consideration of whether it is appropriate to change the design (or licensing) basis is not consistent with the intent of NTTF Recommendation 2.1 and does not appear to be consistent with the language of the Consolidated Appropriations Act, Public Law

112-074 (Ref. [8]). Section 402 of the law requires a NRC consider whether it is necessary to update plant design bases for external hazards (e.g., the law states, in part: "the Commission shall require licensees to update the design basis for each reactor, if necessary").

As another example, the COMSECY (p. 5) states:

> In some cases, the newly estimated elevated [sic] flooding levels, should they occur, might result in ***significant damage to a nuclear power plant*** and warrant scenario-specific strategies. However, even in such extreme cases, licensees will be required by the planned [mitigating beyond-design-basis events] regulation to have mitigating strategies that provide capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools and the resultant large release of radioactive materials to the environment. ***In addition to satisfying the requirements of the NRC regarding radiological health and safety concerns, the above approach provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster***. The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site [emphasis added].

The above excerpt implies that use of scenario-specific mitigation strategies in response to an event causing significant damage to the nuclear plant satisfies "the requirements of the NRC regarding radiological health and safety concerns" and "provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster." This can be interpreted to imply a pre-judgment that NRC requirements are met and further regulatory action (e.g., additional protection) would not be required.

The COMSECY also states:

> Except as imposed by the NRC through specific regulations, orders, or license conditions, licensees are not required to assess or modify plant designs to meet new or revised standards. Nor are licensees normally requested to periodically assess possible changes to plant designs or procedures to address external hazards beyond those used in the initial plant siting and licensing decisions.

Although the COMSECY is correct that the NRC has not previously required licensees to periodically reassess external hazards, this does not preclude the NRC from considering the need to take actions to improve the protection of plants in light of new information about the severity of natural hazards. With regard to the definition of adequate protection, the NTTF report (Ref. [1]) notes the evolving nature of the standard:

> ***Adequate protection has been, and should continue to be, an evolving safety standard supported by new scientific information, technologies, methods, and operating experience***. This was the case when new information about the security environment was revealed through the events of September 11, 2001. Licensing or operating a nuclear power plant with no emergency core cooling system or without robust security protections, while done in the past, would not occur under the current regulations. As new information and new analytical techniques are developed, safety standards need to be reviewed, evaluated, and changed, as necessary, to insure [sic] that they continue to address the NRC's requirements to provide reasonable assurance of adequate protection of public health and safety. The Task Force believes, based on its

> review of the information currently available from Japan and the current regulations, that the time has come for such change [emphasis added].

Moreover, several court cases (e.g., [16] and [17]) are consistent with the NTTF's statement and note both the evolving standard of adequate protection to keep pace with developing information and the legal obligation of NRC to consider adequate protection before considering the cost-justification of any particular regulatory action.

As described in Section 2.3 , the intent of Recommendation 2.1 and associated implementation activities is to determine whether additional regulatory actions are appropriate. The proposed path forward described in the COMSECY will truncate the information-gathering steps needed to make this decision. The COMSECY advocates this truncation based on an assumption that the reevaluation of this hazard will not generally give the NRC cause to reexamine the current design or licensing basis.

2.6. Insufficient information to support a staff decision

2.6.1. Description of concern

The proposed path forward described in the COMSECY truncates the Recommendation 2.1 implementation process by reducing the scope and rigor of the integrated assessment, or eliminating the integrated assessment altogether. As a result, important insights about plant response will not be gathered at sites for which the reevaluated hazard is more severe than the design basis. Information about the increase in hazard alone is not sufficient to determine whether additional regulatory actions should be pursued. Therefore, the proposed path forward described in the COMSECY will not provide sufficient information to support staff decisions regarding whether to take additional regulatory action (beyond providing functional requirements and reference bounds for Order EA-12-049 mitigating strategies) to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements.

2.6.2. Supporting information

As described in Section 2.3.2, the integrated assessment will provide information to support a staff decision regarding whether to take additional regulatory action to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements. The COMSECY proposes to eliminate (or reduce) the integrated assessment and notes that a significant amount of information will no longer be collected under the proposed path. For example, in Enclosure 2 (p.6), the COMSECY states the following:

> The ***integrated assessments envisioned by the original guidance provided an opportunity for licensees and the NRC staff to gain insights into plant responses to flooding beyond testing capabilities to mitigate the event.*** Although the ***assessment of flooding hazards will now be focused primarily on the mitigating strategies capabilities*** (including necessary installed SSCs), the revised approach does not rule out the ***possibility*** that some licensees may perform the more detailed integrated flooding assessment as described in the current guidance documents (i.e., assessing plant impacts beyond maintaining mitigating strategy capabilities). These assessments could support licensees' consideration of asset protection measures ... or identify possible cost

> savings associated with traditional flood protection versus revised mitigating strategies. Detailed integrated assessments that assess flood protection and mitigation capabilities beyond Order EA-12-049 and the MBDBE [mitigation of beyond design basis events] rulemaking may also be undertaken if needed to support evaluating the possible pursuit of plant-specific requirements in accordance with NRC's backfit regulation. The NRC staff will, on a case-specific basis, consider information about the reevaluated hazards; available response times for identified scenarios; plant-specific configurations and licensing histories; and other factors when defining an appropriate integrated assessment of flooding scenarios to support evaluating a potential plant-specific backfit [emphasis added].

The statement in the COMSECY acknowledges the *possibility* that additional evaluations, beyond a "check" of mitigating strategies, may be performed at the discretion of licensees or on a case-by-case basis to support backfit analysis. However, this is presented as something that will happen in an ad hoc manner because the COMSECY does not make it clear how the NRC will initiate these "more detailed" assessments. The COMSECY also does not establish how licensees would be requested to perform such assessments or the basis by which licensees would be selected. In it noted that, under the current Recommendation 2.1 implementation process, a criteria for requiring an integrated assessment has already been established (i.e., licensees are requested to perform an integrated assessment when the reevaluated hazard is not bounded by the design basis). The COMSECY provides no basis for deviating from the establish criteria. Thus, COMSECY introduces unnecessary ambiguity and an ad hoc approach into what is currently well-established and systematic process. Moreover, it is noted that it would also be challenging for the staff to require these analyses outside of the 50.54(f) letter response. Finally, as described in Section 2.3.2, the integrated assessment interim staff guidance (Ref. [2]) already facilitates a graded approach that ensures the complexity of the evaluation is commensurate with the complexity of the strategy employed under the reevaluated hazard.

In addition to the above except from the COMSECY, similar statements are made elsewhere in the document that specify that mitigating strategies will be acceptable as the primary response to reevaluated hazard. The need for additional actions will be based only on information related to the reevaluated hazards and will not include information about plant response. As described later in this section, information regarding the hazard alone does not provide sufficient information to support a backfit analysis. For example, the COMSECY (p. 5) states:

> **Much of the focus for the reevaluated flooding hazards is related to assessing the capabilities for mitigating strategies**. Nonetheless, the activities related to the flooding reevaluations may result in the NRC staff identifying other safety concerns and the need to consider additional regulatory actions beyond those being implemented by licensees in accordance with Order EA 12 049 and the related MBDBE [mitigation of beyond design basis events] rulemaking. The NRC staff will use established processes such as those defined in Management Directive (MD) 8.4, "Management of Facility-specific Backfitting and Information Collection" to initiate, review, and disposition these types of safety concerns.

The COMSECY further states:

> Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will ***reduce the need for a broader assessment*** of

> the plant response as described in current plans and staff guidance for integrated assessments. Where warranted, ***the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits*** [emphasis added].

Thus, the COMSECY suggests that (1) focusing on mitigating strategies reduces the need for the broader integrated assessment and (2) that information about the hazard alone (without information about the effects of the hazard on the site) would be sufficient to understand whether a backfit would be appropriate. This is not consistent with Commission direction and is not technically justifiable. Moreover, it is important to note that there is a bi-directional causality issue associated with the logic in the referenced statements in the COMSECY and the COMSECY overall (i.e., there is a "chicken or the egg problem"). In order to understand whether a backfit is appropriate, it is necessary to understand risk insights about the problem. However, without performance of the integrated assessment (as describing in current guidance), this information will not be gathered. Therefore, under the proposed path forward, it would be challenging for staff to systemically understand when a backfit should be considered because information regarding the hazard alone is not sufficient to make a determination regarding the appropriateness of backfit (e.g., a small increase in hazard at one site may be consequential whereas another site may be able to accommodate large changes in the magnitude of the hazard).

As stated in NUREG/BR-0058, "Regulatory Analysis Guidance of the U.S. Nuclear Regulatory Commission" (Ref. [18]),[6] risk (or risk insights) is an important part of regulatory decisionmaking:

> ***Assessing the risk of potential changes to public safety has always been a fundamental part of regulatory decisionmaking.*** In the early development of regulations, this assessment was based on qualitative analysis, simple reliability principles and practices (such as worst-case analysis), defense in depth, and the single-failure criterion. The frequency or probability of the hazard was not an explicit factor, primarily because the overall state-of-the-art of probabilistic risk assessment (PRA) technology was not sufficiently advanced and accepted. Because of the advancements made and an increased confidence in PRA, regulators have progressively relied more on the insights and results from risk assessment in managing regulatory activities. The safety goals for the operation of nuclear power plants, which are in the "Policy Statement on Safety Goals for the Operation of Nuclear Power Plants," published in August 1986 by the NRC, are a clear example of this change, and these goals established a guide for regulatory decisionmaking [emphasis added].

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[6] It is noted that the above excerpt from p. 5 of the COMSECY refers to Management Directive (MD) 8.4 when referring to the process for backfitting of plants. MD 8.4 refers to NUREG/BR-0058 and other documents For example, MD 8.4 (p. 34) states: "[f]or a complete discussion of NRC's regulatory analysis requirements, the staff is directed to the latest versions of NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," and NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook." For a thorough discussion of NRC's backfit analysis requirements, the relevant document is the latest version of NUREG-1409, "Backfitting Guidelines."

Understanding risks requires information about both the hazard and the consequences of that hazard. Under the proposed path forward described in the COMSECY, information about consequences will not be collected nor fully understood.

In addition, it is important to note that flood hazards reevaluated under present-day regulatory guidance are primarily deterministic. For this reason, conventional risk analyses (e.g., PRA) are not fully applicable. However, this does not preclude the ability of technical staff to use risk insights in decisionmaking. Thus, it is important to understand: (1) the magnitude and characteristics of the reevaluated hazard, (2) detailed information regarding the impact of the hazard on the site, and (3) the effectiveness of strategies for response including potential options for addressing the hazard. In developing the integrated assessment interim staff guidance, staff recognized that it was necessary to understand the above items in order to inform a backfit analysis. Therefore, the integrated assessment was developed to provide the following insights:

- Whether flood protection is reliable with margin, whether equipment is reliable, and whether associated actions are both feasible and reliable.
- An understanding of: the balance between protection/prevention and mitigation realized during the flood event, whether defense in depth is maintained, and whether there is redundancy and diversity in proposed strategies.
- Identification of whether there are adverse consequences from smaller and more likely flood events and identification of the characteristics of the strategies used to respond to these smaller events (e.g., whether flood protection barriers are "overtopped" at flood elevations lower than the magnitude of the reevaluated flooding hazard).
- Identification of whether there is an early transition to a reliance on mitigation for smaller, more likely flood events resulting in a significant increase in plant risk from external flooding (e.g., identification of cliff-edge effects).
- Identification of effective/efficient strategies for addressing floods (e.g., installation of flood protection such as flood gates rather than sacrificing equipment to "go straight to FLEX").

Under the proposed path forward described in the COMSECY, the information gathered under Phase 1 would be limited to understanding the magnitude and characteristics of the reevaluated hazard. Insights regarding the impact of the hazard on the site, the effectiveness of strategies for response, and potential efficient and effective options for addressing the hazard would *not* be obtained under the path proposed in the COMSECY. As described above, the information gathered on the hazard alone is not sufficient to determine whether a backfit is appropriate to undertake. For this reason, the proposed path forward described in the COMSECY does not provide generally sufficient information to take regulatory action beyond defining functional requirements and reference bounds for mitigating strategies.

2.7. Lessons learned from operating experience are not incorporated

2.7.1. Description of concern

Operating experience has demonstrated the potential hazards posed to nuclear power plants by flood events as well as the importance of ensuring plants can appropriately protect against flooding events. NRC operating experience in this area stretches back decades. Several examples of this past experience include the impact of Hurricane Andrew on Turkey Point (Ref. [19]), deficient flood panels at Prairie Island (Ref. [20]), and flooding of Cooper Nuclear Station (Ref. [21]). In addition there have been a number of recent events involving flooding of sites or structures, as well as recent "greater than green" findings under the reactor oversight process and recent non-cited violations and licensee event reports. This operating experience has brought to the forefront the importance of carefully evaluating flood protection. Recent flooding events have involved (1) failed or missing seals that resulted in the inundation of areas containing safety-related equipment, (2) the effect of rising water levels on instrumentation and information availability during a hurricane event, and (3) storm surge and debris effects. Recent findings under the reactor oversight process have involved missing seals, inadequate procedures, and infeasible manual actions. Although there can be some solace taken in the fact that some of these events have been discovered under the reactor oversight process, it is important to note that the purpose of the reactor oversight process is to inspect, measure, and assess plant performance, not to systematically evaluate plant response to new information regarding increased hazards. All of these insights arising from operating experience would be addressed as part of the integrated assessment. However, the proposed path forward described in the COMSECY would significantly reduce or eliminate the assessment of plant response that is performed under Recommendation 2.1 activities.

2.7.2. Supporting information

Recent events:

The summaries below provide an overview of several recent events involving flooding hazards:

- **St. Lucie (2014):** On January 9, 2014, the St. Lucie site experienced heavy rainfall and storm drain blockage caused water to backup within the emergency core cooling system pipe tunnel. Water entered the reactor auxiliary building (RAB) through two degraded conduits that lacked internal flood barriers. Specifically, the water was observed entering the RAB through an electrical junction box, which was below the elevation for which the RAB flood protection was designed. The extent of condition identified four more conduits with the same legacy installation issue. The licensee identified a previous similar event involving degraded penetration seals associated with LER 355-2012-010.
  Source: St. Lucie LER 2014-001-02
- **ANO (2013):** On March 31, 2013, the collapse of the temporary crane resulted in the rupture of an eight-inch fire main in the turbine building train bay. Water from the fire suppression system migrated to several areas of the turbine building on both the Unit 1 and Unit 2 sides, and leaked through floor hatches in the train bay into the Unit 1 auxiliary building. The water from the firewater system leaked past the flood barriers

installed in hatches in the train bay and filled the building sump, eventually accumulating on the 317-foot elevation of the Unit 1 auxiliary building. The loss of offsite power prevented the auxiliary building sump pumps from operating. The water rise in the auxiliary building stopped when operators secured the fire water system. The licensee deployed temporary air-driven sump pumps to the 317-foot elevation of the Unit 1 auxiliary building to remove the accumulated water. Although this event involved internal flooding, it highlighted external flooding vulnerabilities because the turbine building is allowed to flood during certain flood events. From its extent of condition review, the licensee identified other paths for water to get into the auxiliary building, which included:

- drains in the turbine building
- a sump from the solid radioactive waste storage building (located in the switchyard) to the Unit 1 auxiliary building sump
- unprotected penetrations in the auxiliary building annex
- unprotected electrical conduits entering into the auxiliary building
- unsealed holes in the auxiliary building from the turbine building
- the tendon gallery access hatches.

Source: ML14083A409 and ML13158A242

- **Fort Calhoun (2011)**: Missouri River flooding in the summer of 2011 significantly challenged plant operation at Fort Calhoun, even though it was less than the design basis. Significant challenges were encountered during the event including seal failures, a breaker fire, aqua berm rupture, and issues with site access and security. In addition, it was discovered during the event that protocols were not established for briefings between the dam operators and the site.
- **Oyster Creek (2012)**: An alert was declared at Oyster Creek during Hurricane Sandy due to high water levels at the intake. In addition, an offsite power line tripped and a caused a trip of the spent fuel pool cooling system. The modem that was transmitting intake level data to the control room failed and control room operators had to rely on secondary indicators (i.e., personnel stationed at the intake structure using local pressure indicators) to make emergency action level decisions. Eventually, personnel at the intake structure could not monitor for the entire event due to rising water levels. Offsite power was lost causing a trip of the shutdown cooling system and diesel generators automatically aligned to restore power to emergency buses.
  Source: ML13010A470
- **Salem (2012):** Salem, Unit 1 experienced a loss of 4 of 6 circulating water pumps due to heavy river debris from Hurricane Sandy. The reactor was manually tripped (0109 hours). An automatic start of the Auxiliary Feedwater system occurred as expected on unit trip due to low Steam Generator water levels. Later (0118 hours) the remaining two circulating water pumps were tripped due to continuing debris build up. Main Steam Line Isolation was manually initiated (0513 hours) in response to a loss of condenser vacuum.
  Source, Salem LER no. 2012-004-0 (event date: 10-30-12, report date 12-26-12)
- **Vermont Yankee (2013)**: On March 19, 2013, with the plant in the cold shutdown condition during a refueling outage, Vermont Yankee discovered water from dredging

operations inside two electrical manholes located in the Vital Switchgear Rooms. On March 23, 2013, it was identified that the water had entered the two manholes through a partially dislodged flood seal in an underground spare conduit that communicates with the Switchgear Room manholes. On March 27, 2013, during an extent of condition review, an additional water intrusion pathway into the Switchgear Rooms via an abandoned sump pump discharge line was discovered. The dislodged flood seal and sump pump discharge line compromised the interior flood design controls for the Switchgear Rooms. The causes of the dislodged flood seal were due to the seal not being conservatively sized or tested for the application it was used in and failure to take timely corrective actions following a similar event reported in LER 2012-001-01.
Source: Vermont Yankee LER no. 2013-001-00 (event date 03-19-2013; report date 05-16-2013)

Recent greater than green findings:

The summaries below provide an overview of several recent "greater than green" findings involving flooding hazards:

- **Ginna (2014)**: In April 2014, Ginna was issued a white finding with notice of violation involving failure by the licensee to assure prompt identification and correction of conditions adverse to quality concerning two cable penetrations between manhole 1 and battery room 'B' at Ginna which were not hydrostatically sealed as required. The missing seals were identified in May 2013 but were not promptly corrected.
  Source: ML14107A080
- **Point Beach (2013):** In August 2013, Point Beach was issued a white finding with notice of violation involving failure to implement external flooding wave runup protection design features as described in the Final Safety Analysis Report. Associated procedures would not protect safety-related equipment in the turbine building or pump house.
  Sources: ML13169A212 and ML13221A187
- **Monticello (2013)**: In August 2013, Monticello was issued as yellow finding and notice of violation involving the licensee's failure to maintain a procedure addressing all of the effects of an external flooding scenario on the plant (i.e., the licensee failed to maintain flood procedures such that it could support the timely implementation of flood protection activities within the 12-day timeframe credited in the design basis as stated in the updated safety analysis report).
  Source: ML13240A435
- **Dresden (2013):** In July 2013, Dresden was issued a white finding with notice of violation for failure to establish a procedure addressing all of the effects of an external flooding scenario on the plant (i.e., the flood-specific procedure did not account for reactor vessel inventory make-up during an external flooding scenario up to and including the probable maximum flood event which could result in reactor vessel water level lowering below the top of active fuel).
  Source: ML13213A073
- **Three Mile Island (2013):** In April 2013, Three Mile Island was issued a white finding with notice of violation associated with the TMI external flood barrier in which electrical cable couplings located in the Air Intake Tunnel were not flood sealed, as designed, to

protect against a flood. Inspectors identified that Exelon failed to identify and correct the issue during external flood barrier walkdowns.
Sources: ML13120A040 and ML13042A277

- **Watts Bar (2013):** In June 2013, Watts Bar was issued a white finding and notice of violation associated with the failure to establish and/or maintain an Abnormal Operating Instruction (AOI) procedure to mitigate onsite the effects of a probable maximum flood event. The procedure was inadequate to mitigate the effects of a PMF event in that earthen dams located upstream of the facility could potentially overtop, causing a subsequent breach. Failure of the earthen dams during a PMF event would have resulted in onsite flooding and subsequent submergence of critical equipment, such as the emergency diesel generators, resulting in an ineffective flood mitigation strategy for these PMF events.
  Source: ML13155A572

  In June 2013, Watts Bar was issued a yellow finding and notice of violation associated with failure to establish and/or maintain an AOI procedure for the plant to be reconfigured and systems realigned within 27 hours of notification of a significant flooding event, consistent with Technical Requirements Manual (TRM) 3.7.2 and Watts Bar Updated Final Safety Analysis Report (UFSAR) Section 2.4. The licensee was initially unable to demonstrate timely implementation of AOI-7.1 to reconfigure and realign systems necessary for flood mitigation within 27 hours. The walkdown identified spool piece fit-up issues, inability to locate staged equipment, and, in general, lack of thorough understanding of the collective workload, workflow, and labor requirements for completing flood preparation tasks. As a result, the flood mitigation strategy for certain design-basis flooding events, including PMF events, was inadequate.
  Source: ML13155A572
- **Sequoyah (2013)**: In June 2013, Sequoyah was issued a white finding and notice of violation involving failure to properly establish an adequate abnormal operating procedure (AOP) to mitigate the impact of a PMF. The procedure was inadequate to mitigate the effects of a PMF event, in that, earthen dams located upstream of the facility could potentially overtop, causing a subsequent breach. Failure of the earthen dams during a PMF event would have resulted in onsite flooding and subsequent submergence of critical equipment, such as the emergency diesel generators, resulting in an ineffective flood mitigation strategy for these PMF events.
  Source: ML13155A560

  In June 2013, Sequoyah was issued a white finding and notice of violation involving failure to translate the design basis related to onsite flooding protection into specifications, drawings, procedures, and instructions. Sequoyah's existing design documentation, including current licensing documents and configuration controlled drawings for the Essential Raw Cooling Water (ERCW) pumping station, did not contain sufficient information to identify the penetrations seals as flood barriers to prevent flood water from entering the building during design-basis flood (DBF) events. As a result of degraded or missing flood penetration seals, the ERCW pump station would not have remained functional when subjected to the design-basis PMF and other less severe flooding events. Flooding of the ERCW Pumping Station would have resulted in

submerging service water equipment relied on during DBF events which would have compromised the function of the emergency diesel generators (EDGs). Failure of the EDGs would have resulted in an ineffective flood mitigation strategy to prevent core damage.
Source: ML13155A560

- **Brunswick (2011)**: In December 2011, Brunswick was issued a white finding and notice of violation associated with failure to identify and correct a condition adverse to quality associated with the entrance enclosures for the emergency diesel generator (EDG) fuel oil tank rooms (i.e., the enclosures contained openings which would adversely impact their ability to mitigate external flooding of the EDG fuel oil tank rooms in the event of an external event (hurricane)).
Source: ML113610594

Fort Calhoun (2010, 2013): In March 2013, Fort Calhoun was issued a notice of violation associated with a finding that was identified involving the failure to classify the river sluice gates as Safety Class 3. The significance of this finding was bounded by the previously issue yellow finding and therefore was not characterized by color significance.
Source: ML13070A399

In October 2010, Fort Calhoun was issued a yellow finding and notice of violation for failure to maintain procedures for combating a significant flood as required by technical specification. Procedures did not adequately prescribe steps to mitigate external flood conditions in the auxiliary building and intake structure up to 1014 feet mean sea level, as documented in the Fort Calhoun Updated Final Safety Analysis Report.
Source: ML102800342

Additional recent licensee event reports and green findings:

The list below provides references for additional licensee event reports and green findings involving flooding hazards:

- Three Mile Island: ML13042A277 and ML13042A277
- Watts Bar (2013): ML13155A572
- Millstone (2013): ML13016A194 and ML13312A992
- Fort Calhoun (2011, 2012): Fort Calhoun LER 2011-003-01 (event date 02-03-2011; report date 05-16-2011); ML12366A158; and Fort Calhoun LER 2012-001-1 (event date 02-10-12; report date 05-17-13)
- Brunswick: ML14149A149
- Browns Ferry (2009): Browns Ferry LER 2013-001-01 (event date 02-06-2013, report date 06-12-2013)
- Ginna (2013): Ginna LER no. 2013-003-1 (event date: 09-20-2013, report date 12-13-2013)
- Monticello (2013): Monticello LER no. 2013-003-02 (event date 05-31-2012; report date 01-28-2014)
- Vermont Yankee (2012, 2013): Vermont Yankee LER no. 2012-001-01 (event date 05-24-2012; report date 09-12-2012); Vermont Yankee LER no. 2013-002-00 (event date 11-07-2013; report date 12-31-2013)

- Prairie Island (2012, 2013): Prairie Island LER no. 2012-001-00 (event date 02-15-2012; report date 04-12-2012); Prairie Island LER no. 2013-002-00 (event date 09-19-2013; report date 11-18-2013)

2.8. Lack of clarity regarding differences in the intended purposes of the integrated assessment versus the mitigating strategies activities and associated guidance

2.8.1. Description of concern

The integrated assessment interim staff guidance (Ref. [2]) describes the set of evaluations and documentation necessary to support licensees' assessments of their proposed strategies for evaluating the total plant response to any increased flooding hazards identified as a result of the hazard reevaluation using present-day guidance and methods applicable to defining the design basis for new reactors. The interim staff guidance (ISG) was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment .In recognition that operating reactors are already sited and cannot be redesigned, the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities. Figure 1 provides a conceptual illustration of the integrated assessment process described in the ISG. Although the ISG allows licensing to credit mitigation (including FLEX or alternate strategies), the "level of review" described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049. This is appropriate in light of the differences in intended goals of the integrated assessment and mitigating strategies evaluations (intended to provide broad capabilities for defense in depth). The COMSECY does not recognize these differences nor reflect the necessity of using the process described in the integrated assessment to develop the information required for staff to determine, with adequate technical justification, that a licensee's proposed approach to responding to the reevaluated hazard (whether using protection or mitigation) will be effective.

2.8.2. Supporting information

The discussion below highlights the differences in the intended purposes of mitigating strategies and the integrated assessment. The discussion also notes the resultant differences in the associated guidance.

Mitigating strategies

The purpose of mitigating strategies in response to EA-12-049 is to provide **"strategies and guidance for additional defense-in-depth measures to supplement the capabilities of permanently installed plant structures, systems, and components that could become unavailable following a beyond-design-basis event"** (Ref. [22]). The additional capabilities provided by mitigating strategies address plant conditions involving an extended loss of ac power and loss of access to the ultimate heat sink as a *surrogate* for a beyond-design-basis

(external) event.[7] Mitigating strategies are not generally tied to any specific damage state or mechanistic assessment of external events, but the guidance provides storage and deployment considerations for external hazards (Refs. [23] and [22]). To date, external hazards considered under mitigating strategies have been defined according to the design-basis external hazards for the site. This is due to the implementation of Order EA-12-049 prior to the completion of activities in response to Recommendation 2.1.

In light of the intended use of mitigating strategies to provide additional defense in depth that supplements installed equipment (rather than to serve as the primary defense against a hazard), the supplemental staff guidance for evaluation of mitigating strategies (Ref. [22]) provides guidance to help staff understand the appropriate level of their review. For example, the cover memo states:

> As NRC staff only rarely reviews documents associated with beyond-design-basis events, this should assist in achieving the proper level of review.

Later, the supplemental staff guidance (Ref. [22]) states:

> The staff is expected to use considerable engineering judgment and reliance upon existing knowledge and expertise in determining the acceptability of the mitigation strategies. The review is expected to be substantially different from the review of design-basis accidents, wherein acceptability is often based on endorsement of deterministic engineering codes and standards or compliance with existing staff positions for design-basis accidents.

The types of evaluations performed by licensees as well as the level of review performed by staff of mitigating strategies is thus less rigorous than a design basis review, commensurate with the intended use of mitigating strategies as a defense-in-depth measure. However, this does not mean the mitigating strategies have been developed, evaluated, and reviewed in a manner that is commensurate with the use of these strategies as a "first line of defense" against the reevaluated hazard defined under Recommendation 2.1.

Integrated assessment

The integrated assessment guidance provides a graded approach to evaluate plant response in which licensees will evaluate the protection and/or mitigation capabilities (if needed) of the plant in light of the reevaluated hazard. In the context of the integrated assessment, evaluation of mitigation may include capabilities provided under Order EA-12-049 or alternate flood-specific strategies. However, under the integrated assessment, mitigation is only evaluated if existing or proposed flood protection cannot be shown to be reliable with margin. Compared to mitigation being used as a "first line of defense" against the reevaluated flood hazard, the integrated assessment provides a systematic, flood-specific, and appropriately rigorous evaluation of mitigation capabilities that involves:

[7] Ref. [22] specifically states: "While the initiating event is undefined, it results in an extended loss of all ac power (ELAP) with loss of normal access to the ultimate heat sink (LUHS), which should be considered a surrogate for a beyond-design-basis external event."

- Complete characterization of the flood event (i.e., i.e., flood height, associated effects, flood event duration associated with multiple mechanisms)
- Plant conditions during the specific flood events (e.g., site accessibility, event timeline, plant mode)
- Assessment of the performance of existing or planned flood protection (e.g., definition of credible flood protection failures and consequences such as affected safety-related SSCs or mitigating strategies equipment)
- Assessment of manual actions (i.e., whether actions are feasible *and reliable* using performance shaping factors and timing analysis derived using concepts that have been employed to evaluate ex-control room manual actions for fire events)
- Assessment of equipment (e.g., whether equipment is functional, available, accessible, and reliable)
- Integration of aspects of response (e.g., use of system models to capture dependencies and identify diversity/redundancy)

Subject matter experts from across NRC, supported by a large number of public interactions with members of the public and industry, developed the integrated assessment ISG to include an appropriately rigorous evaluation that will (1) allow NRC to fully understand the capability of plants to withstand a flooding hazard defined based on present-day guidance and methods and (2) provide sufficient information to support a backfit analysis (if needed). Specifically, the integrated assessment will yield important insights such as:

- Assessment of whether flood protection is reliable with margin and there is confidence in mitigation approaches (if mitigation is needed)
- Cliff–edge effects
- Whether there is defense in depth, redundancy, and diversity
- The balance between protection and mitigation
- Whether there is a reliance on mitigation (rather than protection) for smaller, more frequent flooding events

It is also important to note that the integrated assessment was developed to address many of the issues identified by an assessment of relevant operating experience related to flooding (Section 2.7 describes recent operating experience).

The integrated assessment is intended to provide the NRC staff with sufficient information to determine whether there is *confidence* that a site can withstand a well-defined, reevaluated flood hazard specified based on present-day methods for defining the design basis at new reactors, regardless of whether protection or mitigation (or some combination) is employed. This means that, even if the licensee is not using conventional flood protection, the NRC has confidence that strategies are appropriately reliable. As discussed in the NTTF report, the purpose of Recommendation 2.1 is to ensure that plants have adequate protection from seismic and flooding hazards, consistent with the current state of knowledge and analytical methods.

As described in Section 2.3, the level of effort/rigor associated with the integrated assessment is intended to be commensurate with the challenges posed by the licensee's strategy. For example, the integrated assessment requires conventional, engineering evaluations (including crediting existing design-basis evaluations) in situations where licensees rely on permanently

installed passive flood protection. The integrated assessment appropriately and necessarily increases the level of rigor and amount of supporting information required when there is heavy reliance on manual actions and non-safety-related equipment. This may include the use of conservative but rigorous deterministic methods *or* the use of more realistic assessments though PRA techniques. This level of rigor is particularly important in light of the concerns cited in the NTTF report regarding the heavy reliance on manual actions by some plants to adequately cope with design or licensing basis floods.

Comparison of guidance documents

As a result of the differences in the intended purposes of mitigating strategies and the integrated assessment, there are consequently differences in the manner in which evaluations and reviews are performed. Several examples are provided below.

Mitigating strategies are not generally tied to any specific damage state or mechanistic assessment of external events, but the guidance provides storage and deployment considerations for external hazards (Refs. [23] and [22]). For example, Ref. [23] specifies that "[i]t is not the intention to define precise time windows, simply to gauge the timing so that plant response actions can be considered." The guidance in Ref. [23] does not include provisions related to evaluation of the technical basis for warning time or evaluation of durable agreements needed to ensure warning time for flooding events. The guidance associated with mitigating strategies also does not define or describe means to address associated effects (e.g., wind waves, runup, debris, sedimentation, and erosion). This differs from the integrated assessment, which provides a mechanistic and scenario-driven assessment of flooding with detailed event timelines. The integrated assessment defines flood events using flood height, associated effects, and flood event duration (e.g., warning time and period of inundation). The integrated assessment also requires consideration of different flood mechanisms with differing flood scenario parameters or plant response strategies (e.g., use of different types of flood protection to respond to different flooding mechanisms).

Mitigating strategies are developed to provide general capability and manual actions are assessed with a feasibility rather than reliability target. For example, the FLEX manual action validation guidance (Ref. [24]) outlines a process "to reasonably assure required tasks, manual actions and decisions for FLEX strategies **are feasible** and may be executed within the constraints identified in the [licensees integrated plan for Order EA-12-049]." As noted in Ref. [25], a feasible action[8] differs from a reliable action.[9] For example, "performing an action

[8] Feasible action- An action that is analyzed and demonstrated as being able to be performed within an available time so as to avoid a defined undesirable outcome. As compared to a reliable action (see definition), an action is considered feasible if it is shown that it is possible to be performed within the available time (considering relevant uncertainties in estimating the time available); but it does not necessarily demonstrate that the action is reliable. For instance, performing an action successfully one time out of three attempts within the available time shows that the action is feasible, but not necessarily reliable (Ref. [25]).

[9] Reliable action- A feasible action that is analyzed and demonstrated as being dependably repeatable within an available time, so as to avoid a defined adverse consequence, while considering varying conditions that could affect the available time and/or the time to perform the action. As compared to an action that is only feasible (see definition), an action is considered to be reliable as well if it is shown that

successfully one time out of three attempts within the available time shows that the action is feasible, but not necessarily reliable." In addition, validation of manual action in accordance Ref. [24] does not include all manual actions and makes assumptions regarding the availability of resources. For example, Ref. [24] states:

> ***Anticipatory actions*** taken for [beyond-design-basis] external events that have warning (e.g., plant shutdown, pre-staging FLEX equipment, extra personnel and/or staffing of TSC/OSC, etc.) ***are excluded from the validation process*** [emphasis added].
>
> ⋮
>
> ***Phase 3 activities, tasks occurring greater than 24 hours after the event, and tasks performed while units are in a shutdown mode, will not be time validated***. In each case additional personnel and equipment will be available either from off site [sic] response, or in the case of an outage, additional onsite personnel, such that resources would not be a factor [emphasis added].

Moreover, the endorsed guidance for assessing staffing and communication capabilities (Refs. [26] and [27]) makes several assumptions regarding staffing and site accessibility:

> The event impedes site access as follows:
>
> A. Post event time: 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.
>
> B. Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
>
> C. Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.

The above assessment of mitigating strategies under Order EA-12-049 differs from the manual action evaluation described in the integrated assessment ISG. The ISG describes a process for assessing whether all manual actions are **feasible and reliable** through a qualitative evaluation of performance shaping factors and a detailed timing analysis of available margin under site-specific flood conditions. There are no a priori assumptions made regarding the availability of resources or site accessibility. All assumptions and conclusions must be justified under the conditions expected to prevail during the flood event.

Guidance associated with mitigating strategies (Ref. [23]) does not include guidance for evaluation of flood protection features. The IA ISG provides guidance to support evaluation of a range of flood protection features, including: earthen embankments; flood walls; sea walls; concrete barriers; plugs and penetration seals; flood doors and hatches; temporary protection

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it can be dependably and repeatably [sic] performed within the available time, by different crews, under somewhat varying conditions that typify uncertainties in the available time and the time to perform the action, with a high success rate. All reliable actions need to be feasible, but not all feasible actions will be reliable (Ref. [25]).

(e.g., sandbags); pumps and valves; and associated manual actions. The IA ISG also includes guidance to support three different types of evaluations of flood-specific mitigation capability.[10] Thus, the integrated assessment ISG includes guidance to support conventional engineering evaluations of flood protection (e.g., appropriate codes/standards for flood protection) in response to the reevaluated hazard, as well as equipment reliability assessment, manual action evaluations, and use of PRA concepts and tools (e.g., event and fault trees).

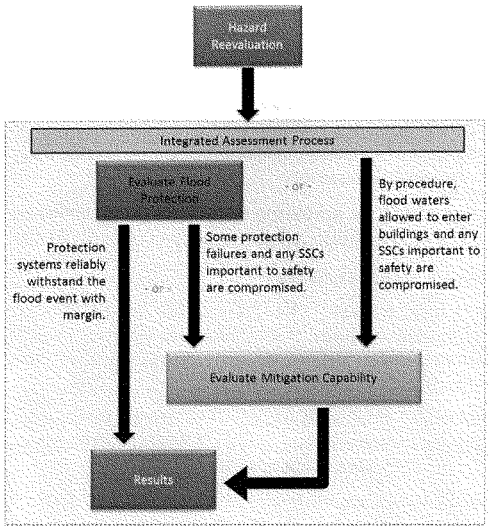

Figure 1: Conceptual illustration of integrated assessment implementation process (Ref. [2])

2.9. Lack of appreciation of differences between consequential floods and the reevaluated flood hazard

2.9.1. Description of concern

The draft COMSECY does not appropriately address the importance of understanding the capability of flood protection, cliff-edge effects, and whether there is a premature reliance on mitigating strategies for smaller and more frequent flooding events.

[10] The three types of evaluation methods are:

- Scenario-based evaluation: A systematic, rigorous, and conservative, (although primarily qualitative) evaluation used to demonstrate that there is high confidence that key safety functions can be maintained
- Margins-type evaluation: A quantitative evaluation that uses conditional core damage probability (CCDP) and conditional large early release probability (CLERP) as output (more realistic than a scenario-based evaluation)
- PRA

2.9.2. Supporting information

NRC's regulatory guidance for flooding hazards uses a framework for evaluation that is primarily deterministic. These deterministic methods rely on a limited number of stylized event combinations to develop estimates of flooding hazards. When used deterministically, these combinations are considered appropriate for establishing a sufficiently severe flood for consideration. However, an operating reactor may be vulnerable to events that are smaller in magnitude than these "maximum credible" events and this insight is important to support regulatory decisionmaking.

The COMSECY focuses primarily on this single maximum credible flood but does not address the importance of smaller events that still may be consequential to a site. Figure 2 shows an illustration of the difference between the reevaluated flooding hazard and the hazard that may be consequential to a site as a result of, for example, overtopping of flood barriers. This information about a "cliff-edge" significantly below the maximum credible flood height (as defined by the reevaluated flooding hazard) provides an important insight into whether additional regulatory actions are appropriate. However, under the proposed path described in the COMSECY, this type of information will not be collected. Moreover, it will not be clear whether there is a premature reliance on mitigating strategies for smaller, more frequent flooding events. Finally, under the proposed path described in the COMSECY, it will not be clear if relatively simple and potentially inexpensive actions (e.g., use of temporary berms, sandbags, or flood gates) could protect against the reevaluated hazard or smaller events and may represent a cost-justified safety enhancement.

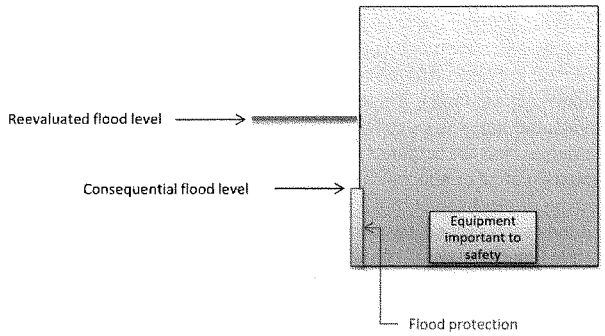

Figure 2: Illustration of the difference between the reevaluated flood level and the consequential flood level

2.10. Vague description of "targeted mitigating strategies"

2.10.1. Description of concern

The COMSECY provides a vague description of strategies that licensees may employ under floods that "might result in significant damage to the nuclear power plant." The description

provided in the COMSECY is not sufficiently explicit to inform the Commission and external stakeholders regarding the types of strategies that may be employed.

2.10.2. Supporting information

The COMSECY provides the following general statement regarding the proposed approaches that may be applied under "targeted mitigating strategies:"

> In some cases, the newly estimated elevated flooding levels, should they occur, might result in significant damage to a nuclear power plant and require scenario-specific strategies. However, even in such extreme cases, licensees will be required to show as part of implementation of mitigating strategies that they have developed capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools and the resultant large release of radioactive materials to the environment. The above approach provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster. The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site.

Enclosure 2 (p.8) indicates that scenario-specific mitigation strategies would include facility structures and cooling functions. They would involve certain key steps: (1) preparing for the arrival of the flood waters; (2) providing cooling for the reactor core and spent fuel for the range of possible flooding levels; and (3) maintaining a manageable shutdown condition for the range of possible flooding levels.

However, the COMSECY is not appropriately explicit to inform the Commission and external stakeholders of the types of approaches that are being proposed as part of targeted mitigating strategies. In affirming the approaches licensees may take as part of mitigating "floods that might result in significant damage," it is important that the Commission be informed that, in response to reevaluated hazards significantly in excess of the design basis, some licensees may propose strategies that are targeted to maintain core and spent fuel cooling but that may result in the inundation of all or a significant portion of safety-related equipment and the intentional breaching or disabling of radiological barriers (including primary or secondary containment and the reactor pressure boundary), in order to minimize offsite radiological consequences. It is noted, these strategies have been adopted at a small number of sites as a result of past increase in estimates of flooding hazards.

2.11. Lack of responsiveness to external recommendations

2.11.1. Description of concern

As described in Sections 2.1 and 2.2, the proposed path forward for Recommendation 2.1 described in the COMSECY is no longer meeting the intent of Recommendation 2.1 and is not consistent with previous Commission and Congressional direction. Moreover, the proposed path forward (1) does not comport with the NRC's response to a recent report from the United States Government Accountability Office and (2) is not responsive to one of the key observations from a recent National Academies of Sciences report.

2.11.2. Supporting information

In April 2012, the United States Government Accountability Office (GAO) released a Report to Congressional Requesters titled "Nuclear Regulatory Commission - Natural Hazard Assessments Could Be More Risk-Informed" (Ref. [28]). The study was initiated because the accident at Fukushima Dai-ichi raised questions about the threats of natural hazards to U.S. commercial nuclear power plants. GAO was asked to (1) determine the extent to which PRA is applied to natural hazards at operating U.S. reactors and (2) describe expert views on and suggested changes, if any, to NRC processes for assessing natural hazards at such reactors. GAO recommended that NRC analyze whether licensees of operating reactors should be required to develop PRAs that address natural hazards. NRC agreed with the recommendation and stated it will conduct the analysis in the context of ongoing initiatives. In its reply to the GAO (Ref. [28]), the NRC cited the ongoing activities related to implementation of Recommendation 2.1:

> [The March 12, 2012 50.54(f) letter] includes a request that licensees reevaluate both the seismic and flooding hazards at nuclear power plants using updated seismic and flooding hazard information and present-day regulatory guidance and methodologies, including risk assessment approaches, as appropriate. The NRC staff will evaluate the licensees' responses to this request for information, and will determine whether additional regulatory actions are necessary to provide additional protection against the updated hazards.

Although the status of this item is currently "open," the GAO website notes "[a]s of March 12, 2014, NRC reported that it had several initiatives underway directly related to this recommendation. NRC stated that it would conduct and document the analyses GAO recommended in the context of the agency's follow-on actions for those ongoing initiatives." The proposed path forward for Recommendation 2.1 described in the COMSECY will no longer be consistent with the aforementioned response to the GAO because the integrated assessment (based on PRA concepts), where needed, will no longer be performed in accordance with the integrated assessment ISG.

The National Academies of Sciences report on lessons learned from the events at Fukushima (Ref. [24]) noted the following factors that contributed to the overall severity of the accident:

> Failure of the plant owner (Tokyo Electric Power Company) and the principal regulator (Nuclear and Industrial Safety Agency) to protect critical safety equipment at the plant from flooding in spite of mounting evidence that the plant's current design basis for tsunamis was inadequate.

Comparable to the NTTF report and Congressional direction, the National Academies of Science report emphasized the importance of considering changes to protect safety-related equipment in the face of significant new information regarding the flooding hazards that may affect a site. This will not be considered under the proposed path forward described in the COMSECY.

2.12. Inconsistency with Recommendation 2.1 process for seismic hazards

2.12.1. Description of concern

Approximately parallel implementation processes are being used for seismic and flooding hazards under Recommendation 2.1. There are, of course, necessary adaptations to the processes to account to differences in the state of practice between the two hazards. The COMSECY proposes significant changes to the implementation process for flooding. It does not describe whether similar changes will be implemented for other external hazards. It remains unclear why, in light of recent operating experience, flooding hazards would be treated differently (and potentially less rigorously) that other external hazards.

2.12.2. Supporting information

The overall implementation frameworks for Recommendation 2.1 are approximately analogous for seismic and flooding hazards with adaptations to account for differences (including limitations) in the state of practice for each hazard. Each process consists of the following key components:

1. *Revaluation of hazards using present-day guidance methods:* Revaluations for Recommendation 2.1 for seismic hazards will use probabilistic seismic hazard analysis (PSHA). Revaluations for flooding hazards will use a primarily deterministic hazard framework.
2. *Determination of whether further evaluation is needed:* For seismic hazards, a screening criterion is applied to assess whether further evaluation is needed. For flooding hazards, additional evaluation is needed if the reevaluated flood hazards are not bounded by the design basis.
3. *Assessment of plant response:* Plant response to the reevaluated hazard is assessed using a seismic PRA or seismic margins assessment. The flooding integrated assessment is used to evaluate the total plant response to the reevaluated flooding hazards considering protection and/or mitigation.
4. *Development of risk insights:* The seismic PRA or seismic margins assessment will yield both qualitative and quantitative risk insights. The integrated assessment will yield insights as described in Section 2.3 and 2.6, which are intended to facilitate a backfit analysis, if needed. The degree to which the insights are qualitative or quantitative will depend on the evaluation method selected by the licensee. For example, a scenario-based evaluation of mitigation capability will yield primarily qualitative insights with some quantitative reliability information. A margins-type or PRA will yield information analogous to a seismic PRA or seismic margins analysis.
5. *Regulatory decisionmaking*

The COMSECY proposes that there will be a significant modification to the implementation process for flooding but is silent with respect to the treatment of other hazards. The COMSECY states (Enclosure 2, p. 7):

> The staff will also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations and related NRC activities.

It remains unclear how other external hazards (e.g., seismic hazards) will be addressed if the changes proposed in the COMSECY are adopted for flooding hazards. Moreover, in light of recent operating experience regarding flooding events, it is not clear why evaluation of plant response to flooding hazards would be treated differently (and potentially less rigorously and less systematically) than seismic or other external hazards.

3. Proposed resolution to concerns expressed in this paper

3.1. Current content of COMSECY

The current COMSECY addresses three key topics:

1. The paper proposes that licensees for operating nuclear power plants would address the reevaluated flooding hazards from Recommendation 2.1 within their mitigating strategies (Order EA-12-049 and related rulemaking).
2. The paper notes that licensees for operating nuclear power plants may need to develop targeted or scenario-specific mitigating strategies to prevent fuel damage in reactor cores or spent fuel pools to address some specific flooding scenarios. The flooding scenarios could significantly damage the power plant site and nearby environments.
3. The paper proposes to alter the implementation process for Recommendation 2.1by changing the information that will be collected under Phase 1, Stage 2 (i.e., the integrated assessment) and not undertaking a systematic analysis of effects under Phase 2 (i.e., regulatory decisionmaking). Instead, under the proposed path forward, the flood hazard reevaluations would be used to define the "functional requirements and reference bounds" for mitigating strategies and information would not be collected regarding other facets of plant response (e.g., impacts of the flood on the site and consideration of flood protection for equipment not associated with mitigating strategies).

The COMSECY requests a Commission vote on items (1) and (2) but does not request a vote on item (3). However, item (3) is the primary subject of contention in the non-concurrence.

3.2. Understanding of impetus for changes to NTTF Recommendation 2.1

The authors of this document understand that NRC would like to minimize the burden on licensees regarding the number of analyses performed under the post-Fukushima activities. This is particularly relevant in light of the fact that some licensees may propose to use mitigating strategies as part of their response to the reevaluated flooding hazard. In that case, under current implementation processes, the assessment of the mitigating strategies would be evaluated as part of the implementation of the mitigation of beyond design basis events (MBDBE) rule (using NEI 12-06, Ref. [23]) as well as under the integrated assessment (using the integrated assessment ISG, Ref. [2]). However, the approach described in the COMSECY, which significantly changes the intent of NTTF Recommendation 2.1, is not necessary to

resolve this concern regarding the potential for duplicative assessments. An alternative approach is proposed below.

3.3. Proposed approach

Consistent with Commission and Congressional direction related to Recommendation 2.1, the purpose of the flooding hazard reevaluation and integrated assessment is to support a regulatory decision about whether additional regulatory actions are necessary (e.g., update the design basis and SSCs important to safety) to provide additional protection against the updated hazards. In this context, changes to the design or licensing basis would be considered as plant-specific backfits. The proposed approach described herein resolves the concerns expressed in this non-concurrence and can simultaneously meet the following objectives:

1. Maintain fidelity of NTTF Recommendation 2.1
2. Ensure that mitigating strategies are not rendered ineffective under the reevaluated flooding hazard
3. Reduce the need to perform multiple evaluations of mitigating strategies under the reevaluated hazard

The approach proposed by the authors of this non-concurrence recognizes that licensees may propose a variety of approaches to respond to the reevaluated flooding hazards. The list below describes the three high-level approaches licensees may choose as well as the proposed mechanisms for evaluation such the above three objectives are met:

1. Use of flood protection: Licensees may propose to implement new flood protection (e.g., temporary flood protection measures such as portable berms or flood gates) to protect safety-related equipment under the reevaluated flooding hazard or may be able to justify the continued capability of existing protection under the reevaluated hazard (e.g., existing flood protection may be demonstrated to be capable of withstanding the larger hydrostatic and hydrodynamic loads associated with the reevaluated hazard). In such cases, the existing or proposed flood protection would be evaluated under the integrated assessment. The integrated assessment would not assess mitigation capability, if the flood protection is shown to be reliable with margin under the reevaluated hazard. However, in accordance with the proposed path forward on the pending mitigation of beyond design basis events (MBDBE) rulemaking, any necessary changes to mitigating strategies would be separately evaluated using NEI 12-06 (Ref. [23]), which (as described previously) provides a generally non-mechanistic assessment of strategies that is intended to ensure mitigating strategies provide additional defense in depth. This would ensure plants are appropriately protected for the reevaluated hazard (as demonstrated via the integrated assessment) and that mitigating strategies continue to provide additional defense in depth under the reevaluated flooding hazard (as demonstrated using the guidance in NEI 12-06).
2. Use of mitigation: A licensee may propose to rely on mitigation as the primary means to address the reevaluated hazard rather than use of protection. To avoid the potential for assessments of mitigating strategies using two different guidance documents (i.e., in accordance with NEI 12-06, as well as under the integrated assessment using JLD-ISG-

2012-05), it is proposed that NRC prescribe the use of the flood-specific integrated assessment methodology rather than the more general NEI 12-06 guidance. This ensures that the strategies are assessed using a mechanistic and scenario-specific evaluation that is commensurate with the use of mitigating strategies as the *primary* means by which a licensee will respond to the specific plant conditions defined by the reevaluated flooding hazard (Section 2.8.2 provides additional information regarding differences between the guidance documents). Additionally, this would ensure sufficient information and insights (e.g., identification of whether mitigation is relied upon for less severe, more frequent events than those defined by the deterministic reevaluated hazard) are gathered to support a regulatory decision related to backfit in light of the reevaluated hazard, if necessary. In this case, assessment of mitigating strategies for flood events using NEI-12-06 would not be necessary in light of the integrated assessment that was performed under Recommendation 2.1.

3. Use of a combination of protection and mitigation: Licensees may propose to use protection for smaller, more frequent flooding events and transition to a mitigation-based approach for larger events. In this case, the integrated assessment guidance describes the appropriate, flood-specific evaluation process to address this "combination approach."

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NRC FORM 757 NRC MD 10.158 (09-2014)	U. S. NUCLEAR REGULATORY COMMISSION	NCP TRACKING NUMBER
	NON-CONCURRENCE PROCESS	NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation	ML14238A616

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COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

See attached document.

SIGNATURE	DATE
	10/27/2014

NRC FORM 757 (09-2014)

Use ADAMS Template NRC-006 (ML063120159)

Section B - Comments for the NCP Reviewer to Consider (Supervisor)

Introduction

I supervise Dr. Michelle (Shelby) Bensi and Mr. Kenneth See, who are among those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

I support each of the twelve concerns documented in NCP-2014-010.

As one of the authors of the 50.54(f) letter implementing Near-Term Task Force (NTTF) Recommendations 2.1 and 2.3, I would also like to provide additional comments. These comments are discussed to some degree in the NCP, and I've included pointers to the relevant NCP sections in an effort to be helpful. I hope my comments are beneficial to the NCP Reviewer when considering improvements to the final COMSECY.

I would like to express my appreciation of all staff who contributed to developing the comprehensive and thoughtful documentation of non-concurrence. This is an important subject and I appreciate their willingness to use the non-concurrence process to put their views forward.

Comment 1: Strategies for Floods that may Damage the Nuclear Power Plant

NCP Section 2.10 discusses a portion of the draft COMSECY describing strategies a licensee may employ to cope with reevaluated floods that "might result in significant damage to the nuclear power plant." However, as noted in NCP Section 2.10.2, "...the COMSECY is not appropriately explicit to inform the Commission and external stakeholders of the type of approaches that are being proposed." I completely agree.

I recommend that the final COMSECY explicitly inform the Commission that in response to reevaluated floods significantly in excess of the current design basis, some licensees may propose strategies with the goals of maintaining reactor core cooling and spent fuel cooling. To achieve these goals, licensees may propose intentionally breaching or disabling one or more key radiological barriers during the flood event, such as the reactor containment (including primary or secondary containment) and the reactor coolant pressure boundary. As noted in NCP Section 2.10, similar strategies have already been adopted at a small number of nuclear power plant sites as a result of past increases in flooding hazard estimates. My recommendation is to expand the discussion of these strategies in the final COMSECY. The expanded discussion should explicitly request the Commission affirm future application of strategies that intentionally breach or disable one or more key radiological barrier(s) as suitable options for licensees to propose for coping with reevaluated flooding hazards.

Comment 2: Reevaluated Flood Hazards and Regulatory Inconsistency

For many sites, the flooding hazard scenario being reevaluated as part of Recommendation 2.1 is the same hazard scenario as described in the site's current Final Safety Analysis Report (FSAR). If a difference exists in flooding level as a result of the hazard reevaluation, the difference is likely due to new information regarding the credibility of the hazard (e.g., sunny-day dam failure) or the existence of new modeling and analysis tools (e.g., existence of computer models). The methodologies and regulatory guidance being applied as part of Recommendation 2.1 do not include any additional margin or safety factor beyond what would be applied as part

of a new reactor application. As discussed in NCP Section 2.5 (Safety Conclusions are Pre-Judged) and Section 2.4 (Regulatory Inconsistencies), the fact that staff currently considers the Recommendation 2.1 reevaluated hazards to be 'beyond-design-basis' is a product of NRC's regulatory structure. Use of the term "beyond-design-basis" should not imply any additional flooding height or safety factor is added 'beyond' the standard hydrologic analysis.

As discussed in NCP Sections 2.4.1 and 2.4.2, several sites have ongoing regulatory activities evaluating the same flood hazard scenarios as considered by Recommendation 2.1. To be efficient, these activities were subsumed by Recommendation 2.1 (see NCP Section 2.4.2). However, if implementation of Recommendation 2.1 is now truncated and focused on mitigating strategies (which was developed to provide additional defense-in-depth) as described in the draft COMSECY, results from the focused-scope implementation will not provide sufficient information to support resolution of all subsumed activities. Therefore staff may be required to restart these processes to ensure timely resolution of these subsumed activities.

I recommend that the final COMSECY address these regulatory inconsistencies and potential inefficiencies. One suggestion is provided in NCP Section 2.6.2 (Insufficient Information to Support a Staff Decision: Supporting Information), which recommends the final COMSECY explicitly describe specified conditions under which additional information will be gathered (i.e., when a licensee will be required to perform an Integrated Assessment [ML12311A214] in addition to performing the focused-scope assessment of mitigating strategies) instead of the *ad hoc* case-specific basis proposed in the draft COMSECY.

Comment 3: Confusion between a Consequential Flood and the Maximum Flood Height
NRC's July, 2011, NTTF Report concluded that "flooding risks are of concern due to a 'cliff-edge' effect, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level" (pg. 29). This concept was incorporated into both Recommendation 2.3, Flooding Walkdowns (see 50.54(f) letter, Enclosure 4, Purpose, bullet 5), and Recommendation 2.1, Flooding Hazard Reevaluation. As discussed in NCP Section 2.9, there is a lack of appreciation in the draft COMSECY for the difference between a consequential flood (i.e., one that exceeds a cliff-edge height) and the maximum flood height postulated at a reactor site. In other words, a reactor may have plant-specific vulnerabilities to flooding events that are smaller in magnitude than this 'maximum postulated' event. It is further noted that the term 'vulnerability' is defined in footnote 1 of the 50.54(f) letter, Enclosure 2, as "those features important to safety that when subject to an increased demand due to the newly calculated hazard evaluation have not been shown to be capable of performing their intended functions". The concepts of cliff-edge effects and plant-specific vulnerabilities were incorporated into the Integrated Assessment guidance (ML12311A214). However, as described in NCP Section 2.8.2 (Supporting Information: Comparison of Guidance Documents), there are differences in approach between the guidance documents developed to address Order EA-12-049 and the Integrated Assessment. The NCP correctly states in Section 2.9 that, "[t]he COMSECY focuses primarily on this single maximum credible flood but does not address the importance of smaller events that still may be consequential to a site."

The draft COMSECY should be modified to incorporate the key Recommendation 2.1 concepts of cliff-edge effects and plant-specific vulnerabilities. An alternative is for the final COMSECY to

explicitly state the original intent of Recommendation 2.1 is no longer going to be met. Likewise, any guidance applied to verify the mitigation strategies used to cope with the Recommendation 2.1 flooding hazards should incorporate the concepts of cliff-edge effects and plant-specific vulnerabilities.

Summary and Overarching Issues

The staff did a wonderful job developing the NCP, which includes twelve overarching concerns that are supported by extensive information for each. In this Section B document, I have attempted to amplify three concerns. However, I could of think of no better way to summarize my overarching concerns than to reiterating the four key issues expressed by the non-concurring staff regarding Recommendation 2.1 (see NCP Section 2.1, Deviation from Intent of Recommendation 2.1). My overarching issues with the draft COMSECY are as follows:

1. The draft COMSECY represents a significant departure from the intent of Recommendation 2.1.
2. The paper provides no technical or safety basis for departing from Recommendation 2.1.
3. The draft COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.
4. The draft COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.

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NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation	ADAMS ACCESSION NO. ML14238A616
DOCUMENT SIGNER Mark A. Satorious	SIGNER TELEPHONE NO. (301) 415-1700
TITLE Executive Director for Operations	ORGANIZATION EDO
NAME OF NON-CONCURRING EMPLOYEE(S) David Desaulniers	TELEPHONE NUMBER (301) 415-5918
TITLE Sr. Technical Advisor for Human Factors and Human Performan	ORGANIZATION NRO/DCIP

☐ DOCUMENT AUTHOR ☐ DOCUMENT CONTRIBUTOR ☑ DOCUMENT REVIEWER ☐ ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR Andrea Valentin	
TITLE Deputy Director	ORGANIZATION NRO/DCIP

☑ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.

☐ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: ☑ PUBLIC ☐ NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)

See group non-concurrence submitted by Michelle Bensi dated 10/9/14. That document provides my signature as a non-concurring individual and the associated documentation.

SIGNATURE [signature]	DATE 10/14/14

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NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO
Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation	ML14238A616

NAME: ANDREA D. VALENTIN

TITLE	TELEPHONE NUMBER
Deputy Director, Division of Construction Inspection and Operational Programs	(301) 415-0210

ORGANIZATION: NRO

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

I have read the document provided with this non-concurrence., and I support the conclusions.

SIGNATURE	DATE
Andrea D. Valentin	10/15/14

Use ADAMS Template NRC-006 (ML063120159)

NRC FORM 757
NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-10

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT: Relationship Between MS for DBE & Reeval. of Flooding

ADAMS ACCESSION NO.: ML14238A616

NAME: Sunil Weerakkody

TITLE: Chief, PRA Operations & Human Factors Branch

TELEPHONE NUMBER: (301) 415-2870

ORGANIZATION: Office of the Nuclear Reactor Regulation

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

See attached.

SIGNATURE: SDhll

DATE: 10-17-14

Use ADAMS Template NRC-006 (ML063120159)

CONTEXT

Three of the staff members who non-concurred on the subject COMECY (Mr. Jeffery Mitman. Dr. Fernando Ferrante, Mr. George Lapinsky) are in the Division of Risk Assessment of the Office of Nuclear Reactor Regulation. They have provided extensive support to various activities directly related to the Mitigating Systems Directorate (MSD) and the NTTF 2.1 External Flooding. They have also provided extensive support to assist the regions in dispositioning a large number of GREATER THAN GREEN inspection findings related to External Flooding.

Since the non-concurrence is approximately 40 pages long and discusses a large number of issues, I briefly communicated with each of the three staff members who report to me further understand the key concerns that prompted them to non-concur. Subsequently, since I am not cognizant of the needs that prompted the NRC to prepare the COMSECY, I consulted a manager in JLD to enhance my understanding about the technical as well as other equally important issues pertaining to the COMSECY.

Based on my current understanding of the subject non-concurrence and the draft COMSECY, I offer four observations and one suggestion for your consideration. In light of the mission of the PRA Operations and Human Factors Branch, I chose to offer one suggestion that would maximize the risk reduction achievable via the implementation of mitigation strategies as they pertain to issues brought up via this non-concurrence.

I want to also acknowledge the contribution that the staff members made by choosing to participate in this important discussion by offering their perspectives via the NCP.

General Observation

Based on my understanding of all circumstances (technical, policy, and other) surrounding MSD and NTTF 2.1 Flooding, I believe that the proposed COMSECY is an appropriate step towards dispositioning key safety issues relevant to External Flooding. In fact, the COMSECY represents a "course correction" that we should, conditional to Commission approval; in light of the NRC's commitment to its fundamental Principles of Good Regulation.

Risk-Informed Observations

1. Unreliable or missing flood barriers, degraded conduits that lacks internal barriers, degraded or missing flood seals and unreliable operator manual actions contributed to a majority of the Greater Than Green findings. Post Fukushima efforts such as the walk down resulted in identification and expeditious elimination of a large number these risk-outliers.

2. In spite of staff and licensee efforts to continue to identify and eliminate degraded conditions, as reflected by the recent events at St. Lucie (2014) and ANO (2013), in nuclear plants that have significant number of seals, barriers, and conduits, there is a credible probability that some degraded conditions would reveal themselves during actual floods. Therefore, mitigating capabilities (e.g., operator manual actions) that provide the defense-in-depth must be reliable.

3. In the event the Commission approves the strategies proposed in COMSECY, licensees are likely to rely more on operator manual actions (OMAs), a number of which will be implemented outside of the control room as opposed to engineered design features (e.g., robust barriers, berms, hardware that protect safety-related SSCs) to minimize risk attributed to external floods.

4. The non-concurrence appears to imply that the strategies proposed in the COMSECY lower the acceptance standard of OMAs to "feasible," i.e. they do not have to meet the standard for "reliable" even though the acceptance standard for OMAs should be "Feasible and Reliable[1]" for other similar events (e.g. fire[2]).

Risk-Informed Suggestion

In light of the above, I recommend that during the process of dispositioning the subject non-concurrence, we examine the accuracy of the implication mentioned in Item (4) above. If it is accurate, then, I suggest that cognizant staff and management adequately deliberate the acceptance standard for operator manual actions that the licensee may rely on to mitigate impacts of floods. I also suggest that in setting these standards and\or in developing implementing guidance, NRC staff uses qualitative or quantitative risk-insights to prompt licensees to focus resources on the subset of operator manual actions that are risk-significant[3].

---

[1] NUREG-1852 provides a detailed distinction between "Feasible" vs "Feasible and Reliable" Operator Manual Actions.

[2] It is recognized that MSDs are applicable to beyond-design-basis accidents in comparison to fire protection (which are also not design basis) which is regulated by 10 CFR 50.48.

[3] Commission Meeting SRM M140529 and the associated Commission Meeting on Human Reliability (5/28/2014) provides a recent communication between the staff and the Commission on the subject of Operator Manual Actions implemented outside of the Control Room.

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NRC MD 10.158
(11-2006)

U.S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

TITLE OF DOCUMENT
Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation

ADAMS ACCESSION NO.

SECTION B - TO BE COMPLETED BY NON-CONCURRING INDIVIDUAL'S SUPERVISOR

NAME Sean E. Peters

TITLE Branch Chief

PHONE NO
301-251-7582

ORGANIZATION
Human Factors and Reliability Branch, Division of Risk Analysis, Office of Nuclear Regulatory Research

COMMENTS FOR THE DOCUMENT SPONSOR TO CONSIDER

☐ I HAVE NO COMMENTS

☒ I HAVE THE FOLLOWING COMMENTS

I agree with the non-concurrence. Even in its revised version, the proposed SECY paper continues to propose the skipping of the assessment of the impacts of more severe flooding hazards on the plant. These assessments would allow the licensees and the NRC to determine whether protection, mitigation, or a mix of protection and mitigation is the appropriate response. Instead, the SECY paper allows the focus to shift towards assessing whether some aspects of the plant's mitigating strategies should be modified. It shifts the focus away from protecting safety-significant structures, systems, and components as a primary or even an optional means of defense against flooding and moves the conversation towards the consideration of FLEX issues. This approach was neither the intent of Congress nor the Commission when the staff originally undertook this rulemaking and, with its high reliance on FLEX capabilities, it does not ensure that plant sites are adequately protected against the re-evaluated flood risk.

SIGNATURE

DATE

SUBMIT THIS PAGE TO DOCUMENT SPONSOR

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NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation	ADAMS ACCESSION NO ML14238A616
NAME William R. Ott	
TITLE Branch Chief	TELEPHONE NUMBER 251-7407
ORGANIZATION Environmental Transport Branch, Division of Risk Analysis, Office of Nuclear Regulatory Research	

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

also addresses participation in NCP-2014-010 by Jacob Philip, RES/DRA/ETB - see email dated 10/31/14

I supervise Dr. Joseph Kanney who is one of those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

Comments/Evaluation:

1. I support each of the twelve concerns documented in NCP-2014-010.

2. The non-concurrence and proposed alternatives are presented logically and supported by sound reasoning and a thorough knowledge of the background of the various documents discussed and the implications of the proposed action.

3. I read the non-concurrence and COMSECY searching for some quantitative basis to support the confidence that is being placed in the use of mitigative features as the primary line of defense for public safety in the event of a very low probability extreme flood and the attendant disruption from impacts beyond the plant. I found none. There is actually little direct evidence in the COMSECY to support the actions that it recommends to the Commission. Instead, the non-concurrence pointed out repeatedly that the result of the COMSECY proposed path would be to limit the quantitative information that would be collected. I am convinced that the provision of mitigative capabilities is a good practice and may be invaluable in responding to lesser calamities or as a complement to site specific protective measures. However, in meeting the agency's safety mission, my judgement says that we need far more assurance that we both understand the hazard and can protect the public from the consequences of that hazard impacting one of our licensees.

4. I also support the alternative resolution proposed in the non-concurrence.

SIGNATURE William R. Ott	DATE 10/29/14

NRC FORM 757
NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation	ML14238A616

NAME: Lynn A. Mrowca

TITLE	TELEPHONE NUMBER
Chief, PRA and Severe Accidents Branch	(301) 415-0525

ORGANIZATION: NRO/DSRA/SPRA

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

I supervise Malcolm Patterson, Marie Pohida, and Suzanne Schroer (at the time of non-concurrence), who are among those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

I support the well-articulated concerns in NCP-2014-010. Since plant safety is the key issue when addressing lessons learned from the experiences at Fukushima, it is not clear that "mitigating strategies" referenced in EA-12-049 will provide an effective level of targeted flood protection as the "mitigation capability" resulting from the integrated assessment.

SIGNATURE	DATE
Lynn Mrowca	11/3/14

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(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-010

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards	ADAMS ACCESSION NO ML14238A616
NAME William D. Reckley	
TITLE Special Advisor for Policy	TELEPHONE NUMBER (301) 415-7490
ORGANIZATION Office of Nuclear Reactor Regulation/Japan Lessons Learned Division	

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document)
SEE ATTACHED

EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document)
SEE ATTACHED

TYPED NAME OF NCP COORDINATOR William D. Reckley	TITLE Special Advisor for Policy
ORGANIZATION NRR/JLD	
SIGNATURE - NCP COORDINATOR Will D Reckley	DATE 11/6/14
TYPED NAME OF NCP APPROVER William M. Dean	TITLE Director
ORGANIZATION Office of Nuclear Reactor Regulation	
SIGNATURE - NCP APPROVER W M Dean	DATE 11/16/14

NRC FORM 757 (09-2014)

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NRC FORM 757 NRC MD 10.158 (09-2014)	U. S. NUCLEAR REGULATORY COMMISSION **NON-CONCURRENCE PROCESS**	NCP TRACKING NUMBER NCP-2014-010
TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards		ADAMS ACCESSION NO. ML14238A616

CONTINUATION OF SECTION A B ✓ C

SEE ATTACHED

Non-Concurrence Process Documentation

NCP-2014-010; Section C (Document Sponsor)

Summary of Issues

The issues raised in the non-concurrence relate to the information being provided to the Commission, the recommendations in the COMSECY, and the related changes to the NRC staff's activities for flooding reevaluations. The authors of the non-concurrence summarize the general concern and twelve specific concerns as follows:[1]

> *The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and "first line of defense" against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an important contribution to implementing the lessons learned from Fukushima, their existence does not negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1.*

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[1] NCP-2014-010 was initiated based on a version of the COMSECY distributed for division and office level concurrence on October 7, 2014. The October 7, 2014 version is referred to as the "original version" within this section of the non-concurrence package. The COMSECY has subsequently been revised to address concerns expressed in the non-concurrence and comments received from other staff, the Office of General Counsel, and NRC senior managers.

A COMSECY is a document in which the NRC staff requests guidance from the Commission, and includes a concurrence process and ultimately reflects the position of the document signer. Differing views among NRC employees are welcomed and can be reflected through various forms of communication, including the formal non-concurrence process. This response to the non-concurrence therefore refers to "the NRC staff or the staff" when referring to the views in the COMSECY or in other established agency positions. The terms "non-concurring staff" or "authors of the non-concurrence" are used to refer to the NRC employees expressing a differing view on the COMSECY.

The above leads to the following twelve specific concerns, which are further described in Section 2 of this document:

1. *It departs from the intent of NTTF Recommendation 2.1 (Section 2.1).*
2. *It departs from previous Commission and Congressional direction (Section 2.2).*
3. *It deviates from the implementation process currently established for reevaluating flooding hazards and plant response (Section 2.3).*
4. *It may create regulatory inconsistencies (Section 2.4).*
5. *It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted (Section 2.5).*
6. *It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action (Section 2.6).*
7. *It does not incorporate lessons learned from operating experience (Section 2.7).*
8. *It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities (Section 2.8).*
9. *It does not adequately distinguish between consequential floods and the reevaluated flood hazard (Section 2.9).*
10. *It is vague in its description of "targeted mitigating strategies" (Section 2.10).*
11. *It is not responsive to external recommendations by regarded experts (Section 2.11).*
12. *It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1 (Section 2.12).*

In addition, to the twelve specific concerns above, the authors of the non-concurrence also identified four general concerns:

1. *The COMSECY departs from an approved, systematic process that has been in place for several years.*
2. *The COMSECY does not recognize the importance of understanding total plant response to flooding hazards. The approach proposed in the COMSECY is not consistent with operating experience and evidence that flooding hazards are in some cases larger and more likely than was believed when plants were licensed.*
3. *The COMSECY proposes to eliminate the systematic evaluation that is necessary to determine if additional regulatory actions are needed to protect a given plant from flooding hazards.*
4. *The COMSECY does not call for input and direction from the Commission on significant policy decisions that would change the path forward for implementing NTTF Recommendation 2.1 and complying with previous Commission and Congressional direction.*

The general concern and twelve specific items are addressed below:

General Concern Summary and Actions Taken

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and "first line of defense" against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an important contribution to implementing the lessons learned from Fukushima, their existence does not negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1

Background

Order EA-12-049 was issued on March 12, 2012, and directed power reactor licensees to develop, implement, and maintain guidance and strategies ("mitigation strategies") to maintain or restore core cooling, containment and SFP cooling capabilities following a beyond-design-basis external event. The NRC staff plans to incorporate these requirements into NRC regulations through the mitigation of beyond-design basis events (MBDBE) rulemaking. The NRC also issued letters on March 12, 2012, to power reactor licensees pursuant to 10 CFR § 50.54(f), which requested licensees reevaluate the seismic and flooding hazards at their sites using updated hazard information and current regulatory guidance and methodologies. The reevaluations of seismic and flooding hazards are related to Recommendation 2.1 from the NRC's Post-Fukushima Near-Term Task Force (NTTF) report. The COMSECY has been prepared to clarify the NRC staff's plans to complete activities currently underway to address lessons learned from the Fukushima accident and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to describe a more integrated process.

The NRC staff is proposing in the COMSECY for the Commission to affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazards from Recommendation 2.1 within their mitigating strategies for beyond design basis external events (Order EA-12-049 and related MBDBE rulemaking). The rationale for this approach is to ensure

that the reevaluated hazards will, at a minimum, be addressed by the requirements for improved mitigating strategies. This expectation was included in the regulatory basis published in support of the MBDBE rulemaking. The NRC staff documented this expectation within the regulatory basis document to address the concern that mitigating strategies were being developed to cover a variety of external hazards but not necessarily protection against the postulated flooding scenarios from the Recommendation 2.1 reevaluations. This discrepancy results from licensees needing simultaneously to implement Order EA-12-049 and reevaluate seismic and flooding hazards. The guidance for Order EA-12-049, therefore, allowed licensees to base their mitigating strategies on the most recent site flood analysis because the hazard reevaluations from Recommendation 2.1 were not available. The regulatory basis for the MBDBE rulemaking and the subject COMSECY reflect the view that the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rulemaking is that licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments.

An underlying theme within the non-concurrence and related discussions involves the potential benefits of a broad-based (total plant) integrated assessment of the response of selected operating nuclear plants to various flooding scenarios. The selected plants are those where the estimated flooding hazards using present day information and guidance exceeds the design-basis-flood for the facility. The design basis flood defines the conditions against which safety related structures, systems, and components (SSCs) need to be protected. The non-concurrence states that such a systematic assessment can support NRC staff and licensees identifying and evaluating measures to enhance flood protection features, improve mitigating equipment and strategies, or develop a combination of protection- and mitigation-related actions. This line of inquiry could be characterized as seeking information to help determine the appropriate balancing of accident prevention and mitigation. The staff describes the actual decision-making related to an appropriate or justifiable regulatory action within the flooding reevaluations as an activity (Phase 2) that would follow completion of information gathering, including integrated assessments.

The alternative approaches described in the COMSECY and this non-concurrence can largely be described in terms of two different but related issues. The first is the relationship between the regulatory actions for mitigating strategies for beyond-design-basis external events and the reevaluation of flooding hazards (i.e., do the regulatory requirements for mitigating strategies address reevaluated flooding hazards?). This relationship is addressed specifically in the COMSECY and by the first two items for which the NRC staff is seeking affirmation from the Commission. The non-concurrence does not focus on this central point of the COMSECY but rather on the processes to be used by the NRC staff in gathering information on reevaluated flooding hazards and how this information will be used in considering possible regulatory actions. As reflected in the original version of the COMSECY, the NRC staff viewed this largely as a matter to be resolved by internal procedures and revisions to staff-issued guidance (e.g., interim staff guidance). As discussed later, the NRC staff has added a request in the COMSECY for the Commission to approve revising the Recommendation 2.1 flooding assessments (focusing on mitigating strategies) and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking. The COMSECY was also revised to make more clear that the NRC staff is proposing to revise the information gathering and assessments to reflect the recommended regulatory approach (i.e., a requirement for mitigating strategies to address reevaluated flooding hazards).

The NRC staff discussed several possible approaches during the development of the COMSECY – involving variations of the two issues mentioned above. The three primary alternatives considered are as follows:

(1) Maintaining the requirements for mitigating strategies to address reevaluated hazards and consider various factors when deciding on a plant-specific or conditional basis whether to pursue more detailed flooding assessments as part of evaluating plant-specific backfits;

(2) Maintaining the requirements for mitigating strategies to address reevaluated hazards and perform the currently planned integrated assessments to possibly identify additional protective or mitigative measures, and then assess whether those measures could be imposed as regulatory requirements (i.e., backfits) in addition to mitigating strategies; and

(3) Removing the requirements for mitigating strategies to address reevaluated hazards and pursuing Recommendation 2.1 as the primary vehicle to assess and, where justified, impose requirements to address reevaluated flooding hazards as separate regulatory actions (possibly but not necessarily including requirements for mitigating strategies).

The COMSECY describes the first option as the approach favored by the NRC staff. The authors of the non-concurrence favor the second approach, emphasizing the importance of maintaining the integrated assessments as described in the 50.54(f) letter and JLD-ISG-2012-05. The actual guidance in JLD-ISG-2012-05 and the process usually described prior to the COMSECY for Phase 2 decision-making reflected the third approach.

Summary/Discussion

The authors of the non-concurrence correctly point out that the COMSECY proposes changes to the activities related to flooding reevaluations, mitigating strategies and the related MBDBE rulemaking. The NRC has made changes and adjustments within other Fukushima lessons-learned activities as the staff and nuclear industry have gained experience and knowledge in implementing imposed requirements and evaluating various issues. The authors of the non-concurrence state that the original version of the COMSECY did not appropriately identify and highlight the change to the Commission and did not request Commission approval of the described changes in approach.

Another underlying concern expressed in the non-concurrence relates to changes in the scope of integrated assessments included in the request for information and how that might impact subsequent decisions on possible regulatory actions. The general vision described in JLD-ISG-12-05 includes assessing various flooding mechanisms, the impact of the flooding conditions on the plant, and identifying possible measures to protect plant SSCs or mitigate the loss of plant SSCs. The hazard reevaluations and possible measures to address them would then be evaluated within the NRC's processes to determine what, if any, regulatory actions the NRC staff should pursue. The COMSECY describes a different process in that it recommends that the Commission affirm that that licensees for operating nuclear power plants need to address the reevaluated flooding hazard within their mitigating strategies for beyond-design-basis external events.[2] Contrary to the statements in the non-concurrence, the NRC staff is proposing this approach to ensure that the lessons learned from Fukushima and other insights

[2] To "address the reevaluated flooding hazard," the mitigating strategies need to provide key safety functions such as core cooling given an extended loss of alternating current (ac) power that might be caused by a beyond-design-basis external event. The mitigating strategies equipment and

related to flooding hazards are addressed by a specific regulatory requirement for safety improvements. With a minimum regulatory requirement addressing reevaluated flooding hazards established for all plants, the assessment of the information can become more focused, with expected improvements in efficiency and timeliness. The flooding reevaluations and focused assessments will ensure mitigating strategies provide the capability to address the range of beyond-design-basis flooding hazards from various mechanisms and conditions.

The COMSECY also describes how additional assessments might be undertaken if the NRC staff determined that regulatory actions beyond improving mitigating strategies might be warranted to address plant or scenario-specific issues. The NRC staff expects that such assessments would not be needed for all plants and the staff would document the basis for additional assessments and consideration of plant-specific actions (beyond the requirements for mitigating strategies to address the reevaluated flooding hazard). The authors of the non-concurrence advocate pursuing the total plant integrated assessments described in JLD-ISG-12-05 for all affected plants and then using those assessments to determine if additional regulatory actions should be considered. Assuming the Commission affirms the positions described in the COMSECY, the staff would initiate internal and external discussions about changes to the internal plans, revisions to staff-issued guidance, and integration of the flooding reevaluations and mitigating strategies activities. The original version of the COMSECY did not seek specific Commission approval of this integration but instead considered it a natural result of the requested Commission affirmation related to the scope of mitigating strategies. If the Commission decides not to affirm the positions in the COMSECY, the NRC staff will revert back to the flooding reevaluations and integrated assessments described in JLD-ISG-12-05 and drop plans to include requirements in the proposed MBDBE rulemaking for mitigating strategies to address reevaluated external hazards.

The NRC staff and management assessed the overall program for addressing the lessons learned from the Fukushima accident and considered a variety of concerns and possible outcomes in developing the recommendations provided in the COMSECY. The discussions and deliberations can be summarized in terms of tradeoffs between what are often competing elements of a project (e.g., developing proposed regulatory actions). These elements or factors include: (1) Scope or safety improvements sought from the project, (2) Cost or resources needed for the project, (3) Duration or schedule for the project, and (4) Project risk (failing to address first 3 elements).

One of the major concerns of the authors of the non-concurrence is the proposed change to the scope or approach to the request for information related to flooding reevaluations (Stage 2 of Phase 1 of the flooding reevaluation activity). However, the COMSECY is addressing a higher level issue involving the longer term or expected "end state" of the NRC's overall regulatory response to the Fukushima accident. Although the scope of integrated assessments within the flooding reevaluations has been an important part of that program, the NRC staff and management needed to consider all of the above elements and the impacts on the agency, the regulated community, and other stakeholders within the context of ensuring nuclear power plants pose no undue risk to the public health and safety.

The general concern expressed in the non-concurrence reflects the perspective of those involved in the request for information on flooding reevaluations. As mentioned in the COMSECY and the non-concurrence, some of the issues result directly from the need for

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actions would also need to be protected against those beyond-design-basis events identified during the reevaluation of flooding hazards (see Figure 2.1 in Enclosure 2 to the COMSECY).

licensees to implement plant changes for mitigating strategies to address beyond-design-basis external events while simultaneously reevaluating seismic and flooding events using more recent information and analysis methodologies. This in turn led to developing mitigating strategies for Order EA-12-049 based on the most recent site flood analysis available, which in some cases might be the current design-basis flood described in a plant's final safety analysis report (FSAR). Some of the existing staff-level documents and discussions associated with mitigating strategies and flooding reevaluations reflect this interim measure in that they refer to mitigating strategies only addressing flooding hazards to the magnitude of the design-basis flood. Some possible paths forward included an assumption that these interim configurations would satisfy the subsequent MBDBE rulemaking. The guidance for flooding reevaluations generally assumed the two activities (mitigating strategies and flooding reevaluations) were separate in terms of the associated regulatory actions, with Phase 2 of the flooding reevaluations determining what, if any, requirements would be imposed to address the reevaluated flooding hazards.

A possible outcome of treating flooding reevaluations as a separate activity is that the mitigating strategies developed to address a variety of external hazards would not address flooding events similar to those identified from the reevaluations. A separate justification and regulatory action would then be needed under Phase 2 of the flooding reevaluation to address the revised hazard, either by improving flooding protection or mitigation measures (including but not necessarily limited to the strategies covered by the MBDBE rulemaking). However, the regulatory basis for the MBDBE rulemaking described how the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rule is that, at a minimum, licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments. The NRC staff is requesting that the Commission affirm that approach for the reasons provided in the COMSECY and expanded upon in this section of the non-concurrence package. The deliberations leading to the recommendations in the COMSECY reflect the above project elements or tradeoffs and a management decision based on the best overall outcome. For example,

- The COMSECY reflects the established view (as reflected in the regulatory basis document published for the MBDBE rulemaking) that a regulatory requirement should exist for plants to address the flooding reevaluations. The regulatory requirement currently being developed where this concern would be incorporated is the MBDBE rulemaking. The non-concurrence focuses upon the current information gathering phase of the flooding reevaluations as described in JLD-ISG-12-050. However, pursuing a separate regulatory action for the reevaluated flooding hazard would increase costs, extend schedules, and increase overall project risk because it is uncertain if or when the NRC would impose any additional requirements. To the degree that the concerns of the non-concurrence apply to imposing requirements beyond mitigating strategies, the differences between the described approaches are that the COMSECY describes a staff evaluation that would initiate further assessments (i.e., conditional based on staff judgment) while the authors of the non-concurrence propose assessments for all affected plants as currently described in JLD-ISG-12-050.
- NRC and industry are facing resource challenges related to the implementation of new requirements and performance of additional studies in response to the Fukushima accident. The relationship between the external hazard re-evaluations and the development of mitigating strategies for such events has become clearer as both activities have been developed over time, and the planned integration of the activities will support a more efficient and effective resolution of the issues.

- The ongoing information gathering activities related to flooding reevaluations have experienced delays, and the staff foresees more delays as licensees decide to use new approaches to address some flooding mechanisms, such as intense precipitation events. The industry may choose to pursue such approaches for responding to the request for information because of uncertainties about the regulatory "end state" under Phase 2 of Recommendation 2.1 activities. Establishing regulatory clarity and stability at this time may accelerate resolution of reevaluated flooding hazards to support implementation of NRC Order EA-12-049 and the related MBDBE rulemaking.
- The approach described in the COMSECY provides real and timely safety improvements by requiring – at a minimum – that mitigating strategies include capabilities to address reevaluated flooding hazards. There is some uncertainty associated with this approach given the associated rulemaking is still under development – but the likelihood of achieving this outcome is high provided the Commission affirms the positions identified in the COMSECY. The NRC staff acknowledges the logic of the general process in the non-concurrence – collect information, assess information, and then make a regulatory decision. In such a model, more information and insights about flooding or other risk contributors are useful in helping with the decision-making process. In this case, the integrated assessment might be viewed as an analytical tool comparable to probabilistic risk assessments used in evaluating other potential regulatory actions. However, experience has shown that such approaches are often long-term projects, and the outcomes are highly uncertain in terms of achieving a change in NRC requirements. For example, the initial estimated schedule for the NRC's Probabilistic Flood Hazard Assessment Research Plan (PFHARP), which is being developed to help resolve some of these issues, extends into 2019. Incorporating insights from the PFHARP into the regulatory decisions for the flooding hazard reevaluations would be some years after that, most likely well into the 2020s. A thorough evaluation of possible approaches needs to consider the possible costs of information gathering efforts; not only in terms of resources and schedule but also in potentially leading to a less effective regulatory response to lessons learned from the Fukushima accident.

In summary, the NRC staff and management acknowledge the concerns expressed by the authors of the non-concurrence in terms of the changes to the planned flooding reevaluations as described in JLD-ISG-12-05. However, the evaluation and development of the COMSECY needed to consider other factors – not mentioned in the non-concurrence – to determine the best overall approach in terms of optimizing safety improvements, costs, schedules, and project risks.

Action

The authors of the non-concurrence correctly point out that the recommendations in the COMSECY include changes to the current activities related to flooding reevaluations, mitigating strategies, and the related MBDBE rulemaking. The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The presentation of the information in the COMSECY and its enclosures is a reasonable way to ensure the Commission has the needed information and is made aware of the issues related to the recommendations. The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of where the agency has consolidated activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency (e.g., COMSECY-13-002, "Consolidation of Japan Lessons Learned Near-Term Task Force Recommendations 4 and 7 Regulatory Activities"). The additional discussions and request for Commission approval of the integration of flooding reevaluations and mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

Specific Issue Summaries and Actions Taken

1. *NTTF Recommendation 2.1 is for the NRC to "[o]rder licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs [structures systems and components] important to safety to protect against the updated hazards." Thus, at the core of Recommendation 2.1 is the reevaluation of flooding hazards and, if needed, updating a plant's design basis to ensure protection of SSCs important to safety. Recommendation 2.1 was implemented via the issuance of the 50.54(f) letter in March 2012, as described above. The reevaluation of flooding hazards is responsive to the first portion of Recommendation 2.1, while the integrated assessment provides the relevant information regarding plant response to support an NRC decision regarding the need to change the design or licensing basis of the plant to protect SSCs important to safety or to take other regulatory action.*

   In light of the intent of Recommendation 2.1, four key issues emerge regarding the COMSECY:

   1. *The COMSECY represents a significant departure from the intent of Recommendation 2.1.*
   2. *The paper provides no technical or safety basis for departing from Recommendation 2.1.*
   3. *The COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.*
   4. *The COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.*

Summary/Discussion

As previously discussed, the NRC staff and management acknowledge in the COMSECY and in this response to the non-concurrence that now is an appropriate time to identify and implement changes to various activities within the agency's response to the Fukushima accident. The COMSECY has been prepared to clarify the NRC staff's plans to complete activities currently

underway and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to describe a more integrated process. The NRC staff and management have requested the Commission affirm those changes viewed as potential policy issues to minimize potential confusion or future challenges to the recommended approaches. The NRC staff can address more detailed changes to the coordination of information gathering activities, ongoing regulatory actions, and future evaluations of possible regulatory actions through working with stakeholders and revising appropriate guidance documents.

The authors of the non-concurrence refer heavily to the NTTF report as part of the basis for this specific concern. The NTTF report is recognized as a major achievement and provided a good starting point for subsequent actions defined by the NRC's Japan Lessons Learned Steering Committee and the Commission. However, the agency made many changes to the actions recommended by the NTTF, and more appropriate references salient to the agency's post-Fukushima activities are the later Commission papers and related staff requirements memoranda. The evolving nature of the NRC's response to lessons learned from the Fukushima accident is reflected in the numerous status updates, policy papers, and Commission decisions prepared since the orders and requests for information were issued in March 2012. The staff views the COMSECY as part of the continuing evolution of the NRC's response and changes needed to address information and insights gained during the evaluation and implementation of the closely related activities.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and specifically requests Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

As explained under the discussion of the general concern identified in this non-concurrence, the NRC staff needs to consider various factors and possible outcomes when establishing a course of action and making policy recommendations to the Commission. The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the Commission with information needed for their deliberations.

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2. *There has been clear Commission and Congressional direction regarding implementation of Recommendation 2.1. The COMSECY outlines a proposed path forward that significantly deviates from the current path for implementation of Recommendation 2.1. The following issues are observed:*

1. *The COMSECY does not clearly and explicitly describe the previous Commission and Congressional direction regarding the need to reevaluate flooding hazards, identify plant vulnerabilities under the new hazard, and (as needed) take further regulatory action in response to Recommendation 2.1.*
2. *The main body of the COMSECY does not clearly acknowledge that the proposed path forward for implementation of Recommendation 2.1 represents a significant deviation Section A from the previous Commission and Congressional direction regarding Recommendation 2.1.*
3. *The paper does not ask the Commission to vote on the change in direction that is proposed in the COMSECY.*

Summary/Discussion

The NRC staff includes recommendations in the COMSECY for the Commission to affirm the proposed relationship between mitigating strategies and flooding reevaluations. The original version of the COMSECY treated this relationship as a central issue and the matter needing Commission attention to enable the NRC staff to effectively establish regulatory requirements and revise various internal plans and staff-level guidance documents. The evolving nature of the NRC's response to lessons learned from the Fukushima accident is reflected in the numerous status updates, policy papers, and Commission decisions prepared since the orders and requests for information were issued in March 2012. The staff views the COMSECY as part of this continuous assessment and adjustment of activities as information and insights are gained from performing evaluations and implementing plant changes. The NRC staff considers the information provided, approaches developed, requested Commission decisions, and the resultant changes to staff-level guidance to be consistent with previous directions from the Commission and the language of Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011).[3]

The authors of the non-concurrence point out that related changes to the plans for reevaluated flooding hazards and the integration of parts of two Fukushima-related activities were not emphasized in the original version of the COMSECY and that the Commission was not asked to approve those changes. Assuming the Commission affirms the positions described in the COMSECY, the staff would initiate internal and external discussions about changes to the internal plans, revisions to staff-issued guidance, and integration of the flooding reevaluations and mitigating strategies activities. The original version of the COMSECY did not seek specific Commission approval of this integration but instead considered it a natural result of the requested Commission affirmation related to the scope of mitigating strategies. However, a

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[3] Section 402 of the Consolidated Appropriations Act, 2012, states:

> The Nuclear Regulatory Commission shall require reactor licensees to reevaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licensees as expeditiously as possible, and thereafter when appropriate, as determined by the Commission, and require each licensee to respond to the Commission that the design basis for each reactor meets the requirements of its license, current applicable Commission requirements and guidance for such license. Based upon the evaluations conducted pursuant to this section and other information it deems relevant, the Commission shall require licensees to update the design basis for each reactor, if necessary.

request for Commission approval of the integration of flooding assessments and decision-making into the development and implementation of requirements for mitigating strategies has been added to the memorandum.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

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3. *The COMSECY describes a change from the implementation process for Recommendation 2.1. The following issues arise:*

- *The COMSECY does not, for the awareness of the Commission and external stakeholders, clearly and explicitly articulate that the COMSECY proposes a significant change to the current implementation process for Recommendation 2.1.*
- *The COMSECY does not clearly articulate a sound basis, technical or otherwise, for the changes to the implementation process.*
- *The COMSECY does not describe the consequences of the proposed changes to the implementation process (Sections 2.4 through 2.11 describe the consequences of changes to the process).*

Summary/Discussion

The authors of the non-concurrence correctly point out that the recommendations in the COMSECY include changes to the current activities related to flooding reevaluations, mitigating strategies, and the related MBDBE rulemaking. The COMSECY can be viewed as part of the ongoing program to address lessons learned from the Fukushima accident, which has included numerous changes and adjustments to address information or insights from implementing newly imposed requirements and evaluations undertaken by the NRC and others. The changes to the information gathering efforts mentioned by the authors of the non-concurrence result primarily from the decision, if affirmed by the Commission, to include requirements for licensees to address reevaluated flooding hazards within the mitigating strategies covered by the proposed MBDBE regulation. Inclusion of a requirement within the MBDBE rule for mitigation of the reevaluated flooding hazard necessarily leads to changes in the Phase 2 decisions on

regulatory actions for improved flood protection or mitigation. Changes to the decision-making process in turn lead to changes in the information collection and assessments being requested from licensees. These changes were mentioned in the original version COMSECY but not discussed in detail because it was considered to be an implementation detail within the NRC staff's purview once the Commission decides upon the other higher-level policy recommendations included in the paper.

This recurring theme within the non-concurrence to maintain the integrated assessments as described in JLD-ISG-12-05 is largely indicative of differences in perspective. The NRC staff acknowledges that changes to various activities will result from the COMSECY if the recommendations are affirmed by the Commission. Changes will be needed to staff-level guidance for mitigating strategies and flooding reevaluations as well as to the proposed regulations being prepared as part of the MBDBE rulemaking. Whereas the NRC staff does not discuss in detail the reduction in scope of flooding integrated assessments within the COMSECY, neither does the COMSECY include detailed discussions of potential issues with maintaining the current path in terms of resource challenges, schedule changes, and the possibility of missing opportunities to effectively address beyond-design-basis external events within regulatory requirements meant to address lessons learned from the Fukushima accident (see previous response to general concern). The focus of the COMSECY (original and subsequent revisions) is on the policy-level issues for which the staff is seeking Commission affirmation.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

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4. *The proposed path forward may lead to several potential regulatory inconsistencies:*

- *The treatment of increased flooding hazards from dam failures may differ between (1) sites for which there is ongoing regulatory activity that may lead to changes in the protection of the plant or other backfits and (2) sites for which regulatory activity is not already ongoing.*

- *The treatment of new information about different flood mechanisms may differ. For example, NRC may treat new information about increased flooding hazards from dam failures (at some sites) differently than new information about increased flooding hazards from other mechanisms such as storm surge and local intense precipitation.*

Recent regulatory activity at Oconee Nuclear Station provides an illustration of regulatory actions related to dam failure that were initiated before the events at Fukushima. Actions were taken by NRC in response to new information about flooding hazards from dam failure and resulted in documented staff concerns regarding whether the plant was adequately protected. Staff concerns resulted in the initiation of activities to build protective features at the site. In contrast to treatment of new information regarding flooding hazards at Oconee, under the proposed path forward for Recommendation 2.1 described in the COMSECY, all new hazard information would be broadly classified as "beyond design basis," without consideration of whether the design or licensing basis of the plant should be updated to protect SSCs important to safety. Instead, mitigating strategies would serve as the primary "defense" against the reevaluated hazard defined using present-day guidance and methods used to define the design basis of new reactors.

Experience with Oconee contributed, in part, to the proposal (and subsequent designation) of Generic Issue 204 related to flooding of nuclear power plants following upstream dam failure. The activities related to Generic Issue 204 as well as other site-specific regulatory activities were subsumed by the NTTF Recommendation 2.1 activities. However, the proposed path forward for NTTF Recommendation 2.1 will not provide information to support resolution of the issues subsumed by Recommendation 2.1 activities and thus they would require use of other processes to ensure resolution.

Finally, the COMSECY describes the systematic evaluation program (SEP) and invokes it as regulatory precedent. The description of the program and the resulting implications for Recommendation 2.1 is not clear and may be misleading.

Summary/Discussion

The COMSECY describes the recommended approach including a requirement that reevaluated flooding hazards at least be addressed by the mitigating strategies being developed and implemented in accordance with the proposed MBDBE rulemaking. This approach provides a generic minimum or baseline that all licensees would need to address. In addition, the NRC staff may elect to request additional information from licensees and conduct further assessments to determine if the NRC should consider imposing additional requirements. Further information gathering, assessments and consideration of potential regulatory actions could be pursued unless proposed backfits are not likely to provide a substantial increase in overall protection, or the direct and indirect costs of implementation are not likely to be justified. The licensing histories and applicable regulatory requirements differ among operating plants and so the need to consider plant-specific decisions is appropriate. Proposed regulatory actions could be based upon the need to comply with established regulatory requirements (generic or plant specific), measures needed to provide reasonable assurance of adequate protection of public health and safety, or cost-justified enhancements that provide a substantial safety benefit. The NRC staff notes that the approach advocated in the non-concurrence relies on plant-specific decisions and regulatory actions. As previously discussed, the authors of the non-concurrence prefer the information gathering described in JLD-ISG-12-05 followed by plant-specific Phase 2 regulatory evaluations versus the conditional collection of information

described in the COMSECY. Ongoing activities within the operating experience program, generic issues program, reactor oversight process, enforcement program, and generic communications program will continue to play an important role in the NRC oversight of nuclear power plants under the approaches mentioned in the COMSECY and this non-concurrence. The NRC processes for addressing requests for information do not offer any clear advantage in terms of ensuring consistency in regulatory approach compared to the processes to establish and implement regulatory requirements such as Order EA-12-049 and the related MBDBE rule. Examples of specific regulatory issues such as the potential flooding of the Oconee Nuclear Station cited in the non-concurrence were identified and addressed using the processes and decision-making criteria described in the COMSECY.

The authors of the non-concurrence sometimes refer to the benefits of the approach described in JLD-ISG-12-05 (i.e., increasing the understanding of potential plant risks from flooding events) without reminding the reader that the current activity involves requesting information from licensees and related staff assessments to support future and largely undefined regulatory decisions. The requests for information and staff efforts will not resolve issues without a subsequent regulatory action at which time the staff would face many of the same limitations and obstacles identified as concerns in the non-concurrence (e.g., the lack of detail in performance-based rules). The brief mention of the systematic evaluation program (SEP) and individual plant examination of external events (IPEEE) within Enclosure 1 of the COMSECY are offered to provide historical background and some regulatory context to current information gathering activities. NRC regulations and processes remain largely the same now as they were when those evaluations were undertaken and the agency will face many of the same challenges in terms of proposing new requirements, managing budgets and schedules, and negotiating compromises with internal and external stakeholders. Discussions of maintaining the integrated assessments and other activities as they were contemplated in 2012 should acknowledge the risks of that approach getting bogged down in analytical discussions and ultimately leading to no regulatory actions. Some evidence of this currently exists as the staff is continuing its reviews of flooding hazard reevaluations submitted in March 2013 and some licensees are undertaking additional reevaluations for specific flooding scenarios. In such cases, the more detailed efforts to obtain and analyze information may have an actual adverse impact on the safety of operating nuclear power plants compared to taking a more timely regulatory action. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

Action/Conclusion

The NRC staff did not make specific changes to the COMSECY to address this concern. However, the authors of the non-concurrence raise a legitimate issue regarding the importance of achieving as much consistency as possible during the assessments and decision-making process. As discussed in the COMSECY, the NRC staff will use established guidance (e.g., management directives, office instructions) to ensure consistent and predictable actions are taken to gather information, perform evaluations, and, where appropriate, impose requirements. No additional changes or delays in providing the paper to the Commission are needed.

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5. *As described in the previous sections, Phase 1 of the implementation process for NTTF Recommendation 2.1 is intended to gather sufficient information about (1) the reevaluated flooding hazard for a site, (2) the effects of the hazard on the site, and (3) the plant's proposed response to a hazard (e.g., protection, mitigation, or some combination). This information is gathered so that NRC can ensure that plants are adequately protected and make decisions regarding safety enhancements. It is important to note the typical reasons that flooding hazards have increased as a result of the NTTF Recommendation 2.1 flood hazard reevaluations. These reasons for increase include:*

1. *Hazard mechanisms were not previously considered (e.g., local intense precipitation events not considered when the plant was sited are evaluated as part of the NTTF Recommendation 2.1 hazard assessment)*
2. *Reassessment of or new information regarding the credibility of hazards (e.g., dam failure events previously considered not credible based on an assessment of dam failure frequencies are reassessed as credible)*
3. *New modeling and analysis tools lead to the understanding that flood height, associated effects, or flood event duration associated with the same events considered in the design basis for a site are more severe than previously estimated (e.g., estimation of higher flood levels resulting from same dam failure events already included within the design basis)*

The COMSECY proposes to truncate the current Recommendation 2.1 implementation process and focus on mitigating strategies (originally developed to provide additional defense in depth) as the first line of defense against the reevaluated flooding hazard. The COMSECY prejudges the outcomes of Phase 2 of the implementation process for NTTF Recommendation 2.1 and states that NRC does not expect to redefine the design basis for protection of safety-related SSCs. This may conflict with NRCs obligation to continually assess whether there is adequate protection of public health and safety.

Summary/Discussion

The concern expressed by the authors of the non-concurrence again reflects differences in perspective and presents reasonable arguments for sticking to the process defined in JLD-ISG-12-05. That approach reflects a straightforward logic of collecting information, assessing plant risks or vulnerabilities, and then determining what, if any, regulatory actions might be appropriate. It is worth noting that the 50.54(f) letter and related guidance does request licensees to provide information about interim actions taken or planned to address any higher flooding hazards relative to the design basis, prior to completion of the integrated assessment, if necessary. However, the non-concurrence does not discuss possible downsides with that overall approach in terms of resource challenges, schedule delays, and the possibility of missing opportunities to more effectively address beyond-design-basis external events within regulatory requirements. The importance of taking timely actions is especially important when dealing with operating reactors and the finite terms of their operating licenses. Delayed actions mean that real risks of operation are not addressed during the period of analysis except for possible licensee-initiated interim actions included in the responses to the 10 CFR 50.54(f) request for information. The potential benefits of delayed regulatory actions are diminished because they are in place for a shorter period of time (which in turn makes it more difficult to justify such an action in the future). The approach recommended in the COMSECY takes into account these various factors and while reducing the scope and possible benefits of the broader

integrated assessments favored by the authors of the non-concurrence, a requirement for mitigating strategies to address reevaluated flooding hazards does result in a more timely and predictable regulatory action (and related safety enhancement) that appropriately addresses lessons learned from the Fukushima accident. The COMSECY also states that the NRC staff will use information about the reevaluated flooding scenarios, plant design, and other available information to decide if further assessments and potential plant-specific backfit evaluations should be pursued (see response to Concern #9 regarding reasonable judgment to initiate additional assessments).

If the Commission affirms the NRC staff's recommended positions in the COMSECY, various staff-level guidance documents related to mitigating strategies and flooding reevaluations (including integrated assessments) will need to be revised. The NRC staff would immediately work with stakeholders to revise guidance and the planned MBDBE rulemaking to provide for the timely implementation of mitigation strategies with the capability to address the reevaluated flooding hazards. In addition, the COMSECY discusses how additional analysis should be undertaken if the NRC staff has technical concerns or reason to believe that plant-specific regulatory actions are warranted. The COMSECY reflects the views of the NRC staff and management that when these issues are looked at more holistically, the proposed approach will provide more timely and certain safety enhancements while still maintaining an ability to pursue additional assessments and plant-specific actions, if warranted.

Enclosure 1 to the COMSECY includes a discussion of the terminology associated with licensing basis information, including design basis and design-basis events. As mentioned in the non-concurrence, the enclosure includes a statement that the NRC staff does not expect to revise the design-basis flood against which safety related equipment would need to be protected, but does not definitively rule out that plant-specific information could warrant such a rare regulatory action. As described in the paper, the last several decades of regulatory history and the fact that more economical measures can be taken to provide similar controls on plant risks is the basis for the statement. The discussion in the COMSECY is based upon available guidance in Regulatory Guide 1.186, "Guidance and Examples for Identifying 10 CFR 50.2 Design Basis." The NRC staff included this topic within the COMSECY because the continued discussions about the hypothetical redefining of design-basis floods may be among the reasons a number of licensees are currently refining analyses of flooding scenarios, which leads to delays in the gathering of information and evaluating possible regulatory actions. Approaches based on established NRC processes for identifying and establishing design-basis information (e.g., Regulatory Guide 1.186) are consistent with the direction given in Commission and Congressional documents cited in the non-concurrence. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

Action

The NRC staff did not make significant changes to the COMSECY to address this concern. An example and additional figure were added to Enclosure 1 to help explain the proposed approach and how it would affect licensing basis information, including the design basis for specific SSCs.

Conclusion

Beyond the actions taken to further explain how the recommended approach affects licensing basis information (i.e., figure and example), no additional changes or delays in providing the paper to the Commission are needed.

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6. *The proposed path forward described in the COMSECY truncates the Recommendation 2.1 implementation process by reducing the scope and rigor of the integrated assessment, or eliminating the integrated assessment altogether. As a result, important insights about plant response will not be gathered at sites for which the reevaluated hazard is more severe than the design basis. Information about the increase in hazard alone is not sufficient to determine whether additional regulatory actions should be pursued. Therefore, the proposed path forward described in the COMSECY will not provide sufficient information to support staff decisions regarding whether to take additional regulatory action (beyond providing functional requirements and reference bounds for Order EA-12-049 mitigating strategies) to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements.*

Summary/Discussion

Similar to previous concerns expressed in the non-concurrence, this item relates to changes in the scope of integrated assessments included in the request for information and how that might impact subsequent decisions on possible regulatory actions. The general vision described in JLD-ISG-12-05 includes assessing various flooding mechanisms, the impact of the flooding conditions on the plant, and identifying possible measures to protect plant SSCs or mitigate the loss of plant SSCs. The hazard reevaluations and possible measures to address them would then be evaluated within the NRC's processes to determine what, if any, regulatory actions should be pursued. The COMSECY describes a different process in that it recommends that the Commission affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazard within their mitigating strategies for beyond-design-basis external events. The assessments of mitigating strategies equipment and actions would ensure protection against various flooding mechanisms and conditions identified from the flooding reevaluations. Mitigating strategies would therefore need to address scenarios that could range from slightly above the design-basis flood to significantly above the design-basis flood and depending on the site, scenarios involving different warning times, debris loads, event durations, and other factors identified by the hazard reevaluations. With a specific regulatory requirement addressing reevaluated flooding hazards established for all plants, the assessment of the information can become more focused, with expected improvements in efficiency and timeliness and therefore, meaningful safety enhancements established more promptly. The COMSECY also describes how the NRC staff may undertake additional assessments if they determine that regulatory actions beyond improving mitigating strategies might be warranted to address plant or scenario-specific issues. The NRC staff – including the decision-makers on matters related to operating reactors – finds the recommended approach provides appropriate regulatory controls and flexibilities to address plant-specific safety issues (see response to Concern #9 regarding reasonable judgment to initiate additional assessments). Assuming the Commission affirms the positions described in the COMSECY, the staff can initiate internal and external discussions about changes to the internal plans and revisions to staff-issued guidance. If the Commission decides not to affirm the positions in the COMSECY, the NRC staff will revert back to the flooding reevaluations and integrated assessments described in JLD-ISG-12-05 and drop

plans to include requirements in the MBDBE rulemaking for mitigating strategies to address reevaluated external hazards.

Action/Conclusion

Beyond the actions described in response to other concerns (e.g., describing integration of some parts of Recommendation 2.1 into mitigating strategies and requesting Commission approval of that integration), no changes were made to the COMSECY to address this specific concern.

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7. *Operating experience has demonstrated the potential hazards posed to nuclear power plants by flood events as well as the importance of ensuring plants can appropriately protect against flooding events. NRC operating experience in this area stretches back decades. Several examples of this past experience include the impact of Hurricane Andrew on Turkey Point (Ref. [19]), deficient flood panels at Prairie Island (Ref. [20]), and flooding of Cooper Nuclear Station (Ref. [21]). In addition there have been a number of recent events involving flooding of sites or structures, as well as recent "greater than green" findings under the reactor oversight process and recent non-cited violations and licensee event reports. This operating experience has brought to the forefront the importance of carefully evaluating flood protection. Recent flooding events have involved (1) failed or missing seals that resulted in the inundation of areas containing safety-related equipment, (2) the effect of rising water levels on instrumentation and information availability during a hurricane event, and (3) storm surge and debris effects. Recent findings under the reactor oversight process have involved missing seals, inadequate procedures, and infeasible manual actions. Although there can be some solace taken in the fact that some of these events have been discovered under the reactor oversight process, it is important to note that the purpose of the reactor oversight process is to inspect, measure, and assess plant performance, not to systematically evaluate plant response to new information regarding increased hazards. All of these insights arising from operating experience would be addressed as part of the integrated assessment. However, the proposed path forward described in the COMSECY would significantly reduce or eliminate the assessment of plant response that is performed under Recommendation 2.1 activities.*

Summary/Discussion

To the degree that the staff needs to consider operating experience within the flooding reevaluations and integrated assessments associated with the request for information under Recommendation 2.1, the staff will likewise consider operating experience within the licensing reviews, audits and inspections associated with licensees' actions to comply with the regulatory requirements for mitigating strategies. The NRC processes for addressing such information in responses to the 50.54(f) do not offer an advantage compared to the processes to establish and implement regulatory requirements such as Order EA-12-049 and the related MBDBE rule. The recommended approach should result in a more focused assessment of the implications of operating experience and other technical issues since the generic regulatory action (MBDBE rulemaking) would require licensees to ensure mitigating strategies are protected against the reevaluated flooding hazards. However, NRC activities related to gathering and analyzing

information about operating experience and problems with protection against design-basis floods would continue within the current programs. Those NRC programs associated with operating experience, generic issues, reactor inspection and oversight, enforcement, and generic communications will continue to play an important role in the agency's oversight of nuclear power plants both under the approach recommended in the COMSECY and the approach favored by the authors of the non-concurrence.

Action/Conclusion

The NRC staff did not make specific changes to the COMSECY to address this concern. The authors of the non-concurrence highlight the importance of operating experience and incorporating insights into NRC programs. The NRC staff will continue to use established guidance (e.g., management directives, office instructions) and use existing programs (e.g., operating experience, inspections, generic communications) to ensure licensees address identified issues with flood protection and mitigation. No additional changes or delays in providing the paper to the Commission are needed.

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8. *The integrated assessment interim staff guidance (Ref. [2]) describes the set of evaluations and documentation necessary to support licensees' assessments of their proposed strategies for evaluating the total plant response to any increased flooding hazards identified as a result of the hazard reevaluation using present-day guidance and methods applicable to defining the design basis for new reactors. The interim staff guidance (ISG) was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment .In recognition that operating reactors are already sited and cannot be redesigned, the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities. Figure 1 provides a conceptual illustration of the integrated assessment process described in the ISG. Although the ISG allows licensing to credit mitigation (including FLEX or alternate strategies), the "level of review" described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049. This is appropriate in light of the differences in intended goals of the integrated assessment and mitigating strategies evaluations (intended to provide broad capabilities for defense in depth). The COMSECY does not recognize these differences nor reflect the necessity of using the process described in the integrated assessment to develop the information required for staff to determine, with adequate technical justification, that a licensee's proposed approach to responding to the reevaluated hazard (whether using protection or mitigation) will be effective.*

Summary/Discussion

The authors of the non-concurrence refer to the benefits of the approach described in JLD-ISG-12-05 (i.e., increasing the understanding of potential plant risks from flooding events) without acknowledging that the current activity involves requesting information from licensees and conducting related staff assessments to support possible but uncertain regulatory actions in the future (See discussion under issue 4). Statements such as "*the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities*" and "*the "level of*

review" described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049" does not reflect the actual regulatory hierarchy and treatment of requests for information versus compliance with NRC requirements. The non-concurrence cites the guidance and assumes the information collection and assessments will occur as envisioned when the staff issued the guidance in 2012. The NRC staff simply notes that the agency's history with similar activities is that things rarely go so smoothly. The non-concurrence does not mention, for example, more recent discussions with the industry regarding difficulties in responding to the requests for information and related implications related to budgets, schedules, and actual information that licensees might provide. In addition, the requests for information and assessments described in JLD-ISG-12-05 do not resolve issues without a subsequent regulatory action, at which time the staff would face many of the same limitations and obstacles that the authors cite as shortcomings in the regulatory requirements already imposed in response to lessons learned from the Fukushima accident. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

The referenced figure (Figure 1) and related descriptions from JLD-ISG-12-05 do not reflect the approach described in the regulatory basis for the MBDBE rulemaking or the COMSECY. The recommended approach includes imposing a regulatory requirement through the MBDBE rulemaking to ensure mitigating strategies for beyond-design-basis external events address the reevaluated flooding hazards identified from Recommendation 2.1. The inclusion of a requirement within the MBDBE rule for mitigation of the reevaluated flooding hazard necessarily leads to changes in the Phase 2 decisions on regulatory actions for improved flood protection or mitigation. Changes to the decision-making process (based on the "results" box in the figure) in turn leads to changes in the information collection and assessments needed to support such decisions. In the context of the figure, the approach in JLD-ISG-12-05 currently calls for the flooding reevaluations to support an integrated assessment (total plant) which considers possible actions to improve flood protection and/or mitigation. The results from this integrated assessment are input to Phase 2 decision-making, including the need to address requirements for evaluating plant-specific backfits. However, the NRC staff is including a recommendation in the COMSECY for the Commission to affirm that regulatory requirements for mitigating strategies need to address the flooding scenarios from the reevaluations. The result of this recommended approach is more certain and timely implementation of safety enhancements to address reevaluated flooding hazards.

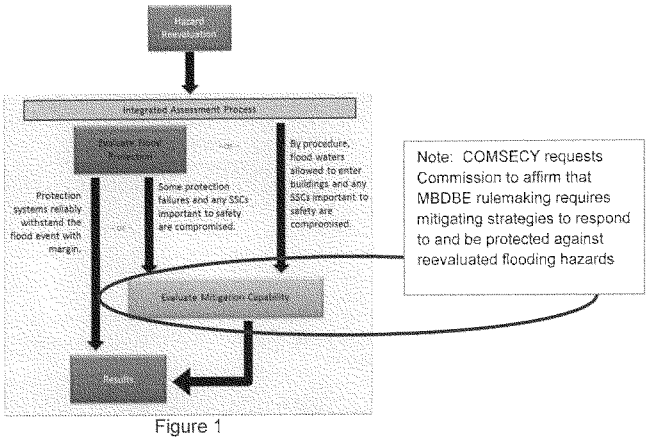

Figure 1

Action/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the discussion of Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern.

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9. *The draft COMSECY does not appropriately address the importance of understanding the capability of flood protection, cliff-edge effects, and whether there is a premature reliance on mitigating strategies for smaller and more frequent flooding events.*

Summary/Discussion

The authors of the non-concurrence provide a figure (Figure 2) to help describe the concept of cliff-edge effects and the possible implications of a range of flooding scenarios from various mechanisms (e.g., precipitation, dam failures). However, to reflect the approach described in the COMSECY, the figure would need to be revised to reflect that the requirements for mitigating strategies to include capabilities to address the reevaluated flooding hazards (Figure 3).

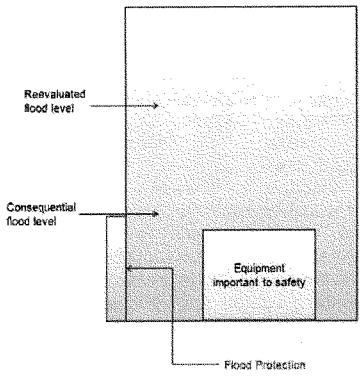

Figure 2
(re-created from NCP-2014-10)

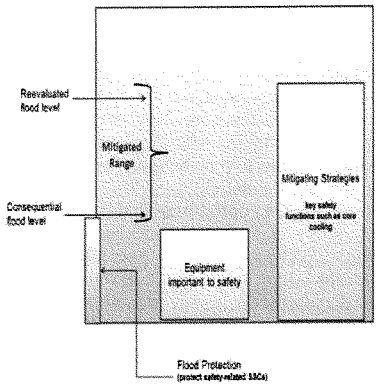

Figure 3

The NRC staff acknowledges that a variety of flooding scenarios exist and result in a range of possible conditions. These include floods protected against by existing flood protection measures to those up to the maximum reevaluated flood level. As previously discussed, the approach described in JLD-ISG-12-05 involves assessing the range of events but would require a separate regulatory action be taken to provide actual safety improvements. The approach recommended in the COMSECY involves including a regulatory requirement in the MBDBE rulemaking ensuring at a minimum that mitigating strategies address the various scenarios from reevaluating flooding hazards. The assessments of mitigating strategies equipment and actions would ensure protection against various flooding mechanisms and conditions identified from the flooding reevaluations. Mitigating strategies would therefore need to address scenarios that could range from slightly above the design-basis flood to significantly above the design-basis flood and depending on the site, scenarios involving different warning times, debris loads, and event durations. The range of conditions from the existing flood protection up to the revaluated flood level is addressed by the mitigating strategies (mitigated range in Figure 3). Plant-specific questions, if pursued, would be whether the range of events covered by mitigating strategies – using the acceptance criteria of providing key safety functions (e.g., preventing core damage) is reasonable or if a case could be made for increasing the flooding protection for all safety-related SSCs or some subset of equipment that is important to safety (e.g., normal electrical supplies). The evaluation of additional measures in accordance with established rules and procedures would consider factors such as:

- frequency of events within the mitigated range,
- likelihood of such events progressing to core damage, and
- success of possible protective actions (e.g., evacuations)

The same factors and process would be used to evaluate the results from the integrated assessments described in JLD-ISG-12-05 to determine if the NRC should consider additional flood protection or mitigation measures. In the approach where the MBDBE rule includes a requirement for mitigating strategies to address the reevaluated flooding hazards, the

recommendations in the COMSECY and those included in the non-concurrence would very likely result in the same regulatory outcome. Both approaches ultimately need to conform to the NRC's backfit regulation which ties information gathering and consideration of plant modifications to the likelihood that such actions will provide a substantial increase in overall protection, and the direct and indirect costs of implementation being justified. The distinction largely comes down to whether (1) NRC staff judgment using available information (e.g., from flooding reevaluations, mitigating strategies reviews and inspections, operating experience) is used to initiate further assessments, or (2) the process itself directs licensees to perform the integrated assessments as described in JLD-ISG-12-05 (recognizing the guidance includes the use of graded approaches and possible alternatives that would be based largely on expert judgment). In the approach where the MBDBE rule does not include a requirement for mitigating strategies to address the reevaluated flooding hazards, there is a real possibility (and perhaps a high likelihood) that the approach advocated in the non-concurrence would result in no regulatory requirements to address flood levels within the mitigated range shown in Figure 3. This possibility was a large factor in the NRC staff preparing the COMSECY and requesting Commission affirmation of the recommended positions described in the paper so that we are assured of meaningful results that will enhance safety for beyond-design-basis flooding events.

Actions/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern.

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10. *The COMSECY provides a vague description of strategies that licensees may employ under floods that "might result in significant damage to the nuclear power plant." The description provided in the COMSECY is not sufficiently explicit to inform the Commission and external stakeholders regarding the types of strategies that may be employed.*

Summary/Discussion

The NRC staff has had some discussions with the nuclear industry on efforts to expedite resolution of Recommendation 2.1 flooding activities and integrate flooding-related Phase 2 decisions and assessments into mitigating strategies. The industry described a possible approach that would ensure that the mitigating strategies implemented to satisfy Order EA-12-049 or new alternate strategies (termed targeted hazard mitigating strategy in a recent industry presentation) would be established to address the reevaluated flood hazards. From the industry's standpoint, the focus on mitigating strategies may be a cost-effective approach that optimizes ongoing post-Fukushima safety upgrades to the U.S. power reactor fleet. The planned approach reduces the level of information to be submitted by licensees, and the integrated assessments will focus on mitigating strategies instead of more varied enhancements that could be developed to protect against a range of flooding conditions. However, the NRC staff finds that the integration of the activities can provide the desired outcome in terms of meaningful and assured safety improvements. The recommended approach also provides benefits in terms of establishing regulatory clarity and stability, reducing demands on schedules and resources, and ensuring more timely responses to the lessons learned from the Fukushima accident.

The targeted strategy would be, by its nature, plant and scenario specific. Licensees would identify such targeted hazard mitigating strategies within the programs developed and implemented to satisfy regulatory requirements defined in the proposed MBDBE rulemaking. These would be subject to NRC reviews and inspections to provide the desired level of confidence that the targeted hazard mitigating strategies include the needed capabilities for cooling of fuel assemblies in reactor cores or spent fuel pools. The NRC staff is amenable to the concept of targeted hazard mitigating strategies given it is consistent with existing NRC regulations, staff-level guidance for mitigating strategies, and the expected level of protection to be required by the MBDBE rulemaking. The COMSECY mentions some of the possible actions identified in the non-concurrence (e.g., allowing flood waters to enter plant structures). The staff requested the Commission affirm this position because it is important for some licensees developing and implementing their mitigating strategies. The NRC staff revised the language slightly to address other stakeholder comments – and now highlight that the actions under these targeted strategies may include "unconventional measures."

Actions/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern. The plant- and scenario-specific targeted hazard mitigating strategies (including any unconventional measures) will be described in documents submitted by licensees in accordance with the reporting requirements in Order EA-12-049 and the pending MBDBE rulemaking.

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11. *As described in Sections 2.1 and 2.2, the proposed path forward for Recommendation 2.1 described in the COMSECY is no longer meeting the intent of Recommendation 2.1 and is not consistent with previous Commission and Congressional direction. Moreover, the proposed path forward (1) does not comport with the NRC's response to a recent report from the United States Government Accountability Office and (2) is not responsive to one of the key observations from a recent National Academies of Sciences report.*

Summary/Discussion

The NRC staff does not consider the requested Commission action or the resultant changes to staff-level guidance to contradict previous directions from the Commission or the language of Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011). The integration of the flooding reevaluations and mitigating strategies, if affirmed by the Commission, will result in changes to staff-level plans and guidance for various activities. The net result of the changes will, however, increase the efficiency and effectiveness of the NRC actions being taken to address the lessons learned from the Fukushima accident. In response to the non-concurrence, the NRC staff is requesting that the Commission approve the recommended integration of the subject activities similar to how the Commission has addressed previous requests by the staff to consolidate Fukushima-related items.

The NRC routinely provides information on the status of its activities to the GAO, Congress, and other organizations. The information related to flooding reevaluations in the referenced GAO report does not include detailed discussions of how we are conducting our related activities and program changes to address the recommendations in the COMSECY do not conflict with the overall message or NRC response. In any case, such reports are not intended to prevent the NRC from subsequently making appropriate changes to its regulatory programs.

In regard to the National Academy of Sciences (NAS) report, the NRC staff is currently preparing a response to the findings and recommendations in the report. However, Finding 3.1 in that report states:

> **FINDING 3.1:** The overarching lesson learned from the Fukushima Daiichi accident is that nuclear plant licensees and their regulators must actively seek out and act on new information about hazards that have the potential to affect the safety of nuclear plants. Specifically,
> 1. Licensees and their regulators must continually seek out new scientific information about nuclear plant hazards and methodologies for estimating their magnitudes, frequencies, and potential impacts.
> 2. Nuclear plant risk assessments must incorporate these new information and methodologies as they become available.
> 3. Plant operators and regulators must take *timely* actions to implement countermeasures when such new information results in substantial changes to risk profiles at nuclear plants.

A problem cited by the NAS was the inclination of both licensees and regulator to "call for more studies." So while the authors of the non-concurrence are correct to promote the seeking out of new information and insights, the benefits of such efforts are diminished when the information collection efforts delay timely regulatory actions. As noted in the NAS report, the accident at Fukushima might have been prevented if certain countermeasures had been pursued, including "Installing additional backup equipment at higher elevations on the plant site" (e.g., mitigating strategies). The NRC staff considered a variety of factors when developing the recommendations in the COMSECY in an effort to appropriately balance the desired safety improvements from regulatory actions and the related costs and schedules of the NRC efforts to address lessons learned from Fukushima, The recommendations in the COMSECY reflect the NRC staff's conclusion that the best overall results involve an appropriate compromise between information gathering and analysis and actual, timely regulatory actions to achieve safety improvements. The NRC staff request in the COMSECY that the Commission affirm that mitigating strategies should address reevaluated flooding hazards. This approach provides the most timely action to address the new hazard estimates.

Actions

The COMSECY has been revised to include a short discussion of the NRC staff's consideration of safety results, costs, schedules, and uncertainties in developing the recommendations. No changes were made to address this concern specifically by adding discussions of the GAO or NAS reports.

Conclusion

Beyond including a short discussion of balancing factors to develop the recommendations, no changes or delays in providing the paper to the Commission are needed

12. *Approximately parallel implementation processes are being used for seismic and flooding hazards under Recommendation 2.1. There are, of course, necessary adaptations to the processes to account to differences in the state of practice between the two hazards. The COMSECY proposes significant changes to the implementation process for flooding. It does not describe whether similar changes will be implemented for other external hazards. It remains unclear why, in light of recent operating experience, flooding hazards would be treated differently (and potentially less rigorously) that other external hazards.*

Summary/Discussion

The NRC staff recognizes that there are both similarities and differences between the ongoing evaluations of seismic and flooding hazards. The COMSECY acknowledges the need to also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations and related NRC activities. For example, the regulatory basis for the MBDBE rulemaking mentions the "expedited approach" being developed and implemented to address increased seismic hazards and its potential relevance to the rule. The NRC had incorporated risk insights and performance-based approaches into regulations and guidance for addressing seismic hazards before the Fukushima accident. The availability of such risk-informed approaches for addressing seismic hazards is a notable difference between seismic- and flooding-related activities. The staff has recently developed a Probabilistic Flood Hazard Assessment Research Plan (PFHARP), which is being developed to help resolve some of the issues mentioned in the COMSECY and in responses to concerns in this non-concurrence. The initial schedule for the PFHARP extends into 2019. If the Commission affirms the approach recommended in the COMSECY, the staff will immediately begin discussions internally and with external stakeholders on the applicability to and implications for seismic and other hazards. The NRC staff has already discussed the issue during meetings with the industry's Fukushima Steering Committee and the Advisory Committee for Reactor Safeguards. Information on future discussions will be provided to the Commission in routine status reports and briefings. If policy issues are identified, the staff will raise them to the Commission for consideration and resolution.

Actions/Conclusion

The COMSECY acknowledges that the NRC staff will have follow-up actions if the Commission provides the recommended affirmations related to the plans for mitigating strategies to address reevaluated flooding hazards. An assessment of the implications for seismic and other hazards is among the activities identified in the COMSECY. No changes or delays in providing the paper to the Commission are needed.

Proposed Approaches

The approach proposed by the authors of this non-concurrence recognizes that licensees may propose a variety of approaches to respond to the reevaluated flooding hazards. The list below describes the three high-level approaches licensees may choose as well as the proposed mechanisms for evaluation such the above three objectives are met:

1. *Use of flood protection: Licensees may propose to implement new flood protection (e.g., temporary flood protection measures such as portable berms or flood gates) to protect safety-related equipment under the reevaluated flooding hazard or may be able to justify the continued capability of existing protection under the reevaluated hazard (e.g., existing flood protection may be demonstrated to be capable of withstanding the larger hydrostatic and hydrodynamic loads associated with the reevaluated hazard). In such cases, the existing or proposed flood protection would be evaluated under the integrated assessment. The integrated assessment would not assess mitigation capability, if the flood protection is shown to be reliable with margin under the reevaluated hazard. However, in accordance with the proposed path forward on the pending mitigation of beyond design basis events (MBDBE) rulemaking, any necessary changes to mitigating strategies would be separately evaluated using NEI 12-06 (Ref. [23]), which (as described previously) provides a generally non-mechanistic assessment of strategies that is intended to ensure mitigating strategies provide additional defense in depth. This would ensure plants are appropriately protected for the reevaluated hazard (as demonstrated via the integrated assessment) and that mitigating strategies continue to provide additional defense in depth under the reevaluated flooding hazard (as demonstrated using the guidance in NEI 12-06).*
2. *Use of mitigation: A licensee may propose to rely on mitigation as the primary means to address the reevaluated hazard rather than use of protection. To avoid the potential for assessments of mitigating strategies using two different guidance documents (i.e., in accordance with NEI 12-06, as well as under the integrated assessment using JLD-ISG-2012-05), it is proposed that NRC prescribe the use of the flood-specific integrated assessment methodology rather than the more general NEI 12-06 guidance. This ensures that the strategies are assessed using a mechanistic and scenario-specific evaluation that is commensurate with the use of mitigating strategies as the primary means by which a licensee will respond to the specific plant conditions defined by the reevaluated flooding hazard (Section 2.8.2 provides additional information regarding differences between the guidance documents). Additionally, this would ensure sufficient information and insights (e.g., identification of whether mitigation is relied upon for less severe, more frequent events than those defined by the deterministic reevaluated hazard) are gathered to support a regulatory decision related to backfit in light of the reevaluated hazard, if necessary. In this case, assessment of mitigating strategies for flood events using NEI-12-06 would not be necessary in light of the integrated assessment that was performed under Recommendation 2.1.*
3. *Use of a combination of protection and mitigation: Licensees may propose to use protection for smaller, more frequent flooding events and transition to a mitigation-based approach for larger events. In this case, the integrated assessment guidance describes the appropriate, flood-specific evaluation process to address this "combination approach."*

Summary/Discussion

Previous discussions related to both the general and specific concerns expressed by the authors of the non-concurrence (in particular Concern 7) apply to the above-proposed approaches. The evaluation and development of the COMSECY needed to consider other

factors – not mentioned in the non-concurrence – to determine the best overall approach in terms of the safety improvements, costs, schedules, and project risks. Importantly, the approaches described above do not reflect the general intent of the recommendations in the COMSECY for improving the coordination of activities between mitigating strategies and flooding reevaluations. The NRC staff has requested Commission affirmation of requiring mitigating strategies to address reevaluated flooding hazards. This results in a more effective and efficient approach to ensure that plants have capabilities to address potential flooding events above the current design-basis floods. However, another intended outcome of the approach was improved coordination and integration of activities related to lessons learned from the Fukushima accident. Assuming the Commission affirms the approaches recommended in the COMSECY, the staff will use the resultant need to revise plans and guidance documents for mitigating strategies and flooding reevaluations as an opportunity to improve the coordination and integration of these activities.

Actions/Conclusions

No changes or delays in providing the paper to the Commission are needed beyond those previously discussed under the general and specific concerns raised in the non-concurrence.

Enclosure 4

COMSECY: Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards

Non-Concurrence NCP-2014-011

NON-CONCURRENCE PROCESS
COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP). http://nrcweb.nrc.gov.8600/policy/directives/catalog/md10.158.pdf.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- [ ] Concurred
- [x] Continued to non-concur
- [ ] Agreed with some of the changes to the subject document, but continued to non-concur
- [ ] Requested that the process be discontinued

  - [ ] The non-concurring employee(s) requested that the record be non-public.
  - [x] The non-concurring employee(s) requested that the record be public.

NRC FORM 757
NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: 2014 - 011

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT Integration of Mitigating Strategies for Beyond-Design-Basis External Events and Reevaluation of Flooding	ADAMS ACCESSION NO. ML 14238A616
DOCUMENT SIGNER Mark A Satorius	SIGNER TELEPHONE NO. 415-1700
TITLE Executive Director for Operations	ORGANIZATION OEDO
NAME OF NON-CONCURRING EMPLOYEE(S) Scott Flanders, Gary M Holahan, Glenn M Tracy	TELEPHONE NUMBER 415-1897
TITLE Director DSEA/NRO; Deputy Director NRO and Director NRO	ORGANIZATION NRO

☐ DOCUMENT AUTHOR ☐ DOCUMENT CONTRIBUTOR ☐ DOCUMENT REVIEWER ☑ ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR Michael R Johnson	
TITLE Deputy Executive Director for Reactor and Preparedness Prgms	ORGANIZATION OEDO

☐ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.

☑ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: ☑ PUBLIC ☐ NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)

The Commission paper at issue proposes to revise the current approach to addressing the post-Fukushima Daichi accident flooding Recommendations 2.1 and 4.2. Although the proposed changes appear to be within the Commission's authority and would, no doubt, lead to reduced resource expenditures for both the staff and industry, the question remains whether such changes constitute good safety and regulatory policy decisions.

As stated in the staff's Near-Term Task Force (NTTF) report, the collection of recommendations was intended to strengthen the NRC's defense-in-depth philosophy by enhancing each level of defense-in-depth where potential weaknesses were identified, namely:
- Recommendation 2 acknowledges that our understanding of the consequences from design-basis flood events has improved and calls for enhanced protection from design-basis floods and seismic events, where warranted.
- Recommendation 4 calls for enhanced mitigation, for both design-basis and beyond design-basis events.
- Recommendation 8 calls for enhanced severe accident mitigation capability, and
- Recommendation 9 calls for enhanced emergency preparedness.

These recommendations constitute a rational set of enhancements, strengthening defense-in-depth, with each recommendation having a specific nexus to the Fukushima Daichi accident. The Commission supported these recommendations, in whole or in part, through various mechanisms: Orders, rule-makings, or information demands.

The fundamental changes being proposed in the COMSECY are: 1) to limit staff and industry efforts on flooding to a confirmation that mitigation strategies can cope with the reevaluated flooding hazard; and 2) to eliminate the systematic re-consideration of any other external flooding protection. There are several consequences associated with such an action:
- First, the post-Fukushima recommendations would no longer constitute a full set of potential enhancements consistent with the Commission's defense-in-depth safety philosophy;

SIGNATURE XSM Holahan	DATE 11/10/14

NRC FORM 757 (09-2014) Use ADAMS Template NRC-006 (ML063120159)

- Second, a systematic evaluation of the total plant response to flooding, addressing both protection and mitigation would be curtailed. This would constitute a lost opportunity to identify potential plant vulnerabilities and to implement practical measures to protect key safety-related equipment from not only the reevaluated flood events, but also from less severe but more-likely flooding events that also exceed the current plant protections; and

- Third, a non-safety-related system or collection of systems, intended for beyond design-basis events (i.e. systems without quality controls or quality assurance requirements, without redundancy requirements, without Technical Specification controls, without an assessment of system reliability, and without Maintenance Rule controls), would be used to compensate for potential weaknesses in or even non-compliances with flooding design-basis protection requirements.

We support the paper's approach on one specific issue; namely, reaffirming the issue of flooding protection for mitigation equipment (i.e. using the 2.1 re-evaluated flooding levels in the 4.2 mitigation strategy), thereby adding to defense-in-depth, as intended by the Commission.

We cannot support the full "integration" of Recommendations 2.1 and 4.2 because of the adverse impact on the re-consideration of flooding protection, as intended under Recommendation 2.1. Protection of the normal, design-basis safety equipment used for decay heat removal (e.g. the first line of defense including: diesel generators, electrical distribution equipment, motor-driven auxiliary feedwater, service water and other support systems) is too important to not be given a thorough and systematic re-evaluation. Simply stated, we do not believe that mitigation is an appropriate substitute for protection. Both mitigation and protection are essential, but separate, elements of the Commission's defense-in-depth safety philosophy and should be treated as such.

NRC FORM 757 NRC MD 10.158 11-2014	U. S. NUCLEAR REGULATORY COMMISSION **NON-CONCURRENCE PROCESS**	NCP TRACKING NUMBER NCP-2014-011

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO
COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards	ML14238A616

NAME
n/a

TITLE	TELEPHONE NUMBER
n/a	

ORGANIZATION
n/a

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

Section B not requested/provided
for NCP-2014-011

SIGNATURE	DATE
n/a	n/a

NRC FORM 757 — U. S. NUCLEAR REGULATORY COMMISSION

NRC MD 10.158 (11-2014)

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2014-011

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards	ADAMS ACCESSION NO ML14238A646
NAME William D. Reckley	
TITLE Special Advisor for Policy	TELEPHONE NUMBER (301) 415-2400
ORGANIZATION Office of Nuclear Reactor Regulation Japan Lessons Learned Division	

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document)

See Attached

EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document)

See Attached

TYPED NAME OF NCP COORDINATOR William D. Reckley	TITLE Special Advisor for Policy
ORGANIZATION NRR/JLD	
SIGNATURE - NCP COORDINATOR Will Reckley	DATE 11/14/14
TYPED NAME OF NCP APPROVER William M. Dean	TITLE Director
ORGANIZATION Office of Nuclear Reactor Regulation	
SIGNATURE - NCP APPROVER WM Dean	DATE 11/16/14

NRC FORM 757 (11-2014) — Use ADAMS Template NRC-006 (ML063120159)

NRC FORM 757 NRC MD 10.158 (11-2014)	U. S. NUCLEAR REGULATORY COMMISSION **NON-CONCURRENCE PROCESS**	NCP TRACKING NUMBER NCP-2014-011
TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards		ADAMS ACCESSION NO ML14238A616

CONTINUATION OF SECTION A B ✓ C

See attached

Non-Concurrence Process Documentation

NCP-2014-011; Section C (Document Sponsor)

Summary of Issues

The authors of the non-concurrence provided the following description of concerns and preferred alternatives to the plans outlined in the subject COMSECY:

The Commission paper at issue proposes to revise the current approach to addressing the post-Fukushima Daiichi accident flooding Recommendations 2.1 and 4.2. Although the proposed changes appear to be within the Commission's authority and would, no doubt, lead to reduced resource expenditures for both the staff and industry, the question remains whether such changes constitute good safety and regulatory policy decisions.

As stated in the staff's Near-Term Task Force (NTTF) report, the collection of recommendations was intended to strengthen the NRC's defense-in-depth philosophy by enhancing each level of defense-in-depth where potential weaknesses were identified, namely:

- *Recommendation 2 acknowledges that our understanding of the consequences from design-basis flood events has improved and calls for enhanced protection (permanent or temporary) from design-basis floods and seismic events, where warranted.*
- *Recommendation 4 calls for enhanced mitigation, for both design-basis and beyond design-basis events.*
- *Recommendation 8 calls for enhanced severe accident mitigation capability, and*
- *Recommendation 9 calls for enhanced emergency preparedness.*

These recommendations constitute a rational set of enhancements, strengthening defense-in-depth, with each recommendation having a specific nexus to the Fukushima Daiichi accident. The Commission supported these recommendations, in whole or in part, through various mechanisms: Orders, rule-makings, or information demands.

The fundamental changes being proposed in the COMSECY are: 1) to limit staff and industry efforts on flooding to a confirmation that mitigation strategies can cope with the reevaluated flooding hazard; and 2) to eliminate the systematic re-consideration of any other external flooding protection. There are several consequences associated with such an action:

- First, the post-Fukushima recommendations would no longer constitute a full set of potential enhancements consistent with the Commission's defense-in-depth safety philosophy;

- Second, a systematic evaluation of the total plant response to flooding, addressing both protection and mitigation would be curtailed. This would constitute a lost opportunity to identify potential plant vulnerabilities and to

implement practical measures to protect key safety-related equipment from not only the reevaluated flood events, but also from less severe but more-likely flooding events that also exceed the current plant protections; and

- Third, a non-safety-related system or collection of systems, intended for beyond design-basis events (i.e. systems without quality controls or quality assurance requirements, without redundancy requirements, without Technical Specification controls, without an assessment of system reliability, and without Maintenance Rule controls), would be used to compensate for potential weaknesses in or even non-compliances with flooding design-basis protection requirements.

We support the paper's approach on one specific issue; namely, reaffirming the issue of flooding protection for mitigation equipment (i.e. using the 2.1 re-evaluated flooding levels in the 4.2 mitigation strategy), thereby adding to defense-in-depth, as intended by the Commission.

We cannot support the full "integration" of Recommendations 2.1 and 4.2 because of the adverse impact on the re-consideration of flooding protection, as intended under Recommendation 2.1. Protection of the normal, design-basis safety equipment used for decay heat removal (e.g. the first line of defense including: diesel generators, electrical distribution equipment, motor-driven auxiliary feedwater, service water and other support systems) is too important to not be given a serious, thorough, and systematic re-evaluation. Simply stated, we do not believe that mitigation is an appropriate substitute for protection. Both mitigation and protection are essential, but separate, elements of the Commission's defense-in-depth safety philosophy and should be treated as such.

Summary/Discussion

The COMSECY describes an approach involving two basic uses of information related to the reevaluated flooding hazards. The first is to ensure that mitigating strategies being developed and implemented in accordance with Order EA-12-049 and the followup mitigation of beyond design basis events (MBDBE) rulemaking can address the reevaluated hazard. This approach ensures that licensees are required to implement mitigating strategies to address the range of postulated flooding events from the flooding-related hazard reevaluations. The COMSECY requests that the Commission affirm this requirement is needed to provide reasonable assurance of adequate protection of public health and safety. A Commission decision to affirm the position recommended by the staff would increase confidence that this specific regulatory requirement would be imposed and implemented. The authors of the non-concurrence state they favor establishing the requirement for mitigating strategies as recommended in the COMSECY.

The COMSECY also discusses how the staff may consider the need for flooding protection or mitigation beyond that provided by mitigating strategies. NRC staff decisions to evaluate further actions would be based on insights from the flooding reevaluations, previous plant inspections, overall integrated plans for mitigating strategies, and other available information as part of an assessment of each plant's capabilities to address reevaluated flooding hazards. The non-concurrence, therefore, overstates the degree to which the COMSECY proposes to "eliminate the systematic reconsideration of any other external flooding protection." The COMSECY does, however, propose that the staff makes an informed decision on the amount of plant-level

analyses requested from licensees and subsequently reviewed by the NRC staff. Further information gathering, assessments and consideration of potential regulatory actions could be pursued unless proposed backfits are not likely to provide a substantial increase in overall protection, or the direct and indirect costs of implementation are not likely to be justified. The imposition of requirements for licensees to have mitigating strategies to address the reevaluated flooding hazard will reduce the likelihood of additional flood protection providing a substantial increase in overall protection. The COMSECY describes an appropriate approach considering various factors to determine if further assessment by the staff is warranted. The staff would undertake further assessments as part of the established processes to initiate and evaluate potential plant specific backfits. The statement in the non-concurrence implying that the NRC staff is not approaching these decisions in a serious or thorough manner is not an accurate description of the plan or the manner in which the staff routinely approaches its responsibilities to fulfill the mission of the agency.

The COMSECY describes the staff's plans to provide real and timely safety improvements by requiring that mitigating strategies include capabilities to address reevaluated flooding hazards. While giving support to that approach, the non-concurrence does not mention the inter-relationships between the ongoing activities and how current and anticipated additional delays in the flooding hazard reevaluations jeopardize the ability to make timely and meaningful safety improvements. The experience of the staff with information collection activities undertaken without well-defined regulatory decision-making criteria is that they often become long-term research projects, and the outcomes are highly uncertain in terms of achieving a change in NRC requirements. In the case of flooding reevaluations, the Probabilistic Flood Hazard Assessment Research Plan (PFHARP) describes the large uncertainties and difficulties expected in using the integrated assessments within established regulatory processes. These uncertainties in analytical approaches and subsequent NRC decision-making are evident in current delays in licensees responding and NRC staff reviewing the first stage of information being provided on flooding reevaluations. As noted in SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," the NRC staff's goal is to complete Phase 1 and collect sufficient information to make a regulatory decision for most plants within 5 years. This goal does not seem achievable without making the adjustments proposed in the COMSECY. The approach described in the COMSECY defines a clear use for the information on flooding reevaluations - a test for mitigating strategies - and therefore allows licensees and NRC staff to make more informed decisions regarding the balancing of analyzing flooding hazards and instituting timely safety enhancements. The NRC staff has discussed these inter-relationships with the industry during several public meetings. The Nuclear Energy Institute documented in a letter dated November 4, 2014, their view that integration of the activities would better support moving forward on resolving the lessons learned from the Fukushima accident. A thorough evaluation of possible approaches needs to consider the possible costs of substantial information gathering efforts; not only in terms of resources and schedule but also in potentially leading to a less effective regulatory response.

The non-concurrence uses a defense-in-depth rationale for proposing further information collection and presumably as a future justification for requiring plant-specific modifications. While the near-term task force report discussed such an approach, the Commission did not adopt these changes to NRC rules, policy or guidance documents. In fact, the Commission specifically directed in the staff requirements memorandum for SECY-13-0132, "U.S. Nuclear Regulatory Commission Staff Recommendation for the Disposition of Recommendation 1 of the Near-Term Task Force Report," that the staff explore clarifying expectations for defense in depth outside the scope of NRC's post-Fukushima actions. The staff will therefore continue to

consider plant-specific backfits using established guidance (e.g., MD 8.4, "Management of Facility-Specific Backfitting and Information Collection") which assesses overall protection without being prescriptive in terms of how to address prevention, protection, and mitigation. It is worth noting that even existing guidance (JLD-ISG-12-05) and future plans (PFHARP) prepared for flooding reevaluations provide for crediting mitigation as an alternative to improving flood protection features and do not seem to go as far as the statements in the non-concurrence that imply the need to provide both protection and mitigation against the reevaluated flooding hazards. The proposal in the non-concurrence reflects a rational and understandable approach to defense in depth and is generally consistent with design standards published by the International Atomic Energy Agency (IAEA) and some other regulatory bodies for siting and designing new nuclear power plants. The approach is, however, inconsistent with the NRC's policies and procedures for addressing safety concerns for operating nuclear power plants. As discussed in the COMSECY, the NRC has adopted risk-informed and performance-based approaches to addressing operating reactor issues over the past several decades. The NRC staff will reassess the approach described in the COMSECY if the Commission decides not to affirm the recommendations or if the Commission decides to use this opportunity to instruct the staff to deviate from established rules and related guidance regarding resolution of safety concerns for operating nuclear power plants.

The non-concurrence also does not accurately reflect the expected requirements for the mitigating strategies in terms of programmatic controls. The description of mitigating strategies as not being safety-related equipment could likewise apply to fire protection, station blackout, equipment for loss of large areas due to fire or explosions, and any number of other risk-significant regulatory actions taken by the NRC following the initial design and construction of operating nuclear power plants. The existing guidance for Order EA-12-049 as well as the expected requirements in the MBDBE rule and associated guidance address programmatic controls for quality assurance, testing, maintenance, procedures, and other measures to ensure mitigating strategies provide reliable protection against beyond-design-basis events. In addition, much of the physical equipment relied upon for mitigating strategies consists of existing structures, systems and components (SSCs) classified as safety-related. These SSCs, such as turbine-driven auxiliary feedwater pumps and direct current (dc) power systems, are governed by technical specifications, quality assurance requirements, and the maintenance rule in addition to the requirements imposed by the Order and pending rulemaking. The non-concurrence would seem to not only challenge the staff's plans for mitigating strategies but also call into question the last several decades of NRC's use of risk-informed and performance-based approaches to address safety issues for operating plants. The implied confidence in traditional approaches for flood protection articulated in the non-concurrence would also seem to contradict the statements in the PFHARP regarding the need for research into the feasibility and reliability of flood protection features. As a general matter, it would seem advisable to await the results of the research project before drawing conclusions on particular remedies or decision-making criteria for possible regulatory requirements beyond the approach described in the COMSECY. The COMSECY explains the staff's plans to define a requirement for licensees to address the reevaluated flooding hazards using mitigating strategies and also deciding in a systematic approach for each plant whether additional information should be sought to support evaluating potential plant-specific backfits.

Action/Conclusion

The COMSECY was changed to address comments and reflect interactions with the authors of the non-concurrence prior to the filing of NCP-2014-011 (e.g., describing the proposed approach as "integration of Recommendation 2.1 assessments and decision-making into mitigating strategies" and clarifying the discussions on considering plant-specific backfits). Additional changes were made following the filing of NCP-2014-011 to further explain some of the concerns prompting the NRC staff to prepare the COMSECY. These changes include additional discussions on the possible adverse impact on achieving timely and meaningful safety improvements caused by delays in the resolution of flooding hazard reevaluations. No further changes or delays in providing the paper to the Commission are needed

Senator BARRASSO. Thank you, Madam Chair. I appreciate the opportunity for this hearing today.

The Nuclear Regulatory Commission is vital to ensuring nuclear safety. I think it is important for this committee to ensure that their mission is effectively carried out.

I have concerns that our mission of oversight is being thrown out the window in the name of political expediency, thrown out by the actions of those who seek to turn the Nuclear Regulatory Commission into a political prize rather than a sacred trust.

This is nothing new. Once again, in the name of short-term gain, the majority has broken the rules of this committee to further the goals of partisanship. Since Fukushima, this committee has held numerous hearings with the full Commission. Many on this committee fought hard to see that the Commission functions as it should.

However, the Majority Leader chose to push a former one of his staffers to serve on the Commission and then become its chairman. This was an unmitigated disaster. His deeds are well documented by the NRC Inspector General and this committee.

In the interim, this Administration, along with the Majority Leader, has pushed to eliminate other very qualified members of the NRC and replaced them with less qualified individuals. We have lost good, seasoned commissioners like Commissioner Apostolakis and William Magwood.

In return, the current majority has unilaterally passed Commissioner Baran without one Republican vote and no hearing for this longer term to fill the remainder of Ms. Macfarlane's term.

As mentioned before, it is against committee precedent to not have a hearing on a nominee, so it appears that the current majority is trying to chip away at the NRC brick by brick until all that is left are those who do as they are told. This is not good for public safety.

Commissioner Svinicki, the Nuclear Regulatory Commission has taken a number of actions post-Fukushima to improve public safety on our nuclear fleet. Can you go into detail as to what the Commission has achieved and learned post-Fukushima?

Ms. SVINICKI. The NRC has engaged on a number of different issues. Chairman Macfarlane's written testimony describes those in detail.

In the interest of time, I would highlight the immediate orders issued to require mitigating strategies for more extreme natural events at nuclear power plants. When you visit a nuclear power plant in the United States today, you will see that they have additional pumps and emergency equipment with unified quick connections so that it can be used against a whole different range of events.

That is a significant achievement that you can go and visibly see at power plants. We continue to work on an integrated set of rulemakings and other response measures that will take some time to put in place. We are in a very active implementation phase at nuclear power plants and regulated sites now.

Senator BARRASSO. Does anyone else have anything they want to add to this?

Mr. OSTENDORFF. Senator, I would like to add to Commissioner's Svinicki's response.

I am very proud of the actions that we have required as an agency. Commissioner Svinicki and I have been here on the Commission since Fukushima. I believe we have taken a thoughtful approach based on science, engineering and risk principles to ensure that the right thing is being done in the proper sequence. I think they have been done so far.

This is not easy and it is taking some time, but I think the actions taken by the NRC and the industry have been appropriate to the issue.

Senator BARRASSO. Thank you.

Ms. MACFARLANE. Senator, I want everyone to understand right now that plants have acquired a lot of extra equipment. I have been to many of them and seen it myself. I think some of my other fellow commissioners have as well.

If an accident was to befall a plant now, they are significantly better prepared to handle it than they were in the past.

Senator BARRASSO. Commissioner Svinicki, could you explain your perspective on additional things that still need to be done post-Fukushima?

Ms. SVINICKI. There are a number of the Near-Term Task Force recommendations that are still under analysis and review.

As Commissioner Ostendorff mentioned, NRC has taken a stepwise approach, first, of necessity because some of our experts need to be working on higher safety priority items right now, but also because we do not want to diminish the effectiveness of measures already in place by taking subsequent actions.

We want to be certain that this enhancement and the ability to respond that Chairman Macfarlane talked about is something we can continue to capture all the benefits of as we move forward on subsequent items.

Senator BARRASSO. Chairman Macfarlane, given all the NRC has been asked to do post-Fukushima, are we losing some perspective on everything else the Commission is tasked to do?

For example, as you know, Wyoming has an abundance of uranium. Given all of the work that has been devoted to post-Fukushima activities, do you believe the NRC has the staffing and the resources available to process all the new uranium applications and permits for other activities the NRC needs to approve as well?

Ms. MACFARLANE. We do have the appropriate staffing to handle all the uranium recovery license applications, license renewals and extensions that we have received. I want to assure you of that.

We have not lost sight of the mission of safety and security at nuclear plants given all the extra Fukushima work. We have been working very closely with industry to ensure that they have not lost sight of that as well as they try to meet some of these new requirements.

Senator BARRASSO. Thank you.

Thank you, Madam Chairman.

Senator BOXER. Thank you so much.

I am going to place in the record a comparison of Commissioner Svinicki's and Commissioner Baran's experience. What you will

find is it is identical. I never heard one word from a Republican against Commissioner Svinicki.

[The referenced information follows:]

Jeffery Baran and Kristine Svinicki- experience

NEI has questioned whether nominee for NRC Jeffery Baran has sufficient relevant experience. A comparison of his experience to that of current Commissioner Kristine Svinicki's at the time of her 2007 nomination shows that Mr. Baran has at least equivalent and arguably more relevant experience than Ms Svinicki did. NEI raised no similar concerns with the Svinicki nomination.

Education:
Svinicki: B.Eng. in nuclear engineering, University of Michigan, 1988 (19 years before being nominated)

Baran: B.A. and M.A. in political science, 1998 (16 years before being nominated), J.D. from Harvard 2001, admitted to Illinois and DC bar

Hill experience:
Svinicki: 1997-2001, DOE detailee to Senator Craig, 2001-05, Senior Policy Advisor to Senator Craig, 2005-08 Professional Staff on SASC staff responsible for defense S&T programs, and for the atomic energy defense activities of DOE, no nuclear power or NRC responsibility. Traveled to several foreign and U.S.-based uranium enrichment /reprocessing facilities, no recorded trips to U.S. nuclear reactors (using a search of publicly available documents).

Baran: 2003-2008, House OGR counsel. 2009-present, Counsel, Senior Counsel and then Staff Director for Energy & Environment, responsibility for a range of energy and environmental issues, including civilian nuclear energy. Primary responsibility for NRC, including being lead staffer on 13 hearings related to NRC matters, including NRC budget, nuclear waste, Fukushima & reactor safety. Reached bipartisan agreement on grid security, grid reliability, and drilling safety legislation passed by the House and hydropower, energy efficiency, pipeline safety, and medical radiological isotope bills signed into law. Visited Calvert Cliffs nuclear power plant in 2014.

Other experience:
Svinicki: 1990-1997 nuclear engineer at DOE in DC and Idaho. 1989-90, energy engineer with the Wisconsin Public Service Commission.

Baran: Two years as a Judicial Law Clerk, Judge Lesley Wells, Cleveland, OH

Senator BOXER. As a matter of fact, not one Democrat ever criticized her experience even though she worked for Senators Craig and John Warner. In her work, she had nothing to do with civilian nuclear energy whereas Mr. Baran worked for Congressman Waxman with direct oversight of civilian nuclear energy.

This outrage over appointing commissioners who worked as congressional staffers is worse than ringing hollow. It is really ridiculous when, in fact, not one Republican ever complained, nor one Democrat, about Commissioner Svinicki's background.

As a matter of fact, I well remember how happy I was for Senators Warner and Craig because they were smiling from ear to ear.

With that, I turn to Senator Whitehouse.

Senator WHITEHOUSE. Thank you.

Let me ask this question to the members who will be continuing on because this is a forward looking question.

We have a massive carbon pollution problem in this world. If anyone needs a reference, look no further than today's AP CBS news story, "Hotter, Weirder, How Climate Change Has Changed Earth."

Nuclear power does not contribute to carbon pollution, and there are new technologies out there, some actually not so new, but they just have not been deployed in the civilian electric power fleet.

We have small modular reactors. The U.S. Navy has been running submarines and carriers off that kind of reactor safely for decades, yet it has never transitioned into the electric fleet.

Traveling wave is a technology developed in the United States of America that has the potential at least to turn nuclear waste into electric power. The Chinese are now developing traveling wave reactors. We are not.

Thorium was developed as a reactor back in I want to say the 1970s on an experimental basis in the United States. That initiative collapsed. The Chinese and the Indians are now building thorium reactors, again a U.S.-based technology.

Over and over again, what I hear is that an American industry that wants to go into these strategies and explore them has essentially a regulatory black box at the NRC. It has no idea when it walks into those woods, how long the path will be, how winding it will be, or what lurks there in the dark.

The position of the NRC has been very reactive about this. You bring it to us, and we will take a look as opposed to looking at this as a significant threat, the carbon pollution problem as a grave problem, and the nuclear solution as a potential solution.

I am not suggesting for a minute that anyone should step back on being completely safety oriented, but I do think that a clearer way in the future of engaging with the industry to let them know what they have to look forward to is necessary.

If you are planning to enter this business on a business basis, huge question marks in the business plan are disabling, even if the actual answer, if you could open the box, is it is not that bad, because they simply cannot take the risk to find out. You have to be able to walk them through it in advance.

I don't know why on earth the technology that drives our subs and our carriers has never been able to make it into the civilian

fleet. I don't know why on earth the Chinese have to be developing thorium and traveling wave technologies.

In the case of thorium, we have actually built and run them in this country but have never turned it into a viable technology.

To now see the Chinese and the Indians out there doing it again, using our technology, it is very frustrating, particularly when you see this as an alternative to the coal fleet which is doing such immense damage to our country and to our world.

I would ask Commissioners Baran, Svinicki, Ostendorff and Burns to respond briefly.

Mr. BARAN. Senator, I completely agree that it is NRC's responsibility to have an efficient and effective licensing process for small modular reactors and other reactor designs that may be coming in future years.

As Chairman Macfarlane mentioned, I think the earliest applications we are likely to see for a small modular reactor is in 2016, the new scale application.

The Commission just last month had a public meeting, like a hearing, with NRC staff and outside stakeholders to look at these very questions. My impression is, and it seems pretty clear to me, that the NRC staff is focused and engaged on this.

They are thinking through in advance what the tough issues, technical issues and policy issues are that have to be though through in advance, whether it is control room staffing, security, emergency preparedness, annual fees or the range of issues where the answers might be different for a small modular reactor or an advanced design than for our traditional larger, light water reactors.

That is happening. Information and papers are being prepared. There may be some questions that come up to the Commission as policy matters but my sense is the staff has been quite proactive on this.

Senator WHITEHOUSE. Commissioner Svinicki.

Ms. SVINICKI. Your reaction to the Indian and Chinese programs was similar to mine. At the invitation of the U.S. State Department, I have had the opportunity to travel to both of those countries.

Even knowing the level of activity in advance, it was hard not to be a bit overwhelmed at the level of activity and investment those countries are making in advanced reactors.

I would say since my service on the Commission began in 2008, I have monitored the NRC activity in this area. I think it has been commensurate with the amount of industry interest in the United States. It has been scalable to that.

Also, our extent of pre-application engagement where we meet with vendors in advance of their finalizing their design has really been somewhat unprecedented. You said there is the regulatory uncertainty question mark. We are really working to try to fill that in so we can get high quality applications.

Senator WHITEHOUSE. Commissioner Ostendorff.

Mr. OSTENDORFF. My background is in nuclear submarines. I spent 16 years in sea duty on six different submarines driving reactors that were not too far different from the size we are talking about here.

Senator WHITEHOUSE. So you can appreciate the question.

Mr. OSTENDORFF. Yes, sir.

I have been at the Commission four and a half years. I have seen us, even in the wake of Fukushima, go through the design certification approval for Westinghouse's AP–1000 design cert, including licensing reactors to be built in South Carolina and Georgia.

I have seen us recently approve GE-Hitachi's economic simplified boiling water reactor, ESBWR, and design certification.

Along with Commissioners Svinicki and Baran, I think we are ready for the SMRPs. I am very optimistic that we can deal with this from a regulatory standpoint.

Senator WHITEHOUSE. Commissioner Burns, you have the last 10 seconds.

Mr. BURNS. I agree with much of what my colleagues are saying. Over the last couple of years, part of my duties at the Nuclear Energy Agency in Paris was to provide support of the Generation IV Forum and Framework Agreement. There is a lot of work being done there.

As Commissioner Svinicki said, my experience has been that being able to at least stepwise able to engage those who may be interested in the new technologies is what is important.

For example, the generation of the small modular reactors that often are still current generation, probably the process is a little clearer but we need to make sure we are adept and ready for looking at the advanced technologies in terms of the framework.

Senator WHITEHOUSE. My time is up.

Senator BOXER. I am sorry. I think that question is so important and I appreciate it.

Senator Gillibrand, just so we know, the vote is about to start. Ask your questions and then I will stay and ask all of mine. Then the panel will be relieved to know they can go. The other panel will take a walk around the block and we will get back as soon as we can because I really want to talk about Diablo and hear from the people out there.

Senator Gillibrand.

Senator GILLIBRAND. Thank you all for being here. I am very grateful for your testimony and your participation.

I have three questions. I will ask them all and whoever wants to answer them can answer them.

The first is about emergency planning in an evacuation zone. We have Indian Point, as you know, where 17 million people live within 50 miles of a nuclear power plant.

You are familiar with the geography of New York. You know that in the event of an evacuation of New York City, the only options are north or west which means you would have a large number of people evacuating toward Indian Point.

Since Fukushima, the FERC recommended that Americans who live in a 50-mile radius be evacuated. That sends a very mixed message for preparedness.

My question is, has the NRC taken any steps to work with FEMA and other Government agencies to develop an emergency plan that encompasses the shadow evacuation zones? That is my first area of inquiry.

My second is about cyber security. Last year, the Department of Homeland Security and the Industrial Control Systems Cyber Emergency Response Team responded to well over 200 cyber-related incidents with the majority taking place in the energy sector. This represents nearly a doubling of the recent yearly caseload.

While these incidents have yet to cause a major disruption, the possibility of cyber-related terrorism is obviously a threat.

The question I have is how is the NRC working with utilities to address the threat, and are you seeing the same obstacles in the energy sector with regard to cyber incidents that other sectors are actually facing, whether it is the need for capital improvements, better information sharing between the industry and appropriate regulators and better training? Are those necessary?

The third and final question is about seismic activity and seismic concerns because New York actually is on a fault line. In November, NRC announced it is requiring Indian Point to conduct a high level earthquake risk report for both Units 2 and 3, a requirement for plants in the higher seismic risk category. This report must be completed by June 2017.

Do you think that more than two and a half years is an appropriate timeline to complete this study for the plant with recent documented aging infrastructure and its proximity to 17 million people and the high risk?

Once the risk evaluation is complete, when would you suggest any action to address be implemented?

There are three questions and whoever thinks they have the most expertise, I would appreciate your response.

Ms. MACFARLANE. Let me try to run through a couple of those. Let me take your last question first, your seismic activity question.

I think two and a half years is probably reasonable. There aren't a lot of seismic experts in the country. These seismic performance assessments take a long time to do, and we want to make sure that they are done properly and thoroughly.

In the interim, we have required plants that have qualified to do this extra analysis, this extra evaluation, to ensure that they have safety systems in place. We are going to be inspecting them for that.

They have given us their plans on that, they will by the end of this year and we will be inspecting them.

Let me also say that with regards to Indian Point, we put them in our first priority category to move out on this. They asked to be taken out of that first priority category. We refused.

In terms of emergency planning, emergency preparedness, we do closely coordinate with FEMA on this. We do have extensive regulations. We are actually in the process of strengthening our regulations on emergency preparedness based on what happened in Fukushima. We do conduct regular drills and exercises with the State and local officials.

Senator GILLIBRAND. Do you have a written plan that I can see because I just know the experience from Super Storm Sandy. If we had had to evacuate, we would not have been able to because most of the roads in that region were closed because of downed power lines, because of downed trees, so we had days when people could

not actually use the roads to get their families to school or to work throughout Westchester County.

Ms. MACFARLANE. I completely understand and empathize with your concerns on this issue. I think you are right on track to be concerned about this. We are looking at this and we will get you that information.

Senator GILLIBRAND. I definitely want to see updated reports. Also, the confluence of factors during Super Storm Sandy was very concerning. We had swells up to, I think it was 10 feet. I think our clearance was 12 feet. It was something very close. It was very close, so a storm with a little more strength, a little more flooding, a little more rain would have perhaps overwhelmed the plant.

Ms. MACFARLANE. Right, and we are looking at that too.

Senator GILLIBRAND. We only had a second generator, only one backup. Again, if you look at Fukushima as an example of all the things that can go wrong that you cannot possibly imagine could go wrong, I was beginning to see it during Super Storm Sandy.

If it was 2 more feet, if it flooded the second generator, you could see it happening. I saw all the trees and powerlines down and there would be no evacuation availability.

Ms. MACFARLANE. You are right to be concerned about these issues. We are, too, and we are taking our lessons from Fukushima and Super Storm Sandy and ensuring that there are flood hazard analyses being redone for Indian Point and for other plants as well. Be assured we are on top of this.

In terms of cyber security, yes, this is a threat that is constantly changing. I think we have been way ahead of the game on this one. We required regulations on cyber security for our nuclear power plant licensees in 2009. We are working on that.

I will ask Commissioner Ostendorff to say something more on that issue. He is an expert on that one.

Mr. OSTENDORFF. I am not an expert, but I have had some experience in this from other jobs.

I will just tell you that we agree with you, Senator, that cyber is a key area of concern. We take it very seriously.

As the Chairman noted, the NRC put out a rule in 2009 requiring our nuclear power plants to comply with certain cyber requirements. We meet as a commission frequently with the Department of Homeland Security CERT group on critical infrastructure concerns as well as the FBI and the National Security Agency.

For the sake of time, I will just tell you that in a couple of our meetings with DHS, the experts they have on industrial control systems for critical infrastructure commented very favorably on the regulations we have in place.

Senator GILLIBRAND. Thank you.

Senator BOXER. Thank you, Senator Gillibrand.

I hope the rest of you can answer her in writing because she hit on something that also impacts my people. I remember when I went to visit the San Onofre plant, which is now shut down, millions of people live within 50 miles, similar to your situation.

I asked the sheriff what happens in case of an emergency here at the plant. She sort of laughed in a sad way and pointed to the freeway and said, that is our answer. In a regular day, you are backed up.

It is a huge issue because a lot of the time these plants are quite old. I don't know how old your plant is. It must be quite old and the population was much smaller. Then you discover these new earthquake faults or tsunami zones or climate change, the different kinds of impact.

I think you are on to something critical which is the emergency preparedness has to be more front and center given the fact we are going into these extreme weather events that shock us. I thank you very much.

I would say to the panel that the first vote has started. I am going to stay here as long as I can and finish my questioning. If anyone wants to come back, they should go vote now and come back. If not, we will recess until we finish all five votes. Hang around here but you can take at least a half-hour, the second panel.

Madam Chairman, when you talked about your tenure, you said, significant progress in post-Fukushima safety. I guess that goes to the issue of beauty is in the eye of the beholder because I look at the NRC's Near-Term Task Force, made up of senior staff, who represented together 135 years of experience and made just 12 recommendations to address Fukushima lessons learned.

They did that in July 2011. They put out their 12 recommendations. July 2012 passed, July 2013 passed, July 2014 passed and there isn't one of these that is in place, not a single one.

We have a chart just in case. I don't want you to say I don't agree with you because you can't not agree because here are the facts. None of them are in place, so how you can say you are proud of what you did?

I know you did a lot of other things that are good but how you can say you are proud that you helped us post-Fukushima is beyond my belief and understanding. I guess we would have to sit and talk for a long time for me to figure it out.

I am a person who believes there are benchmarks, you lay them out and you meet them. If I have to visit so many counties by such and such a time, I commit to do it, I do it or I fail.

Here it is and not one of them has been implemented by the industry. At the same time while this is going on, the NRC has apparently joined with Russia to block a reactor safety proposal overseas that would require existing reactors to be retrofitted to prevent accidents caused by severe earthquakes or other natural hazards.

Again, I am sure you are proud of your work. I am sure there are things you could point to but for me, sitting in a State that now has one plant left and one plant closed because, in my opinion, there was lax oversight, the problem they faced could have been prevented.

Be that as it may, why haven't these been done and why did you join with this Russian idea that we shouldn't move forward? Do you want to answer that?

Ms. MACFARLANE. Let me answer your question about what I think you are talking about here. The proposal you referred to in terms of Russia is the proposed amendment to the Convention on Nuclear Safety.

Let me state up front that we work closely with our European counterparts, and we collaborate with them a lot over Fukushima changes that we are all doing. We have been collaborating extensively with them.

Our view on the proposed amendment to the Convention on Nuclear Safety is that we are already meeting the essence of that amendment in other ways. Opening an amendment to the Convention on Nuclear Safety is a difficult, long, time consuming process and it may actually damage global nuclear safety.

Senator BOXER. I have to ask you. It will damage nuclear safety to require existing reactors to be retrofitted to prevent accidents caused by severe earthquakes or other natural hazards. That is your quote. It would be damaging to safety. I don't understand you.

Ms. MACFARLANE. I want to be clear about what I said. What I said was that amending the Convention on Nuclear Safety is a very difficult, long-term, time consuming process.

Senator BOXER. Just give me a yes or no. The Russian proposal opposes that reactors be retrofitted to protect against natural hazards and you oppose that? Will you support that?

Ms. MACFARLANE. That is not what the Russian proposal proposes. The Russians are saying they do not want to amend the amendment language.

Senator BOXER. Right, to make it stronger.

Ms. MACFARLANE. No, they simply are saying they do not want to amend the amendment language. We are heavily involved in working with the State Department who has the lead on the negotiations on this issue of whether to amend the Convention on Nuclear Safety.

Senator BOXER. You are on your way out the door and happily, I think, for you because I think you are happy. You are proud of what you did, and I am glad that you are proud of what you did.

I have to say you teamed up with Russia, that is the story, to block a reactor safety proposal overseas that would require existing reactors to be retrofitted to prevent accidents caused by severe earthquakes. That is just the fact and it is disturbing to me that we are teaming up with Russia on this. It just is disturbing given Russia's record.

I have a question and I am going ask each of you to answer. Think this through before you answer it. It is not a trick question, it is pretty straightforward, but I want you to think it through.

Do you believe that reactor operators are required to comply with their operating licenses? Do you believe that reactor operators are required to comply with their operating licenses? Mr. Baran.

Mr. BARAN. Yes.

Senator BOXER. Ms. Svinicki.

Ms. SVINICKI. This is the license issued to each operator?

Senator BOXER. Yes.

Ms. SVINICKI. Yes.

Ms. MACFARLANE. Yes, we require reactor operators to comply with their licenses.

Senator BOXER. Yes?

Mr. OSTENDORFF. Yes.

Mr. BURNS. Yes.

Senator BOXER. Excellent. Despite your answers, the Commission has allowed California's Diablo Canyon nuclear power plant to continue to operate even though it is out of compliance with the seismic safety terms of its license.

NRC also declined to act when its own senior inspector said that the plant should be shut down until it could be shown that it was in compliance with its license. Can you confirm that Diablo Canyon is operating without a license that accounts for the new seismic faults? I ask that question. Mr. Baran.

Mr. BARAN. I think the answer is somewhat complicated because there was a very complicated licensing history for Diablo Canyon. I think there are two questions. One is safety and one is compliance.

On the safety side, the NRC staff has looked at it, done an independent review of the data and they have concluded it is safe to operate the plant.

The second question, which is more of what you are getting at, is how they in compliance with their license. Right now, the staff is looking at whether a license amendment would be necessary.

Senator BOXER. It is not in dispute that PG&E is out of compliance with its license. That is why PG&E asked NRC for a license amendment and then it withdrew. Does anyone disagree with that? It is not in dispute that PG&E is out of compliance with its license.

Ms. MACFARLANE. I think you are referring to the license amendment request they withdrew with regard to the seismic hazard analysis?

Senator BOXER. Yes, right.

Ms. MACFARLANE. The reason they withdrew that is that we provided guidance when we required them, after Fukushima, to do a new seismic hazard reevaluation. That is why they withdrew that license amendment request.

Senator BOXER. Madam Chairman, can you confirm that Diablo Canyon is operating without a license that accounts for the new seismic faults? The NRC never approved a new request.

Ms. MACFARLANE. They are in compliance with their license and we consider them safe to operate until we see new information that tells us otherwise. If we find new information that suggests they are not safe to operate, we will shut them down. Of course that is what we would do with any nuclear power plant.

Senator BOXER. Does their current license cover the new information discovered on the earthquake faults? Does their current license cover that?

Ms. MACFARLANE. This is a very complex issue.

Senator BOXER. Let me give you my opinion as someone who has been in politics a long time. I always tell my constituents when someone says this is complicated, they really don't want to answer it.

I am telling you we have information, you know that very well, of new seismic problems there. The license doesn't match that. They need to upgrade their facility. Your own senior inspector said it. Why don't you listen to your own senior inspector, can you answer that question, who says they ought to be shut down or make the upgrades? You are saying you did listen to the inspector?

Ms. MACFARLANE. Certainly.

Senator BOXER. What have you done to make sure they shut down until they upgrade the facility?

Ms. MACFARLANE. We considered the concerns of the senior resident inspector who said there was no immediate safety concern that he was presenting about Diablo Canyon.

Senator BOXER. Immediate is not good enough for this Senator, and immediate is not good enough for the 500,000 people who live within 50 miles. Immediate is what they said at Fukushima, oh, there is no immediate problem, and Fukushima happened. This is a problem. You know there is a problem there.

I am going to go into this with the second panel. I am going to move along.

The NRC Inspector General recently issued its report about how NRC oversaw efforts by the operator of the California San Onofre nuclear power plant to replace its steam generators using a less rigorous regulatory process. The flawed steam generators ultimately caused the plant's permanent closure.

The NRC Inspector General said that the NRC missed an opportunity to identify the problems with the steam generators when it inspected San Onofre's steam generator replacement efforts in 2009 with NRC experts saying there were many shortcomings in the analysis Southern California Edison provided to the NRC to justify the less rigorous regulatory process.

Do any of you disagree with the conclusion of the Inspector General of the NRC? Does anyone disagree with that?

Ms. MACFARLANE. Senator, we actually have lessons learned analysis going on for the San Onofre nuclear power plant. Part of that analysis will look at what we call the 10 CFR process.

Senator BOXER. Let me try this again. The NRC Inspector General said that two former senior NRC officials said that Southern Cal Edison should have applied for a license amendment for its new steam generators which would have required a much more rigorous review by the NRC. Let me add parenthetically, maybe that plant wouldn't have had to shut down.

They also said the NRC would not have approved such a license amendment because the design was fatally flawed.

Do any of you disagree with the IG's conclusion that NRC should have done a more rigorous review?

Ms. MACFARLANE. We are in the process of looking at their conclusions.

Senator BOXER. Do you agree?

Ms. MACFARLANE. We are in the process of looking at their conclusions in terms of the situation at the San Onofre power plant.

Senator BOXER. Could I just say, it is so frustrating. You have senior officials that talk about safety, you have an IG that faults you and all you do is continue to look at something. You have 12 recommendations that are very clear and even most people could understand what they are. They are pretty straightforward.

Not one has been done, and you say you are proud of the work of the Commission. Not one is in place, not one. There has been no upgrade to the emergency response draining, no longer term study of emergency response topics, and no improved reactor inspection and oversight. It is unbelievable.

There is not a study completed to upgrade seismic flooding and other hazard protections. Some licenses are still not in compliance with pre-Fukushima requirements.

All I am saying is think what you will about how great a job you are all doing, I know you work hard, every one of you cares deeply, but you have to do better because this isn't an academic setting where we talk about things that may happen.

I live in the real world where I go out to these places and look in the eyes of the people, some of whom will be here this afternoon. Senator Gillibrand says after Super Storm Sandy, she was terrified at what could happen at that plant.

I am just saying from the bottom of my heart, more has to be done. I want to address the new commissioners who are joining the team here. I hope you four can work as a team. I hope you can find common ground.

If you can't agree on doing the 12 things, for God's sake, do two, three or four of the things and get it done because one of those 12 things could be absolutely critical.

I guess I want to ask another question of Chairman Macfarlane or all of you. This is another question so think it through before you answer.

Do any of you disagree that when reactor operators replace equipment like steam generators, NRC's so-called 50.59 regulations require the operators to demonstrate that the new equipment can perform safely? Do any of you disagree with that?

Ms. MACFARLANE. Madam Chairman, I would like to submit, for the record, our charts which show the progress that we have made on Fukushima upgrades at plants.

Senator BOXER. Sure.

[The referenced charts were not received at time of print.]

Senator BOXER. I will give to you the list of 12, and you tell me which ones of those you have put in place.

Ms. MACFARLANE. Absolutely. We are happy to provide all of that information.

Senator BOXER. Let me get back to my questioning. Let the record reflect that none of you disagree that the operator has to demonstrate the new equipment can perform safely when replacing equipment licensed generators.

I would like to place NRC's response to questions my staff asked about Diablo Canyon into the record.

[The referenced information was not received at time of print.]

Senator BOXER. Those responses acknowledge that when PG&E replaced both of its steam generators and its reactor vessel head, it did not comply with NRC's 50.59 regulations.

What is more, the analysis PG&E failed to do was to answer the question of whether the new equipment could work safely following both a severe earthquake and a loss of ability to cool the reactors similar to what happened at Fukushima.

I would like for Chairman Macfarlane to answer this. Can you confirm that NRC has known about PG&E's failure to meet these key NRC regulations, the 50.59, since 2011 but has not taken enforcement action against the licensee for this failure?

Ms. MACFARLANE. Madam Chairman, I did learn recently about this issue. I am aware of the general outlines of this issue. I asked

the staff to get back to me on this issue. They informed me that the licensee in 2011 found, PG&E noted the failure to collect this kind of information.

Also at that time, they did the evaluation they needed to previously have done and the NRC concurred on that.

Senator BOXER. I will put in the record the fact that the NRC did not pursue this issue. We have the background on it. They have known about it. You have known about it since 2011. I have the proof from the staff, your staff, and did nothing about it.

I am going to turn it over to Senator Markey and give him the gavel. I will run and vote and come right back. Then you can vote on the second vote. Is that OK, Senator?

Senator MARKEY. Yes.

Senator BOXER. I will be right back.

Senator MARKEY [presiding]. It is like I am Chairman of the House again, eh? Thank you.

The NRC's Office of Investigations was created in 1982, which was 2 weeks after a hearing I chaired about a case where NRC officials whitewashed a safety investigation after they showed it to a former NRC chairman who had been hired by the subject of the investigation.

I recently wrote a letter to the NRC about my concerns that the independence of this office was being eroded, that the Office of General Counsel may have inappropriately attempted to interfere with a recent investigation and that the staff which assisted with the investigation was being retaliated against.

In response, I was told that you, Madam Chairman, and others had referred those concerns to the NRC's Inspector General. That is why I was so disturbed when I obtained a copy of a draft proposal that you authored that directed the Office of General Counsel to effectively take over and reorganize the Office of Investigations and limit the resources and types of investigations that could be conducted in the first place.

You even did this before the NRC Inspector General completed his work.

When Chairwoman Boxer and I sent you a letter conveying our strong concerns about this proposal, you did not respond to us. Instead, you directed your staff to deny the very existence of the proposal in the first place, even though I had been provided a copy of the document.

Madam Chairman, is this proposal, which unquestionably was prepared and circulated by you, still being considered?

Ms. MACFARLANE. At the moment, it is not being considered, but let me tell you that the draft memo that you are referring to was only circulated to the very senior management of the agency and to my colleagues here, of course. It was a draft to get their feedback.

Never and nowhere in that memo will you find any contemplation of any reorganization of the Office of Investigations. As commissioners, we are trying ensure that we have an effective enforcement process because that is critical to our agency's ability to enforce our regulations.

Senator MARKEY. The document actually said that the Office of Investigations couldn't do the same work, it said it couldn't have

the same resources, it said that the General Counsel had to direct every action that was going to be taken.

Ms. MACFARLANE. I do not agree with your analysis. That is not what it said. The Office of General Counsel was only cited in terms of providing guidance. I would ask my colleagues to weigh in because they have seen this memo.

Senator MARKEY. Do any of the other members of the commission wish to address that?

Mr. OSTENDORFF. I would like to respond, Senator Markey.

I agree with the Chairman's response. I, along with the other commissioners, was offered a chance to review this memo. This is a personal viewpoint. There were some concerns in the organization. I think it was a very responsible act by the Chairman to take the initiative to address a problem.

That memo did not direct reorganization of the Office of Investigations. I think the actions the Chairman circulated as a draft proposal were responsible and appropriate.

Senator MARKEY. Do any other members wish to comment? Commissioner.

Ms. SVINICKI. Senator, in the feedback I provided to Chairman Macfarlane, I also indicated that I viewed the proposal as an opportunity to look at strengthening the coordination between the Office of Investigations, Enforcement and General Counsel.

My feedback to her as that I supported having the NRC staff look at that and see if any enhancements could be made.

Senator MARKEY. Do you support the continued complete independence of this office?

Ms. MACFARLANE. The office should be independent to the degree that it does report back to our Executive Director of Operations. That is the structure of the Office of Investigations. It is not the Inspector General. That is a separate and distinct office at our agency.

Senator MARKEY. Does each of you agree that it should maintain its independence?

Mr. BURNS. I agree that the Office of Investigations has to have the capability to carry out its professional responsibilities as an investigative office. I worked closely with them when I was General Counsel and an attorney at NRC for 25 years.

Sometimes there are disagreements between the lawyers and investigators about where to go but essentially, the office has the ability to make its recommendations and to cooperate with the Justice Department in appropriate cases. That is what is important and that is what I would defend.

Senator MARKEY. Should it be able, Commissioner, to do whatever investigations it deems to be appropriate?

Mr. BURNS. Essentially, it makes the judgment call as to its investigative workload or the investigations it pursues. You have this sometimes in the constraints of when an investigation is underway, because that is the nature of the American legal system in terms of objections that persons may make.

For example, if I am someone who is the subject of an investigation, do I have to testify. There are ways of resolving those things through subpoena and through other types of actions. The judgment call is essentially within the office to carry out its mission.

Senator MARKEY. Should it have to report to the General Counsel during the course of an investigation?

Ms. MACFARLANE. It doesn't report to the General Counsel, but it works with the General Counsel's office.

Senator MARKEY. Should it have to?

Ms. MACFARLANE. Yes, because it is part of our overall enforcement process. Our overall enforcement process encompasses three of our offices, the Office of Investigations which carries out the investigations but they need to work with our General Counsel's Office and the lawyers in forming those investigations, and because this is part of our enforcement of our regulations process, they have to work together with the Office of Enforcement.

They all have to work together and that is what we wanted to look at.

Senator MARKEY. Should it be able to be free to pursue any investigation is my question to you? Do you agree with that?

Ms. MACFARLANE. It does have the ability to pursue any investigation. They have not been prevented from that.

Senator MARKEY. Should it continue to have that ability is my question to you?

Ms. MACFARLANE. It should continue to have the ability to develop investigations as it sees fit, but it does have to work with the other offices because it is part of our overall enforcement process.

Senator MARKEY. You are a former General Counsel, can you help us to sort this out because we want to have vigorous oversight taking place? Should they have the ability to be free to pursue any investigation?

Mr. BURNS. I think, as the Chairman is saying, they essentially are free to pursue investigations. The point I was trying to make is, both as a matter of administrative law and constitutional law, there are sometimes limits on that with respect to is it a matter within the scope of the agency's competence, are they investigating something that is a matter within the NRC, and are they carrying out the appropriate protections that are required under the Administrative Procedures Act or other statutes? Those are the only caveats that I would put on that.

Senator MARKEY. I am trying to clarify. As long as they continue to operate within their legal authority, should they be permitted to continue operating the way they have historically, in your opinion as a former General Counsel?

Mr. BURNS. In my view, yes, again, within the framework of what their responsibilities are and what the NRC's responsibilities are, they are able to do that.

Senator MARKEY. Do you think there is a reason to limit the resources and types of investigations that could be conducted in the first place? That is something that there is a draft proposal out there to look at this as an issue.

Ms. MACFARLANE. There is no draft proposal to limit their resources. There is a draft proposal to look at the whole enforcement process.

Senator MARKEY. We have a copy of a draft proposal that would limit the resources. You are saying there is no draft proposal?

Ms. MACFARLANE. That is correct.

Senator MARKEY. Then there is a disagreement between the committee and the agency. We will have to resolve that because obviously we have a document that says that is not the case.

You are not, in fact, supporting a proposal to erode the mission or the independence while they are in the middle of an investigation right now?

Ms. MACFARLANE. I am supporting a proposal to improve and ensure that our enforcement process is as efficient and effective as possible because as a regulator, we are not going to be able to regulate properly unless we can have an effective enforcement process to enforce our regulations.

Senator MARKEY. I have a document. I am not going to introduce it into the official record right now. We do have a disagreement between the committee and the commission on this. I am not going to introduce it into the record at this point in time but we are going to have to have a private discussion and negotiation between the commission and the committee over this document where we are in fundamental disagreement.

With that, let me say there is a second roll call on the floor of the Senate. I am going to run over and make the roll call.

The Chair is back, so let me ask one final question.

Chairman Macfarlane, the recent litigation challenging NRC's assertion that spent nuclear fuel could be stored at reactor sites indefinitely cost the agency between $250,000 and $300,000 in legal fees and cost the Department of Justice additional taxpayer dollars as well.

There are more than 300 contentions pending on the Yucca Mountain license proceeding and contentions cost more than litigation to resolve because the process for resolving them is much more complicated.

Is it safe to say that the legal costs of resolving the Yucca Mountain contentions is likely to exceed 300 times the cost the agency absorbed on the other spent fuel litigation, that it would be much, much higher than the $75 million to $95 million?

Ms. MACFARLANE. I don't know about the math that you elaborated but I can tell you that it would cost in excess of probably $300 million.

Senator MARKEY. It would cost in excess of $300 million. I think that is very important for us to have on the record because clearly this is becoming a more and more costly enterprise for the Federal Government.

I thank you, Madam Chairman. I yield back.

Senator BOXER [presiding]. Thank you.

I understand that you asked about a document. I am going to follow through on that, but you should go to make vote.

The NRC is still withholding two categories of documents that Senator Markey talked about. Senator Markey did you read into the record what renowned constitutional scholar Mort Rosenberg said?

Senator MARKEY. No, I did not.

Senator BOXER. This is why this is critical. When you get confirmed, you answer in the affirmative to turn over documents. Now you say there is no such document when there is such a document. That is a problem. That is a real problem before this committee.

We don't swear in people here, we don't do that, but you are under oath. That is the rule. You are considered under oath. I don't care what the General Counsel is whispering at this point.

Anyone here is considered under oath, and they cannot say anything to the contrary but the truth under 18 U.S.C. Section 1001. You can read it. You have to be truthful to Congress.

There has been denial of a document. We have the document. Thank God there are people in the NRC.

It is interesting, Chairman, because of your discussion about how great morale is. Listen, I am sure it is true for most people, but for some of the senior people, I say this to the four commissioners, they are calling us all the time, telling us that safety is not being followed.

Renowned constitutional scholar Morton Rosenberg said that NRC's reasons for withholding these documents demonstrates, I am glad senior counsel is here, "a profound misunderstanding of Congress' investigatory power that they misstate court decisions, they ignore overwhelmingly contrary case law that supports the committee's right to receive the materials, and they show a lack of awareness of over 90 years of congressional investigations in which agencies have had to give Congress what it asked for. What is more, last year, Congress enacted statutory legislation language requiring NRC to respond to congressional requests."

The Chairman has already not dealt with me in a fair way, in my opinion. We have had to go through hell and back to get anything, and we still don't have documents. We will get them because there are whistleblowers in the agency helping us, so the truth will come out.

I want to ask the other four, will each of you follow the law and give the committee what it has asked for?

Mr. BARAN. Madam Chairman, I agree with you that you have an important oversight role. My view is that NRC should work with the committee to provide documents when you request them.

Senator BOXER. Thank you.

Mr. BARAN. Our focus should be on providing information that is requested, not withholding it. There will sometimes be sensitive issues that we have to work through but we should be working through those issues.

Senator BOXER. We should work through them together.

Mr. BARAN. Yes.

Senator BOXER. Because the bottom line is we all care about the safety of the people. I do and you do, so why are we in this tug of war, you can't see my papers?

Let me ask Commissioner Svinicki, will you vote to give the committee what it asks for as you promised to do when you took your oath?

Ms. SVINICKI. Chairman Boxer, I have supported our continued engagement with you and your staff.

Senator BOXER. That is not the question. What does engagement mean, discussion? I am asking if you would vote to give us the documents we request.

Ms. SVINICKI. I have been part of the deliberation on providing the documents over the last couple of years and I have supported the outcomes as articulated by Chairman Macfarlane where we

would continue to respect the oversight role and work with you and your staff.

Senator BOXER. The Chairman denied us.

Go ahead, Mr. Ostendorff.

Mr. OSTENDORFF. I agree with Commissioner Svinicki. I have been involved in these decisions as well. I believe we have followed the law as we understand it. I know we have sent several letters to this committee requesting to meet in person and we have not been able to arrange those meetings.

Senator BOXER. We are meeting in person. What is this? How many oversight hearings have we had? This is the tenth. You can tell it to me out here in the real world. You don't have to whisper in my ear about it.

Mr. OSTENDORFF. We sent very clear letters in November and December of last year addressing this topic. I have read the Rosenberg memo and I believe the position we have taken is still consistent.

Senator BOXER. This is going to be a big problem because we asked for documents, not a meeting privately or secretly, and we didn't get them. This is serious stuff. Your counsel is telling you things that are in absolute conflict with renowned constitutional scholars, so you may wind up in a courtroom pretty soon.

Mr. Burns.

Mr. BURNS. I will echo what Commissioner Baran said. I think it is in the extraordinary power of the Congress to get documents, to get information it needs. I have read the Rosenberg memo and some other things.

I want to say I think there is a very limited, limited set where there may be some questions and there may be some issues, but my commitment is to work with the committee and assure its needs but at the same time, assuring whatever issues need to be protected are protected.

Senator BOXER. Let me say there is no legal restriction on our getting papers, period. That is the truth. If you go back in history, one thing we know about America, our people want transparency. They don't like secrecy.

Of course if there is a paper that shows a certain technology and there is a right to make sure people don't know how to make a certain part, we understand that and we have agreed to that.

Here is the deal. I am not encouraged by the two to two split here on papers. I am saying this is an area of deep concern and it is not going away.

I want to ask the remaining four of you a straightforward question because we may be without a fifth person for a while. We don't know how long it will take. As you know, two to two equals nothing getting done and it puts a burden on each of you to try and reach out and listen to the other side.

I can give you an example in this committee. As you know, there are lots of disagreements here. We have gotten together on many pieces of legislation, highways, water, protecting animals, Superfund clean ups, all kinds of issues. We have set aside our differences.

I am asking you, particularly on this series of 12 recommendations which could mean life and death, that is not hyperbole, to my

people and to people all over the country. I only have one plant left but there are 500,000 people living within 50 miles of that plant.

We can look at the other chart. I don't know what the other chart says, but I can tell you we have reviewed this and we know. Not one of these has been implemented fully.

Will each of your work with each other to try and get the maximum number of these post-Fukushima recommendations by your own staff put in place within the next 6 months? Will you work in that effort? Soon to be Chairman Baran.

Mr. BARAN. That would be news to me.

Senator BOXER. Commissioner Baran. I guess that is what I would like to see.

Mr. BARAN. I absolutely commit to work with my colleagues to implement the recommendations expeditiously.

Senator BOXER. Will you reach out to those that you would normally not see eye to eye with because that is the critical part here?

Mr. BARAN. All five of us talk all the time.

Senator BOXER. There are only going to be four. That means in order to move from A to B, there needs to be someone giving. One of you is going to have to really work with the other side to say, you know what, that makes sense. Will you be willing to do that kind of extraordinary effort to get this done?

Ms. SVINICKI. Yes, Chairman Boxer. I have had many colleagues come and go from the commission. The two new members constitute very significant new blood for us. I agree with you that two to two is not a great outcome for the United States. We need to re-engage and work together. I pledge to do that.

Senator BOXER. I appreciate that.

Mr. Ostendorff.

Mr. OSTENDORFF. I am committed to working with my colleagues.

Senator BOXER. Excellent.

Mr. BURNS. As am I.

Senator BOXER. OK.

Ms. MACFARLANE. May I interrupt for 1 second? I just want to correct the record.

Senator BOXER. No, no, I will give you your time in a moment, just a minute.

That was kind of a general response from you two. I am saying on those 12 issues, to get them in place within the next 6 months, many of them, will you work together to do that? Will you try to get that done?

Can you answer that, please? Mr. Ostendorff.

Mr. OSTENDORFF. I am not going to sit here and tell you that all those can be approved in the next 6 months.

Senator BOXER. I didn't say all 12, I said some of them.

Mr. OSTENDORFF. I think we are making strong progress. We will continue to work toward implementing those as quickly as we can.

Senator BOXER. You will work with all colleagues even though it might be a two to two situation to get some of these into place?

Mr. OSTENDORFF. I don't see a two to two situation on the Commission as being a bar to moving forward.

Senator BOXER. Excellent.

Mr. Burns.

Mr. BURNS. Nor do I. When I was with the agency as a general counsel under Chairman Jaczko, including Commissioners Svinicki and Ostendorff, proved going forward. One of the emphases the Commission did was get these done, and I think it was a 5-year timeframe. It doesn't mean all of them done in 5 years, but the things done in a timely manner. That is what I commit to do.

Senator BOXER. Let the record show 2011 was the date and nothing is happening yet.

Chairman, you wanted to say something?

Ms. MACFARLANE. I just want to correct the record in my discussion with Senator Markey about the Office of Investigations. I want to be clear that I said there is a preliminary draft memo that he was referring to. That is all.

Senator BOXER. Now you are saying this document does exist?

Ms. MACFARLANE. Yes, I always acknowledged it. I acknowledged it the entire time. I just want to be clear.

Senator BOXER. We will read back the record. We will leave it in and then we will correct what you said so that it is clear.

I want to say to all of you that you have really important jobs. So will you, Chairman, when you go back to your atmosphere at the university because those are the minds of the future. Thank you for doing that. It is important.

I just want to say for those of you who remain on the Commission and the new people, whenever I lose my way sometimes, even around here, I go back and read the Constitution, and I read what some of my predecessors said.

I look at the different issues, whether it is environmental issues, civil rights issues or human rights issues. I read what legal experts have said. I think the most important thing for you to do is to go back to why this commission was founded. It is so instructive to read what it says. It really is so clear that it is safety.

If that is not foremost in your mind, then that is not what you should be doing. You should reset because it isn't about playing footsie with any operator, it isn't about the future of nuclear power which many of us hope will find its way, be say and be an answer to climate. I think you heard that from colleagues.

We are looking for safety. We are looking to make sure that we don't build plants on earthquake faults and if they are there, they have to be retrofitted. They can't stay the way they are. They are too dangerous.

Go back and I think you will get infused with even more energy, no pun intended, in the work you are about to pursue.

Good luck to you, Chairman. I think one of the greatest things for you is you will not have to face me across this divide anymore. That will be a reason for celebration.

For the rest of you, good luck. We have an open door. The biggest open door is right here in this chamber because there is nothing we have to keep secret. We are transparent here.

Thank you, very, very much.

I am going to recess and tell my second panel we will be back in about 25 minutes. We are recessed until the call of the Chair.

[Recess.]

Senator BOXER. We are back and I apologize deeply for the delay. There is a lot happening, including voting, and then, after that,

just putting together the final stages of an omnibus bill that requires my attention because there is like, oh, at least 14 environmental riders that are being attempted to go on there, and I am trying to deal with those.

So I am just thrilled with this panel. Well, Dan Hirsch is someone I have worked with, is the word forever apt here? Honestly, I don't know how far back it goes, but I think it was before I was in the U.S. Senate, so we are talking decades. And I just think he is tremendous. He is a lecturer at University of California, Santa Cruz, and that doesn't begin to describe his contribution to safety from toxics and the rest.

And then we will go with Hon. Sam Blakeslee, a former State and I have to say Republican senator, because that is important to know, that this is bipartisan testimony; former California Seismic Safety Commissioner. These are the two majority witnesses.

And our minority witness is Mr. Anthony Pietrangelo, Senior Vice President and Chief Nuclear Officer at the NEI. And that is our minority witness.

So I am very happy you are here. I am very grateful to you for sticking around, because I know this has been a long wait. But as you could tell from the first panel, these issues are matters of life and death, and that is why we took the time we took, and I didn't want to rush your panel. I have a lot of time here, so we will go back and forth.

So, Mr. Hirsch, do you want to please begin? And we will give you 6 minutes. Go ahead. And make sure you turn on your microphone and speak into it.

STATEMENT OF DANIEL HIRSCH, LECTURER, UNIVERSITY OF CALIFORNIA, SANTA CRUZ

Mr. HIRSCH. I have a written statement which I——

Senator BOXER. We will put it in the record.

Mr. HIRSCH. Thank you.

Chairman Boxer, thank you so much for the invitation to appear here today.

The Japanese parliamentary investigation into the Fukushima tragedy concluded that it was caused by a too cozy relationship between the reactor operator and its regulator that allowed the nuclear plant to be built to withstand only an earthquake and tsunami far smaller than actually occurred. These problems plague the American nuclear regulatory system as well.

My testimony will focus on an examination of one case study, Diablo Canyon, that suggests the Fukushima lessons have not been learned here. This is particularly important in light of extraordinary new seismic discoveries near the site and the inadequate response to them by the NRC. Unless the underlying dysfunctional nature of nuclear regulation in this country rapidly undergoes sweeping reform, a Fukushima-type disaster or worse can occur here, perhaps on the California coast.

Diablo was designed and permitted based on the claim that there were no active earthquake faults within 30 kilometers of the site. We now know, however, that there are at least four large active faults nearby, all capable of more ground motion than the plant was originally designed for. Each time there was a new belated

seismic discovery at Diablo, however, the Commission gave PG&E a pass. Rules were relaxed, safety margins reduced, public hearings denied. The most recent discoveries of increased seismic risk have met the same fate.

At the construction permit hearings in 1970, the intervener asked for a few hours to present evidence of nearby faults. PG&E and the Commission staff objected and the NRC refused to permit the matter to be heard.

Senator BOXER. Say that one more time, that last point.

Mr. HIRSCH. In 1970, interveners wanted a few hours to be able to present evidence of undiscovered faults. Both PG&E and the Commission staff objected; the licensing board refused to permit the testimony. Tom Pickford, a member of the board, dissented, saying, shouldn't we find out, before we pour concrete, if there are earthquake faults?

Senator BOXER. Thank you.

Mr. HIRSCH. He lost and they went ahead and poured the concrete, and almost immediately it was revealed that there was an offshore fault, the Hosgri fault, much larger than the plant was designed for. But instead of withdrawing the permit or requiring a full upgrade to deal with the new fault, NRC waived the normal requirements of the license and granted an exception for the Hosgri. Only minimal retrofits were required.

But it didn't end then. Within days of granting the operating license, NRC, egg on its face, had to rescind it because it turned out that PG&E had used the wrong blueprints for putting in the retrofits, mirror image blueprints, placing the retrofits in the wrong places. They had to do it all over again, leading to a cost moving from $320 million to over $5 billion, the cost over-end largely passed on to the ratepayer. But we were assured there can't be any more faults out there.

And then, a few years later, the second and the third nearby faults were discovered, the Los Osos and San Luis Bay faults. Again we were told, don't worry, there can't be any more surprises.

And then, in 2008, the U.S. Geologic Survey found the fourth fault that wasn't supposed to exist, the Shoreline fault, coming within 600 meters of the plant. PG&E and NRC said, don't worry, the three recently identified faults were well within the licensed limits.

But then something absolutely remarkable happened. Dr. Michael Peck, the senior resident inspector for NRC at Diablo, actually went and checked the license, and what he discovered was that all three of those faults, according to PG&E itself, had ground motions greater than the plant license allowed. He said that it should be shut down until the problem was fixed. So PG&E proposed, instead of fixing the plant, to amend the license to remove the provisions they were violating. But even that didn't work because they couldn't meet the criteria for license amendments, so they withdrew it.

And that should have been the end of the matter. The plant should have been shut down until it was retrofitted. But, instead, NRC allowed PG&E to, in essence, amend the license without amending the license, all to avoid a public hearing. And then Peck

took the gutsy step of filing a dissenting professional opinion, which this September, as expected, the NRC rejected.

But here is where the story gets most troubling, with developments essentially not reported to the public until today. On the very same day NRC issued to the news media its denial of Dr. Peck's dissent, PG&E released an 1800-page study, required by the State, of the seismic situation near the facility, and they discovered that the Shoreline fault, which they hadn't even known about until a few years earlier, was twice as long as they had previously thought; that a number of the faults are now estimated to produce larger magnitude earthquakes than they had thought just a few years ago; and that, again, all of these are estimated to produce ground motions in excess that was permitted in the license for all faults except the Hosgri.

It is déjà vu all over again, repeat of the problem we have seen year after year after year. And unless we fix these problems of regulated entities pressing for weakening of safety requirements and of regulators viewing themselves more as allies of the industry rather than protectors of public safety, we will not have learned the lessons of Fukushima, and a Fukushima-type disaster is just waiting to happen here. All it takes, just as at Fukushima, is an earthquake larger than the plant was designed to withstand. It could happen tomorrow.

[The prepared statement of Mr. Hirsch follows:]

Statement of
Daniel Hirsch[1]

Before the
Committee on Environment and Public Works

Oversight Hearing
NRC's Implementation of the Fukushima Near-Term Task Force Recommendations and Other Actions to Maintain and Enhance Nuclear Safety

Washington, D.C.
December 3, 2014

Chairman Boxer, Ranking Member Vitter, and Members of the Committee,

Thank you for your invitation to appear before you today to address this critical matter.

The disaster at the Fukushima Daiichi reactors in 2011 had many causes, but at its core were two fundamental and inter-connected problems: a nuclear plant allowed to be designed, licensed, and constructed to only withstand an earthquake and tsunami far smaller than actually occurred; and a too-cozy relationship between the nuclear utility and its regulator that allowed weak safety requirements in the first place.

These problems plague the American nuclear regulatory system as well. My testimony will focus on an examination of one case study – Diablo Canyon – that suggests the Fukushima lessons have not been learned here. This is particularly important in light of the extraordinary and disturbing new seismic discoveries near the site and the inadequate response to them by the Nuclear Regulatory Commission. Unless the underlying dysfunctional nature of nuclear regulation in this country rapidly undergoes sweeping reform, a Fukushima-type disaster, or worse, may occur here, perhaps on the Central California coast.

The late environmentalist David Brower once defined a nuclear reactor as a complex technological device for locating earthquake faults in California. It seems that wherever a reactor was planned or built, earthquake faults were subsequently found, greater than the plant had been designed to withstand.

Arguably, Brower's definition applies nowhere better than Diablo Canyon. When Diablo was designed and granted its Construction Permit, PG&E and the Commission *asserted there were no active faults within thirty kilometers of the plant.* **We now know there are at least four.**

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[1] Lecturer at the University of California, Santa Cruz, teaching nuclear policy, and former Director of the Stevenson Program on Nuclear Policy there. The views presented today are his own and not necessarily those of the University of California. Mr. Hirsch also serves as President of the Committee to Bridge the Gap, a 44-year-old non-governmental organization addressing nuclear policy matters.

Each time there was a new, belated seismic discovery at Diablo, the Commission gave PG&E a pass. Rules were relaxed, safety margins reduced, public hearings denied. The most recent revelations of increased seismic risk have met the same fate to date.

When the Hosgri Fault was revealed shortly after the construction permit had been granted, NRC waived the normal requirements of the license and granted an exception for the Hosgri. It did so assuring the public that the Hosgri was not connected to the nearby San Simeon Fault and that it was essentially impossible that there were any other nearby active faults waiting to be discovered.

A few years later, however, the San Luis Bay and Los Osos faults were found to be active nearby. And in 2008, USGS discovered the Shoreline Fault, coming within 600 meters of the plant. Faced with these embarrassing revelations, NRC and PG&E nonetheless asserted that these new faults were well within the license requirements.

However, the NRC's own senior resident inspector at Diablo, Dr. Michael Peck, soon discovered from PG&E's own estimates that the ground motion from those three new faults would exceed the ground motion permitted under the license. Rather than upgrade the plant, PG&E, at NRC urging, submitted a license amendment request to remove the license conditions they were violating. But the request failed to conform to NRC requirements in scores of instances, and was rejected from consideration. Rather than now require the plant to meet the license, however, NRC allowed it to keep operating in violation of the central seismic requirements.

Dr. Peck took the extraordinary step of submitting a Dissenting Professional Opinion, saying the plant should be shut down until it can demonstrate compliance with the license. After sitting on the DPO for a year, and only after the Associated Press had made its existence public, on September 10 of this year NRC issued its rejection. The DPO denial was neither unexpected nor persuasive.

But here is where the story gets most troubling, with developments essentially not reported to the public until today. On the very same day NRC issued to the news media its DPO denial, PG&E released its long-awaited new seismic study that had been required by the state. To no surprise, it received virtually no coverage, lost in the attention given to the NRC action.

Nonetheless, it is a stunning document. Buried in its more than 1800 pages are the following extraordinary findings:

- Despite longstanding claims that the Hosgri Fault is only 110 kilometers long and not connected to the San Simeon Fault, it is in fact connected, and a joint rupture is therefore possible; and the true length is at least 171 kilometers.
- The Shoreline Fault, which wasn't even known to exist a few years ago, is twice as long as previously thought.
- The Shoreline Fault also connects to the Hosgri, making possible a huge earthquake on both, coming within 600 meters of the plant.

- Despite the repeated claims by PG&E and NRC that the Hosgri Fault is the largest threat to Diablo, the new report estimates ground motions from the Shoreline and San Luis Bay Faults, and the San Simeon-Hosgri and Shoreline-Hosgri connected faults, all in excess of what would now be estimated for the Hosgri Fault alone.
- All of these are estimated to produce ground motion in excess of the Double Design Earthquake requirements in the license that apply to all faults except the Hosgri single fault.

It is *déjà vu* all over again. The PG&E and NRC response has been an almost exact repeat of the pattern evidenced from the beginning of the plant: discoveries of new seismic threats that had been claimed couldn't be possible; responding by sharpening pencils, to try to allow the plant to continue in the face of the new discoveries by removing the last remaining vestiges of conservatism in assumptions and reducing safety margins thereby; and avoiding public hearings where the discoveries and response thereto would be subject to serious scrutiny.

In this case, although the faults are longer, larger, more connected, and closer than previously assumed, PG&E and NRC have remarkably claimed that the seismic challenge to the plant would be lower. They have done so by applying dramatically weakened input assumptions, not allowed under the license and not subject to scrutiny in an evidentiary license hearing.

When the first nearby fault that wasn't supposed to be there was discovered, the Hosgri, the NRC gave PG&E an exception from the seismic conditions of its license that applied to all other faults. When the second, third, and now fourth active faults were discovered, after assurances they couldn't be there, the NRC has again in effect given further exceptions. And it has done so without license amendments and the right to a public hearing that the Atomic Energy Act requires.

As we have seen in the recent San Onofre matter, this pattern is endemic. The resistance to allowing adjudicatory hearings that would permit enhanced independent scrutiny and instead relying on backroom deals between the regulator and the regulated entity result in technically deficient safety decisions. In the Diablo case, the decisions have turned out to be erroneous, over and over again. And yet the pattern is repeated, over and over again. How many times do they get to be wrong before something changes?

If this dysfunctional regulatory system were responsible for relatively minor matters like, say, siting fast-food restaurants, the potential consequences would be marginal. But there are a thousand times the long-lived radioactivity of the Hiroshima bomb in each Diablo reactor, and approximately ten times that in its irradiated fuel pools. An earthquake larger than the plant is capable of withstanding can disrupt the essential cooling, causing massive release of radioactivity.

Unless we fix these problems—of regulated entities pressing for exceptions to and weakening of safety requirements and of regulators viewing themselves more as advocates for and allies of the industry they are to regulate rather than primarily protectors of public safety—we will not have learned the lessons of Fukushima. And a Fukushima-type disaster is just

waiting to occur here. All it takes is an earthquake larger than a plant like Diablo is capable of withstanding. It could happen tomorrow.

I explore these matters in more detail in what follows.

The Fukushima Lessons

The Japanese Diet passed legislation in October 2011 establishing the Fukushima Nuclear Accident Investigation Commission. The Fukushima Commission found:

> The direct causes of the accident were all foreseeable prior to March 11, 2011. But the Fukushima Daiichi Nuclear Power Plant was incapable of withstanding the earthquake and tsunami that hit on that day. The operator (TEPCO), the regulatory bodies (NISA and NSC) and the government body promoting the nuclear power industry (METI), all failed to correctly develop the most basic safety requirements....

The Fukushima Commission found that the accident was clearly "manmade" and preventable:

> The TEPCO Fukushima Nuclear Power Plant accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly "manmade." We believe that the root causes were the organizational and regulatory systems that supported faulty rationales for decisions and actions, rather than issues relating to the competency of any specific individual.

They concluded that "The underlying issue is the social structure that results in 'regulatory capture,'" and that industry had "manipulated the cozy relationship with the regulators to take the teeth out of regulations." The nuclear industry must change, they said, and:

> The Commission has concluded that the safety of nuclear energy in Japan and the public cannot be assured unless the regulators go through an essential transformation process. The entire organization needs to be transformed, not as a formality but in a substantial way.

One could just as correctly make these diagnoses and prescriptions about the troubled U.S. nuclear power enterprise. These Fukushima "lessons learned" apply directly here as well. After all, the Fukushima accident involved American-designed reactors and a regulatory structure markedly similar to ours. The two fundamental problems at the heart of the Fukushima tragedy plague the American system as well: regulatory capture, resulting in weak regulations and enforcement, and the concomitant regulatory fiction of allowing reactors to be designed to only withstand challenges far less severe than they could actually face. We do not appear to have learned those lessons or in any serious way taken steps to repair the broken nuclear regulatory process here so as to avoid a Fukushima or worse occurring in this country.

Diablo Canyon as Case Study: A Potential Fukushima on the California Coast?

In my testimony today I will examine one case study, that of the Diablo Canyon Nuclear Plant in California.[2] The similarity of the Diablo history to the institutional problems that led to Fukushima are striking.

Each of the two Diablo reactors contains, when operating, about fifteen billion curies of radioactivity. To put that in perspective, we generally measure "permissible" concentrations of radioactivity in the environment in pico-curies, millionths of a millionth of a curie.[i] All told, many Chernobyls-worth of long-lived radioactivity reside at Diablo Canyon, in the heart of a seismically active region.

If a significant portion of that radioactivity were to be released to the environment, widespread damage could result--at high doses, close in, prompt death if there hasn't been effective and timely evacuation; at lesser doses, over wide areas, significantly increased rates of cancer and leukemia. Land can be contaminated for long periods of time, forcing relocation of people and cessation of activities such as agriculture. A major release of radioactivity in central California could be devastating.

The radioactivity only stays inside the fuel so long as it is continuously cooled. An atomic reactor is an extraordinary device. It cannot be turned off completely. Even after being "scrammed" (control rods inserted to stop the fissioning), a substantial amount of heat (initially about 7% of the amount when running) is still generated by decay of the fission products. Thus the fuel can, for weeks or months after the reactor is scrammed, melt and release its radioactivity if cooling is lost. An earthquake can trigger such a loss of cooling—e.g., by disrupting offsite power and onsite diesel generators, and/or breaching pipes or damaging pumps needed to circulate the coolant-- as well as the failure of backup systems and mitigation features.

The "Design Basis" Fiction

One would think that reactors would be required to be designed and constructed to safely withstand the greatest challenge (earthquake, terrorism, etc.) they could face. One would be wrong.

From the earliest days of the industry to the present, reactors have only been required to deal with a "design basis" event, which is often far less severe than the maximum challenge they could in fact experience. For example, reactor containments are only required to be designed to withstand the pressure from a break in a main pipe, not the pressures that could be generated from a meltdown. To save money, for instance, Mark I Boiling Water Reactor containments had been allowed to be very small, with backup pressure-reducing systems that could be quickly overwhelmed in a real accident. At Fukushima, the Mark I containments, based on the General Electric design, indeed failed to prevent massive release of radioactivity. U.S. pressurized water reactors (PWRs) likewise are not required to be designed to withstand pressures resulting from events involving major core damage. Recommendations to establish Containment Performance Design Objectives that would improve the situation went nowhere.[ii]

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[2] The research assistance of Cristine Peterson and Dorah Shuey is gratefully acknowledged.

Similarly, the "design basis threat" (DBT) regulations for establishing security provisions at reactors against a terrorist attack long required only protecting against a maximum of three external attackers, on foot, acting as a single team. In the Diablo Canyon operating license proceeding in the 1980s, experts appearing on behalf of Governor Jerry Brown testified that the security plan should be able to protect against a group of at least twelve attackers. PG&E and NRC argued that it wasn't "credible" there would ever be a terrorist attack in this country involving that many people and the design basis threat of three was sufficient.[iii] Of course, on 9/11, there were nineteen attackers, in four separate teams, and they weren't on foot. But the NRC's design basis threat regulations have only been modestly upgraded since, and proposals to increase the DBT to meet a 9/11-level threat have been rejected by NRC.[iv]

For years, evacuation plans were not required for areas surrounding nuclear plants, and environmental reviews did not have to consider accidents involving major releases of radioactivity, because the NRC had declared that Class IX accidents (those involving major core damage) were, in that remarkable phrase used so often, "non-credible." Then major core damage occurred at Three Mile Island, and the Governor of Pennsylvania, on the advice of the NRC, recommended an evacuation of pregnant women and children. The NRC had to admit Class IX accidents could in fact happen and change some of its regulations accordingly, though this was done grudgingly and in a limited fashion.

As seen from the above examples, the nuclear industry and compliant regulators have frequently decided, short-sightedly one must conclude, that it is cheaper to declare by fiat that serious safety or security challenges to nuclear plants are "non-credible" and don't need to be protected against, than to require that the atomic facilities be designed up front to handle the threats that can indeed occur. Over and over again, reality has risen up and bitten industry and regulator on the heels; optimistic assumptions dissolve when the "non-credible" ends up happening.

The Seismic Design Basis Fiction

For earthquakes, the design basis has been two-fold: a "Design Earthquake" or DE (now called the Operating Basis Earthquake, or OBE) and a "Double Design Earthquake" or DDE (now called the Safe Shutdown Earthquake). The first earthquake is the one that the reactor should be designed to be able to ride out without needing to shut down. The second, more serious earthquake is one in the face of which the reactor should be capable of safely shutting down and maintaining cooling and other safety functions thereafter. Despite definitions that indicate the safe shutdown earthquake is the maximum one deemed possible at the site, in practice, industry has pressed for and NRC granted approval for reactors to be designed to only withstand earthquakes and similar natural hazards such as tsunamis and floods far smaller than could indeed occur.

That is what happened at Fukushima. TEPCO and its regulators engaged in a regulatory fiction, establishing the design basis earthquakes (and ensuing tsunami) as considerably less than what turned out to be possible. It is expensive to design against these large challenges. The company instead pressed for, and the regulator acquiesced to, requiring the facility to be designed to a fictional earthquake and tsunami that were far less severe than could actually occur. It was this cutting of corners, in terms of safety, that produced the disaster at Fukushima. Nature

did not go along with the regulatory fiction. It is a similar regulatory pattern that has been evidenced in the long, troubled history of Diablo Canyon and its seismic design.

Nuclear Reactors: Complex Technological Devices for Locating Earthquake Faults in California

As indicated earlier, the late environmentalist David Brower once defined a nuclear reactor as a complex technological device for locating earthquake faults in California. Over and over again, nuclear plants have been planned and/or constructed in the state, only to be followed by the discovery of major faults nearby. These belated seismic discoveries led to the closure of PG&E's Humboldt Bay plant and General Electric's Vallecitos reactor and the abandonment of plans by the LA Department of Water and Power for an atomic power plant at Corral Canyon in Malibu and by PG&E at Bodega Head. Discovery of additional seismic hazard at San Onofre contributed to Unit 1's premature shutdown and cast a cloud over operations of Units 2 and 3, resolved only with their permanent closure last year, albeit for different reasons. For our purposes, however, let us look briefly at the track record of PG&E and the Commission leading up to the Diablo situation.

When PG&E applied in the early 1960s for permission for a nuclear plant at Humboldt Bay, it asserted that the nearby Little Salmon fault was not active and its presence need not be taken into account in designing the plant. In the early 1970s, however, oil company geologists doing studies in the area discovered that the fault was indeed active. (As we shall see, this pattern repeated itself at about the same time with Diablo Canyon.) Rather than upgrade the plant to meet the newly acknowledged seismic threat, it was permanently closed.[v]

In the early 1960s, PG&E applied to construct a nuclear plant at Bodega Head, a bit north of San Francisco. PG&E asserted that there were no serious seismic risks, despite being quite close to the San Andreas Fault, and in particular, that the plant would not be located over an active fault. The firm proceeded to dig a massive hole for the reactor containment foundation, which became known as the "Hole in the Head." Pierre Saint-Armand, a geophysicist at the China Lake naval base volunteered to help the community group concerned about the planned reactor. One weekend, when the excavation was unguarded, he crawled down a ladder into and examined the Hole in the Head and found an earthquake fault exposed therein. In other words, there was a fault directly below where PG&E was planning to construct a nuclear plant.[vi] His revelation led to the abandonment of the plant, and, ironically, PG&E turning its attention southward to Diablo Canyon as a prospective site.

Thus, PG&E and the Nuclear Regulatory Commission had two strikes against them already leading into the Diablo Canyon matter: Humboldt Bay and Bodega Head. In both cases, PG&E had claimed to have done thorough seismic evaluations beforehand; in both cases, someone other than PG&E or the regulator had subsequently revealed active faults nearby or indeed, at Bodega, directly beneath where the plant was to go. Both had to be abandoned.

Diablo Canyon: Hearing Denied on Possible Nearby Faults

Arguably, Brower's definition applies nowhere better than Diablo Canyon. When Diablo was designed and it obtained its Construction Permit, PG&E and the Atomic Energy

Commission asserted there were *no* active faults within thirty kilometers of the plant.[vii] We now know there are at least four major active faults nearby.

During the proceeding over PG&E's construction permit application for Diablo Canyon Unit 2 in 1970, the local intervenor in the hearing, the Scenic Shoreline Preservation Conference, requested a half day to present evidence of potential previously unidentified faults. PG&E and the Atomic Energy Commission staff opposed allowing any such evidence to be heard. By a two to one vote, the Atomic Safety and Licensing Board (ASLB) ruled with PG&E and the AEC staff and refused the request. The third ASLB member, Dr. Tom Pigford, who was for many years Chair of Nuclear Engineering at the University of California, Berkeley, vigorously dissented, saying in essence, shouldn't we find out before we pour concrete whether there are nearby earthquake faults? His concerns were overridden, the evidence of additional faults was not considered, and the construction permit was granted.[viii]

The plant was thus permitted and designed based on the premise put forward by PG&E and the AEC staff that there were no active faults within thirty kilometers.[ix] The Design Earthquake/Operating Basis Earthquake was set at 0.2 g peak ground acceleration. The Double Design Earthquake/Safe Shutdown Earthquake was set at double the DE/OBE, or 0.4 g.

Hosgri Fault Belatedly Discovered

The Construction Permit for Diablo Unit 2 was issued in December 1970, predicated on no active faults anywhere in the vicinity. Shortly thereafter, in 1971, the discovery of a massive offshore fault, the Hosgri, by two Shell Oil geologists, Hoskins and Griffiths, was published. By the time PG&E acknowledged the existence of the fault and NRC began to consider the ramifications, several years passed and the plant was already 80% constructed. The Construction Permit proceedings were not reopened to address the new discovery, something NRC Commissioners Victor Gilinsky and Peter Bradford more than a decade later stated was a mistake:[x]

> No hearings were held when the Hosgri fault was discovered. The persistence of litigation over these issues to this day suggests that it would have been wise policy, as well as good law, to reopen the construction permit at that time.

The U.S. Geological Survey estimated the Hosgri was capable of a 7.5 magnitude earthquake. It was clear that such an earthquake could produce ground motion considerably in excess of that for which the plant was designed. The staff of the Nuclear Regulatory Commission (which had, by this time, been formed after Congress broke up the AEC due to concerns about the conflict of interest in both being a regulator and advocate of nuclear power) urged that senior management attempt to pressure USGS to back off its estimate.[xi] USGS remained adamant.

Rather than abandon the plant because of the failure to characterize adequately the nearby seismic situation prior to construction, or undertake subsequent very expensive upgrades, PG&E reanalyzed the design using far less conservative (i.e., less protective) assumptions and argued that the plant could go forward without significant upgrades. PG&E did this by carving out

significant conservatisms from the seismic analysis that had been performed when the plant was designed, markedly reducing safety margins.

Pencil Sharpening Rather Than Significant Plant Upgrade

The central issue is translating earthquake magnitude and distance into acceleration (essentially the severity of shaking) at the plant. USGS recommended relying on its Circular 672, which estimated 1.15g peak acceleration for a M7.5 earthquake.[xii] If Diablo had to be retrofitted to withstand 1.15g peak acceleration, it is unclear that the facility could be upgraded to meet that requirement; in any case, the cost would be very high. Instead, PG&E, with NRC support, sharpened pencils and, by use of at least four modifications to normal practice at the time, dramatically reduced—alas, only on paper—the presumed ground motion that the plant should have to be retrofitted to withstand.

First, the NRC staff and PG&E argued that rather than use actual peak acceleration, they should use "effective" acceleration, i.e., employ a far lower value. They proposed 0.75 g, instead of 1.15 g, a large reduction. The "effective" acceleration figure of 0.75 g appeared arbitrary even to the Atomic Safety and Licensing Appeal Board which stated, "It is not entirely clear how the anchor point acceleration of 0.75g ultimately settled upon for the basic response spectrum was actually obtained."[xiii] Nonetheless, the Appeal Board upheld this and all the other reductions.

So, the first step taken by NRC staff and PG&E was to reduce the peak acceleration dramatically by putting forward a far smaller "effective" acceleration. They then reduced it even further by assuming a less conservative damping factor than had been used in the seismic design basis for the plant during construction (i.e., the methodology used for the DE and DDE). This second modification further reduced estimated acceleration and safety margins.

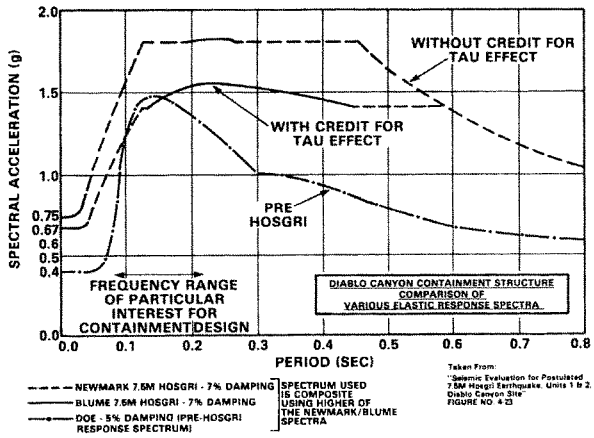
Third, PG&E proposed, and NRC allowed, the use of average estimates of as-built strength for components instead of code-allowable strengths, as normally required. This further reduced safety margins.

And finally, and most controversially, PG&E and NRC proposed a new reduction factor, never used before in nuclear licensing, which they called the "tau effect." They argued that peak acceleration should be reduced not just by their far smaller estimate of "effective" acceleration, weakened further by a less conservative damping factor, and relaxed further by use of average as-built strengths rather than code-allowable, but on top of all those reductions, one should further reduce significantly the acceleration by what was widely viewed as an arbitrary never-before-used fudge factor they called "tau." Their analogy was that a large ship is tossed about in the sea less than a small one, and therefore the reactor structures should be assumed to react less to an earthquake than normal structures. The "tau" factor thus resulted in about a 20% further reduction in presumed acceleration, on top of all of the other reductions.[xiv]

When added together, these cumulative relaxations of normal procedures for estimating ground motion from a large earthquake resulted in the new, far larger challenge to Diablo from the Hosgri Fault being estimated to produce little more acceleration than the far smaller quakes for which the plant was originally designed. For some frequencies of interest, indeed, the

estimated acceleration from the lesser quakes was in fact greater than that now estimated for the far more dangerous Hosgri event, because of the use of so many new non-conservative assumptions for the Hosgri analysis. As NRC Commissioners Victor Gilinksy and Peter Bradford noted in their opinion on the matter:[xv]

> With the changes and adjustments permitted by the [Atomic Safety and Licensing Appeal] Board it turns out that the post-Hosgri seismic response spectrum does not in all respects represent a more severe seismic standard than the one used before the discovery of the Hosgri fault. As the accompanying diagram illustrates, in the frequency range between 5 and 10 hertz (cycles per second), a range of particular interest in the analysis of the containment building surrounding the reactor, the two response spectra are quite close. [footnote omitted] For part of this range, in fact, the old spectrum shows a higher response. In other words, for that part of the range the original design conditions were more demanding than the new ones imposed after the discovery of the Hosgri fault. This new spectrum is the basis of the engineering reanalysis and ultimately determined the extent to which the containment was to be modified. Not surprisingly, in view of the above, only minor changes were required in this area.
>
> (emphasis in original)



As the above graph taken from the Opinion of Commissioners Gilinsky and Bradford shows, the use of the "tau factor" permitted PG&E to presume far less acceleration from a Hosgri earthquake than would normally be presumed, and thus avoid having to do much upgrade at all of Diablo to deal with the far greater threat to the plant posed by the Hosgri compared to

the earthquake threat for which the plant was originally designed. The reduction resulting from the use of the tau factor, less conservative damping factors, etc. is so large that, in the frequency of concern for key structures, there is little difference between the assumed threat by the larger, closer Hosgri and the earlier lesser seismic challenge on which design was predicated. Indeed, at some frequencies, the old design requirements for the lesser earthquakes are greater than those for the far larger, new Hosgri.

Note that the graph only shows the large difference created by the use of the tau effect and the less conservative damping factors. Compare the dashed lines, which are presumed ground motion after having been reduced by the tau effect and the new protective damping assumptions, with the DDE line based on the pre-Hosgri input assumptions required by the existing permit. When the other factors are taken into account – the huge reduction of actual peak acceleration by instead assuming a far smaller "effective acceleration" and the use of average presumed as-built strengths instead of the normal requirement to assume code-tolerance strengths – the actual challenges to the structure could literally be off the chart, i.e., the challenge to the plant could be higher than the graph goes.[3]

In any case, these modifications, or fudge factors, depending on one's perspective, resulted in the extraordinary result that little upgrade to the plant ended up being required by NRC despite a vastly larger earthquake challenge quite close to the facility now being known to be possible. Indeed, because of the less conservative input assumptions, in some circumstances, the reductions were so large that the Hosgri was claimed to produce less risk than the far smaller quakes upon which the plant design had been originally based.

The Commission Refuses to Review; Commissioners Gilinsky and Bradford Dissent

The local community group that was the intervenor in the operating license proceeding, Mothers for Peace, and subsequently Governor Jerry Brown when he entered the case on behalf of the state, challenged these reductions in ground acceleration estimates. The Atomic Safety and Licensing Board ruled down the line for PG&E and the NRC Staff, as did the Atomic Safety and Licensing Appeal Board. The majority on the Commission itself did not agree to even undertake review of the rulings. Commissioners Gilinsky and Bradford issued a stinging opinion, faulting the Commission for not undertaking review and criticizing the Appeal Board's decision.

As they put it in their opinion, the central issue was what to do regarding the "discovery of the nearby Hosgri fault, which had not been taken into account in the original design of the plant." They said:

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[3] Peak acceleration is "anchored" at 100Hz (essentially the vertical axis on the left in the Bradford-Gilinsky graph above), and then a response spectrum in constructed from that axis for other frequencies that are of interest for the seismic response of various kinds and elevations of structures. In the graph, the frequencies of special interest for containment design are marked, and for those, the Hosgri acceleration, modified by tau and other reductions, is not much different and in some cases lower than that presumed under the pre-Hosgri DDE for a smaller/further away earthquake.

> Since the plant was in large part already constructed at this point, the reanalysis and redesign understandably did not proceed as they would have in a plant yet to be built. Every advantage was taken of slack in safety margins left in the pre-Hosgri analysis, both in developing the response spectrum and in its application. To cite a couple of examples: a larger damping value was used in analyzing structures (7 percent instead of the earlier 5 percent), which reduced the effect of ground vibrations on the structures. At the same time, credit was taken for the actual – "as-built" -- strengths of materials (rather than the minimum required strengths, as is the usual practice) so that larger vibrations became tolerable....The point is that these further relaxations come on top of a redesign that has already shaved safety margins...."

They continued, "on top of all this trimming, the Board permitted a further substantial reduction, more-or-less across the board, in the response spectrum," by allowing the use of the so-called "tau effect," which they say reduced the acceleration response spectrum "by about 20 percent over the frequencies of interest." In accepting with virtually no basis the value proposed for the "tau effect," they say, the "Licensing Board's justification sounds almost mystical." They similarly criticize the Appeal Board's acceptance of the proposed tau factor, saying what isn't clear "is whether either Board had any idea what it was talking about." The tau value that was put forward, the Commissioners wrote, "is merely conjecture." They said, "The fact is that the tau effect has not been used in any other nuclear plant analysis. To our knowledge, it has not been used in the design of any other large building."

Commissioners Gilinsky and Bradford concluded, "Altogether, we cannot escape the impression that the Commission is declining review not because the opinion is essentially sound, but because it is unsound and the prospect of reviewing it is so unsettling."

Had there been one more vote on the Commission to review the Diablo matter, the present situation might not face us. But in the absence of Commission review, the approval of the operating licensing by the licensing board and the appeal board stood, and Diablo was allowed to commence operations without the significant upgrades that would have been required had the NRC not allowed the safety margins to be so dramatically eroded by use of these various reductions factors.

Upgrades Done Backwards, Erroneously Using Mirror-Image Blueprints

But the problems did not end at that point. Although PG&E was not required to do the full range of upgrades that would have been required without the use of the relaxed assumptions allowed, it still had to do some. And those it got astonishingly wrong.

The two Diablo units were built to mirror image blueprints of each other. When it came to making the modifications required, however, PG&E used the wrong set of blueprints for one of the units, i.e., the mirror-image blueprints for the other unit. It thus put the pipe supports and whip restraints and other upgrades in the wrong places. The error was revealed only a few days (!) after NRC had issued PG&E an operating license for low power testing, in part based on findings of adequate quality assurance controls. When the error was discovered, NRC had to

temporarily suspend the license, and PG&E had to go back and do the seismic retrofits all over again.

These errors—failing to do sufficient seismic characterization to identify the Hosgri before construction, and failing to have adequate quality assurance controls, resulting in putting the upgrades in the wrong locations due to use of the wrong blueprints—contributed to a plant that was supposed to cost $320 million ending up with more than a $5 billion cost overrun, much of which was passed on to the ratepayers.[xvi]

Errors Continue; New Seismic Discoveries Continue to Erupt, Disproving Past Claims

1. Los Osos and San Luis Bay Faults Found to Be Active Nearby Faults

Despite the embarrassment of not identifying or disclosing the Hosgri Fault before construction and the use of the wrong blueprints for the upgrades, PG&E and NRC assured the public that there were no other likely seismic problems yet to be addressed. PG&E and NRC staff all asserted, and the licensing board expressly ruled in the operating license proceeding, for example, that the Hosgri Fault was not connected to the San Simeon fault. If there were such a connection, there could be a larger quake, but they were sure there was no such link. PG&E and NRC staff also claimed, and the board so ruled, that there was essentially no chance that there were other active faults not yet discovered.[xvii]

A few years later, however, in its Long Term Seismic Program (LTSP), PG&E admitted there were at least two other active faults near the plant not previously identified in their original site characterization, the San Luis Bay and Los Osos Faults. These would turn out worrisome, as we shall see, because the subsequent estimates of ground motions possible from those new faults exceeded the limits in the license

2. Shoreline Fault Discovered

More than a decade after the LTSP, in 2008, USGS identified another new large active fault, this one the Shoreline Fault, coming within 300 meters of the plant intake and 600 meters from the reactor itself. This was deeply troubling, because its proximity to Diablo could result in an earthquake quite challenging for the plant to withstand. We were now up to four nearby active faults, whereas PG&E and the AEC had asserted at the time of the Construction Permit that there were none.

3. PG&E Analyses of Ground Motion from Shoreline, San Luis Bay, and Los Osos Faults Exceed the Double Design Earthquake/Safe Shutdown Earthquake in the Licensing Basis

In its subsequent Shoreline analyses, PG&E estimated ground motions for the Shoreline, San Luis Bay, and Los Osos Faults. PG&E asserted that these ground motions were below those spelled out as part of the license. However, Dr. Michael Peck, the NRC's Senior Resident Inspect at Diablo, noticed that in fact PG&E's ground motion estimates for these three faults all exceeded the DDE/SSE in the license. One will recall that the DDE/SSE is set at 0.4 g. To the extent that the Hosgri Exception was part of the licensing basis – and there appears question

whether it made its way into the license at all—it was an exception to the DDE/SSE and only applied to the Hosgri Fault. (PG&E took the position that the DDE of 0.4 g was the SSE and the Hosgri was not part of the SSE.[xviii])

PG&E estimated in its Shoreline analysis that the Shoreline Fault was capable of producing 0.62 g of ground motion, compared to the 0.4 g limit for the DDE/SSE. The Los Osos Fault was estimated as producing 0.60, also in excess of the 0.4 g limit. And the San Luis Bay Fault was estimated as producing 0.70 g, far above the 0.4 g level.

Dr. Peck pointed out that by PG&E's own estimates, these three new faults exceeded the DDE/SSE in the license. PG&E had two choices, he told them: come into compliance with the license by evaluating the capability of all the plant's safety components to withstand the higher levels of shaking and upgrading those that can't, or amend the license to remove the requirement they were violating.

License Amendment Sought, Then Withdrawn

PG&E chose the latter course. Rather than bring the plant into compliance with its license, it proposed amending the license so as to eliminate the provisions they weren't meeting.[xix] In particular, it proposed changing the Safe Shutdown Earthquake to be the Hosgri, with its far weaker assumptions and methodologies. The Hosgri exception would become the rule. The Shoreline, rather than have to meet the DDE/SSE, would be considered an "included case" of the far more lax Hosgri exception.

NRC staff requested PG&E provide a comparison table showing any deviations between the methodologies and acceptance criteria proposed in the license amendment request and NRC's Standard Review Plan. The subsequently provided comparison tables went on for hundreds of pages, identifying a vast number of deviations from NRC current requirements.[xx]

NRC concluded it could not accept the license amendment request for review (in part, apparently, because PG&E hadn't met the standards for a showing of "no significant hazards considerations" necessary for avoiding the opportunity for a prior public hearing if one was requested.) PG&E withdrew the application.

That should have been the end of the matter. Diablo should then have been shut down until it could be upgraded as necessary to meet the requirements of the license and the newly discovered and analyzed seismic threats. This was not to be.

Instead, NRC remarkably suggested to PG&E that it merely amend its Final Safety Analysis Report Update (FSARU) to include the Shoreline as an included case in the Hosgri evaluation. In essence, amend the license without amending the license; all to avoid the detailed scrutiny that would occur by NRC if there were a license amendment request and the transparency of a public license amendment hearing in which experts from parties other than NRC and PG&E could participate and testify. Without any public notice, PG&E quietly did so late last year.

Unfortunately, NRC regulations do not permit this. If the FSARU is to be amended to allow the use of methodologies and assumptions less conservative, i.e., with smaller safety margins, than those currently in the FSARU, a license amendment—and opportunity for public hearing—is required anyway. See 10 CFR §50.59.

Dr. Peck objected. He first filed a non-concurrence, and then a Dissenting Professional Opinion (DPO), a gutsy and rare move.[xxi] Peck asserted that under NRC's regulations, the plant needed to be shut down until it could be shown to be able to withstand the ground motions from the new faults, using the assumptions and methodologies in the license for the DDE/SSE.

Despite Dr. Peck's formal request that his DPO be made public, it remained hidden from public view for a year, until the Associated Press obtained a copy and published a major article about it. Shortly thereafter, the DPO denial was issued.

The Latest Embarrassment: the AB 1632 Seismic Study Findings

On the same day as the DPO denial was released, PG&E issued 1800+ pages of its AB1632 seismic study.[xxii] Required by California agencies in response to legislation authored by then-Assemblymember Sam Blakeslee in 2006, the study was to examine the earthquake faults that could potentially affect Diablo. Buried in it are following remarkable findings:

- PG&E now concedes that the Hosgri Fault is connected to the San Simeon Fault, making a joint rupture possible, and is thus much longer than previously assumed (61 kilometers longer).[4]
- They further admit that the Shoreline Fault is twice the length and capable of a larger earthquake than previously assumed.
- On top of that, the Shoreline appears to be connected to the Hosgri, thus allowing rupture on one to trigger rupture on the other, coming within a few hundred meters of the plant.
- Estimated ground motions for the Shoreline, San Luis Bay, and Los Osos Faults all continue to exceed the 0.4 g DDE/SSE of the license.
- Estimated ground motions for the Shoreline and the San Luis Bay Faults exceed those from the Hosgri (even when connected to the San Simeon). The Shoreline-Hosgri joint rupture produces ground motions greater than all of these.

When the plant was designed and got its construction permit, it was assumed, as indicated earlier, that there were no active faults within 30 kilometers and the plant was thus constructed to safely shutdown at ground motions up to 0.4 g. Now it is known there are at least four large, active faults close to the site, one coming to within a few hundred meters, and that all of them produce ground motions far in excess of 0.4 g.

After the Hosgri was discovered, PG&E and NRC argued it was not connected to any other major fault. After the San Luis Bay, Los Osos, and Shoreline Faults were discovered to be active near the plant, PG&E and NRC asserted that none could produce ground motion greater

[4] The Hosgri-San Simeon Fault could be considerably longer, but PG&E chose not to examine its potential connections with the San Gregorio Fault.

than the Hosgri. Now it is admitted that the Hosgri *is* connected to the San Simeon Fault Fault, making the Hosgri effectively much longer than previously presumed. It is also connected to the Shoreline, making possible a large joint rupture that occurs with the nearest approach a few hundred meters from the plant.

Most intriguingly the new report estimates ground motions for an earthquake on the San Luis Bay fault to be greater than the ground motion from an earthquake on the Hosgri-San Simeon. It similarly estimates that the Shoreline Fault can produce more ground motion than the Hosgri-San Simeon Fault. It estimates that a joint rupture on the Shoreline and Hosgri Faults would cause more ground motion than on the Hosgri-San Simeon. And presumably a joint Hosgri-San Simeon rupture would cause more ground motion than on the Hosgri alone.

In other words, the Hosgri Fault, long claimed to be unconnected to other major faults like the San Simeon, is now not necessarily the primary threat to Diablo. The new findings indicate these other, more recently identified faults, and recently admitted connected faults, can cause more damage to Diablo than the Hosgri.

The defense by NRC and PG&E for not taking action to deal with these increased potential challenges to Diablo is that the newly estimated ground motions, while larger than those now estimated for the Hosgri and the DDE/SSE, are smaller than they presumed long ago for the Hosgri. But that is dependent upon using the non-conservative, non-standard assumptions allowed only for the Hosgri exception, and then apparently using new, even less conservative assumptions on top of them. These new methodological presumptions are not allowed under the license. And there has been no license amendment, nor any vetting of these assumptions and their associated reduced safety margins in any adjudicatory hearing, where they may not withstand detailed scrutiny.

Once again, PG&E has commenced a process of sharpening its pencils, using new, even less conservative input assumptions to drive down estimated ground motions even as its studies identify longer, more connected faults capable of larger threats to the plant than the Hosgri. And PG&E and NRC have resisted licensing hearings to address these critical issues. The historical pattern seems to be repeating itself.

The Historical Pattern Continues

This has been the pattern throughout Diablo's troubled history. NRC and PG&E attempt to avoid public licensing hearings on the critical seismic issues. Overly optimistic assumptions are thus chosen, only to be, time and time again, disproven by newly discovered scientific facts. Rather than shut the plant down or require sufficient upgrades to address the newly revealed seismic challenges, NRC and PG&E carve more and more safety margins out of the design, using ever less conservative (i.e., less protective) assumptions and methodologies. And they try to do this behind closed doors, with the public locked out of their right to evidentiary hearings.

Right now there is an Atomic Safety and Licensing Board that is supposed to consider PG&E's application for extending the life of Diablo at least two decades beyond its original design life and license. The position of both the NRC staff and PG&E is that the new seismic

discoveries are forbidden to be considered in those hearings on the Atomic Energy Act license renewal matters.

Right now, NRC has allowed PG&E to eliminate the DDE/SSE requirements and methodologies in its license that it cannot meet, and to do so via amending its Final Safety Analysis Report but without a license amendment request that would trigger a public right to hearing. NRC and PG&E have taken the position that the public has no right to a hearing on those seismic issues either. Essentially, on the critical seismic new discoveries, NRC and PG&E want to be allowed to just work it out between themselves, behind closed doors, with the public and independent experts frozen out.

This has not worked very well in the past. The public has generally been right, and NRC and PG&E wrong, over all these years. In 1970, for example, the intervenor group alleged evidence of undiscovered faults; they were denied the right to present the evidence in the hearing. Then the Hosgri Fault was revealed. The construction permit proceeding wasn't reopened.

The intervenor group in the operating license proceeding, Mothers for Peace, alleged that the Hosgri Fault was connected to the San Simeon Fault, that PG&E hadn't done an adequate job studying the seismic situation in the area, that there could be more undiscovered faults, and that there were inadequate quality assurance controls. PG&E and NRC Staff argued to the contrary, and the licensing board and appeal board ruled with them. The group of mothers turned out to be right on each count, and PG&E and NRC wrong on each.

Now we face one more repetition of history. Newly released findings show longer, more connected faults, capable of more ground motion than the Hosgri. But once again the pencil sharpeners are out, trying to make the findings go away by using ever less conservative and protective assumptions, carving out more and more safety margin, and doing so without the scrutiny of public licensing hearings.

The problem is that nature may not go along with the regulatory fictions. As at Fukushima, an earthquake larger than the plant can withstand could occur at any moment. And as at Fukushima, it will not be an act of nature, but a manmade disaster, caused by the failure of our institutions.

Conclusion

When the application for the Diablo Canyon construction permit was being heard in 1970, PG&E and the Commission blocked a hearing on the prospect of additional, previously unidentified faults. They asserted that there were NO active faults within 30 kilometers.

A few years later, when the plant was almost complete, the first such active nearby fault was discovered, the Hosgri. Rather than upgrade to the full risk from the fault, they created an exception for the Hosgri from the normal requirements of the license, and modified the inputs in the calculation of ground motion to reduce the estimates and allow operation with minimal

upgrades. But they asserted there were no other significant undiscovered faults in the area, and that the Hosgri wasn't connected to the San Simeon Fault (or further, to the San Gregorio).

A few years later, however, the San Luis Bay and Los Osos Faults were identified as active and nearby. Again there confidence was expressed there were no other additional undiscovered faults.

Then the Shoreline Fault was discovered. At least four active faults have thus been found near the plant, after PG&E and the Commission had asserted that were none.

Now it is conceded that the Hosgri Fault is much longer than previously assumed and is connected to at least the San Simeon Fault. (PG&E did not look to see if it is also connected to the San Gregorio Fault, as many geologists believe, claiming that was "outside the study area." Not looking, of course, doesn't make a potential fault connection disappear.)

Now it is admitted that the Hosgri Fault is also connected to the Shoreline Fault, making possible a joint rupture coming within a few hundred meters of the plant.

Repeating past practice, in the face of all these troubling discoveries, PG&E has tried to downplay the challenge to the plant by use of new input assumptions that reduce, on paper, the ground motions expected from these larger seismic challenges. Even so, their own ground motion estimates show the Shoreline and San Luis Bay Faults individually produce more ground motion than the Hosgri, with the same situation for the Shoreline-Hosgri and San Simeon-Hosgri joint ruptures. The new information about the seismic threat shows these individual faults and conneeted faults to be more of a risk than the Hosgri alone.

In short, virtually every seismic claim about Diablo made by PG&E and the NRC over the years has proven erroneous and overly optimistic. The failure to allow these issues to be aired fully in public adjudicatory hearings has contributed to these problems, and is being repeated again. The barring of public hearings suggests a fear of not being able to withstand strict scrutiny.

Fukushima occurred because the reactor was designed for a smaller earthquake and tsunami than turned out to be possible. Reviews of the accident have suggested that a too-cozy relationship between regulator and industry contributed to allowing the selection of a fictional, small earthquake and tsunami as the design basis. Nature did not go along with the regulatory fiction. One can only hope that history does not repeat itself on the Central California Coast.

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[i] See NRC radiation protection regulations in 10 CFR 20 Appendix B; and EPA's Superfund cleanup preliminary remediation goals (PRGs) [http://epa-prgs.ornl.gov/radionuclides/]

[ii] See, e.g., NRC Commissioner James Asselstine to Victor Stello, Jr. NRC Executive Director for Operations, Subject: *NUREG/CO-0084, Proceedings of the Workshop on Containment Performance Design Objective,* April 13, 1987, transmitting attached paper by Daniel Hirsch,

Director, Stevenson Program on Nuclear Policy, University of California, Santa Cruz, *Minority Report: Assessing the Need for Containment Performance Design Objectives,* July 20, 1986.

[iii] Daniel Hirsch *et al.,* "Protecting Reactors from Terrorists," *The Bulletin of the Atomic Scientists*, Vol. 42, No. 3, March 1986; Daniel Hirsch, ""The Truck Bomb and Insider Threats to Nuclear Facilities," in Paul Leventhal (Ed.), *Preventing Nuclear Terrorism*, Lexington Books, Lexington, MA: 1987; Daniel Hirsch *et al., Nuclear Terrorism: A Growing Threat*, A Report to the Safeguards and Security Subcommittee, Advisory Committee on Reactor Safeguards, U.S. Nuclear Regulatory Commission; May 7, 1985. Reprinted in monograph series, Stevenson Program on Nuclear Policy, UC Santa Cruz, SPNP-85-F-1

[iv] Daniel Hirsch, "The NRC: What Me Worry?", *Bulletin of the Atomic Scientists,* January/February 2002; Daniel Hirsch, Edwin Lyman, and Dave Lochbaum, "The NRC's Dirty Little Secret: The Nuclear Regulatory Commission is Still Unwilling to Respond to Serious Security Problems," *Bulletin of the Atomic Scientists,* May/June 2003; Committee to Bridge the Gap, Petition to the Nuclear Regulatory Commission for Rulemaking, *PROPOSED AMENDMENTS TO 10 C.F.R. PART 73 (Upgrading the Design Basis Threat, Regulations for Protection Against Terrorist Attacks on Nuclear Reactors)*, July 23, 2004; NRC, SECY-05-0106, *Proposed Rulemaking to Revise 10 CFR 73.1, Design Basis Threat (DBT) Requirements.*

[v] David Lochbaum, *Seismic Shift: Diablo Canyon Literally and Figuratively on Shaking Ground,* Union of Concerned Scientists: November 2013

[vi] Gayle LeBaron, "Battle Over Bodega Head Nuclear Plant Set the Stage," April 15, 2011, *Press Democrat;* David Okrent, *Nuclear Reactor Safety: On the History of the Regulatory Process,* University of Wisconsin Press, 1981; Thomas Reymond Wellock, *Critical Masses: Opposition to Nuclear Power in California, 1958-1978,* University of Wisconsin Press, 1998.

[vii] U.S. Nuclear Regulatory Commission, *Safety Evaluation Related to the Operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2, Docket Nos. 50-275 and 50-323*, NUREG-0675, Supplement No. 34 (hereafter SSER 34), p. 2-39

[viii] Thomas H. Pigford, *Building the Fields of Nuclear Energy and Nuclear Waste Management, 1950-99,* University of California, Berkeley, University History Series, Regional Oral History Office, The Bancroft Library, 2001, pp. 144-150. Pigford reports that one of the factors involved in the ASLB refusing the request for a few hours to present evidence of nearby faults was that the ASLB chairman was running for election as County Manager of Montgomery County in Maryland and was in a hurry to return to the campaign.

[ix] The design was based on an earthquake more than 20 miles away on the Naciemento Fault, or a much smaller aftershock, not on an existing fault, arising from an earthquake on the San Andreas Fault, which is located 48 miles away. FSARU §2.5.2.9

[x] *Opinion of Commissioners Gilinsky and Bradford on Commission Review of ALAB-644 (Diablo Canyon Seismic Proceeding),* CLI-82-12A, 16NRC8,10

[xi] R.C. DeYoung, Assistant Director for Light Water Reactors Group 1, Division of Reactor Licensing, to Roger Boyd, Acting Director, Division of Reactor Licensing, USNRC, *Diablo Canyon Geology-Seismology,* January 5, 1976.

[xii] In these proceedings, peak acceleration is benchmarked at 100 Hz for comparison purposes. USGS did indicate one could modify the values from Circular 672, but did not recommend how or any other value.

[xiii] Atomic Safety and Licensing Appeal Board, *In the Matter of Pacific Gas and Electric Company, Diablo Canyon Nuclear Power Plant Units 1 and 2, Dockets No. 50-275 (OL) and 50-323 OL (Seismic Proceeding)*, ALAB-644, 15 NRC 903, June 16, 1981
[xiv] Gilinsky-Bradford opinion at 12.
[xv] Gilinsky-Bradford Opinion at 13-14
[xvi] Barbara Byron, California Energy Commission, *California's Policies and Recommendations for Advanced Seismic Research at Diablo Canyon,* September 9, 2010.
[xvii] Atomic Safety and Licensing Board, *Partial Decision*, Diablo Canyon Units 1 and 2, September 27, 1979.
[xviii] PG&E took the position that the Hosgri analysis was not part of the Safe Shutdown Earthquake, that the SSE was the DDE at 0.4 g. See NRC SSER7, p. 2-3, citing a PG&E letter to NRC of April 11, 1978.
[xix] Pacific Gas & Electric, License Amendment Request 11-05, "Evaluation Process for New Seismic Information and Clarifying the Diablo Canyon Power Plant Safe Shutdown Earthquake," October 20, 2011.
[xx] Pacific Gas & Electric, Standard Review Plan Comparison Tables for License Amendment Request 11-05, "Evaluation Process for New Seismic Information and Clarifyinq the Diablo Canyon Power Plant Safe Shutdown Earthquake," December 6, 2011
[xxi] The Peck DPO, its Denial, the Appeal DPO Denial, and the Denial of the Appeal were released by NRC on September 10, 2014, available on the NRC ADAMS database at ML12452A743.
[xxii] available at http://www.pge.com/en/safety/systemworks/dcpp/seismicsafety/report.page

Senator BOXER. Thank you for your testimony. It is quite riveting, and you tell it in the most straightforward way, and that is what I know about you and what I have always admired. You just give us the facts, and you let us understand the drama just by giving us the facts, and this is dramatic testimony and I am very grateful.

Now we are very honored to have Sam Blakeslee here, Hon. Sam Blakeslee. You have great background in nuclear safety and serving people, and I talked to you, I don't know, a year or two ago, when all this was hitting the fan, about this new earthquake discovery, and you were so forthcoming. So please proceed.

STATEMENT OF HON. SAM BLAKESLEE, Ph.D., FORMER STATE SENATOR, STATE OF CALIFORNIA, AND FORMER COMMISSIONER, CALIFORNIA SEISMIC SAFETY COMMISSION

Mr. BLAKESLEE. Thank you, Senator Boxer and Ranking Member Vitter, members of the committee. May I ask that my written remarks be entered into the record?

Senator BOXER. Yes, they will be.

Mr. BLAKESLEE. Thank you for this invitation to testify today at the hearing regarding actions to ensure nuclear plant safety in the aftermath of lessons learned at Fukushima.

I am Dr. Sam Blakeslee. Let me start my comments by stating that I am a lifelong Republican, a scientist, and am not anti-nuclear. My testimony here today reflects the culmination of my experiences as a former State senator, as the GOP leader in the California State assembly, as a member of the California Seismic Safety Commission, and a former senior research geophysicist with Exxon.

When elected to California's legislature a decade ago, I raised concerns that state-of-the-art seismic assessment technologies used by oil companies had never been applied to identifying offshore earthquake faults near Diablo Canyon Nuclear Power Plant. I therefore, in 2006, authored legislation, and Governor Schwarzenegger subsequently signed, that mandated a report that was released just a couple of months ago about the new seismic hazards at Diablo. But even before the release of that report, as Mr. Hirsch just testified, in 2008, the utility confidently declared to State regulators and the public that their seismic study program had already learned everything there was to know about the surrounding seismic landscape near the plant.

Amazingly, only weeks after these assurances in writing of safety, the USGS announced the discovery of a powerful Shoreline fault within 600 meters of the plant. And now here we are with updated seismic data from the studies released just a few months ago confirming what many had feared and what the utility had long denied: a number of new earthquake threats do exist that are larger and closer to the plant than previously believed.

The report uncovers the following revelations:

Contrary to earlier representations, the Hosgri fault is in fact connected to the San Simeon fault, capable of producing a 171-kilometer rupture.

The Hosgri also connects to the powerful Shoreline fault, introducing the potential for a magnitude 7.3 just 600 meters from the plant and 300 meters from the intakes, a magnitude 7.3.

There are now five earthquake hazards that can produce shaking greater than an earthquake on the Hosgri fault, the same fault which the utility claimed was the controlling fault and the largest threat to Diablo.

Despite these astonishing findings, the utility continues to argue the plant is now safe and, in fact, now it is safer than ever before.

How is that done? They have concluded this by developing a new less conservative methodology that reduces shaking estimates from all nearby earthquakes.

The information about these new faults is so compelling that it led Dr. Michael Peck, NRC senior resident inspector at Diablo, to issue an official dissenting professional opinion stating these earthquakes could in fact, by the utility's own estimates, produce shaking stronger than permitted under the current license. He called for closure of the plant until the utility could prove that the reactors could withstand potential earthquakes from these faults. Yet, his concerns were silenced by the NRC.

For the NRC to de facto accept this new less conservative methodology which reduces estimated shaking from these nearby earthquakes would be a stunning delegation of authority to the utility and NRC staff that would result in dramatically weakened seismic safety standards at the Diablo Canyon Nuclear Power Plant. This passive erosion of regulatory oversight is exactly what led to the Fukushima disaster, the Deepwater Horizon disaster, and the recent unexpected shutdown of California San Onofre Nuclear Generating Station, all of which were foreseeable and avoidable.

In fact, just this year the Office of Inspector General at the NRC reviewed the factors leading to the shutdown of San Onofre and chastised the NRC for allowing the utility to sidestep the license amendment process.

So the question before us today is how will the NRC respond to these new revelations about new earthquake threats that surround Diablo. Will they repeat the mistakes of Japan's nuclear regulation authority and rely upon the utility's representations? Will they give the utility a pass around the license amendment process, which is exactly what happened at San Onofre? Or will they recognize the dangers of passive regulatory oversight and insist on higher seismic safety standards?

You heard in the prior testimony the commissioners testified to the complex and convoluted licensing history at Diablo. But we now know much more about seismic issues than when Diablo was licensed. Therefore, the NRC has a responsibility to the public to define updated seismic standards through a formal license amendment process that protects the public interest. This process ensures a robust independent setting where the best technical arguments can be made in public, rather than behind closed doors between the utility and NRC staff.

I would like to use this opportunity to urge a license amendment process for Diablo in light of these new earthquake threats.

Thank you.

[The prepared statement of Mr. Blakeslee follows:]

WRITTEN STATEMENT

BY SAM BLAKESLEE, PH.D.
CALIFORNIA STATE SENATOR, FORMER
CALIFORNIA SEISMIC SAFETY COMMISSIONER, FORMER

TO THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

DECEMBER 3, 2014

Senator Boxer, Ranking Member Vitter, and Members of the Committee,

Thank you for the invitation to testify at today's hearing titled 'NRC's implementation of the Fukushima near-term task force recommendations and other actions to ensure and maintain nuclear safety.' The Fukushima meltdowns raised important concerns about nuclear reactors and one of those concerns relates to seismic safety. As a geophysicist and former California State Senator, I authored AB 1632, a bill that required PG&E to conduct seismic hazard research of the faults near the Diablo Canyon Nuclear Power Plant (Diablo) housed in the community that I reside in and represented for 8 years as a state legislator. Just two months ago, PG&E published the Coastal California Seismic Imaging Project (CCCSIP) Report and the results were astonishing. The Report documents the presence of a number of earthquake faults discovered after the design and construction of the plant that have been found to be larger and more dangerous than previously understood. In a post-Fukushima regulatory environment, it is important that policymakers and regulators understand the ramifications of these findings.

EXECUTIVE SUMMARY

PG&E has a long history of grappling with California's earthquake faults when trying to site its nuclear plants. It had previously proposed a nuclear power plant on the California coast at Bodega Bay but abandoned the plan when it was discovered that the site was to be built overtop the Shaft Fault and within 1000 feet of the San Andreas Fault. Later, PG&E built a small nuclear power plant on the California coast at Humboldt Bay, but the plant was shut down after the discovery of three faults within few thousand meters of the plant. PG&E selected the location for the Diablo plant, representing that the seismic activity in the area was minimal.

In the late 1970s, when Diablo was still under construction, data surfaced on the presence of a large active fault (named the Hosgri) located just three miles offshore from the plant. PG&E first denied its existence. When that assertion was disproved, it argued the fault was likely inactive. When PG&E had to concede it was active, it argued it was not capable of producing particularly large earthquakes. It turned out it that was capable of generating very large earthquakes.

In a recent replay of these events concerning a newly discovered fault system, the Shoreline fault was discovered in 2008 and analyzed with state-of-the-art methods and found to be capable of generating an M7.3 earthquake within a mere 600 meters of the plant.

There is no getting around the fact that PG&E has consistently downplayed seismic hazards on the coast near its nuclear plants. Especially disturbing is that during these past decades the NRC has repeatedly relaxed its seismic standards to accommodate the operation of Diablo Canyon.

Now that the data about the faults near Diablo is indisputable, PG&E has changed tactics and declared the plant safe on the basis of a new set of equations it has developed. PG&E has undertaken major revisions to the complex ground motion equations that have been used to estimate how much shaking can be produced by earthquakes. Unsurprisingly, PG&E's changes to its methodologies have dramatically reduced estimated shaking at the plant from all hypothetical earthquakes. So far, NRC has largely gone along with these changes.

With PG&E's history of playing down seismic concerns these recent developments are cause for deep concern. So is PG&E's documented history of co-opting the very regulatory bodies tasked with overseeing it. Just this year:

- PG&E was found to be inappropriately, and possibly illegally, lobbying California Public Utilities Commissioners and staff to successfully "judge shop" in a case before the CPUC. The revelation resulted in the firings of three senior PG&E executives, the reassignment of the CPUC's chief of staff, and the decision by the President of the CPUC to recuse himself from future PG&E decisions and to not seek re-appointment. The CPUC was just fined a $1.05 million for this back-channel lobbying.

- PG&E was indicted on 12 criminal charges related to safety violations in its gas distribution, including an accusation that PG&E officials obstructed a federal investigation and that the utility "knowingly relied on erroneous and incomplete information" to avoid inspections that would have exposed risks that ultimately killed 8 people in a 2010 gas pipeline explosion

- PG&E was discovered, through email disclosures, to be exploring how and when the Diablo Canyon Independent Peer Review Panel could be disbanded. This is the state-mandated panel tasked with providing third-party quality control of seismic risk analysis at Diablo that is quantified by the Report, which is my subject here.

In 2013, because of steam generator failures, San Onofre, California's only other nuclear power plant was permanently shut down at great cost to ratepayers, shareholders, and grid operations. Last month, the Office of the Inspector General at the NRC issued a report criticizing the NRC's failure to call for a license amendment process, which might have identified the shortcomings of the utility's technical analysis that ultimately led to those leaks. The safety ramifications of steam generator leaks at San Onofre, as serious as they were, are dwarfed by the risks to the public should PG&E's Diablo seismic analysis prove to be incomplete or inaccurate. You would think that after Fukushima the NRC would go beyond a "check the box" review process when confronted, as it is at Diablo, with the possibility of a 7.3 magnitude earthquake within a half-mile of the plant. So far we have been disappointed.

Remarkably, in all the years of its operation, the facility has never gone through a formal license amendment process to deal with even the Hosgri Fault discovered in the 1970s. Instead, its possible ramifications were more or less explained away in a separate document. More significant faults have been discovered since, which speaks poorly of PG&E's original examination of the area, and of the NRC's supervision of that process. One should not be discovering such faults after building a plant. The potential earthquakes affecting the plant have increased with each major study. But what's equally striking is that the shaking predicted by PG&E for these increasing threats has systematically decreased as PG&E adopted less and less conservative analytical methodologies, and they did so with NRC approval.

It is time to end this hodge-podge of licensing rationalizations. We know a great deal more about seismic issues than we did when Diablo Canyon was licensed. It's time for the NRC to reassess the seismic standards for the plant and submit them to a formal licensing amendment process. The thing that both PG&E and NRC fear most is a public hearing in which they would have to justify what they have done. It is also what we need most to assure seismic safety, and it is what the public deserves.

INTRODUCTION

In 2005, as the elected State Assemblyman representing the Central Coast and as a geophysicist, I became concerned that PG&E's prior seismic hazard analysis in the vicinity of the Diablo Canyon Nuclear Power Plant had failed to utilize modern state-of-the-art geophysical techniques that have proven highly effective at mapping seismic faults. In 2006, I authored, the state legislature passed, and Governor Schwarzenegger signed AB1632, which directed the California Energy Commission to assess existing scientific studies to determine the potential threat of earthquakes to the future reliable operation of Diablo. After extensive review the California Energy Commission concluded that significant seismic uncertainty existed and charged PG&E with the task of acquiring new state-of-the-art geophysical data to reassess the seismic threats to Diablo. In the furtherance of AB1632 the California Public Utilities Commission provided $64M of California ratepayer funds to compensate PG&E for the Coastal California Seismic Imaging Project that resulted in the Report.

At the time of the bill's passage few appreciated the potential threat that large earthquake faults posed to operating nuclear facilities. Since then the public's awareness of the importance of the issue has increased significantly:

- In 2007 the Kashiwazaki-Kariwa Nuclear Power Plant, the largest in the world, was severely damaged and shuttered due to an M6.6 earthquake 19 kilometers offshore from the facility.

- In 2008 the USGS discovered a previously unknown Shoreline Fault only 600 meters from the Diablo Nuclear Power Plant and only 300 meters from the intake.

- In 2011 the Fukushima Daiichi nuclear disaster resulted in the meltdown of three of the plant's six reactors, triggering an emergency review by the NRC of US nuclear reactors and their ability to withstand shaking from earthquakes. This tragedy was

caused by an earthquake and Tsunami far larger than the utility believed possible, which produced greater shaking than the plant was designed to withstand.

Two months ago, eight years after the passage of AB1632, PG&E issued its Report, which will likely be relied upon by state and federal regulators in the course of their immediately upcoming deliberations regarding PG&E's request to extend the operating license of the Diablo through 2044-2045. My review of this Report addresses important historic, technical, and regulatory issues that are central to the final conclusion of the Report; specifically, that the facility has been shown to be safe from seismic threats.

PG&E's Report makes a number of key findings regarding earthquake threats. In virtually every instance, the faults surrounding Diablo are now understood to be larger and more connected than previously believed as recently as 2011. Of course the plant was initially licensed assuming these seismic threats were non-existent. Whereas the Hosgri Fault had previously been believed to be the most dangerous fault near Diablo, newly released research shows that the prior Hosgri maximum earthquake assumption is eclipsed by five other fault-rupture threats:

1. SHORELINE FAULT: The newly discovered Shoreline Fault located within 600 meters of the plant, is now twice as long as thought in 2011 and almost three times as long as the lower bound proposed in 2009. With a length now understood to be 45 km long it is capable of generating M6.7 strike-slip earthquake, which is larger than estimated in PG&E's previous 2009 and 2011 reports.

2. SAN LUIS BAY FAULT: The newly reinterpreted 16 km San Luis Bay Fault located within 1,900 meters of the plant, is capable of generating a M6.4 reverse earthquake, which is larger than previous estimated in PG&E's 2011 report.

3. LOS OSOS FAULT: The newly reinterpreted 36 km Los Osos Fault located within 8.1 km of the plant is capable of generating a M6.7 reverse earthquake which is smaller than the M6.8 estimate in PG&E's 2011 report, but still estimated to produce more ground motion than the Double Design Earthquake (DDE), also known as the Safe Shutdown Earthquake in the license.

4. JOINT SHORELINE/HOSGRI FAULT SYSTEM: The newly reinterpreted 145 km joint Shoreline/Hosgri Fault system now assumes that the Hosgri Fault and Shoreline Fault connect, whereas previously the two were considered to be wholly separate and incapable of failing in a larger single rupture. A joint Shoreline/Hosgri strike-slip rupture within 600 meters of the plant could theoretically generate approximately a M7.3 earthquake according to the Report.

5. JOINT HOSGRI/SAN SIMEON FAULT: The newly re-interpreted 171 km joint Hosgri/San Simeon Fault system now assumes that the Hosgri Fault and San Simeon Fault connect, whereas previously the two were considered to be wholly separate and incapable of failing in a larger single rupture. A joint Hosgri/San Simeon rupture within 4.5 km of the plant is capable of generating a M7.3 strike-slip earthquake, which is larger than the previously estimated M7.1 utilized in numerous prior

reports. The newly defined Hosgri Fault is considerably longer than previously presumed by PG&E and NRC.

The predicted ground motion generated by this list of earthquake scenarios are **all greater than the current ground motion estimates for a M7.3 Hosgri Fault earthquake located 4.7 kilometers from the facility**. This result is remarkable as the enormous Hosgri Fault, which can be seen easily on oil company seismic lines and passes the plant at a distance of only three miles, had been argued for many years to be the greatest threat to the facility. (Note: from a regulatory perspective the Hosgri Fault had previously been treated as the "controlling fault", which is to say the fault posing the greatest possible seismic threat to Diablo.)

However, in a seeming contradiction, rather than finding that larger or closer faults produce greater shaking and therefore a greater threat, PG&E argues in the Report that ground motion will be lower than the levels previously estimated. In other words, these newly discovered and re-interpreted faults are capable of producing shaking that exceeds the shaking from the Hosgri, yet that shaking threat would be much reduced from prior estimates.

Though discussed only in passing in the Report, the reason for this seeming contradiction is quite important when assessing whether or not the plant is safe or whether it is operating within its license conditions. The reason the earthquake threat purportedly went down when new faults were discovered is because the utility adopted significant changes to the methodology utilized for converting earthquakes (which occur at the fault) into ground motion (which occurs at the facility). This new methodology, which is less-conservative than the prior methodology, essentially "de-amplifies" the shaking estimated from any given earthquake relative to the prior methodology used during the licensing process.

DIABLO LICENSING BACKGROUND

The Diablo Canyon Nuclear Power Plant was licensed through a strictly adjudicated process that defined the Safe Shutdown Earthquake as the "maximum earthquake potential for which certain structures, systems, and components, important to safety, are designed to sustain and remain functional." In the unique parlance of the Diablo Canyon Nuclear Power Plant this Safe Shutdown Earthquake was defined as the "Double Design Earthquake." The NRC licensing process "ensures that the detailed operability requirements of the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code are met at the higher ground motions." [i] The Design Earthquake (DE) for Diablo was defined during the construction permit process as the largest of four possible earthquake scenarios. The DE was assumed capable of generating a peak ground acceleration of 0.2 g. The Safe Shutdown Earthquake was then defined for Diablo as 0.4g, which is to say the plant must be able to shut down safely if a hypothetical earthquake generates double the 0.2g of shaking that was estimated to be possible from known surrounding threats. This hypothetical Safe Shutdown Earthquake is known as the Double Design Earthquake (DDE) and is a key element in establishing safety standards during the licensing process.

This formal NRC licensing process, which defined the DDE as the Safe Shutdown Earthquake for enforceable regulatory purposes, occurred prior to the discovery of the Hosgri Fault. Upon its discovery the USGS analyzed the Hosgri Fault and determined that it could generate

a M7.5 earthquake at a distance of 4.5 km. The NRC negotiated with PG&E to create the 1977 Hosgri Evaluation (HE) exception under the theory that the plant could withstand shaking from this newly discovered fault under a narrow and specific set of assumptions. The HE used considerably less-conservative assumptions than those used for the DDE, which was applied to all other earthquake threats. The reduction of safety margins by the use of these special assumptions for the Hosgri Fault was quite controversial, and was strongly criticized by NRC Commissioners Gilinsky and Bradford in an opinion they issued on the Diablo seismic matters in 1981.[ii] The DDE is the Safe Shutdown Earthquake for Diablo and applies in the Current Licensing Basis to all faults that can affect Diablo, with the exception of the Hosgri Fault, to which the 1977 HE exception and its methodology and assumptions uniquely apply. Because of the differing assumptions the HE exception did not and was never intended at the time to eliminate or supersede the DDE standard.

To operate within its license the utility has been required to show that the plant will not be exposed to shaking beyond either the DDE basis or the less-conservative HE exception for a potential Hosgri earthquake. Later, the 1977 HE exception was modified to assume a slightly smaller M7.2 earthquake but with a slightly more dangerous reverse component of slip. The combination of the two changes produced a modified spectrum that changed only modestly with small enhancement at higher frequencies. That modification became known as the 1991 LTSP spectrum;[iii] however, it never became part of the Current Licensing Basis. (For the rest of this letter the Hosgri shaking estimates will be described as the HE/LTSP spectrum due to the fact that the HE and LTSP are used somewhat interchangeably and differ only slightly, even though the differences are important from a historic and regulatory perspective).

In 2008 history repeated itself and, as in the case of the Hosgri Fault, another offshore fault was discovered, but this time even closer to the plant. USGS found the Shoreline Fault within 600 meters of the reactors and within 300 meters of the intakes. When considering that the fault runs to a depth of 16 km, spatially the nuclear power plant lies virtually overtop the new fault. In the immediate aftermath of the discovery, PG&E's data demonstrates that the nearby faults could produce ground motions significantly higher than the 0.4g peak acceleration permissible under the DDE standard (see table below - note this analysis occurred prior to the seismic studies described in the Report which found that the faults were larger than assumed in table).

Table: Comparison of Reanalysis to Diablo Canyon SSE[iv]

Local Earthquake Fault	Peak Ground Acceleration
DDE	0.40g
Shoreline	0.62g
Los Osos	0.60g
San Luis Bay	0.70g
Hosgri	0.75g

In the face of this conflict with the license, PG&E began to compare the new seismic threats not to the DDE in the license, but rather to the HE/LTSP spectrum. If PG&E could ignore the DDE Safe Shutdown Earthquake standard in the license, PG&E could simply seek to prove that the newly discovered seismic threats were 'bounded' by the HE/LTSP spectrum, with

their less conservative assumptions - ergo, notwithstanding the newly discovered and re-interpreted faults, the plant could be said to be operating consistent with its license.

Dr. Michael Peck, the Senior Resident NRC Inspector at the Diablo Canyon Nuclear Power Plant, was concerned that the newly discovered and re-interpreted faults (Los Osos, Shoreline, San Luis Bay) had been shown by PG&E to produce greater shaking than the .04g peak acceleration DDE design basis. He stated that the only approved exception to the DDE was the 1977 HE exception, which applied only to the Hosgri Fault, and that the exception was not transferrable to these other nearby faults - ergo a license amendment was required to correct the inconsistency between the existing license and the new seismic threats.

Buttressing Peck's argument that the less strict spectrum was not to supersede or replace the DDE, on October 12th, 2012 the NRC wrote to PG&E[v]: 'The DCPP Final Safety Analysis Report Update states in Section 2.5,

> "...the LTSP material does not alter the design bases for DCPP." In SSER 34 the NRC states, "The Staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis ***plus*** the Hosgri evaluation basis..." (emphasis added).

Faced with newly estimated ground motions in excess of the DDE Safe Shutdown Earthquake license requirement, PG&E proposed revising its license to eliminate the DDE requirement and have the HE/LTSP spectrum, with its considerably less protective methodological assumptions, apply not just to the Hosgri Fault as an exception to the DDE, but to all faults. The NRC declined to accept the request for review because it failed to meet certain required standards.

CRITICAL ISSUE EXPLORED

I do not seek to engage on Peck's important regulatory issue of whether the utility can now legally disregard the DDE standard and instead meet only the less-conservative HE exception. That is a matter for the NRC to determine based on its safety and regulatory standards and, hopefully, informed by the post-Fukushima understanding of the dangers of lax regulatory oversight. In the aftermath of this disagreement between the Senior Resident NRC Inspector at Diablo Canyon Nuclear Power Plant and NRC staff, deliberation on this regulatory issue is now the subject of a lawsuit filed before the US Court of Appeals for the District of Columbia.

Instead, this analysis seeks to explore a different issue; specifically, is PG&E correct when it asserts that the utility has shown that the new seismic threat is bounded by the 1977 HE exception? (By exploring only this second issue I do not mean to minimize the importance of the first issue, but this second issue is central to the critical conclusion of the Report). In other words, the question is whether or not the new seismic threats have in fact been shown to produce shaking that is smaller than the HE basis exception <u>when the same associated analytical methods used to create the HE basis exception are applied to the new seismic threats</u>.

Why is it important to add this caveat about the same "associated analytical methods?" Because the rest of the NRC statement cited above under SSER 34 goes on to say,

> "The Staff notes that the seismic qualification basis for Diablo continues to be the original design basis plus the Hosgri evaluation basis, ***along with associated analytical methods, initial conditions, etc.***"(emphasis added).

If the utility seeks to argue that the 1977 HE exception can be used as an alternative standard to avoid the stricter DDE standard, which is controversial in itself, then the methods which were used to compute the HE exception become of paramount importance. This analysis seeks to document that the "associated analytical methods" used by the utility to analyze the new seismic threats in the Report are markedly less-conservative than those used for the 1977 HE exception.

Why is this change in methodology important, particularly when the methodology is less conservative? Under 10 CFR 50.59, a license amendment is required when the Final Safety Analysis Report (FSAR) is inadequate to describe the circumstances at the plant and there is a

> "departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analysis." NRC regulations define such a departure as: "(i) **Changing any of the elements of the method described in the FSAR (as updated) unless the results of the analysis are conservative or essentially the same**; or (ii) Changing from a method described in the FSAR to another method unless that method has been approved by NRC for the intended application."

The NRC requires a license amendment when there is a <u>departure</u> from a method of evaluation that established the design basis unless that departure is essentially the same or more conservative. If the utility is allowed to employ less-conservative analytical methods to obtain more optimistic results then prior safety standards could be lowered without the full understanding or regulatory concurrence of the NRC.

It was this very problem that led to the shutdown of the San Onofre SONGS' plant. The failure of the NRC to recognize the need for a license amendment to replace San Onofre's steam generators was identified by the **Office of the Inspector General** at the Nuclear Regulatory Commission as a missed opportunity to identify weakness in Edison's technical analyses[vi]. There is a marked difference between NRC staff review of a utility's change in methodology versus the rigor and process associated with a license amendment.

This analysis contends that because a true apples-to-apples comparison was never made in the Report between the Hosgri and the new seismic threats using analytical methods that are **"conservative or essentially the same"** as those used for the Hosgri evaluation. Therefore, it is inaccurate to assert that the new seismic threats are shown to be "bounded by the Hosgri evaluation basis" – as that phrase has any bearing for regulatory purposes.

This contention is important because - If PG&E is allowed by the NRC to reject both the stricter standard of the DDE and the conservative analytical methods used when the 1977 HE exception was authorized, then the NRC's prior seismic safety licensing standards will have been, for all practical purposes, circumvented.

Making this particularly troubling is that this circumvention will have been achieved without a license amendment process, which would ensure a more robust process for including

analysis of differing and minority findings and opinions – findings and opinions which have been proven over time to be right, more often than not.

GROUND MOTION PREDICTION RETROSPECTIVE

Methodologies employed to assess potential shaking at the nuclear power plant can be broken into three broad categories:

1) SOURCE: Estimated energy released by a specific earthquake on a given fault – based on equations that involve factors such fault mechanics, stress drop, radiation pattern, directivity, rupture history, rupture length and width, etc.

2) PROPAGATION: Estimated attenuation and amplification factors that convert the energy released during the fault rupture process to the actual observed free field ground motion at a particular site, based on:

   a. TRANSMISSION EFFECTS: Energy transmission involves absorption and scattering, otherwise known as attenuation, incurred along the propagation path from the earthquake to the vicinity of the particular site, and

   b. SITE EFFECTS: Site amplification and de-amplification effects due to the stiffness of the rocks and soils of the particular site and the impedance contrasts that give rise to a variety of scattering and reverberation effects.

3) TRANSFERENCE: Estimated shaking adjustments from reference free-field station to power-block, turbine-building foundation levels, and then to structures, systems, and components throughout the facility – based on certain projection, coherence, and damping factors.

This analysis seeks to examine #1 and #2a and #2b cited above.

A Ground Motion Prediction Equation (GMPE) is used to predict shaking at a particular distance from an earthquake based on a variety of parameters. A GMPE represents the statistical relationship that best fits the empirical distance-attenuation observations from some database of earthquake recordings. Some of the parameters used to make the estimate include: size of earthquake, fault mechanics, geometry of the fault to the recording station, and the velocity of the rocks immediately below the recording station. GMPEs incorporate a large range of phenomena and effects.

Since discovery of the Shoreline Fault PG&E has significantly changed the GMPE equations used to analyze potential shaking at Diablo. The following summarizes the changes and their net effect on seismic hazard estimates. To help track the evolution of GMPE's they are informally numbered in the following retrospective. (**GMPE-1,** nomenclature for the purposes of this letter would be the methodology used for the DDE and the HE exception from the construction permit).

In 1991, PG&E constructed the LTSP spectrum, which assumed a M7.2 earthquake at a distance of 4.5 km and used a GMPE **(GMPE-2)** derived from their own distance-attenuation relationship based on a database of strong-motion recordings of earthquakes at a range of distances along with regression analysis

In 2008 the Shoreline Fault was discovered which triggered a requirement that PG&E assess whether or not shaking caused by the newly discovered fault was 'bounded' by the DDE *and* the HE exception, as required by its current operating license. Rather than use the same GMPE to perform that analysis PG&E began introducing new methodologies making it difficult to perform historical comparisons with earlier standards approved through the NRC's regulatory process.

PG&E, in an initial sensitivity report[vii] to the NRC, assumed that the length of the Shoreline Fault was as much as 24 km long with a depth of 12 km and capable of generating a M6.5 earthquake. It then used an assortment of different recently developed GMPEs, known as the Next Generation Attenuation models, to create a new averaged GMPE **(GMPE-3)** to compute shaking estimates at the plant caused by a Shoreline earthquake. GMPE-3 resulted in a de-amplification effect of median estimated shaking, relative to the prior methodology, i.e. a decrease in shaking, relative to GMPE-1 or GMPE-2. This new GMPE was justified based on the use of the Pacific Earthquake Engineering Research Center (PEER) database of some 3,600 earthquake recordings. Using GMPE-3 PG&E reported that the shaking was substantially lower than, or bounded by, the LTSP/HE spectrum[1].

In 2009, NRC staff used PG&E's proposed **GMPE-3** equations but then analyzed the Shoreline Fault assuming it was 24 km long with a depth of 16 km, which was more conservative than PG&E's depth of 12 km. Using these parameters, and including a 1 standard deviation of magnitude estimate, the largest possible earthquake was computed to be M6.85 rather than M6.5. Assuming the somewhat larger earthquake their analysis found,

> "The motions are *very close to* the LTSP/HE in the high-frequency range but fall below the LTSP/HE in the long-period range". and "...seismic loading levels predicted for a maximum magnitude earthquake on the Shoreline Fault are *slightly below* those levels for which the plant was previously analyzed in the Diablo Canyon Long Term Seismic Program" (emphasis added).

Using GMPE-3 shaking from an assumed 24 km Shoreline Fault was found to be "*very close to*" and only "*slightly below*" the LTSP/HE spectrum when using the new GMPE-3 methodology (emphasis added).

The five NGA GMPEs which, when averaged, produce GMPE-3 are each shown in figure 10 from the NRC report. The NRC staff analysis also tested the significance of using the lower-bound estimate of rock velocity rather than the "best estimate" (lower velocity corresponds to higher shaking). Using a rock velocity of 800 m/s instead of 1,100 m/s resulted in a spectrum that, "exceeds the LTSP spectrum by a small amount over some frequencies." In summary, by using reasonable but somewhat more conservative approaches to the three available variables (the NGA model selection, earthquake magnitude estimate, or rock velocity) the spectrum was found to be "very close" or "exceeds...by a small amount." This result was quite significant because it showed that, even in the early days when the Shoreline Fault was still believed to be relatively small, shaking could exceed the LTSP Spectrum assuming certain models and certain rock parameters. The Chiou & Youngs (08) GMPE

[1] The LTSP and HE spectra are very similar and are used almost synonymously in some reports cited herein. To avoid confusion caused by switching back and forth, a single term LTSP/HE will be used in some instances even though they differ from a regulatory basis.

(dotted blue line) exceeds the LTSP Spectrum (solid black line) at about 7 Hz and above, the others are just a little below, hence the characterization that they are *"very close"* (emphasis added).

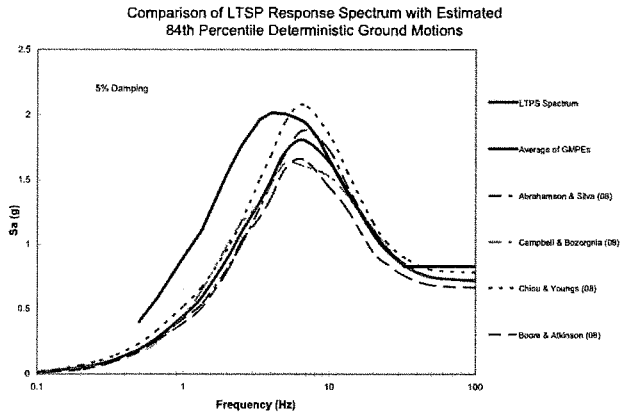

Figure 10. Comparison of Individual 84th Percentile Ground Motion Prediction Equations with Best Estimate Parameters and Diablo Canyon Review Spectrum

This result naturally raises important questions about the effect of the new GMPE applied to the Shoreline. For example: would estimation of shaking on a 24 km rupture of the Shoreline Fault have exceeded the LTSP if GMPE-1 was used rather than GMPE-3? Given what is shown in Figure 10 it appears that the answer would likely be "yes" if the difference between GMPE-3 vs GMPE-1 was anything other than de minimis, but that analysis was not performed in the 2009 Shoreline report.

The effect of which GMPE methodology is employed is highlighted in a NRC staff remark when it wrote, "...epistemic uncertainty in the GMPEs, which tends to be higher in the magnitude-distance ranges with sparse available seismological data (such as large magnitudes at short distances). Generally the GMPEs are the ***largest source of uncertainty*** in the ground motion values produced in seismic hazard analysis" (emphasis added). Here the NRC staff acknowledges that the new GMPEs are the source of the greatest uncertainty, and, that uncertainty is greatest for large earthquakes at short distances, which is exactly the situation for Diablo.

In 2011, PG&E issued its "Report on the Analysis of the Shoreline Fault Zone, Central Coastal California" assuming the same maximum M6.5 earthquake along a 23 km fault, but introducing a number of new factors creating yet another new GMPE, named here as **GMPE-4**. The utility started with its 2009 GMPE-3 equation but then added a new hard-rock effect. The rationale for this equation was inferred from work by Silva (2008). The result adjusted estimated shaking downward still further from GMPE-3. Silva's work, which was specific to a particular range of rock hardness along with other factors, did not include the actual rocks

at Diablo. Therefore PG&E extrapolated the findings of the published paper so they could be applied to Diablo where a faster rock velocity of 1,200 m/s was assumed (faster rocks equate to lower shaking).

Additionally, PG&E created new equations to reduce the standard deviation of the estimated shaking. Because 84th percentile shaking estimates are the sum of the median shaking plus one standard deviation the total spectrum can be lowered either by reducing the median, reducing the standard deviation, or lowering both.

With the issuance of the 2011 report PG&E reduced both the median and the standard deviation used in the analysis of the seismic threats – the first through yet another new GMPE with hard-rock de-amplification effects; and second, through a statistical approach described as "single-station sigma."

Using this new **GMPE-4** the resulting spectrum that was no longer "*slightly below*" and "*very close*" to the LTSP/HE spectrum, per the prior NRC's findings of 2009 (emphasis added). The new margin was significantly larger thereby allowing PG&E's to again assert that the LTSP/HE spectrum was not at risk of being exceeded by shaking on a M6.5 earthquake on the Shoreline Fault. Note how the PG&E's methodology to compute shaking changed not once but twice in the short period of time since the discovery of the Shoreline Fault in 2008. Both those changes produced reduced estimates of shaking from the newly-discovered Shoreline Fault.

In 2012, NRC staff issued its "Confirmatory Analysis of Seismic Hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone. The report details staff's review of PG&E's report. NRC staff decided to lower their maximum possible earthquake from M6.85 to M6.7, which was closer to PG&E's figure of M6.5 (smaller earthquakes correspond to lower shaking). Similarly staff decided to revise their estimate of rock velocity upward from 1,100 to 1,200 m/s which was the figure used by PG&E (faster velocities correspond to lower shaking).

They also reviewed PG&E's new hard-rock de-amplification adjustment and pointed out a number of problems with the approach including uncertainty in the estimate of Kappa, a factor that describes damping in basement rock. When NRC staff explored alternative methodologies they found, "the NRC results are conservative relative to the PG&E results at virtually all frequencies."[viii] Nonetheless, NRC staff incorporated a new hard rock effect and added that factor to GMPE-3. Staff elected not to use add "single-station sigma" effect to further lower the 84th percentile of shaking. They did however agree with PG&E's conceptual approach, albeit they noted statistical unreliability of its use at Diablo due to small amounts of available data.

To issue this report, NRC staff acquiesced to PG&E's use of the

1) Use of the new NGA GMPE's,
2) Averaging of NGA GMPE's to eliminate outliers,
3) Smaller earthquake magnitude estimate,
4) New hard-rock rock scaling factor,
5) Increased site rock velocities, and
6) New statistical single-station sigma.

The net effect of adding these factors allowed the NRC to issue a "confirmation" in 2012 of PG&E's assertion that the Shoreline Fault would produce shaking below the LTSP/HE spectrum.

In 2014, after the offshore seismic studies were completed, PG&E issued its Coastal California Seismic Imaging Project (CCCSIP) Report. The Report concluded that the Shoreline Fault is 45 km long (a tripling of the utility's 2009 lower-bound figure) and that a hypothetical joint Hosgri/Shoreline Fault rupture would be 145 km long generating a M7.3 earthquake within 0.6km of the plant (corresponding to a factor of 30 greater released energy relative to the earlier lower-bound estimate). The Report also details the size and location of the Los Osos and San Luis Bay Faults and the potential earthquakes they could generate. Again, all of these threats produce shaking that is greater than their new calculations of shaking from the Hosgri, which had previously been identified as the 'controlling fault"

In Chapters 11 and 13 PG&E analyzes the new seismic threats, which are markedly larger than those analyzed in 2011 using their new GMPE-4 which was used successfully with the Shoreline Report to calculate lower levels of shaking than the earlier methodology. Analyzing the new threats using GMPE-4 the Report finds that even a massive M7.3 earthquake linking the Hosgri and Shoreline Faults, with rupture occurring within 600 meters of the reactors, could not exceed the LTSP/HE spectrum. Demonstrating just how effective these less-conservative methodologies are in lowering estimates of shaking, without a single retrofit, Diablo becomes virtually invulnerable to any imaginable earthquake regardless of size and proximity.

Evidence of the total cumulative effect of these new methodologies can be inferred by looking at the "before" and "after" calculations of shaking of a hypothetical Hosgri Fault earthquake. Such a comparison shows that the peak acceleration is reduced from 0.75g to 0.46g! The de-amplification effect is even larger than suggested by this 38% decrease in estimated shaking because the "before" Hosgri earthquake is smaller than the "after" Hosgri earthquake, which now assumes a joint rupture on the Hosgri/San Simeon Fault System. The importance of using a new methodology that reduces peak accelerations by at least 38% is never singled out for mention in the Report, nor is the prior less-conservative methodology applied to the new seismic threats.

IMPORTANCE OF NEW GMPEs

These changes to GMPEs, documented in the prior section, are crucial to the fate and future of Diablo and give rise to two important questions.

> First, from a technical perspective: Are these rapidly evolving GMPEs appropriate for application to Diablo given the statistics and science embedded in their assumptions?
>
> Second, from a regulatory perspective: Are these rapidly evolving GMPEs appropriate for application to Diablo when dealing with the safety margins and adjudicated rules that define how nuclear power plant licenses are enforced or amended?

In this retrospective of evolving GMPEs I've made no arguments regarding the technical or scientific merit regarding the half-dozen changes to GMPEs that have occurred. This is a rapidly evolving field of research for which there is insufficient data to provide a simple "yes"

or "no" answer. Instead it is more appropriate to identify concerns and to point out alternative interpretations to the existing data. Therefore, I address the first question in an attached appendix, which can be read separately from this letter.

However, as a former policymaker I do believe there is a clear-cut answer to the second question, which I will address here. Making this GMPE chronology troubling from a regulatory and safety perspective is that, as newly discovered or re-interpreted faults are progressively understood to be larger and more dangerous than previously believed the newly derived methodologies adjust shaking downward just sufficiently to accommodate the new threat. In fact, the safety of the facility no longer depends on whether or not dangerous faults actually surround the nuclear power plant and are capable of generating earthquakes that exceed the shaking predicted from the previously defined 'controlling fault.' That question has been answered unequivocally and the PG&E Report acknowledges the presence of such earthquake faults. Instead the safety of the facility depends upon the reliability of new less-conservative equations, which are going through major revisions literally with each newly issued report.[ix]

These facts raise significant regulatory issues that need to be addressed at the highest levels of the NRC. In this instance we see a nuclear power plant that is found to be exposed marked greater seismic threats than ever envisioned during the licensing process. This increase has happened not once, with the discovery of the Hosgri Fault, but twice. With this year's report an entire new class of earthquake threats have been identified that eclipse the prior Hosgri Fault threat. This fact alone should galvanize the NRC to act. But what makes the situation even more dire is that the methodologies used by the utility to analyze the new threats have changed as well. If the utility's associated analytical methods to compute ground motion were the same or more conservative the debate would be solely on the scientific questions surrounding the earthquake potential introduced by the new faults. However, in this case the associated analytical methods to compute ground motion beneath the plant are markedly less-conservative than those ever used before. These methods are less-conservative than when the plant was licensed and less conservative than even six years ago when the Shoreline Fault was first discovered. If the prior methodologies used during licensing were applied to these new faults it is possible, and perhaps likely, that shaking would exceed both the DDE and LTSP/HE spectrum. If true, this means that the plant is currently operating beyond the tolerances established under its license. That is why this is a critical regulatory issue. Threats are going up at the same time the utility's preferred method for analyzing all such threats has become markedly less conservative. From a regulatory perspective, it is this simultaneous convergence of higher threats and less-conservative methodologies that requires the NRC to act immediately.

CONCLUSION

In summary: The geophysical methodologies to locate faults and assess the size of potential earthquakes are well established and have been tested for innumerable instances over many decades. Similarly, the estimation of site effects when dealing with relatively simple geology is well understood. This history has allowed regulators to rely comfortably on the long record of published findings on these important elements of seismic hazards.

However, the geophysical methodologies for determining ground motion in the extreme near-field are in a rudimentary state of development. Similarly, the estimation of broadband

site effects when dealing with highly complex and heterogeneous 3D geology is a difficult technical problem and an active area of research (see appendix).

PG&E has progressively used methodologies that produce less-conservative results to analyze the steadily increasing seismic threat. With each successive generation of new information about the threat prior methodologies are modified and more sanguine results are obtained.

Of course, from a research perspective, the fact that a whole series of new methodologies are being explored and new equations are being tested, albeit with limited data (see appendix), is a good thing. However, it is a quite perilous thing from a regulatory perspective, which requires high-levels of scientific and statistical certainty based on large datasets and well-vetted methodologies. The regulatory determination of safety should not hang tenuously upon the results of an ongoing science experiment. When faced with such a situation nuclear regulators must rely upon the existing, more conservative, and historically accepted methodologies to assess risk.

But beyond the imprudence of relying upon rapidly evolving methodologies to obtain lower risk estimates at a nuclear power plant, there is a regulatory reason why such an approach is not allowable. The NRC stated,[x] "The Staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis plus the Hosgri evaluation basis, ***along with associated analytical methods, initial conditions, etc."*** (emphasis added). Clearly the Hosgri evaluation basis, if it is to have any regulatory meaning, can only be applied to a new seismic threat if the same, or more conservative, analytical methods are employed to compare the two. This however is not how the utility is treating the Hosgri evaluation basis. Instead, the utility employs significantly less conservative analytical methods and then states that the lower shaking produced by new seismic threats is 'bounded' by the HE exception.

Finally, if altogether less-conservative methodologies are to be used to analyze altogether new and more dangerous faults it is important that such analysis be performed at arms length through a transparent, rigorous, and strict license amendment process so that the public can have confidence that safety is the foremost consideration of the NRC. This is why such analysis should be performed through the course of a license amendment process.

My overarching concerns with the Report include:

- Disregard of DDE basis: In a post-Fukushima setting the NRC must insist upon the high and robust seismic safety standards at the nation's only nuclear power plant that is ringed by numerous nearby faults capable of earthquakes, each larger than the earthquakes envisioned from previously assumed "controlling fault." However, to-date the NRC has ignored the cautions of experts and even its own resident inspector who has declared the plant is operating beyond its current operating license based on the DDE.

- Weakening of HE basis: The 1977 HE basis was allowed as an exception that applied only for an earthquake on the Hosgri Fault. However, while the utility is ignoring the DDE standard and is applying the HE exception to all faults, it is also simultaneously seeking to weaken the 1977 HE exception by creating new "associated analytical methods" that are markedly less conservative.

- Lack of Transparency: Notably, the Report never makes an apples-to-apples comparison wherein the same "associated analytical methods" are used to analyze new seismic threats and the HE exception. Nor are lower-velocity parameters input to the new analytical methods to assess their sensitivity to critical real world parameters and uncertainties at the site. The public is never given the opportunity to see the cumulative effect of each generation of new GMPEs or the range of effects due to rock velocity selection. This makes it impossible for PG&E to accurately assert in the Report that, from a regulatory perspective, the new seismic threats are shown to be 'bounded' by the HE basis. From what data are shown by the Independent Peer Review Panel such a transparent and apples-to-apples analysis would likely prove the opposite.

- Rapidly Evolving Analytical Methods: The utility is relying upon less-conservative methodologies that are evolving and changing rapidly, which reduces reliability and confidence from a regulatory perspective. The velocity parameters themselves, upon which some of these new methodologies depend, are in serious dispute. Furthermore, the methodology to compute extreme near-field ground motion in a setting ringed by large strike-slip and reverse faults is nowhere near developed enough to ascribe certainty to median or variance estimates of probable shaking.

- More Seismic Threats to Come?: Two future possible seismic threats remain unknown due to data limitations. It is not clear that the poorly imaged faults under the Irish Hills have been properly identified in the geologic cross-sections which could mean a whole new category of undiscovered threats may exist directly under the plant. The quality of the seismic data obtained onshore just under the Irish Hills is poor and due to the virtual absence of relevant geologic information from deep wells it is difficult to differentiate between active and dormant faults in the seismic data. Whether or not another class of active thrust faults exist under the plant remains an open question. The current data cannot be used to rule out such a possibility and the compressional nature of the topography argues that such faulting could be inferred. Additionally, the study area used by PG&E does not include the area that connects the more northerly San Simeon Fault with the San Gregorio Fault. The Report agrees that the Hosgri Fault is connected with the San Simeon Fault, which has caused the maximum possible earthquake to increase significantly. If the San Gregorio Fault to the north is similarly connected then the Report has underestimated the maximum earthquake that Diablo might need to survive.

- Troubling History: The utility has a long and remarkable history of producing sanguine technical reports that get the seismic hazard analysis at Diablo exactly wrong. Whenever new data has emerged identifying possible new seismic threats the utility has mobilized its internal and external experts to sequentially argue that nearby faults simply didn't exist, they did exist but were inactive, they were active but not large, and then that they were large but segmented and unconnected. Now that the evidence about the size and location of the faults is indisputable - the argument has suddenly changed again. Now the utility declares that although the faults are quite large, nearby, and interconnected the prior equations used during the licensing process to predict shaking should be abandoned and replaced with less-conservative methodologies which allows the utility

to claim that the plant is safe……even from a M7.3 within 600 meters of the facility. One must ask, **"if the utility has been proven to be wrong so many times in the past on so many similar issues and given the high stakes of mishandling this critical issue, should the utility's new-found conclusions be relied upon without the direct regulatory oversight of the NRC's license amendment process?"** As a scientist and a policy maker I believe the responsible answer is "No."

In conclusion, if the NRC were to decide to rely upon the utility's assertion that the facility is operating in conformance with its license based on these new evolving less-conservative equations the NRC would be allowing the HE exception to be markedly weakened by the utility without the third party objectivity, regulatory safeguards, and technical rigor of the license amendment process. Such a decision in the aftermath of the difficult lessons of Fukushima could come back to haunt the NRC, the utility, and more importantly – the public.

APPENDIX

TECHNICAL CONCERNS

The following are some of the reasons I believe that these less-conservative equations and evolving GMPEs are still very much a work in progress, making it premature to apply the methodology to the Diablo Canyon Nuclear Power Plant. If the only possible way to prove that the plant is operating below the LTSP/HE basis is through the use of these new equations then a formal adjudicated license amendment process, especially if the LTSP/HE exception is to be relied upon in lieu of the DDE safety standard.

CONCERN #1 – Methodology limitations in applying PEER derived GMPE's distance-attenuation predications for extreme near-field applications: The Next Generation Attenuation models, which is the basis for GMPE-3 and many of the other subsequent GMPE's, is derived from the PEER database of some 3,600 recordings. The various peer-reviewed and published attenuation-distance equations are based on robust statistical best-fits to the very large PEER dataset. However, the proximity of the plant to the Shoreline and the San Luis Bay Faults are only 0.6 km and 1.9 km. Out of this entire PEER dataset only a couple dozen recordings exist within 2 km of the fault and of those only 8 recordings occur with 0.6 km. This number of recordings is insufficient to create a statistically significant estimate of ground motion in this **extreme near-field setting**. Any statistical estimate of an empirical distance-attenuation relationship in which *over 99% of the data* occur in a range outside of the distance where the relationship will be applied is unreliable for determining a mean or variance of shaking.

The uncertainty in the extreme near-field estimates of ground motion using NGA GMPE's is not reduced through an averaging approach. All of the GMPE's constructed from various subsets of the PEER dataset include the same systematic under sampling of extreme near-field recordings and over sampling of far-field earthquakes. Because this error is systematic rather than random the averaging process cannot be relied upon to improve confidence of extreme near-field shaking estimates.

The new Next Generation Attenuation models used for **GMPE-3** and the even-newer **GMPE-4** both suffer from data limitations that make them problematic for reliable application to Diablo. Simply adding geologic, site effect, and statistical correction factors to the underlying NGA equations does not overcome the statistical problem inherent in applying these equations in the extreme near-field.

CONCERN#2 – Methodology problems in PG&E's site-specific adjustments to shaking estimates at Diablo: As stated above, the Next Generation Attenuation models, which is the basis for GMPE-3 and GMPE-4 is derived from the PEER database of some 3,600 recordings. The vast majority of these recordings occurred in rock types that differed significantly from the rocks types under the Diablo Canyon Nuclear Power Plant.

The NRC pointed out in September 2012 that there are,

> "...only 51 recordings with sites defined with Vs30>=900 m/s. This is less than 1.4% of the database. There are only 15 recordings with Vs30>=1,200 m/s (less than one-half of one-percent).....Hence, applying a Vs30 of 1,200 m/s directly in the GMPEs

increases uncertainty, as this value is beyond the range well constrained by the observational data.[xi]"

To deal with this deficiency NRC staff and PG&E began constructing a variety of rock type correction factors and single-site correction factors. These new adjustments were derived from the utility's own sparse database.

Such an effort could be justified if the proper dataset were available; however, the Diablo database is inadequate for this purpose. Over the past few years only a handful of strong-motion instruments at Diablo have recorded just two relevant-sized earthquakes (e.g., >=M6.0). These two earthquakes are the M6.0 Parkfield earthquake at a distance of 85 km and the M6.5 San Simeon earthquake at a distance of 35 km. It is simply not possible to perform rigorous statistical analysis on a sample size of two.

What makes the small size of this dataset even more troubling is that neither of these two reference earthquakes occurred to the west or south of the plant, which is where the Hosgri, Shoreline, and San Luis Bay Faults are located. Any site-specific Green's function[2] derived from the small amount of existing strong motion data would not include information about how the site responds to energy from a large earthquake arriving from the west or south.

Wellbore velocity profiles obtained at the site prove that the underlying soft and hard rock environment is neither homogeneous nor layer-cake 1-dimensional. Instead a high degree of 3D complexity with significant impedance heterogeneity is evident in the geology underlying the plant. Therefore a single azimuthally-independent site response will likely fail to incorporate the 3D heterogeneity at the site. Any empirically calculated Green's function based on limited-azimuth data from the north and east will be unreliable in predicting strong ground motion from the Hosgri, Shoreline, and San Luis Bay Faults.

Finally, neither of these two reference earthquakes occurred in the near field. A near-field earthquake cannot be treated as a virtual point source at a fixed azimuth. Instead a near-field earthquake must be treated as a distributed source whose azimuth varies as the rupture propagates up to, along side, and then past the nuclear power plant. This areal source propagates signal to the recording site from a range of azimuths and inclinations, potentially with different Green's functions. Two relatively distant point-source signals, Parkfield and San Simeon earthquakes, from the east and north cannot be used to infer the shaking from a rupture on the Hosgri or Shoreline Faults that actively propagates in the near-field past the plant, and/or stops directly adjacent to the plant to the west.

Given the significant number of large active faults that surround the plant, a dangerous neighborhood to be sure, it is imprudent to base the safety of the plant and the community solely upon reliance on site effects derived from this small dataset.

Future possible research designed to create a numerically simulated 3D site effect (which is reportedly underway and will become **GMPE-5)** to get around the deficiencies of both the empirical data sets identified above, would face significant challenges. Accurate numerical elastic wave-equation simulation of a site-specific Green's function would require a 3-D velocity and impedance structure below and around the facility that extends to considerable

[2] Greens Function: A mathematical term of art defining a system response to an impulse signal which can be used to describe, through convolution and superposition, a system's response to a more complex signal

depth, includes surficial topographic features, and accounts for accurate P-S and S-P and surface-wave conversions calculations, complex ray bending, critical refracting, scattering and focusing effects. To construct such a simulation would require higher-resolution and deeper data than is currently available from the wellbore or near-surface tomographic information.

If somehow such difficulties could be overcome, the numerically simulated site response would still need to be tested to determine how well it predicted the shaking generated by an actual earthquake >=M6.0 impinging on the site from the west and originating in the near-field. A prediction without a test to assess the accuracy of the prediction would be insufficient for regulatory purposes.

CONCERN #3 – Methodology problems in estimating shaking caused by an earthquake located in the extreme near field: This issue is different from the statistical issue regarding the paucity of data available in the near-field recordings or the lack of data for the rock-types in question - which were covered under concerns #1 and #2, respectively. At progressively greater distances from an earthquake the particulars of the dynamic rupture process becomes less important relative to the larger effects of total energy release and energy attenuation during transmission. However, in the extreme near field the location of a recording station relative to an earthquake's rupture history, asperity locations, heterogeneous stress drops, and starting and stopping phases, directivity, and a host of other effects become very important – in some cases the largest effect under consideration. Due to the location of the Shoreline, Los Osos, and San Luis Bay, and Hosgri Faults these effects would likely be significant. As more extreme near-field recordings have been obtained, although still relatively few in number, it has become clear that a simple estimation of an earthquake's magnitude and distance from a site may be insufficient to make precise estimates of shaking.

For example, in 2004, 48 strong-motion recordings within 10 km of the San Andreas Fault were made of the M6.0 Parkfield earthquake[xii]. This dataset was used to test three different attenuation-distance equations. These equations are shown to do a good job of making accurate predictions for distances beyond about 10 km, but the observed shaking becomes highly variable in close proximity to the fault. Rather than finding accurate predictions of mean shaking in the extreme near-field the paper notes,

> "Peak ground acceleration in the near-fault region ranges from 0.13 g at Fault Zone 4, to 1.31 g at Fault Zone 14, ten times larger, to over 2.5 g at Fault Zone 16 (where the motion exceeded the instrument capacity and the actual maximum value is still being estimated)."

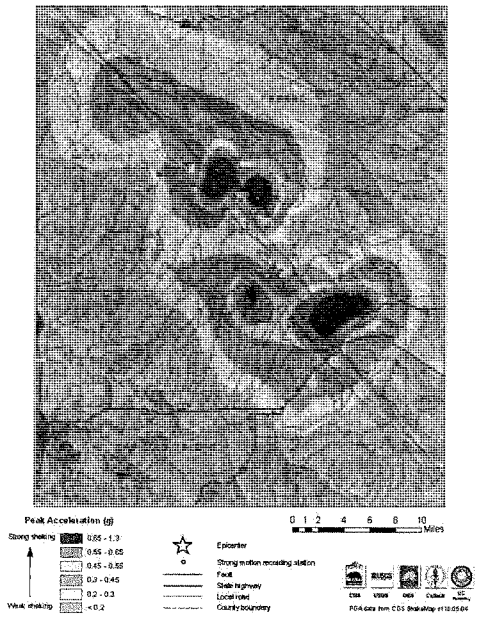

Figure 3: Shakal et. al., 2004 showing remarkably high and low accelerations in the extreme near-field (rupture started where the star is shown and then propagated to the north-east and south-west where they stopped)

The dense strong-motion Parkfield recordings are relevant to the conclusions of the Report for a number of reasons.

- First, these extreme near-field areas of high and low acceleration are not well predicted by a distant-dependent GMPE estimate of shaking. In this extreme near-field setting the particulars of how ruptures start and stop, the direction the rupture propagates, the potential focusing effect of the velocity structure of the fault zone, the locations of specific asperities become major factors that affect ground motion. These factors are not included in the current generation of GMPEs, which were never intended to describe these complex phenomena that are significant effects principally in the extreme near-field.

- Second, the Parkfield data shows that the high degree of variability in the extreme near-field is not a spatially random phenomenon. Instead the highest levels of acceleration are systematically found near the ends of the fault where stopping phases radiated energy

during the rupture process of this specific earthquake. If the nuclear power plant happens to be located in a zone of focused seismic energy the 84th percentile estimate from the GMPE estimate will likely underestimate the observed shaking.

- Third, PG&E has argued in the Report that while an earthquake on 100 km of the Hosgri Fault could jump to the 43 km of the Shoreline Fault creating a 143 km rupture, the likelihood of such an event is purportedly low. They contend that a north-to-south Hosgri rupture that jumped to the Shoreline would terminate due to bending and segmentation before rupturing the full length of the Shoreline Fault. If PG&E is right in this assertion they would be correct to reduce the component of shaking that is derived from the size of the earthquake. But they would then need to account for the markedly higher accelerations produced by stopping phases that would radiate from the segments and asperities associated with terminating the rupture near the facility. Given the high accelerations observed in the Parkfield dataset, an earthquake that propagates the 100 km length of the Hosgri and only 20 km of the Shoreline but violently stops directly adjacent to the nuclear power plant could in fact be more dangerous than a scenario involving the full 145 km of propagation

There are a few ways to demonstrate the significant influence of these new equations. One obvious demonstration is to review the reduction in estimated shaking from an earthquake on the Hosgri Fault relative to PG&E's earlier estimates when creating the HE/LTSP spectrum.

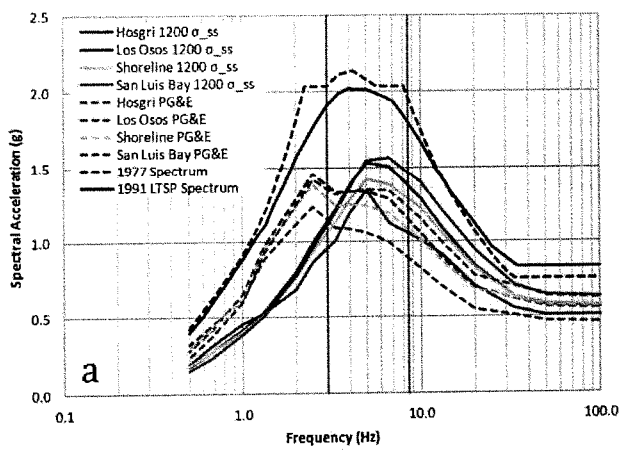

Figure 7. Comparison of deterministic ground motion spectra from PG&E for the DCPP site (dashed color curves; using site amplification term, its uncertainty, and single station sigma) with deterministic spectra of three sensitivity cases (solid curves): (i) a generic site with V_{S30} of 1,200 m/s and single station sigma (Figure 7a); (ii) a generic site with V_{S30} of 760 m/s and single station sigma (Figure 7b); and (iii) a generic site with V_{S30} of 760 m/s and sigma from GMPEs (ergotic sigma, Figure 7c). The PG&E 1991 LTSP/SSER 34, the 1977 HE (Hosgri Earthquake) design spectrum, and the frequency range important to DCPP (marked by vertical dark grey lines) are also plotted for reference.

(Figure 7a from IPRP Report)

As seen in Figure 7a from the Independent Peer Review Panel (IPRP) report and in a number of other related reports, the new less-conservative equations cause a major reduction in shaking across the entirety of the frequency spectrum from a hypothetical earthquake on the Hosgri fault (compare blue lines which use the newly devised methods with black lines which use the prior methods, in figure 7a above). In the frequency range from 2-10 Hz the less-conservative methodologies have cut the maximum estimated acceleration from 2 g down to about 1.3 g. At the peak-frequency range, from 30-100 hz, the maximum estimated acceleration as been reduced by a third from .75 g to under .50 g. In fact the de-amplification effect is even larger than this comparison suggests because the blue lines, which represent the shaking on the re-interpreted Hosgri, assume a larger rupture on the Hosgri Fault than the earthquake that was used to initially create the 1977 HE basis exception.

More importantly, as can be seen in Figure 7a the shaking from the Los Osos, Shoreline, San Luis Bay Faults all exceed the re-interpreted Hosgri (red, yellow, green lines are all above the blue line). **One can reasonably conclude that, if the original analytical methods had been used to estimate ground motion, the new seismic threats would exceed the original HE and LTSP spectra**.

This conclusion is supported by the sensitivity analysis shown in Figures 7b and 7c, which test the importance of various parameters to the new GMPE and site effects. The same IPRP report cited previously states,

> "These two figures also show that if DCPP site had a Vs30 value of 760 m/s rather than 1,200 m/s, and if the site behaves more like an average site in ground motion amplification, **some deterministic spectra would exceed the 1991 LTSP spectrum**[xiii]" (figure 7c below).

In fact, it is more than just "some." Under the scenario shown in Figure 7c the IPRP shows that the LTSP/HE spectrum is exceeded by **all** of the newly discovered and re-interpreted seismic threats, including earthquakes on the Shoreline Fault, the Los Osos Fault, and the San Luis Bay Fault (note that the red, yellow, and green lines are all above the solid black line). The fourth and largest hypothetical earthquake scenario, a M7.3 rupture on a joint Hosgri/Shoreline Fault, is not shown on this figure but could reasonably be assumed to exceed the LTSP/HE as well.

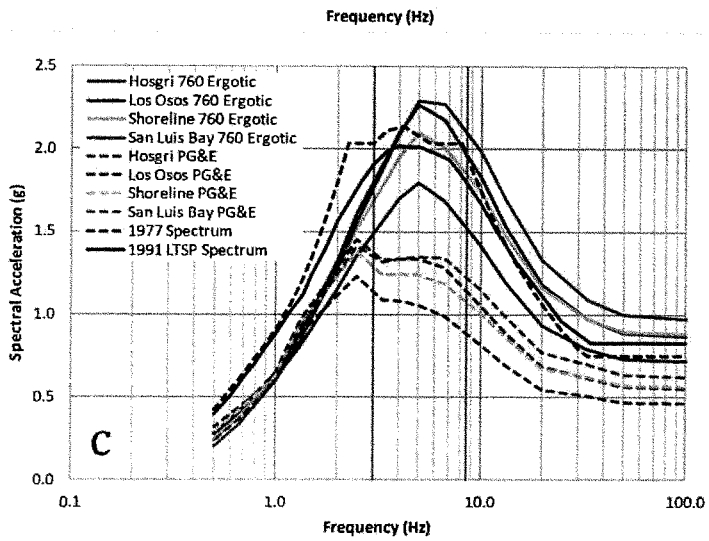

Figure 7. Continued.

(Figure 7c. from IPRP Report)

This sensitivity analysis shows that the cumulative effect of less-conservative fast rock velocities along with less-conservative GMPEs is clearly not a small issue, nor is it a only an academic issue. The IPRP reviewed the limited wellbore data (see IPRP Report 6 Figure 4) and concluded that the wellbore velocities appeared to be lower than those estimated by PG&E, which could result in the conclusion that PG&E has underestimated shaking from new seismic threats even if the new equations are allowed. The IPRP challenged PG&E's use of wellbore data at the ISFSI site to justify the higher 1,200 m/s velocity and instead focused on the velocities measured in the wellbore data closest to the facility.

Specifically, IPRP Report #6 says,

> "Consider the three usable measured profiles, A-2, C, and D, the mean value at 10 m is approximately 800m/s, considerably below PG&E's mean of 1200m/s." and "If A-2 had the same velocity as C at a depth of 5m, consistent with the relative weathering described in the borehole logs, the mean velocity at that depth would be about 650m/s, also below PG&E's mean value of 1000m/s."

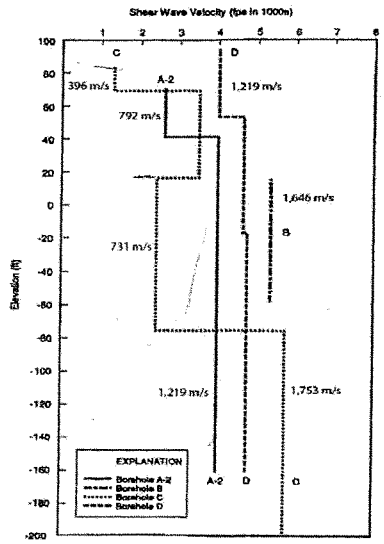

Figure 4. Shear wave velocity profiles from 1978 downhole velocity surveys (provided by PG&E).

IPRP Report 6, Page 5

This appendix does not seek to weigh in on the question of which velocities are appropriate to use when computing site effects at Diablo. Instead, these stated concerns are intended to demonstrate that:

> First, the de-amplification effects of moving from GMPE-1 to GMPE-4 are very large and likely determinative of whether or not the new seismic threats would produce shaking above the HE exception; and
>
> Second, even if one were to accept the use of GMPE-4, which is problematic for the reasons previously stated, the critically important rock velocities upon which the de-amplification factors are based are complex, in dispute, and arguably lower than those used by PG&E, which would mean that shaking would be significantly larger than stated in the Report. Indeed, a conservative approach toward this technical question would have used of the lowest velocities found in the well data rather than the highest.

[i] Peck Differing Professional Opinion – Diablo Canyon Seismic Issues
[ii] Opinion of Commissioners Gilinsky and Bradford on Commission Review of ALAB-644 (Diablo Canyon Proceeding, Dockets 50-275 OL and 50-323 OL)
[iii] Safety Evaluation Report related to the operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2. Docket Nos. 50-275 and 50-323; NUREG-0675, Supplement No. 34
[iv] PG&E submitted to the NRC "Report on the Analysis of the Shoreline Fault, Central Coast California, January, 7, 2011, ML 110140400
[v] Oct 12, 2012 NRC letter from Joseph M. Sebrosky, Senior Project Manager to Mr. Edward D. Halpin, Senior Vice President and Chief Nuclear Officer PG&E; Subject: Diablo Canyon Power Plant, Units Nos. 1 and 2 – NRC Review of Shoreline Fault
[vi] Office of the Inspector General US NRC: NRC Oversight of Licensee's Use of 10 CFR 50.59 Process to Replace SONGS' Steam Generators Case No. 13-006
[vii] Research Information Letter 09-001: Preliminary Deterministic Analysis of Seismic Hazard at Diablo Canyon Nuclear Power Plant from Newly Identified "Shoreline Fault." Pages 8-10.
[viii] U.S. Nuclear Regulatory Commission, 2012. Confirmatory Analysis of Seismic hazard at the Diablo Canyon Power Plant from the Shoreline Fault, Research Information Letter.
[x] Oct 12, 2012 NRC letter from Joseph M. Sebrosky, Senior Project Manager to Mr. Edward D. Halpin, Senior Vice President and Chief Nuclear Officer PG&E; Subject: Diablo Canyon Power Plant, Units Nos. 1 and 2 – NRC Review of Shoreline Fault
[xi] NRC Research Information Letter 12-01, page 56 (September 2012)
[xii] Shakal, A., Grazier, V., Huang, M., Borcherdt, R., Haddadi, H., Lin, K., Stephens, C., and Roffers, P.: Preliminary Analysis of Strong-Motion Recordings from 28 September 2004 Parkfield, California Earthquake. Submitted to SRL November 5, 2004
[xiii] IPRP Report No. 6, August 12, 2013

Senator BOXER. Thank you so much, Senator, Doctor. I don't know which one trumps which one, but we will call you Senator Doctor.

Mr. Pietrangelo.

STATEMENT OF ANTHONY R. PIETRANGELO, SENIOR VICE PRESIDENT AND CHIEF NUCLEAR OFFICER, NUCLEAR ENERGY INSTITUTE

Mr. PIETRANGELO. Chairman Boxer, Ranking Member Vitter, thank you for the opportunity to appear before you today.

I am Tony Pietrangelo, the Senior Vice President and Chief Nuclear Officer at NEI.

America's 100 nuclear power plants provide approximately 20 percent of our electricity and nearly two-thirds of our carbon-free electricity. They produce that electricity 24 hours a day and are not dependent upon wind or sun or fuel delivered by trucks, barges, rail lines, or pipelines to do so. Finally, nuclear power plants provide vital clean air compliance value, and any system that limits emissions or the so-called criteria pollutants or carbon dioxide. The emissions provided by nuclear energy reduce the compliance burden that would otherwise fall on emitting generation capacity.

With that said, some electricity markets in portions of the country are creating serious challenges for base-load generation, including nuclear. Regulated States have been able to create the conditions under which companies can undertake long-term, capital-intensive projects and preserve fuel and technology diversity. In the south and southeast, State legislatures and regulatory commissions provide the assurance of prudent cost recovery necessary for capital intensive projects like nuclear. This is why Vogtle and Summer nuclear energy projects are under construction in Georgia and South Carolina.

Absent significant market redesign or creation of new market mechanisms, it is not clear how merchant markets will ever stimulate investment in anything but the lowest cost short-term option. Given today's conditions, this will be natural gas-fired generation thanks to the relatively low initial capital outlay for a gas-fired combined cycle plant.

This and other factors have led to sustained economic stress on some existing generating capacity, particularly base-load capacity. At a time when the surplus of generating capacity in the eastern United States is decreasing, as existing generation capacity retires, effective and efficient market design and operating practices in the capacity and energy markets are more critical than ever.

At the same time the electricity industry is dealing with challenging market conditions, it is also dealing with the cumulative impact of regulations from the Nuclear Regulatory Commission. The NRC currently has more than 50 rulemakings underway in various stages. Almost all of them, if implemented, will require modifications to plant systems and operations. Yet, the NRC does not appear to be prioritizing or even coordinating many of these rulemakings.

Last year, Senator Vitter and House Energy and Commerce Chairman Upton requested that the Government Accountability Office review the NRC's use of cost-benefit analysis, and we look for-

ward to the results of that analysis. For our part, we have numerous examples in which the actual cost of meeting new NRC requirements was five to ten times higher than the NRC's estimated cost.

We believe that if the NRC more accurately estimated the cost of its regulatory requirements, it would find that many of its requirements do not pass a simple cost-benefit test. As a result, resources are being spent complying with requirements that have little or no safety benefit.

Let me be clear. The industry will implement requirements that have a direct safety benefit. However, regulatory requirements with little or no nexus to safety result in diversion of resources from both the industry and the NRC from higher safety significant requirements and operational safety focus.

I want to take a moment to quickly summarize the state of post-Fukushima preparedness.

After Fukushima, the industry immediately took steps to strengthen our strategies to protect our nuclear energy facilities from severe natural events like earthquakes and floods. We didn't wait for NRC requirements. Each company that operates nuclear power plants has added yet another layer of backup safety equipment to ensure that the facilities will have access to power and water that are necessary to keep reactors safe in the rare event of a severe natural event.

Moreover, we developed national response centers in Memphis and Phoenix. Each of those centers is stocked with five sets of emergency equipment, backup generators, pumps, standardized couplings and connectors for hoses and cables that are ready for delivery to any U.S. reactor in 24 hours.

The companies using some of the Nation's best experts also are reevaluating external hazards, like earthquakes and floods, for their sites using the latest methods and data. The next step is to review the protective and mitigating measures put in place against the latest site-specific hazard information to determine if any refinements are necessary. We are in the process of conducting those evaluations and expect to have largely completed implementation by the end of 2016.

Chairman Boxer, I invite you to go to any nuclear power plant in the country to see what has occurred in response to Fukushima since 2011 to now.

Senator BOXER. I have done so. Thank you, sir.

Mr. PIETRANGELO. Finally, I would like to offer a perspective on seismic regulation, particularly at the Diablo Canyon Nuclear Power Plant.

When Diablo was under construction, the nearby Hosgri fault was discovered. Because the ground motions from the Hosgri fault could exceed the double design earthquake postulated in the plant's operating license, prior to commencing operations, the plant was retrofitted to withstand the ground motions from the Hosgri fault. The Shoreline fault discovered in cooperation with the U.S. Geological Service in 2008, is below the Hosgri ground motion levels for which the plant was retrofitted in the 1970s prior to commencing operation. As a result, the plant is able to withstand the largest ground motion that could be expected to be generated from

any of the nearby faults because none exceed the plant's robust Hosgri earthquake design.

I realize because some staff at the NRC filed a differing professional opinion, and to my friend Sam I just met here, that is not silencing someone to file a differing professional opinion, that is part of the NRC's process, and that was used here. Differing professional opinions do occur among 4,000 staff at the NRC, and they have a process for addressing them. No one was silencing anybody.

In this case, the conclusion was that there is now, or never has been, a safety concern with this issue at Diablo Canyon. In addition, the panel concluded that older analytical techniques were overly conservative and no longer technically justified since the license at Diablo allows for newer technologies to be used.

Chairman Boxer, that concludes my prepared remarks, and I look forward to your questions. Thank you.

[The prepared statement of Mr. Pietrangelo follows:]

Tony Pietrangelo
Senior Vice President and Chief Nuclear Officer
Nuclear Energy Institute

Committee on Environment and Public Works
United State Senate

December 3, 2014

Chairman Boxer, Ranking Member Vitter, and members of the committee, thank you for the opportunity to appear before you today.

I am Tony Pietrangelo, the Senior Vice President and Chief Nuclear Officer at the Nuclear Energy Institute.

My testimony today will cover four issues:

1. Some of the challenges we see in the nation's electricity system;
2. A view from the industry on the NRC's regulatory process;
3. An update on the industry's post-Fukushima safety enhancements; and
4. Some perspective on NRC's seismic regulations, particularly with regard to the Diablo Canyon Nuclear Power Plant.

America's 100 nuclear power plants provide approximately 20 percent of our electricity and nearly two-thirds of our carbon-free electricity.

They produce that electricity 24 hours/day and are not dependent upon wind or sun, or fuel delivered by trucks, barges, rail lines or pipelines to do so.

They produce electricity at low, stable prices and are base-load facilities that are essential to controlling voltage and frequency for the entire electric grid.

The nuclear energy industry employs over 100,000 workers, provides a significant fraction of the tax base at the state and local level, and represents hundreds of millions of dollars in both direct and indirect economic benefits to each state in which the plant operates.

Finally, nuclear power plants provide vital clean air compliance value. In any system that limits emissions – of the so-called "criteria" pollutants or carbon dioxide – the emissions prevented by nuclear energy reduce the compliance burden that would otherwise fall on emitting generating capacity.

Other sources of electricity have some of these attributes, but nuclear energy is unique in this value proposition.

With that said, some electricity markets in portions of the country are creating serious challenges for base-load generation including nuclear energy.

Since a number of states restructured their electricity markets in the late 1990s, the business of producing and transmitting electricity has evolved into two distinctly different enterprises.

In those states still using traditional cost-of-service regulation, companies and regulatory commissions use the process of integrated resource planning to evaluate resource options on a long-term basis, analyze project economics over a 40-year or 60-year time horizon, and assign value to "public goods," such as fuel and technology diversity and forward price stability in the electric sector.

States with competitive electricity markets have not yet developed mechanisms to value these "public goods" and internalize them in their decision-making.

As a result, regulated states have been able to create the conditions under which companies can undertake long-term, capital-intensive projects and preserve fuel and technology diversity. In the South and Southeast, state legislatures and regulatory commissions provide the assurance of prudent cost recovery necessary for capital-intensive projects. This is why the Vogtle and Summer nuclear energy projects are under construction in Georgia and South Carolina.

One of the key questions first raised in the late 1990s – can restructured markets develop mechanisms to preserve fuel and technology diversity and support investment in a diverse portfolio of generating assets? – remains unanswered. Absent significant market redesign or creation of new market mechanisms, it is not clear how merchant markets will ever stimulate investment in anything but the lowest-cost, short-term option. Given today's conditions, this will be natural gas-fired generation, thanks to the relatively low initial capital outlay for a gas-fired combined cycle plant.

This and other factors have led to sustained economic stress on some existing generating capacity, particularly base-load capacity. At a time when the surplus of generating capacity in the eastern United States is decreasing, as existing generating capacity retires, effective and efficient market design and operating practices in the capacity and energy markets are more critical than ever.

At the same time the electric industry is dealing with challenging market conditions, it is also dealing with the cumulative impact of regulations produced by the NRC.

The NRC currently has more than 50 rulemakings underway in various stages. Almost all of them, if implemented, would require modifications to plant systems and operations, yet the NRC does not appear to be prioritizing or even coordinating many of its rulemakings.

Last year, Senator Vitter and House Energy and Commerce Chairman Upton requested that the Government Accountability Office review the NRC's use of cost-benefit analysis, and we look forward to the results of that analysis. For our part, we have numerous examples in which the actual cost of meeting new NRC requirements was 5 to 20 times the NRC's estimated cost. We believe that if the NRC more accurately estimated the costs of its regulatory requirements, it would find that many of its requirements do not pass a simple cost-benefit test. As a result, resources are being spent complying with requirements that have little or no safety benefit. Let me be clear: The industry will implement requirements that have a direct safety benefit. However, regulatory requirements with little or no nexus to safety result in a diversion of resources from both the industry and the NRC to higher safety-significant requirements and operational priorities – the sorts of things that keep our plants reliably producing the electricity for which they are intended.

I want to take a moment to quickly summarize the state of post-Fukushima preparedness.

After Fukushima, the industry took immediate steps to strengthen our strategies to protect our nuclear energy facilities from severe natural events like earthquakes and floods. We didn't wait for NRC requirements. Each company that operates nuclear power plants has added yet another layer of backup safety equipment to ensure that the facilities will have access to power and water that are necessary to keep reactors safe in the rare event of a severe natural event. Moreover, we developed national response centers in Memphis and Phoenix. Each of those centers is stocked with five sets of emergency equipment – backup generators, pumps, standardized couplings and connectors for hoses and cables – that are ready for delivery to any U.S. reactor in 24 hours.

The companies, using some of the nation's best experts, also are reevaluating natural hazards – like earthquakes and floods – for their sites using the latest methods and data. The next step is to review the protective and mitigating measures put in place against the latest site-specific hazard information to determine if any refinements are necessary. We are in the process of conducting those evaluations and expect to have largely completed implementation by the end of 2016.

Finally, I would like to offer a perspective on seismic regulations, particularly at the Diablo Canyon Nuclear Power Plant.

Nuclear plants have several aspects of seismic protection, including safety factors applied to the reactor designs, conservative requirements in engineering codes and standards, and specific requirements for the strength of steel and concrete used to build the plants. These design and

construction practices are above and beyond the protection needed to safely withstand significant ground motion. In addition, engineering and materials design, seismic study technologies and methodologies have evolved significantly over time, which allows for more certainty as to how a nuclear power plant's structures, systems and components will react to a seismic event, and diminishes the reliance on overly conservative techniques and assumptions. When Diablo Canyon was under construction, the nearby Hosgri fault was discovered. Because the ground motions from the Hosgri fault could exceed the double design earthquake postulated in the plant's operating license, prior to commencing operations, the plant was retrofitted to withstand the ground motions from the Hosgri fault. In addition to these retrofits, a commitment also was made to constantly study the local geologic features and global seismic events to ensure seismic safety at Diablo Canyon, referred to as the Long Term Seismic Program (LTSP) through an open-ended licensing agreement. Diablo Canyon is, therefore, a unique facility in the industry, in that it is licensed for three earthquake designs: the Design Earthquake, Double Design Earthquake (equivalent to the Safe Shutdown Earthquake), and the Hosgri Earthquake, and has continually studied the geologic features surrounding the plant through the LTSP

It is through the Long Term Seismic Program that the Shoreline fault was discovered, in cooperation with the U.S. Geological Service, in 2008. The Shoreline fault, like the San Luis Bay and Los Osos faults, are below the Hosgri ground motion levels for which the plant was retrofitted in the 1970s, prior to commencing operation. As a result, the plant is able to withstand the largest ground motions that could be expected to be generated from any of the nearby faults, because none exceed the plant's robust Hosgri Earthquake design, which was also confirmed again as a result of recently completed advanced seismic studies using state of the art two and three dimensional imaging.

I realize this issue is even more complex because some staff at the NRC filed a differing professional opinion on issues related to Diablo Canyon and the Shoreline fault. Differing professional opinions do occur among the 4,000 staff at the NRC, and the NRC has a process for addressing them. In this case, the conclusion was that, "there is not now nor has there ever been an immediate safety concern" with this issue at Diablo Canyon. In addition, the panel concluded that older analytical techniques were overly conservative and no longer technically justified since the license at Diablo Canyon allows for newer technologies to be used.

Chairman Boxer, that concludes my prepared remarks, and I look forward to answering any of your questions.

Senator BOXER. Thank you so much.

Well, just a couple comments, sir. When Mr. Hirsch spoke, he talked about a cozy relationship between industry that occurred and the regulators in Japan, and then you had Fukushima, and I honest to God think, given your obvious intimate knowledge of the NRC and how people disagree and all this, you are proving his point. I don't get how industry knows what different people feel within the regulating agency. I mean, that says to me you have proved the point. It is really a cozy relationship. That is my view. I am sure you don't agree, and I respect that.

Mr. PIETRANGELO. I would hang my hat on our safety record, Chairman Boxer. Review our safety record.

Senator BOXER. Well, they would have done that in Fukushima Daiichi Plant. As a matter of fact, I was listening to your testimony. It could have been given, that same testimony, by the industry, a day before what occurred. So we are not really talking about the fact that, thank the Lord God, we haven't had a crisis. But I will tell you this. The plant in California that just shut down, we averted a crisis, because they upgraded the plant and they didn't do it right because they tried to escape the steps they should have taken. So, at the end of the day, the regulator is very important.

Now, you, in the beginning, complained that there are too many regulations, so on and so forth. Do you know what the cost is going to be to clean up after Fukushima? Do you have that number?

Mr. PIETRANGELO. I know approximately what each plant here is spending to make sure that we don't have a Fukushima.

Senator BOXER. No, no, no, no. I didn't ask you.

Mr. PIETRANGELO. I do not have a good estimate of what they are spending.

Senator BOXER. Well, it is $100 billion, the latest estimate, $100 billion.

Now, here you have the Price-Anderson Act, so you would pay how much in an accident like that before the taxpayers come in?

Mr. PIETRANGELO. It depends on what the Congress approves, Senator.

Senator BOXER. Well, the law has a deductible, it is like $13 billion.

Mr. PIETRANGELO. And the Congress can also approve higher levels.

Senator BOXER. Well, the Congress can, will, won't. If something happens today, God help us, it is $13 billion that you would have to pay, not you, the plant; and the rest would be paid by the taxpayers, which is a whole other issue that we are not going to get into today. But I am making the point the risks, the financial risks that these companies are taking add to my concern because everything is not on the line because of Price-Anderson. It is very rare. We don't have many examples of where an industry is so protected.

And I just say, and I feel for you because you don't have my colleagues who would take your point of view, and they are not here because they are working hard on other things, but I just have to say, from me to you, I think that when you take these safety measures which you say are happening, even though not one of the 12 recommendations by the NRC staff has been fully implemented, it really helps the nuclear industry, it doesn't hurt the industry, it

helps you, because, let me just say, if, God forbid, something happens, whether it is caused by an earthquake or another problem, that will be the end of nuclear power here. We don't want to see that; we want safe nuclear power.

Mr. PIETRANGELO. We do too, Senator.

Senator BOXER. Good. Good.

Mr. PIETRANGELO. And, again, I will meet you at any nuclear power plant in the country to review what they have put in place since 2011.

Senator BOXER. It is not necessary.

Mr. PIETRANGELO. To suggest that nothing has been done at these sites in response to Fukushima is not appropriate, Senator.

Senator BOXER. I didn't say that, sir. Sir, calm down. Calm way back down. I am not talking about what industry is doing; I am talking about what the NRC has put in place post-Fukushima. And you can disagree with it, but you wouldn't be telling the truth to the people because here it is. There were 12 task force recommendations that came in 2011, July. July 2011, July 2012, July 2013, July 2014. Not one of these is in place. So they have not been fully implemented.

Mr. PIETRANGELO. Chairman Boxer, the NRC issued orders in March 2012, 1 year after the Fukushima event occurred.

Senator BOXER. Sir, I will call on you in a minute. Here is my point. You are not responsible for this, sir. You are not in any way responsible for this. I am responsible because I have oversight over the NRC. I am making a point here. Fukushima was a huge disaster for the nuclear industry worldwide. I am sure you know that. And you also know that if anything were to happen, it would be almost a death knell. And we don't want that. I don't want that. I want safe plants. I want plants that respond to new information such as deep earthquakes, longer earthquakes, larger; not by manipulating the shake factor. How ridiculous is that?

You are sitting next to a scientist. And, by the way, a Republican scientist. That is amazing. I am so excited that you are here because we see in the Republicans here, they don't listen to scientists. But you are a Republican scientist and you have told us what they have done is irresponsible.

So I wanted to make that point.

I am going to talk to Dr. Blakeslee and Mr. Hirsch and thank you so much for your testimony. Making sure that a nuclear power plant is protected against a severe earthquake requires an understanding of how much the ground will shake, and that is why I was so pleased to hear you address that as a scientist, and what will happen to the reactor safety systems when they are subjected to an earthquake.

Can you please confirm, to your knowledge, because you may not know this, but I am asking you. Can you confirm that NRC has thus far always accepted estimates of how strong an earthquake might occur at Diablo Canyon that used questionable science to minimize the risk, Mr. Hirsch?

Mr. HIRSCH. That has been the pattern over and over again. When the Hosgri was discovered belatedly, 80 percent of the plant was already constructed. So rather than require them to upgrade it to the shaking that you could get from that earthquake, they al-

lowed them to use a bunch of fudge factors, four different fudge factors, so that they could, in the end, do almost no retrofitting. Commissioners Galinsky and Bradford on the Commission at the time dissented vigorously and said that this was carving out the essential safety margins that were needed.

What is intriguing is that after the Hosgri was done and they created an exception for it, they are now using even less protective assumptions now that these new faults have been discovered. And that is why I was struck by the difference between the first panel and this first. I wasn't even sure which planet I was on. I was getting all these assurances——

Senator BOXER. Well, welcome to my world, Dan.

Mr. HIRSCH. All these assurances that we are on top of it. But what I see by looking at the historic record is that the NRC has been wrong every single time on Diablo, and never seems to get embarrassed. Every time they claim there is no additional fault there is a new one; every time there is a new fault, they say it can't produce more shaking, and then it turns out that it does.

And what I am most worried about is that you can't make the earthquake go away by changing the input assumptions on a piece of paper. Nature isn't going to cooperate with the fiction. That is what happened at Fukushima; the regulator allowed them to build the reactor for a fictional earthquake and tsunami much less than could occur, and that is what is happening at Diablo and at many other plants around the country.

Senator BOXER. Right. I would say, when you say you thought you were on another planet, if you took this question outside of this room and we just went up to a person on the street in any town near a nuclear power plant, not near a nuclear power plant, and you said do you think we should be building a nuclear power plant near earthquake faults, they would start laughing and say, you mean to say you guys allow that? I mean, that is the biggest no-brainer known to mankind.

Mr. HIRSCH. And, Senator Boxer, look at the record in California for PG&E alone. They built a plant at Humbolt Bay, which now has had to be shut down because of the discovery of an earthquake fault that they had claimed was inactive. They wanted to build one at Bodega Head, and they actually dug the foundation for it, a huge hole called Hole in the Head by the locals, and some seismologist crawled into it on a weekend and found a fault in the hole right where the reactor was going to go. So that is why there is no reactor at Bodega Head.

So then they turned their attention down to Diablo.

Senator BOXER. Right.

I want to call on Dr. Blakeslee here. So let me ask a different question, since that one I think was answered. Could you also confirm that ever since the Hosgri fault was first discovered, to your knowledge, the NRC has never required PG&E to prove that the reactor's safety systems could withstand such a severe earthquake using the conservative safety assumptions that NRC is supposed to use?

Mr. BLAKESLEE. I would say that is accurate, and I would probably go further. The technical methodologies that were employed during the licensing process to calculate ground motion from a par-

ticular earthquake were included in the deliberations of the NRC and were part of establishing standards.

What has transpired over the past years and has accelerated during the last 5 years is that with each progressive discovery of a new seismic threat, the calculations of shaking from any earthquake has systematically gone down, so that now all these earthquake threats that have been identified are calculated to produce more shaking than that worst case to Hosgri. But all of the shaking from all of those scenarios has markedly come down to ensure the ability to say that the plant is safe.

So whereas, previously, the debate was do these earthquake faults exist, how large are they, and how close are they to the plant, previously, that was the debate. And pursuant to the legislation that Governor Schwarzenegger signed, the research was performed using advanced geophysical methods, that was answered definitively, and suddenly the utility has changed its argument to, yes, that is fine, they exist. But the methodologies we historically used overestimated shaking, so let's just reduce the shaking from all these faults and declare ourselves to be compliant with the license, which is why I feel it is so important to have a rigorous license amendment process. Because if they got it wrong, the consequences would be catastrophic and, yes, for the State of California, yes for the nuclear industry, but, more importantly and, frankly, for my family. We live within 10 kilometers of that plant, and I brought this, which my daughter gave me, who every night sleeps by that plant. And this is not a technical argument, this is an argument about safety for the public.

Senator BOXER. Absolutely. That is what I said to the four commissioners. They have to go back and read why we set them up, the NRC. And I want to really compliment you for your work in the State legislature, because the facts, the new facts that came to light in this earthquake are critical, but it is unbelievable. I am trying to find an analogy. There is really none because this is life and death. But just take a situation where you had a certain grade to get into a university and so many people needed a lower grade and they said, well, we are still a great university, but now it is 55 percent on your test to get in. You just can't manipulate like that.

This is shocking. This is, in my view, unethical. This is dangerous. And I just hope that what comes out of this today via the media, who I hope will hear this point, is that we have new information about these earthquake faults. An inspector came in from the NRC and said PG&E is not operating Diablo Canyon in compliance with its license requirements because of these faults, and he said the reactor should be shut down until PG&E comes back into compliance.

So I want to ask the three of you a yes or a no, and hope you will be able to do that. Do you think that NRC's decision to allow PG&E to study its seismic vulnerabilities for as many as four more years before any safety upgrades are required can substitute for NRC's responsibility to ensure that licensees comply with the terms of their operating license? In other words, it is kind of a long question. They say you have 4 more years before you have to make any

upgrades, as opposed to ensuring that they make them sooner. Would you say now or 4 years?

Mr. HIRSCH. Now. The earthquake may not wait 4 years.

Senator BOXER. Good point.

Mr. BLAKESLEE. We are very familiar with paralysis by analysis, and the threat now is unequivocally so great as a result of these new studies that action is required immediately.

Senator BOXER. Sir.

Mr. PIETRANGELO. The licensee should be allowed to continue to operate because there are measures in place to deal with beyond design basis external hazards like seismic or flooding or rain or hurricanes. That was the response to Fukushima that the industry, as ordered by the NRC in 2012, implemented.

Senator BOXER. Do you agree with that?

Mr. HIRSCH. May I respond to that?

Senator BOXER. Yes, please.

Mr. HIRSCH. I sat through the licensing hears for Diablo many years ago, where the issue of the functioning of the emergency plan in an earthquake was raised. The intervener said that the freeway, the only way in and out is Highway 101, and the overpasses could easily come down in an earthquake, and you have to have a functioning emergency plan according to the law.

The NRC ruled, and I was stunned. I have never quite seen something with so much logic that has been twisted into such a pretzel. The NRC ruled that they didn't need to have an emergency plan that would function after an earthquake because it was not credible, their term, that there would ever be an earthquake and a nuclear accident at Diablo simultaneously.

Well, no one was ever talking about them being two separate events. We are talking about an earthquake that causes an accident and then people can't get out. And so to say that there are good systems for dealing with this if there is a "beyond design basis event," which means something occurs that they didn't design for, really begs the question. That is the whole problem. Fukushima wasn't designed for the earthquake that could occur.

Senator BOXER. Do you think, doctor, that 4 more years before any safety upgrades are required should be permissible at this point, knowing what we know?

Mr. BLAKESLEE. I believe that now that the seismic issues are resolved, the engineering questions should go to the front of the list, and this question of the degree to which the facility in fact could survive these events, which are now clearly much more robust earthquakes than previously envisioned, is critically important to address, and I don't think those questions should be delayed, they should be pursued immediately.

Senator BOXER. OK.

Mr. Hirsch, your written testimony describes numerous instances in which the NRC used irregular licensing and other processes to find a way to allow Diablo to be built and operated. Could you once again just summarize that? In other words, there has been a parade of these things over the years, and I know you have done it, but if you could summarize all the, if you will, errors in judgment the NRC has made leading up to this point.

Mr. HIRSCH. One of the best ways of telling whether the five commissioners who testified here earlier today really have it under control is to empirically look at the track record of how well the NRC has done. So let's look at that record for Diablo.

They built it claiming there were no earthquake faults that were active within 30 kilometers. They said you only have to design the facility for a ground motion of .4 G. Then the Hosgri was discovered and they said you don't have to use the normal assumptions for the Hosgri, we will let you use four different fudge factors that take the estimated ground motion from 1.15 G, which is what USGS said would be the normal figure, and reduced it down to something less than .6. They used pencils and erasers to try to lower the estimated ground motion, rather than deal with the ground motion that was there.

But then they made an actual finding, the licensing board: that it is highly unlikely that there are any more faults that we haven't discovered, and we are absolutely certain that the Hosgri fault is not connected to the San Simeon fault, and that there is high quality assurance of how the plant is being built.

And then the day that the utility people were flying back from Washington with their operating license, it was discovered that they had put the retrofits in all the wrong places.

Senator BOXER. Explain what you mean by that, they put them in all the wrong places. You mean physically in the plant?

Mr. HIRSCH. There are two units at Diablo, Unit 1 and Unit 2, and they were built to mirror image blueprints of each other. So when they got into one unit to put the retrofits in, they used the wrong set of blueprints, the ones that were the mirror image of the unit they were putting it in. So the pipe snubbers and the whip restraints were put in the wrong places, and they had to go back and do it all over again. Complete breakdown in quality assurance, but they said, don't worry, we are fine now, there can't be any more faults.

Then they found the San Luis Bay and Los Osos were active and they said, don't worry, those can't cause more ground motion than in the license; they can't cause more than the .4 G. But then Dr. Peck went and actually looked at PG&E's estimates, and they were estimating those three new faults, Shoreline, Los Osos, and San Luis, were producing from .6 to .7 G. Anyone knows that is a lot higher than .4. They were way over the level.

So now they are doing, as Dr. Blakeslee indicates, the same thing; they are sharpening the pencils again and they are saying let's change the assumptions and let's reduce the safety margins further and drive our estimate of the ground motion down further, rather than upgrade the plant.

Look, in real terms, you either fix the problem or you try to use your pencil to make it pretend to go away. But nature doesn't let things disappear. It was a 9.0 quake at Fukushima. The plant wasn't built for it. There was a massive tsunami. It wasn't built for it.

And let me make one last point here. The chart that you showed so effectively of the 12 recommendations that haven't been carried out, those are tiny, tiny steps they were supposed to take to deal with Fukushima. They are baby steps and they haven't done them.

Senator BOXER. Right.

Mr. HIRSCH. What they haven't done is even thought about the big steps. Reactor containments in this country are not required to be designed to withstand a meltdown accident. The evacuation plant isn't required to work in the case of an event that requires it. You don't have to have offsite power that will stay in place long enough to keep the fuel cooled over the long periods, as we saw at Fukushima. The big problems they aren't even thinking about and the small problems they are not fixing. They are just hoping that we get lucky, and that is the problem with earthquakes, it is just tossing dice. When will one of those faults move? It is not up to the NRC, it is not up to the Nuclear Energy Institute or PG&E. Nature is going to decide when that fault moves. And the question is is the plant going to be ready for it, and right now it is not.

One more point. There is 1,000 times the long-lived radioactivity of the Hiroshima bomb in each of those reactors.

Senator BOXER. Say that again.

Mr. HIRSCH. One thousand times the long-lived radioactivity of the Hiroshima bomb is in each of the Diablo reactors, and 10 times that in the spent fuel pools. And the only way it stays in place is if the cooling isn't lost. And an earthquake, as we have seen at Fukushima, can destroy the cooling.

And it is not just the 500,000 people within the immediate area. You could wipe out, for practical purposes, a substantial portion of our State. That radioactivity has to stay inside those domes, and the only way that happens is if the reactors are built to withstand the worst thing that could happen.

Mr. PIETRANGELO. Could I correct Mr. Hirsch for a moment?

Senator BOXER. Let him finish, then, yes, you can, sir. You can have your time to give your perspective on it.

But please finish. And while you are at it, Mr. Hirsch, do you happen to know how many of the rods were permitted for those pools and where they were over those rods?

Mr. HIRSCH. This is again the problem. They built the pools to handle only a few fuel rods, and then they kept re-racking and re-racking, making them more and more compact.

So the National Academy of Sciences has indicated that under some loss of coolant events you could not only have the fuel in the pools lose their cooling, but they could catch fire because the zirconium cladding tends to burn when it gets hot in the presence of air. It doesn't happen for every accident sequence, but it can happen for some. And, as I say, there is 10 times more long-lived radioactivity in the pools than there are in the reactors.

So you have to prevent there being an event that the systems can't withstand, and I have seen for decades of watching the NRC that they basically, at industry urging, create regulatory fictions.

An example, Governor Brown, when he was Governor the first time in California, was an intervener in the Diablo proceeding, and his expert said that you needed to have a security plan that could protect against 12 attackers. PG&E and NRC said absolutely impossible; there will never be an attack involving more than 3 people in the United States; 9/11 was 19.

So over and over again they have been wrong, and the reason is because it is cheaper to pretend that a smaller threat can exist.

Senator BOXER. Well, it is all follow the money.

Now, we are talking about cooling down the plant, and I know Mr. Pietrangelo is losing his cool, so please.

Mr. PIETRANGELO. Nice segue. Thank you.

Senator BOXER. Talk to us. Yes. I try to get a little humor into this otherwise serious panel.

Mr. PIETRANGELO. I appreciate that. Thank you.

When the magnitude 9 earthquake occurred at Fukushima, the plant was in the process of safely shutting down on their emergency diesel generators onsite, OK, per design. That earthquake was historic and for the first 45 minutes of that event those three reactors that were operating at Fukushima Daiichi——

Senator BOXER. And what is your point?

Mr. PIETRANGELO [continuing]. Were shutting down safely. It was the tsunami that caused the accident at Fukushima.

Senator BOXER. OK.

Mr. PIETRANGELO. And until we get into the plant——

Senator BOXER. It is the earthquake that caused the tsunami. That is the reason why you have to build safely, because the earthquake caused the tsunami.

Mr. PIETRANGELO. There is tsunami risk and there is earthquake risk, Chairman Boxer.

Senator BOXER. Yes. But you would agree——

Mr. PIETRANGELO. They are not the same.

Senator BOXER. You would agree that earthquake——

Mr. PIETRANGELO. They are not the same.

Senator BOXER. Excuse me. You would agree that the earthquake caused the tsunami in the Fukushima disaster.

Mr. PIETRANGELO. Yes, I would.

Senator BOXER. Thank you.

Doctor, do you have a final thought?

Mr. BLAKESLEE. Well, I would make one quick observation, that although Fukushima is often used as the test case around which we hold this conversation, it is not the only earthquake which has caused a shutdown of a nuclear power plant. In 2007, Japan had an earthquake, a much smaller earthquake, even a relatively modest size earthquake compared to what we are discussing, that hit the west coast of Japan and knocked out the largest nuclear power plant in the world, the KKPN plant.

And just by way of scale, and I was serving on the California Seismic Safety Commission at the time, so I had access to much of the data that was shown that has never seen public purview, that this earthquake was only a magnitude 6.6. Let's put this in a context. A 6.6 offshore earthquake. We are talking about a 7.3. A 6.6 earthquake located 19 kilometers from this plant knocked it out of commission and caused very serious damage and fires. Nineteen kilometers.

So in terms of energy release, the energy released from that earthquake was one-thirtieth the energy that would be released from the earthquake we are now discussing, and it was 30 times further away, and it knocked out that plant.

So to argue that it would take a tsunami to take out a nuclear power plant is not supported by the facts.

Senator BOXER. I hear you.

Mr. PIETRANGELO. Yes it is, Sam. Unfortunately, I have to disagree with you on this one. There was no damage to any of the safety-related equipment of that plant.

Senator BOXER. Mr. Pietrangelo, talk to me. Talk to me.

Mr. PIETRANGELO. I am sorry.

Senator BOXER. Don't talk to Sam. Talk to me.

Mr. PIETRANGELO. Because I tremendously respect him.

Senator BOXER. I understand you respect him, but talk to me.

Mr. PIETRANGELO. OK.

Senator BOXER. This is a hearing and I would like you to address the Chair.

Mr. PIETRANGELO. Thank you.

Senator BOXER. Please. All right.

Mr. PIETRANGELO. There was a transformer fire at the Kashiwazaki Kariwa site, OK? It didn't knock out the power plant. There was no release to the public. There were no safety-related structure systems or components that were damaged by that earthquake.

In fact, let's go back to the Tohoku earthquake that did cause the tsunami at Fukushima. The Onagawa plant is much closer to where that plant occurred. There were walk-downs done of the Onagawa plant after the Tohoku earthquake and, like Kashiwazaki Kariwa, no damage to any safety-related structure systems or components at that plant. So we have actual operating experience for beyond design basis earthquakes where no safety-related structures are being damaged.

I am not trying to say that we don't study the new information. In fact, I think this is to your point, Chairman Boxer, the licensing basis of a plant does change over time, and there is new information that is brought to the table that has to be evaluated for its safety significance and then acted upon, and there is a process for doing that. Mr. Hirsch may not like the process very much, but it is a very disciplined process——

Senator BOXER. No, I think Mr. Hirsch likes the process; he doesn't like the result.

Mr. PIETRANGELO [continuing]. That the NRC has and that you have oversight over to determine whether new requirements are necessary.

Senator BOXER. I just don't think you are being fair. There is a process and there is the integrity of the process. Those are two different things. You have a process where an inspector said, about Diablo, it is in violation of its license; it either needs to be upgraded or the operation has to be suspended until it is upgraded.

So I don't think it is fair to say that I don't like the process. I just want a fair process that is not a process that results from too cozy a relationship with the industry, because in my mind, and I have been around a long time, the industry is better served, as is everybody else, when safety of the mission—because look what happened after Fukushima; not a good thing for the nuclear industry. It is not good. And you can go through all of the, I never heard someone sort of try to minimize earthquakes, but, anyway.

Dr. Blakeslee, you had some disagreement?

Mr. BLAKESLEE. I do. I think the parsing of the answer was very telling about the safety——

Senator BOXER. The parsing of his answer?

Mr. BLAKESLEE. The parsing of the answer was very telling about what was and wasn't damaged, and he identified certain safety elements that were not damaged. But if you actually look at the photographs, you can see that the foundation of the nuclear power plant settled in a manner that ruptured the water mains that were there to provide firefighting capability, and through luck that transformer did not extend to produce the kind of worst case scenario we saw at Fukushima.

But let me say they also had a safety building which was designed for just that purpose. So when the teams of operators ran to get to the safety building, the earthquake had damaged the door so it couldn't be opened. They could not get into the building to implement their safety procedures that were inside that building.

And when the local fire department came racing to the site because of the alarm, the earthquake had caused sufficient separation of grade in the road; they could not get to the facility using the road. And the nuclear power plant was knocked out of commission for years, or many reactors were. Those are facts.

Mr. PIETRANGELO. They weren't knocked out by the earthquake, Dr. Blakeslee. They were not allowed to operate.

Mr. BLAKESLEE. I wonder why they weren't allowed to operate.

Mr. PIETRANGELO. Right. Again, the roads in the town of Kashiwazaki Kariwa are not safety-related.

Senator BOXER. You know, you two can take this outside.

[Laughter.]

Senator BOXER. But my interest here, you know, is not in Korea, it is about my State and 500,000 people, one of them sitting in front of me who is living in a circumstance where, if I don't do my job and NRC doesn't do its job, there could be a terrible situation.

Now, if you are conservative, you want to do the conservative thing, and it seems to me a pretty straightforward thing. You either suspend operation until you have retrofitted the plant in the right way, and fix it and start it up, or that is it. Those are the two options. You can either fix up the plant or you can suspend operations.

So it seems to me that what the NRC has apparently done, which is to give them 4 years, and what they are doing to change science, which we are kind of used to around here, given people's views of scientists and climate, they pronounce what they want about it, but I don't, I listen to the scientists.

And I am very suspicious when you tell me that they have changed their analysis of how much the plant will shake just to, by happenstance, meet the levels that are allowed in the license. This is scary. And I don't want to overstate what I feel because I don't want to impugn people, but I do want to say there is a lot at stake here. I have gone through some horrific things in California, including an explosion of a pipeline where people died and it turned out there weren't inspections, there weren't upgrades. I have gone through a traumatic experience with San Onofre where they made an upgrade, but it was faulty, and there by for the grace of God that place is shut down. And, you know, it is clear to me what the options are.

I just want to say to all three of you, you have been terrific, all of you. I think the fact that there was a little give and take that way, this way, is always good, and I think that what for me is the critical piece here is the safety of that little daughter. That it is, that is why I am here. I am not here for any other reason. There is no other reason I am here. And I will continue to push hard on this.

But I also want to say to the two of my constituents how important your work is back home. What you did to get the information about the new earthquake and Governor Schwarzenegger then signing that, congratulations. What if we didn't know about it? I mean, you can only be as good as the information that you have.

So I want to thank all three of you. This has been a really long day for us here to get to this, but I think, when it comes to the safety of 500,000 people, if we have to do this again, although I must admit I won't have this anymore, and won't Mr. Pietrangelo be excited when this gavel goes over to my buddy, Jim Inhofe, who sees things a bit differently. But you know what? I still have a role, a voice, and we will still continue to work together.

Thank you very much. We stand adjourned.

[Whereupon, at 12:44 p.m. the committee was adjourned.]

[An additional statement submitted for the record follows:]

STATEMENT OF HON. MIKE CRAPO,
U.S. SENATOR FROM THE STATE OF IDAHO

Thank you, Chairman Boxer and Ranking Member Vitter, for holding this hearing on NRC's Implementation of the Fukushima Near-Term Task Force Recommendations and Other Actions to Enhance and Maintain Nuclear Safety. Like many of my colleagues on this panel, I am concerned by the majority's decision to break committee precedent by approving Mr. Baran to serve the remainder of Chairman Macfarlane's term without a proper hearing. Having visited his first nuclear plant this summer, Mr. Baran lacks the experience and knowledge necessary to serve as a Commission member. I look forward to asking Mr. Baran more about his relevant qualifications.

The Idaho National Laboratory is the world leader in nuclear energy research and in the development of safer and more effective commercial technologies. The Lab has already embarked on the Next Generation Nuclear Plant program, working to incorporate lessons learned from existing facilities and building on recent developments in the field. Congress should ensure the Commission serves as a partner in the development of America's future civilian nuclear energy portfolio.

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