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# EXAMINATION OF THE LICENSING PROCESS FOR THE YUCCA MOUNTAIN REPOSITORY

## HEARING

BEFORE THE

## COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

OCTOBER 31, 2007

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ONE HUNDRED TENTH CONGRESS
FIRST SESSION

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# C O N T E N T S

Page

**OCTOBER 31, 2007**

OPENING STATEMENTS


Boxer, Hon. Barbara, U.S. Senator from the State of California ..... 1
Inhofe, Hon. James M., U.S. Senator from the State of Oklahoma ..... 2
Clinton, Hon. Hillary Rodham., U.S. Senator from the State of New York ..... 9
Craig, Hon. Larry E., U.S. Senator from the State of Idaho ..... 11
Barrasso, Hon. John, U.S. Senator from the State of Wyoming ..... 23
Isakson, Hon. Johnny, U.S. Senator from the State of Georgia ..... 24
Cardin, Hon. Benjamin L., U.S. Senator from the State of Maryland ..... 122


WITNESSES


Demint, Hon. James, U.S Senator From The State of South Carolina ..... 6
Prepared statement ..... 8
Ensign, Hon. John, U.S. Senator From The State of Nevada ..... 13
Prepared statement ..... 14
Reid, Hon. Harry, U.S. Senator From The State of Nevada ..... 16
Prepared statement ..... 19
Sproat, Edward F., III, Director, Office of Civilian Radioactive Waste Management, U.S. Department of Energy ..... 26
Prepared statement ..... 27
Responses to additional questions from:
Boxer ..... 29
Inhofe ..... 35
Clinton ..... 35
Meyers, Robert J., Principal Deputy Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency ..... 42
Prepared statement ..... 44
Responses to additional questions from:
Boxer ..... 45
Cardin ..... 47
Inhofe ..... 47
Clinton ..... 48
Weber, Michael, Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission ..... 50
Prepared statement ..... 51
Responses to additional questions from:
Boxer ..... 53
Inhofe ..... 59
Clinton ..... 61
Catherine Cortez Masto, Attorney General, State of Nevada ..... 88
Prepared statement ..... 90
Responses to additional questions from Senator Boxer ..... 91
Kerr, James Y., III, President, National Association of Regulatory Utility Commissioners, North Carolina Utilities Commission ..... 93
Prepared statement ..... 95
Response to an additional question from Senator Cardin ..... 98
Responses to additional questions from:
Boxer ..... 98
Inhofe ..... 99
Cook, Ken, President, Environmental Working Group ..... 100
Prepared statement ..... 102

Page

## ADDITIONAL MATERIAL

United States Nuclear Regulatory Commission; Judging the Safety of a Repository at Yucca Mountain, NV ..... 125
Map of States Previously Considered for Respository Development ..... 145
Statements:
Nelson, Keven L., Health Physics Society ..... 146
Burk, Richard J., Jr., Health Physics Society ..... 148
Obama Hon. Barack, U.S. Senator from the State of Illinois ..... 150
Gibbins, Jim, Nevada Governor ..... 153
Cook, Kenneth, President, Environmental Working Group (Corrected Copy) ... 154
Makhijani, Arjun, President, Institute for Energy and Environmental Research ..... 166

# EXAMINATION OF THE LICENSING PROCESS FOR THE YUCCA MOUNTAIN REPOSITORY

**WEDNESDAY, OCTOBER 31, 2007**

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

The full committee met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the full committee) presiding.

Present: Senators Boxer, Inhofe, Carper, Craig, Isakson, Clinton, Barrasso.

Senator BOXER. The hearing will come to order. We are awaiting the arrival of three very special witnesses, three Senators, but so much is going on this morning. I think what we will do is we will start with opening statements, Senator Inhofe, if that is OK with you, and then we will move to the witnesses.

Senator INHOFE. Let me ask if it would be acceptable to you if we heard from Senator DeMint before we do opening statements. If we start opening statements, and we end up with, say, eight people here, it could be about an hour and a half.

Senator BOXER. OK. This is what we are going to do. We are going to the Chairman and the Ranking, and then we will go to Senator DeMint, and then we will return. All right?

Senator INHOFE. OK.

Senator BOXER. So if we just have 5 minutes each.

Senator INHOFE. OK. That is good.

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

Senator BOXER. Today's hearing is part of the oversight responsibility of the Environment and Public Works Committee over nuclear power and nuclear waste issues. My serious concerns about Yucca Mountain as a nuclear waste repository date back many years because my home State of California will be severely impacted if it is built and put into operation.

If the Yucca project is constructed, there will thousands of shipments of high level nuclear waste transported throughout California, subjecting our citizens to potential exposure to the most dangerous contaminants known to human kind. Many scientists predict that Yucca Mountain will leak radiation into the groundwater, which poses a real threat to drinking water in California.

This leaking nuclear waste even has the potential to contaminate surface waters, creating uncontrolled exposure in my State.

My concerns extend beyond California to the whole Nation, and obviously to the people oFNevada. Billions of taxpayer dollars could be wasted on a proposal that is fatally flawed because it will put millions of people at risk. If Yucca Mountain becomes operational, radioactive waste will be transported there from across the Nation. The people of an estimated 44 States, including California, will have to guard against a serious terrorist threat as nuclear waste travels throughout our communities. Nuclear waste will be traveling past schools, homes, hospitals and businesses.

This oversight hearing is critically important as we seek information about this controversial proposal, and is part of what will be a continuing process. I really look forward to hearing from the bipartisan Nevada delegation and all of our other witnesses during today's hearing.

I also want to mention that Senator Clinton is the one who approached and asked that we have this hearing today. I want to thank her very much, and I have welcomed all Senators who wish to have statements placed in the record to do so in the 2-weeks following this hearing.

With that, I would turn it over to Senator Inhofe for his opening statement, then we will hear from Senator DeMint and then we will go back and forth.

[The prepared statement of Senator Boxer follows:]

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

Today's hearing is part of the oversight responsibility of the Environment and Public Works Committee over nuclear power and nuclear waste issues.

My serious concerns about Yucca Mountain as a nuclear waste repository date back many years because my State of California will be severely impacted if it is built and put into operation.

If the Yucca project is constructed, there will be thousands of shipments of high level nuclear waste transported through California, subjecting our citizens to potential exposure to the most dangerous contaminants known to humankind.

Many scientists predict that Yucca Mountain will leak radiation into the groundwater, which poses a real threat to drinking water in California. This leaking nuclear waste even has the potential to contaminate surface waters, creating uncontrolled exposure in my state.

My concerns extend beyond California to the whole nation and obviously to the people of Nevada.

Billions of taxpayer dollars could be wasted on a proposal that is fatally flawed because it will put millions of people at risk.

If Yucca Mountain becomes operational, radioactive waste will be transported there from across the Nation. The people of an estimated 44 states, including California, will have to guard against a serious terrorist threat as nuclear waste travels through our communities. Nuclear waste will be traveling past schools, homes, hospitals and businesses.

This oversight hearing is critically important as we seek information about this controversial proposal, and is part of what will be a continuing process.

I look forward to hearing from the bipartisan Nevada delegation, and all our other witnesses, during today's hearing.

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

Senator INHOFE. Thank you, Madam Chairman. I am glad we are having this. The last time we had it was when I chaired this Committee, and there are a lot of questions that need to be asked.

In 1982, Congress passed the Nuclear Waste Policy Act to provide for the development of repositories for disposing of high level

nuclear waste in commercial spent fuel. The process was designed to be a rigorous and thoughtful one.

Now, time has gone by. We are now up to the point where we have spent over 25 years and $6 billion on this lengthy and thorough bipartisan process to prepared DOE to file a license application with the Nuclear Regulatory Commission, asking for authorization to build a repository.

Yet, there are those who would like to abandon Yucca Mountain and start over without the NRC ever considering the project. We are to the point now where we could rapidly get to the NRC looking at this. I believe it is significant that we do it.

Now, my question would be how do you justify this to our taxpayers? Electricity ratepayers pay for the cost of their repository, but taxpayers pay the cost of DOE's delay. DOE estimates that approximately $7 billion in liability costs will be paid to the utilities if DOE begins accepting spent fuel in 2017. For each year of delay beyond 2017, it is at least another $500 million a year, not to mention the cost to DOE of delaying the cleanup of DOE sites, which is about another $500 million per year.

This liability is paid by the U.S. taxpayers by way of the Federal Government's Judgment Fund. How do we justify wasting $1 billion a year while ignoring binding contracts signed with the utilities and refusing to proceed with a process mandated in law in the Nuclear Waste Policy Act?

To me, the toughest question is, if not Yucca Mountain, then where are we going to build a repository? Before Congress directed the DOE to focus its efforts on the Yucca Mountain site, over 37 States—37 States—had been considered as potential hosts for a repository. I have a map here that highlights all those States that have been considered to have geologic formations worth evaluating for the repository. However, they went through the process and determined in their estimation that Yucca was the best place.

Now, to me, I think that we need to get on with this process. We have been talking about his now for certainly for the 12 years that I have been serving on this Committee, and much, much longer than that. I think the time is right to go ahead and continue with it. As difficult as it is politically for a lot of people, I think it has to be done.

The bottom line is this, we are not going to resolve the problems we have without nuclear and we are not going to have nuclear until such time as we are able to determine where the repository is.

Thank you, Madam Chairman.

[The prepared statement of Senator Inhofe follows:]

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

Thank you, Chairman Boxer, for holding this hearing today. It's been just over a year since this Committee last held a hearing on Yucca Mountain, under my leadership, and I'm glad to once again ask tough questions about this very important project. Nuclear energy must play a growing part of our nation's energy future, both for the sake of national security and environmental progress. However, I am concerned that the resurgence of the nuclear industry may be hindered if there isn't sufficient progress toward development of a repository for spent fuel.

In 1982, Congress passed the Nuclear Waste Policy Act to provide for the development of repositories for disposing of high-level nuclear waste and commercial spent

fuel. The process was designed to be a rigorous and thoughtful one whereby our government would research locations, select a site, and license a repository with each relevant Federal agency playing its respective role. The DOE is charged with development and operation of the repository. The Nuclear Regulatory Commission will assess the safety of the proposed facility and regulate its operation, if approved. The EPA is responsible for developing the radiation standard by which the repository's safety will be evaluated. I must observe that the EPA committed in a hearing in March of last year that the radiation standard would be finalized by the end of 2006. However, it is still not final and there is no clear indication when it will become final.

DOE's filing of a license application with the NRC next year will be the culmination of over 25 years of research. Ward Sproat has shown exemplary leadership in preparing the organization to take that step and working to instill the discipline that the NRC requires of its licensees.

So far, we have spent over 25 years and $6 billion on this lengthy, thorough, bipartisan process to prepare DOE to file a license application with the Nuclear Regulatory Commission asking for authorization to build the repository. Yet there are those who would like to abandon Yucca Mountain and start over without the NRC ever even considering the project. I think that view raises some very tough questions.

My first question is: Why should DOE abandon the Yucca Mountain site before the NRC has even evaluated it? DOE has spent 25 years and $6 billion dollars studying the site and developing the license application. The NRC has developed detailed regulations to guide the process of intensively and accurately assessing whether Yucca Mountain can be developed as a safe repository, a process that will take at least 3 years. First, NRC technical staff and independent experts will scrutinize the application. Then, panels of judges will adjudicate contentions. Essentially, every element of the application will be put on trial twice. Then, if the repository gets built, DOE will have to go through a second process before it can begin operations and receive any nuclear waste. How would you explain to ratepayers that the Federal Government threw away $6 billion dollars without even bothering to find out if Yucca Mountain can withstand the level of scrutiny required by the NRC?

My next question is: How do you justify this to our taxpayers? Electricity ratepayers pay for the cost of the repository, but taxpayers pay the costs of DOE's delay. DOE estimates that approximately $7 billion dollars in liability costs will be paid to the utilities if DOE begins accepting spent fuel in 2017. For each year of delay beyond 2017, it's at least another $500 million per year, not to mention the costs to DOE of delaying clean-up of DOE sites which is about another $500 million per year. This liability is paid by the U. S. taxpayer by way of the Federal Government's judgment fund. How do you justify wasting a billion dollars a year while ignoring binding contracts signed with the utilities and refusing to proceed with the process mandated in law in the Nuclear Waste Policy Act?

To me, the toughest question is: If not Yucca Mountain, then where are we going to build a repository? Before the Congress directed the DOE to focus its efforts on the Yucca Mountain site, over 37 states had been considered as potential hosts for a repository. I have a map here that highlights all those states that have been considered to have geologic formations worth evaluating for repository development. I encourage everyone to take a good look at this map and think about what it means to abandon the Yucca Mountain site and look for a new one. THAT is a tough question.

I am not prepared to embrace any new long-term storage concept or any alternative repository sites unless and until the Yucca Mountain facility is given a fair, thorough, and transparent review by the Nuclear Regulatory Commission. I am not in favor of devoting the time and expense of the rate-payers, the government, or this body in pursuing sites in 37 states without first learning whether a safe repository can be built at Yucca Mountain. The prospect of such an effort should give every Member, especially those from these states, great pause.

It's time to proceed with the next step in the rigorous and thoughtful process provided in the Nuclear Waste Policy Act.

Senator BOXER. Thank you so much, Senator.

I ask unanimous consent that the following submissions be placed in the record: a statement by Senator Obama; a statement by Nevada Governor Gibbons; the corrected testimony of Kenneth Cook, who is on one of our panels; and at the request of Senator Reid, a statement of Dr. Arjun Makhijani.

Without objection, so ordered.

[The referenced documents can be found on pages 150-195]

Senator INHOFE. Madam Chairman.

Senator BOXER. Yes?

Senator INHOFE. I ask unanimous consent that the statement of Ronda Hornbeck, who is the County Commission Chairman of Lincoln County, Nevada be placed in the record.

Senator BOXER. Without objection, so ordered.

[The referenced document follows:]

STATEMENT OF RONDA HORNBECK, COUNTY COMMISSION CHAIRMAN, LINCOLN COUNTY, NV

Thank you for the opportunity to submit testimony to this Committee for the record. As one of ten units of local government designated by the Secretary of Energy as "affected" by the Yucca Mountain repository system, Lincoln County has a profound interest in the progress of the Yucca Mountain project. The County is situated immediately downwind from the Yucca Mountain site and is concerned about exposure to radionuclides resulting from atmospheric pathways. In addition, Lincoln County is one of only three Nevada counties directly impacted by the proposed Caliente Rail Corridor. Since the early 1980's Lincoln County has sought to understand and minimize the potential adverse local impacts of the repository system while also seeking to understand and maximize any beneficial local economic affects which the project may produce.

As part of Lincoln County's ongoing efforts to protect our citizens, I wish to call to the Committee's attention an issue that is important to many of the counties in Nevada that will be directly or indirectly affected by the Yucca Mountain project. In a petition for rulemaking filed with the NRC last March, Lincoln County, Nevada has asked the NRC to redress the issue. However, for the past 6 months the NRC has essentially sat on Lincoln County's petition, taking no action.

As presently written, the NRC's regulations may be interpreted to require that county governments must be represented by attorneys in the NRC's licensing proceedings. (In contrast, business entities including partnerships and corporations may be represented by an attorney or a "duly authorized member or officer.")[1]

This issue is of potentially great consequence to rural counties in Nevada that will be substantially affected by the proposed project but who cannot afford to pay for an attorney possessing the requisite experience and expertise to participate in the NRC licensing proceedings at a level that will be sufficient to adequately protect the county's interests.

The example of Lincoln County, Nevada, is particularly instructive. Located in the eastern portion of the state, downwind of Yucca Mountain, it covers 10,637 square miles and is home to approximately 4,100 people, about 17 percent of whom are below the poverty line and whose annual average per capita income is approximately $17,000. The town of Rachel, located in the western portion of the county, sits about 65 miles northeast of Yucca Mountain—closer to the site than the city of Las Vegas. Moreover, the DOE's preferred rail method for transporting nuclear waste to Yucca Mountain involves off-loading nearly all nuclear waste from around the country in Caliente, Nevada—which is Lincoln County's only incorporated city—and then shipping the waste from Caliente by rail to Yucca Mountain along a corridor that will run for 90 miles within the county.

Although Lincoln County likely will be the gateway for high-level nuclear waste entering Nevada and destined for Yucca Mountain, and will likely be affected by repository operations, it does not have the financial resources to pay experienced counsel to participate in the complex and lengthy licensing proceedings on a regular basis.

By way of comparison, DOE itself has retained special outside counsel to assist it in preparing for the licensing proceedings and to represent it in those proceedings when they commence. According to press reports, the DOE paid its first law firm, Winston & Strawn, approximately $16.5 million and may pay its current law firm,

[1](10 C.F.R.§ 2.314(b). In the pre-licensing proceedings now underway before the NRC in the Yucca Mountain matter, the Pre-License Application President Officer Board has stated, in an Order dated December 2, 2005, that a majority of the Board believes that the regulation does require county governments to be represented by attorneys. However, the Board deferred a ruling on this issue until a later date when the issue might be of "greater practical significance to the conduct of the proceeding.' NRC Docket No. PAPO–00, ASLBP No. 04–829–01-PAPO.

Hunton & Williams, as much as $45 million, in these matters.[2] The State of Nevada has been able to retain sophisticated and experienced outside counsel to mount a vigorous legal challenge to Yucca Mountain by raising many millions of dollars through standard and supplemental funding mechanisms that are not available to Lincoln County and other affected units of local governments ("AULGs").

The situation faced by Lincoln County and other rural AULGs is dramatically different. Although these counties and their citizens are as vitally interested in Yucca Mountain as the State of Nevada, Lincoln County's total annual operating budget from general revenues is $3 million. Its authority to levy sales and real property taxes is essentially tapped out. Ninety-eight percent of its land base is managed by the Federal Government, leaving a very narrow opportunity to expand its economic base. In order to participate in the NRC licensing proceedings, Lincoln County and similarly situated AULGs are entirely depended on DOE grants from the Nuclear Waste Fund established by Congress as part of the Nuclear Waste Policy Act. But such funding is uncertain, has varied from year to year—and may only be used by AULGs to hire attorneys if, in connection with each year's authorization, Congress includes specific language authorizing the use of such funds for legal counsel. This fund is not only an unreliable basis on which to plan for participation in the NRC licensing proceedings; historical funding levels have been completely inadequate to permit Lincoln County to retain counsel to participate on a regular basis in the licensing proceedings.

In light of these considerations, on March 23, 2007, Lincoln County filed a Petition for Rulemaking with the NRC, asking the NRC to amend its regulations to allow AULGs to be represented in the NRC licensing proceedings by attorneys or other duly authorized representatives. A copy of Lincoln County's petition is attached as Exhibit A hereto. To date, however the NRC has taken no official action on that petition. It is completely inexcusable that the NRC has chosen to simply sit on Lincoln County's petition for more than 6 months. If the NRC were to initiate a public comment period tomorrow on Lincoln County's petition, it almost certainly would take at least a year from then before any rulemaking proceeding would be completed. Yet with the DOE moving apace to file its license application, AULGs must know soon whether or not they will be able to represent themselves through non-attorneys if they are to be able to prepare appropriately for the licensing hearings. The Federal Government having failed to ensure adequate funding for legal representation by AULGs, it should not further penalize those governments and their citizens by effectively preventing them from participating meaningfully as parties in the NRC licensing proceedings—or by simply deep-sixing Lincoln County's administrative petition that would provide them with some relief.

Senator DeMint, we will stop our talk up here at the platform and we will hear from you for five minutes, and then we will go back side to side here.

## STATEMENT OF HON. JAMES DEMINT, U.S. SENATOR FROM THE STATE OF SOUTH CAROLINA

Senator DEMINT. Thank you, Madam Chairman. I would ask that my complete statement be put in the record.

Senator BOXER. Without objection, so ordered.

Senator DEMINT. If I could talk informally, I don't come in front of you today as an expert on nuclear energy or storage, but as someone who is from a State that has been very much involved with the treatment of nuclear waste, primarily from weapons grade plutonium, but also a State that has 55 percent of its electricity generated by nuclear power.

I am very interested in the combination of a clean environment and low cost energy so that we will have a strong economy. I would like to point out that South Carolina has been receiving nuclear waste from all over the Country for many, many years, millions of miles traveled without ever an incident that would threaten the public in any way. I believe the industry has demonstrated that they can move nuclear waste around very safely.

[2]See Las Vegas Review-Journal, Feb. 5, 2002 (page 1A) and March 25, 2004 (page 4B).

My main point today really comes to the basic point that if we are going to have low cost energy in a clean environment, that we need to produce more of our electricity with nuclear power. I would like to just reference a chart here. If we go back to 1980, Europe was using about twice as much coal as the United States, but we made different decisions at that time about nuclear power.

We decided to cutoff the building of new nuclear plants. Europe decided to build more. While they reduced the use of coal by over 30 percent, we increased ours by over 60 percent, and as all of us know, one of the biggest problems we have with carbons in the air come from coal-fired electricity generation.

If I could just show the second chart here to make the point. The red lines are the building of nuclear facilities in the United States. The blue lines are for Europe. You can see that coincides with the decline in the use of coal. The fact is, our use of coal has gone up, as well as natural gas, putting pressure on the cost of natural gas for industry and residential use so the United States has used more carbons to generate its electricity, while Europe, countries like France now have well over 70 percent of their electricity generated by nuclear power plants.

My main point is this: If we are going to have low cost energy and if we are going to have a clean environment, we have to stop burning coal and have more nuclear power. But nuclear power is going nowhere unless we have a predictable storage facility. South Carolina for years has been taking waste from all over the Country. There are a lot of new technologies on how to encapsulate it and classify it so that it can be shipped and stored safely, but not above ground.

This needs to be moved as well as our nuclear facilities in South Carolina have onsite storage, which long-term is very dangerous.

So if we are going to move ahead with new licenses, and there are at least four new licenses already applied for in South Carolina, the development and the opening of new nuclear facilities in this Country are going to completely stall unless we move ahead with Yucca Mountain.

As has already been referenced, we have been working on Yucca for almost 30 years. We have spent around $10 billion. States like South Carolina have had a tax added to their energy costs.

South Carolina has contributed about $1 billion toward Yucca, and we have been waiting for years with promises from the Federal Government that the waste that we are storing in South Carolina will eventually be moved to Yucca.

I guess if I could just leave this Committee with one point, if we do not open Yucca as planned in 2012, we will stall all development of nuclear generation and we will pollute our environment and put our Country at a competitive disadvantage as far as the cost of energy. It makes no sense for us to talk about taxing the emissions of carbon, cap and trade and all the things that we are talking about, when within our grasp is nuclear power, which has demonstrated safety and efficiency in a clean environment. And all we need is to go through 30 years of research and development.

If not Yucca, where? We have determined that this is the safest site in the Country. I am not going to argue the research. Others will do that today. I know my colleague will argue a different point

of view, but I would just hope this Committee realizes if we don't go with Yucca, not only are $10 billion down the drain, 30 years of research and development, and we are stuck with coal-fired electricity generation and we are going to fall behind the rest of the world.

I appreciate the opportunity to testify today. Thank you.

[The prepared statement of Senator DeMint follows:]

STATEMENT OF HON. JAMES DEMINT, U.S. SENATOR FROM THE STATE OF SOUTH CAROLINA

Chairman Boxer, Senator Inhofe, fellow senators. Thank you for the opportunity to be here today and participate in one of the most important discussions we can have about the future of our Nation.

We are facing many issues regarding our environment, our nation's energy infrastructure, and the demands of our society. How these interests are balanced will be crucial to our quality of life, security, and competitiveness in a global marketplace.

Unfortunately, I believe many of the issues we are confronting didn't need to happen. Thirty years ago due in part to fear, in part to a lack of information, politicians enacted policies that placed numerous road blocks in front of the nuclear energy industry. As a result, we haven't seen a new construction license issued since the late 1970's and energy companies switched from pursuing clean non-polluting nuclear energy and were forced to rely more and more on coal. Now, politicians condemn the energy industry for pursuing a path they were forced to follow.

Yet, at the same time Europe embraced nuclear energy even more. Today, Europeans have almost twice as many nuclear reactors than the United States. And they slashed dependence on coal by more than 30 percent—while we increased our use of coal by more than 60 percent.

While the United States abandoned already built facilities to recycle nuclear waste, the Europeans took American technology, improved it, and have proven the ability to control the entire nuclear fuel cycle. Now, European countries are proposing even more nuclear reactors in order to meet their pollution reduction commitments under their Kyoto agreements.

Before bad policy decisions shut down much of the nuclear industry in the United States, my State of South Carolina embraced nuclear energy, and today more than half of the energy produced in my State comes from nuclear. South Carolinians are responsible stewards of our environment and have sought to protect the mountains, marshes, and beaches that are our treasures and the life blood of my state's economy.

However, in addition to the civilian nuclear industry, for more than 50 years South Carolina has performed a vital national security mission for our country. Along with states like California, Colorado, Idaho, New Mexico, New York, Ohio, and Washington, the Savannah River Site in Aiken, South Carolina helped produce and maintain the nuclear weapons stockpile that helped us win the cold war. Some of these sites have closed and others will eventually close. Interestingly enough, some members of this committee—who oppose Yucca Mountain—have written letters to the Department of Energy demanding that nuclear waste be removed from their State and sent somewhere else.

Unlike other facilities, the Savannah River Site has expanded to meet our nation's energy and defense needs. South Carolinians are proud to continue to serve the Nation, and recently the Department of Energy announced it would start consolidating plutonium from other sites to South Carolina.

South Carolinians recognize there are national security and energy needs and it is the responsibility of all Americans to do what they can, which brings us to Yucca Mountain.

As a member of the EPW Committee last Congress, I participated in hearings and reviewed many of the issues regarding Yucca. My colleagues have some legitimate concerns, and they need to be dealt with accordingly—just like the Savannah River Site. And concerns can be addressed if met with a willingness to talk.

But millions of Americans that use nuclear energy have concerns as well. They have paid billions of dollars into the Nuclear Waste Fund and billions of those dollars have been spent to exhaustively study Yucca Mountain. Nuclear waste continues to fill the storage pools at nuclear stations, and energy companies continue to submit applications for new onsite waste storage.

What I find perplexing is that people argue the environmental standards are not strict enough to justify opening Yucca. However, if Yucca cannot meet these stand-

ards, then no other location where nuclear waste currently resides can qualify either.

For instance, we have heard concerns that EPA's standard of 350 milirems of radiation per year is too high and could potentially endanger Nevada residents. Well the Dirksen Senate building could expose staffers to higher level than the EPA standard for Yucca, but we don't see calls to shut down this building.

We hear concerns about contaminating groundwater in the desert. However, if the Savannah River Site, the Hanford Site, and other DOE locations were to store waste as the Majority Leader has proposed, then how do these sites which sit adjacent to major rivers pose less risk to Americans than a mountain located in an arid desert.

The truth is that opposition is based on politics, not on sound science. Thirty years ago the government made bad policy decisions with significant consequences. I fear we are repeating history.

We are debating Yucca Mountain, despite the fact that every branch of the Federal Government has spoken on the need to move forward. Now this committee is investigating the merits of Yucca before the Nuclear Regulatory Commission has received a license application or finalized the process.

As our nation continues to grow and our economy expands, we will need more energy. If we want to have energy security then we can't rely on renewable energy alone. Every source of energy has its' place in our energy portfolio, but we cannot escape the fact that nuclear energy must be a significant part of confronting our energy challenges.

Without Yucca, a nuclear renaissance will not occur, and without nuclear energy we will never see significant improvements to our environment. We should not set our nation back even further like the misguided policies of 30 years ago.

I applaud President Bush and the administration of every President since Carter for their strong support of Yucca Mountain. The energy needs of our nation will continue to require strong leadership from our Presidents for years to come.

Unfortunately, it appears politics is pushing a conclusion that will perpetuate bad policies, harm our economy, and ultimately damage our environment even more.

Senator BOXER. Thank you, Senator.

Just to reiterate my testimony, we have to make sure it is safe and we don't put millions of people at risk, and that is the purpose of this hearing.

Senator Clinton, and then followed by Senator Craig.

Senator CLINTON. Madam Chairman, do you want to go to Senator Ensign?

Senator BOXER. I think we are going to wait for Senator Reid. He is going to be here shortly.

Senator, please proceed.

Senator CLINTON. Thank you very much.

Senator BOXER. We can take two more, and when Senator Reid comes, we will do both of them.

Yes.

Senator CLINTON.

## OPENING STATEMENT OF HON. HILLARY RODHAM CLINTON, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator CLINTON. I want to begin by thanking Chairman Boxer for holding this hearing. I think it is particularly timely because we are nearing a critical stage of the process, which is the June 2008 date when the Department of Energy plans to submit a license application for Yucca Mountain to the Nuclear Regulatory Commission.

So I think it is important that we use this hearing to get the Administration on record in response to some important unanswered questions about how this process will work. I want to start by stating what the available scientific evidence makes clear. Yucca Mountain is not a safe place to store spent fuel from our Nation's nuclear reactors.

First off, Yucca Mountain is located in an area of considerable seismic activity. There are 32 known active faults at or near Yucca Mountain. There have been more than 600 seismic events registering above 2.5 on the Richter scale within a 50 mile radius of Yucca Mountain in the last 30 years. In 1992, an earthquake registering 5.6 on the Richter scale occurred just eight miles away. And just last month, it was reported that the Department of Energy had to alter plans at the site after rock samples unexpectedly revealed a fault line underneath the proposed location of the concrete pad where waste would cool before going into the repository.

Looking forward, scientists have predicted that an earthquake registering six or more on the Richter scale is likely to occur in the next 10,000 years, given that Nevada is the third most earthquake-prone State in the Country after California and Alaska.

An even greater potential risk at the site is its history of volcanic activity. As an MIT geologist testified to this Committee last year, "Though the likelihood of an explosive volcano erupting directly beneath the repository is remote, the outcome would be devastating, spewing radioactive material directly into the atmosphere."

In addition, the rock at the site has proven to be more porous than the Department of Energy once thought, raising major concerns about contamination of scarce groundwater less than 100 miles from Las Vegas. In recent years, scientists discovered that radiation from nuclear tests done in the 1950's had migrated downward with rainwater to more than 600 feet below ground, rates far faster than predicted by the Department of Energy.

This poses the threat of corrosion of the containers in which the waste would be stored, as well as the potential for much more rapid spread of contamination in groundwater.

Because of these many flaws in the geology of the site, the DOE has turned to what it calls engineered controls to try to contain the waste. In other words, the containers that the waste would be stored in are to be trusted to resist rusting for hundreds of thousands of years under intense heat and the presence of humidity.

Given these problems, it is not surprising that the Administration has been so opaque about the licensing process. As the testimony of Nevada's Attorney General makes clear, the licensing process puts the cart before the horse. EPA has yet to finalize the radiation standards that DOD must prove it will be able to meet in order to license the repository. And the NRC has stated they will accept the application even if EPA's standards are not in place when it is filed.

Madam Chairman, does this make any sense at all? Is this site and this process really the best we can do? I know that some believe that Yucca Mountain is a referendum on the future of nuclear power, or that the waste accumulating across the Country is imperative enough to override the clear problems with the site. I strongly disagree. That is why I voted against the resolution overriding Nevada's veto of Yucca Mountain in July 2002, and that is why I remain opposed today.

We do need to find a long-term storage solution for our Nation's nuclear waste, but Yucca Mountain is not the answer. It is time to step back and take a deep breath. The 25 years since the Nuclear Waste Policy Act passed seems like a long time ago, but this

is a decision that future generations will live with for hundreds of thousands of years, longer than any of us can imagine.

So we need to get it right. It is time to move on from Yucca Mountain. I believe we should start over and assemble our best scientific minds to identify alternatives. In the meantime, we need to make sure we are storing waste safely and securely at the reactor sites where it is located today, and we need to do better thinking about the massive challenge of transporting waste safely and securely from reactor sites to a permanent repository.

What we should not do is to push an incomplete application for a flawed site through a rushed and incoherent process. But unfortunately, it is clear from the written testimony submitted by our witnesses representing the Administration that is precisely the course of action that this Administration intends to pursue. I think we can do better, and I hope that we will get the chance to do that.

Madam Chairman, again thank you for holding this critical hearing.

Senator BOXER. Senator, thank you very much for your leadership on this.

We will go to Senator Craig. If at that time, Senator Reid hasn't come, Senator Ensign we will call right on you and then we will go back to the members.

Yes, Senator Craig.

**OPENING STATEMENT OF HON. LARRY CRAIG, U.S. SENATOR FROM THE STATE OF IDAHO**

Senator CRAIG. Madam Chairman, thank you very much for this important hearing. I am pleased that Senator Clinton is here this morning because of her recent statements and her long-time opposition to Yucca Mountain.

It is clearly a very fundamental and an important debate for our Country to have. I happen to come from a State that is very pronuclear. We have a great heritage of having designed and operated the first commercial reactor, and we have designed 52 since that time. But also with that positive legacy, we also have what I call a neutral legacy. We have from West Valley, New York, a place the Senator knows well, waste, some 26 metric tons that we took at her insistence.

From Three Mile Island in Pennsylvania, we have 81 tons of high level nuclear waste that we took because of DOE's relationship and because we needed a safe place to store it.

Now, the dirty little secret about that waste is it is scheduled to be handled in a permanent repository by 2035. So let me suggest this, if that permanent repository or permanent destination of handling waste is not determined, where must that waste go? Because the law says it leaves Idaho. Do we return it to West Valley, New York? Do we return it to Three Mile Island,

Pennsylvania where it can be stored safely on a more permanent basis? Does New Hampshire's waste, Iowa's waste, South Carolina's waste, that currently fuels its reactors, stay there indefinitely? Those are fundamental issues that we have to talk about as we find a permanent repository for our high level waste.

The citizens of New York have paid $721 billion to find that, and they have currently stored in the State of New York 3,060 metric

tons of high level nuclear waste. That is a legacy that a responsible Senator must deal with. In California, the story is the same: $764 billion spent by the ratepayers, and 2,420 metric tons of waste.

It is so easy to be against. It is so fundamentally important that we act in a responsible manner.

And that is, of course, what our Country and the Congress has attempted to do for a good many years. So where is the legacy and where is the responsibility? From 1995 to 2006, nuclear power avoided over 8,000 million metric tons of carbon dioxide going into the atmosphere, reflective of the testimony of the Senator from South Carolina. The U.S. emits 6,000 million metric tons per year of carbon, 25 percent of the world's emissions into the atmosphere.

Nevada does not want a coal plant. Idaho does not a coal plant. Kansas doesn't want a coal plant. My suggestion is as we tumble through this, for political purposes and I would hope for valid scientific reasons, that we get it right, but we cannot have it both ways. Capping emissions of carbon dioxide while opposing Yucca Mountain and new nuclear just doesn't make a lot of sense.

Decide. Are you more anti-nuclear or more pro-carbon cap? I call it a choose it or lose it theory, because I don't think you can hold both positions and hold them fundamentally honestly in a political world, let alone a scientific world.

I will offer an amendment to any cap and trade proposal that we require that new nuclear be a part of a cap and trade possibility. No nuclear, no cap. Choose it or lose it. That is a fundamental debate that this Country must have. Nuclear must remain at least 20 percent of America's energy portfolio into the foreseeable future. And if we don't, we either become a less productive Nation or we become a dirtier Nation based on current technology. That is a position this Committee doesn't hold, nor is it a position this Committee ought to advocate. We have a responsibility here beyond politics and it is very good science. It is a transparent licensing process, and it is something that should be allowed to move forward to a point of final decision as to the reasonable and responsible destination of our high level waste.

Thank you very much for holding this hearing, Madam Chairman.

Senator BOXER. Thank you, Senator.

I just want to make the point that this hearing is an oversight hearing on Yucca. It has nothing to do with whether you are pro-nuclear or you are anti-nuclear. It is are you pro-safety, are you concerned about that. And that is the question here. It isn't whether we are pro-nuclear or anti—nuclear. It has nothing to do with that. It is where you put the waste in a way that doesn't——

Senator CRAIG. I appreciate that. I also recognize that is a matter of interpretation.

Senator BOXER. If I might finish? Since I called this hearing, I will tell you what this hearing is about. It is about whether Yucca Mountain is safe.

With that, I am going to call on either Senator Ensign or Senator Reid, whomever would like to go first.

**STATEMENT OF HON. JOHN ENSIGN, U.S. SENATOR FROM THE STATE OF NEVADA**

Senator ENSIGN. Thank you, Madam Chairman. I appreciate you calling what I consider to be this I think very important hearing. It is interesting listening to some of the testimony this morning. I think actually, Madam Chair, that you have to put this in the broader context of nuclear power, of the science and the politics because it all does play a role, and it has played a role up to this point.

Senator Craig, a lot of what he was talking about he even said that the waste can be shipped back and stored safely. I think that is an important point to make, that the science has told us that the storage of nuclear waste is safe for at least 100 years in dry casks. Nobody disagrees with that. And so the rush to build Yucca Mountain as a "permanent repository" seem illogical to me.

There are still so many questions left to answer. Some people think it is good science and others have really questioned the science. There have been tremendous cost overruns in Yucca Mountain because of the changes in the science.

The latest estimate is that it is going to cost somewhere around $60 billion to build Yucca Mountain. Nobody believes that estimate is accurate. The actual cost will probably be closer to $100 billion and the dirty little secret here is that you need at least one other Yucca Mountain. Yucca Mountain itself is not adequate enough to handle our Nation's nuclear waste.

In my opinion, Yucca Mountain is dead. Yucca Mountain is never going to be completed. So what we need as a Country to look for the alternative to Yucca. The good thing is we do have the time. We have 100 years of onsite dry cask storage. Senator Reid and I believe we have a solution. We have introduced a bill for the Federal Government to take title to that waste. We take responsibility for that waste. It relieves some of the liability of the nuclear power companies, and then we decide then as a country what is the best thing to with the waste.

I personally believe that recycling of the waste is the right thing to do. Other countries are doing that right now. Some people object to the type of technology they use, but the bottom line is they are doing it and they are doing it very successfully. France has recycled 98 percent of their waste. In Great Britain, they use two different types of technology, but similar applications, and Japan is using France's technology. These recycling process have led to a significant decrease in the volume of the waste is tremendously decreased. You don't need the size or the cost of Yucca Mountain if you go with the recycling of the nuclear waste.

The bottom line is even if you don't like reprocessing the science associated with it is much more sound that associated with Yucca Mount. We as a Nation ought to invest in reprocessing technologies. It does not matter to me if you invest in transmutation or something similar, as long as the money isn't being wasted as it is now on Yucca Mountain. The politics of Yucca Mountain, the science of Yucca Mountain is questionable at best. I think that we are pouring money really down a large rat hole in the State of Nevada and we should be putting that money toward good use instead.

Everybody that I have heard that are proponents of Yucca Mountain say that the ratepayers have already paid in these billions of dollars. However, the ratepayers will never pay in enough money to build Yucca Mountain. It will be the taxpayers who will have to foot the bill on top of what the ratepayers have already paid. In addition, there is the fact that I mentioned earlier, you need a second Yucca Mountain.

So Yucca it is absolutely I think the wrong direction for us to go. It is because of the myriad of problems with Yucca, why I think that we need to be aggressively pursuing the idea of either reprocessing or some other kind of recycling technology. I could walk through all of the problems in more detail, however, Senator Clinton, I think you went through some of the very obvious problems that we have seen.

The fact that the Administration is going forward with this licensing application next year I believe is irresponsible. That is not the direction we need to go in. So I, by the way, support nuclear power. I believe it is an important part of the whole climate change debate, that we need to have more nuclear power in the world, and especially in the United States if we want to have less carbon going into the atmosphere.

The question is just what do we do with the waste. That is just the biggest problem, because as far as safety is concerned at the power plants, nuclear power is probably the safest power that there is, bar none. There have been fewer accidents. There has never been a death in the United States from nuclear power. We do it safely. It is a question of the waste.

We have out there today the technology exists to handle the problem of nuclear waste. Yucca Mountain is not that answer and we ought to proceed on a different course. We ought to be open minded, instead of just blindly going along. Currently, we are hearing some of the biggest proponents lately starting to change their minds. Some in the nuclear power industry themselves are changing their minds about Yucca Mountain. This Senate ought to take a serious look at what is being talked about out there in the technological community.

Thank you, Madam Chair.

[The prepared statement of Senator Ensign follows:]

STATEMENT OF HON. JOHN ENSIGN, U.S. SENATOR FROM THE STATE OF NEVADA

I want to thank the Chair, the Ranking, and other members of the Committee for the opportunity to present testimony on storing nuclear waste at Yucca Mountain. I firmly believe that a storage site at Yucca Mountain should not be built and will not be built.

At the outset, I want to be clear that I am not against nuclear power. I believe that it presents this nation with a viable clean air energy alternative that can help our nation meet its growing needs and reduce our dependence on foreign oil. In fact, nuclear energy currently provides 20 percent of America's electricity. What I am against is building a $60 to $100 billion repository that is scientifically unsound and wastes payers rate and eventually taxpayers dollars. Nuclear power is an important investment, but one that cannot be made idly. With nuclear power generation comes waste, and this nation must be responsible and manage the waste in the safest manner possible.

The proposed Yucca Mountain nuclear waste repository is not a responsible solution. Not a shovel has turned to begin building the actual repository intended to hold tons of hazardous, highly radioactive nuclear waste. Yucca Mountain is already 20 years behind schedule, with its new opening date estimated in 2017 or beyond.

It is time to face reality: the repository will never be built because of the numerous and insurmountable scientific, safety, and technical problems with the site. In addition, nearly three decades of poor management and oversight have demonstrated that the vast body of scientific and technical work done by the Department of Energy (DOE) and its contractors is still incomplete or moot, due to faulty science and constantly changing designs for the repository, none of which have been proven to meet scientific standards. In spite of all of this, aware of the flaws and failures, DOE is still pushing forward to file its license application in June of 2008.

Yucca has experienced one set back after another. Some of these setbacks can be credited to the hard work of the Nevada delegation and others who have fought to cut the budget of Yucca Mountain. Others have been the result of sheer incompetence.

• EPA's radiation protection standards have been rejected and criticized because the standards are wholly inadequate, do not meet the law's requirements, and do not protect the public health and safety.

• The Yucca Mountain Project has suffered nearly three decades of scientific and quality assurance problems with transportation plans, corrosion of casks, the effectiveness of materials, etc., causing DOE to suspend work on the surface facilities and the Nuclear Regulatory Commission to issue a stop work order on the containers.

• DOE revealed that documents and models about water infiltration into the groundwater at Yucca Mountain had been falsified, costing the taxpayer million of dollars and jeopardizing the citizens of Nevada.

• New evidence placed the location of the Bow Ridge earthquake fault line directly beneath where DOE had designed the cooling pads for thousands of tons of highly radioactive spent fuel forcing last minute redesign.]

Given the numerous problems and failures at Yucca Mountain, both policymakers and industry are recognizing the reality—Yucca Mountain is not a safe, sound waste solution. In fact, just recently, the Heritage Foundation, an advocate for Yucca, stated that "We need to move beyond a Yucca-only approach to spent fuel." And, earlier this month Frank Bowman, the President and CEO of the Nuclear Energy Institute (NEI), the policy organization of the nuclear energy and technologies industry, made some very candid comments when asked about the Yucca Mountain project in an interview. He stated that, "a couple of years ago, we began thinking, shouldn't we take Yucca Mountain and move it off the critical path. Is there another approach that we've been missing, because we have been so Yucca-centric?" These are provocative, realistic statements coming from those who have been avidly pro-Yucca in the past.

Now we have the opportunity to face reality and move forward with sensible solutions, responsibly managing our nation's nuclear waste. It can be done. Fortunately, scientists agree. Not only do we have the technology to implement safe, onsite dry cask storage, but also the technology is there to reprocess our waste, which must be part of any long-term waste solution.

On-site dry cask storage is a viable, safe, and secure alternative that is readily available and will allow science and industry the time to catch up. Dry casks are being safely used at 34 sites throughout the country. NEI projects that 83 of the 103 active reactors will have dry storage by 2050. That is why Senator Reid and I have introduced the Federal Accountability for Nuclear Waste Storage Act of 2007, which would amend the Nuclear Waste Policy Act of 1982 to require commercial nuclear power plant operators to transfer spent nuclear fuel into dry casks at independent spent-fuel storage facilities located onsite with the nuclear reactors. These spent-fuel storage facilities would be licensed by the Nuclear Regulatory Commission and operated by the Department of Energy, who will also have the ownership title of the waste. DOE was scheduled to begin taking title to spent nuclear fuel in 1998, but because of the myriad of technical, scientific, legal, and political problems surrounding the proposed Yucca Mountain nuclear waste repository, this has not happened. Taking title to spent nuclear fuel fulfills the Federal Government's obligation and commitment to retake control over nuclear materials. This proposed onsite storage will cost only a fraction of the proposed Yucca dump, the pursuit of which has already wasted billions of taxpayers' dollars. It is a responsible solution and it is available now.

Storing the waste onsite will allow the necessary time to develop a viable reprocessing program using advanced fuel-cycle technologies. I have long believed that we need to invest and develop these technologies as they are the critical components to long-term waste management. Today's reprocessing technology makes it possible to recycle and use the byproducts, which retain enormous amounts of energy, to generate new, affordable, and clean fuel. Consensus is leaning toward using reproc-

essing technologies that have the potential to transform the waste, make it less hazardous over a shorter amount of time, and also reduce the volume of waste requiring disposal. In fact, France has proven itself a model of success. Using current technology, France is on target to reprocess 98 percent of its fuel, providing close to 10 percent of its power needs, and has done so without incident for years.

Many of the technologies being researched today would develop processes that do not produce pure plutonium, removing the concern of proliferation. If there is a positive side to the insurmountable problems facing Yucca Mountain it is that it has given impetus to the nuclear industry and other supporters of enhanced nuclear power opportunities to be open to other ideas for waste disposal. If we give industry the confidence and security that the market exists to reprocess and convert spent nuclear fuel, I am confident that the technology, both with respect to reactors and reprocessing, will develop to match our power and security needs.

We can meet the energy needs of this nation if we begin to develop our domestic resources. Nuclear energy is one of those resources and it can have tremendous long-term benefits to this Nation. However, in order to harness its power we must manage the waste in the most safe, secure, and scientifically sound manner possible. Yucca Mountain is not that solution. It is time to move past Yucca Mountain. The project is expensive. Now is not the time to squander money, resources, and time on a project doomed to fail. Rather, now is the time to pursue real solutions. One of the solutions

Senator BOXER. Thank you very much, Senator Ensign.

Senator Reid, welcome.

**STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM THE STATE OF NEVADA**

Senator REID. Madam Chair, thank you very much for holding this hearing. During my entire career in the Congress, this has been an issue. As I come here today and look at the Chair of this Committee, I can remember on one occasion that I needed one more vote, and you got me that vote on this issue.

I see Senator Clinton. President Clinton was the first to speak out against this, and more than speaking out, his actions spoke much louder than his words. So my mind is flooded with memories of the battles that we have had and, in my opinion, some of the real soldiers.

Today in Nevada, we are celebrating our birthday. It is Nevada Day, October 31. Every Halloween is Nevada's birthday. We were born in 1864 during the Civil War. The motto on our flag says "battle born." And the State of Nevada has been fighting a very lonely fight for these 20 plus years to protect the lives of its citizens from radiation exposure, to protect our land and water from misuse and contamination, and to expose a Government bureaucracy that has been rife with corruption, flawed science, and quality assurance failures as it relates to Yucca Mountain.

Madam Chairman, Yucca Mountain is no longer a Nevada issue. It is an issue that affects everybody in this Country. We are not going to wake up one morning and see that waste at Yucca Mountain. It has to come through the railways of this Country, the highways of this Country, past our homes, our schools, our playgrounds, our churches, our businesses.

Since 9/11, let's be realistic about this. Are these evil people knowledgeable enough to know and find out when 70,000 tons of this stuff is being shipped across the Country? Do you think they could find one truck or train to derail, to take the truck? Of course, they could.

This is a fight that has been rigged from the beginning. After passing comprehensive and thoughtful legislation in 1982, the year

I came to Congress to tackle this difficult issue, led by Congressman Mo Udall, Congress then changed the rules of the game, and Yucca was chosen as the only site to be closely researched. The powerful Senate delegation of a brand new Senator named Reid, and one that had been there shortly longer than me, Chic Hecht, wasn't very powerful, to be very honest with you, and they ran over us.

It was a political decision. It was counter to the spirit of the Nuclear Waste Policy Act, science, safety and security. This same rigged process allowed the State of Nevada to veto the decision, but also allowed Congress to override it, essentially an empty promise. The Government Accountability Office has reported exhaustively on quality assurance failures with the research done at the site; science that has been manipulated; secret meetings have been held without public oversight or participation; and the time line designs are ever-changing without any repercussions from the Department of Energy.

We have uncovered e-mails of scientists who work for the Department of Energy and the U.S. Geological Survey saying, we have never done any studies, but we are going to say we have. That is in effect what they have done. Not in effect what they have done, it is what they did.

EPA has no plans to release its radiation standard before the Department of Energy files its license application, an environmental standard upon which the success of the entire license application rests.

Now that the license application process is upon us, and we are ready for what many believe will be the final battle against the dump, Nevadans are again left shaking their heads in dismay as they see the decks are again stacked against them. The time line to review the application has been unrealistically compressed to 3 years, even though the NRC took 8 years to license the proposed interim storage facility in Utah, which is a little facility on an Indian reservation and not really surrounded by many people.

The license support network that the Department of Energy has recently certified is filled with thousands, most people say millions, of unnecessary documents to make searching for the relevant information like finding literally the needle in the haystack. The Department of Energy's performance assessment computer model, which is the basis for the license application, and purportedly will prove that the department can meet all environmental standards required by law,

can't be reviewed by any other entity. How do you like that? The only one that can read it that is the Department of Energy itself.

Essentially, this computer model is the license application, but the DOE will not let anyone access it, not the State of Nevada, not even the Nuclear Regulatory Commission. I would like someone here to explain to me how the Department of Energy can write a computer modeling program that can prove it can meet an EPA radiation standard that doesn't exist. I don't care how many servers or processors the Department of Energy uses in its complicated computer assessment of Yucca Mountain, you can't prove that you can meet a standard that hasn't been written, unless of course the Department of Energy has told EPA how to write it.

That is an interesting assumption, isn't it? A little backward is how it would have to be described. We are talking about the most dangerous substance known on the face of the earth.

Instead of seriously studying whether or not the proposed site at Yucca Mountain is safe to store this waste, the Department of Energy and the Environmental Protection Agency under this Bush Administration are cooking up their own set of books to write a radiation standard that can be met by Yucca Mountain.

Many of you will remember EPA already published an earlier version of the radiation standard six years ago. In that standard, EPA went too far to accommodate the Department of Energy's desire to build a waste dump at Yucca Mountain and deliberately violated congressional instructions. This rule was thrown out by the courts. The EPA wrote a proposed draft in 2005, two years ago. They haven't finalized it. Where is it? It is obvious to me that the EPA is having trouble writing a final radiation standard that can meet current law without disqualifying Yucca Mountain as a suitable site to dump nuclear waste. The EPA knows that if they fudge the exposure numbers, they will end up back in court.

Instead of sticking to the commitment that Yucca Mountain would proceed only if it would actually protect public health, EPA has cast sound science aside in favor of politics in a myopic pursuit of this mysterious Yucca Mountain. And now they are delaying publishing a final radiation standard because they know the Department of Energy cannot meet the standards required by law. They also know that if they delay long enough that the State of Nevada will run out of time to take the issue back to the courts. Again, it is a rigged process.

How are we going to secure the waste in the interim? Senator Ensign has laid it out very clearly. We leave it where it is in dry cask storage containers. It is safe. It is secure. Isn't it more secure there than hauling it, picking it up, hauling it in trains and trucks, sometimes more than 3,000 miles? Scientists all agree that it is safe leaving it where it is, safe for 100 years, then maybe we can figure out something to do with it, and I am sure we can.

Senators Ensign and Bennett joined me in introducing the Federal Accountability for Nuclear Waste Storage Act earlier this year. This bill is a road map and a time line for safely securing our spent nuclear fuel for up to 100 years, giving us time to find a safe, scientific, long-term solution to this national security issue.

The people of Nevada, as well as the rest of this country, deserve answers to their many questions about the safety of a proposed nuclear dump at Yucca Mountain. Those of you who have nuclear power generated in your States, talk to the owners of those projects and see how they feel about this. You will find that half of them are sick of Yucca Mountain and want out of it. They want nothing more to do with it. That is not hearsay.

We are only 8 months away from the Department of Energy's deadline to submit the license application by the NRC. I have told everyone here what an unfair process it is. I like to talk about when Government works well. When Senator Ensign and I fly into Reno, Nevada, you will see a lake we now call it the Sparks Marina Park. It is a beautiful facility. They are building condos and apartments, they have a walking park around it. It is beautiful. It was

a Superfund site, and now it is one of the most beautiful places for recreation in the State of Nevada. That is government at its best.

Yucca Mountain is the exact opposite. It is government at its worst.

Thank you, Madam Chairman, Madam Chairwoman.

[The prepared statement of Senator Reid follows:]

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM THE STATE OF NEVADA

I want to thank the Chair, the Ranking Member and other members of the Committee and for the opportunity to present testimony on this important issue to the State of Nevada. As some of you may know, today is Nevada Day, the day on which Nevada became a State in 1864. Many of you may know that the motto on Nevada's State flag says "Battle Born," a saying that is just as appropriate now, as it was back then. And now the State of Nevada is in a battle of its own, to protect the lives of its citizens from radiation exposure, to protect their land and water from misuse and contamination, and to expose a government bureaucracy that has been rife with corruption, flawed science and quality assurance failures.

And so, Nevada continues to fight a battle that was rigged from the beginning. After passing comprehensive and thoughtful legislation in 1982 to tackle this difficult issue, Congress then changed the rules of the game and Yucca was chosen as the only site to be closely researched. This was a political decision that was counter to the spirit of the Nuclear Waste Policy Act—science, safety, and security clearly did not drive this decision. This same rigged process allowed the State of Nevada to veto the decision, but also allowed Congress to override it—essentially an empty promise.

GAO has reported exhaustively on quality assurance failures with the research done at the site—science has been manipulated, secret meetings have been held without public oversight or participation, and the timeline and designs are ever-changing without any repercussions for the Department of Energy. And don't forget that EPA has no plans to release its radiation standard before the Department of Energy files its license application, an environmental standard upon which the success of the entire license application rests.

Now that the license application process is upon us and we ready for what many believe will be the final battle against this dump, Nevadans are again left shaking their heads in dismay as they see that the decks are again stacked against them. The timeline to review the application has been unrealistically compressed to 3 years, even though the NRC took 8 years to license the proposed interim storage facility in Utah. The License Support Network that the Department of Energy has recently certified is filled with thousands—maybe millions—of superfluous documents to make searching for the relevant information like finding a needle in a haystack. The Department of Energy's Performance Assessment computer model, which is the basis for the license application and purportedly will prove that the Department can meet all the environmental standards required by law, can't be reviewed by any other entity except itself.

Think about that. Essentially, this computer model is the license application. But DOE will not let anybody access it—not the State of Nevada, and not even the NRC.

I'd like someone here to explain to me how the Department of Energy can write a computer modeling program that can prove it can meet an EPA radiation standard that doesn't exist. I don't care how many servers or processors that the Department of Energy uses in its complicated computer assessment of the Yucca Mountain site, you can't prove that you can meet a standard that has yet to be written—unless of course, the Department of Energy has told EPA how to write it. Interesting assumption, isn't it? A little backward is how I would describe it. We are talking about the most dangerous substance known on the face of the earth. And instead of seriously studying whether or not the proposed site at Yucca Mountain is safe to store this waste, the Department of Energy and the Environmental Protection Agency are cooking up their own set of books to write a radiation standard that can be met at Yucca Mountain.

As many of my colleagues will remember, EPA already published an earlier version of the radiation standard in 2001. And in that standard, EPA went too far to accommodate the Department of Energy's desire to build a waste dump at Yucca Mountain and deliberately violated congressional instructions in the 1992 Energy Policy Act. Thankfully this rule was thrown out by the courts.

The EPA wrote a newly proposed draft in 2005—2 years ago—which has yet to be finalized. Where is it? It is obvious to me that the EPA is having trouble writing

a final radiation standard that can meet current law without disqualifying Yucca Mountain as a suitable site to dump nuclear waste. And EPA knows if they fudge the exposure numbers they will end up back in court.

Instead of sticking to the commitment that Yucca Mountain would proceed only if it would actually protect public health, EPA has cast sound science aside in favor of politics in the myopic pursuit of Yucca Mountain. And now they are delaying publishing a final radiation standard because they know the Department of Energy cannot meet the requirements required by law. And they also know that if they delay long enough that the State of Nevada will run out of time to take this issue back into the courts. Again, this is a rigged process.

How are we to secure the waste in the interim? We leave it onsite in dry cask storage, where it is already safely and securely stored at most nuclear plant sites and where the experts and the nuclear industry have demonstrated that it will continue to be safely stored for decades.

Senators Ensign and Bennett joined me in introducing the Federal Accountability for Nuclear Waste Storage Act earlier this year. This bill is a road map and a timeline for safely securing our spent nuclear fuel for one to two hundred years, giving us time to find a safe, scientific long-term solution to this national security issue.

Thank you again Chairman Boxer for holding this important hearing. The people of Nevada, as well was the rest of the United States, deserve answers to their many questions about the safety of a proposed nuclear waste dump at Yucca Mountain. We are only 8 months away from the Department of Energy's deadline to submit the license application for review by the NRC. I am anxious for this final battle to be over so that we can move on to resolving the underlying problem of what to do with our country's nuclear waste.

Senator BOXER. Thank you, Senator Reid. Either way is fine.

I want to thank both of you so much. You obviously have very deeply felt feelings. I don't have any questions for you except to say personally I have been with you for a very long time on this,

and I think that you have been proven right every step of the way.

I don't know if any colleagues have questions of our witnesses. Senator Carper.

Senator CARPER. I have a question of both of our witnesses. First of all, our leader.

Senator REID. Never ask a question unless you know what the answer is going to be.

[Laughter.]

Senator CARPER. I think I probably do.

I was in the House. I think Senator Craig was in the House. Senator Boxer was in the House.

You were I think over in the Senate when we took up this legislation 25 years or so ago and in a sense just sort of jammed it down Nevada's throat. I reflect back on that any number of times, and I was saying to Senator Clinton, when I was Governor of Delaware, one of the hardest siting decisions we ever made was where do you put a prison. In a State like mine, we are a fairly densely populated State, and nobody ever wanted a prison in their neighborhood. We found that other States where frankly they regard a prison as economic development and good jobs.

I wish when we did this 20 years ago or however many years ago, we were smart enough to figure out how to incentivize a community or find a State who saw this as an opportunity, an economic development opportunity. I said to Senator Clinton, half kidding but half serious, we should have been smart enough to say, you know, for a State that will accept a repository for nuclear waste for the next 1,000 or 10,000 years, whatever, you will get free electricity or make some kind of deal that they couldn't say no to.

Do you recall? Was that ever part of the discussion? I just don't recall.

Senator REID. It was never part of the deal. I would also say this, Senator Carper, when you know in the gambling jargon you have a bad hand, you should start over again. They have been unwilling to do that. Mo Udall's plan was a good plan. It was fair. We would have three separate site characterizations; three different geologic formations, and they would actually characterize those, and find out which one was the best of the three to do this. That was just thrown away.

Yucca Mountain has been bastardized. It was set up to have the geological formation protect the people from nuclear waste. They learned a long time ago that won't work. So now what they are doing is building a sleeve in this big hole to have the sleeve protect it. I mean, it is absolutely without any scientific foundation.

Now, with the passage of time, as Senator Ensign said, the nuclear power generators are now understanding what a bad deal this is. It will never happen. I repeat again, 9/11, what did it teach us? It taught us a number of things, that evil people will go to extremes to do terribly bad things to us. This is an invitation to them, to haul this stuff across America's railways and highways.

Senator ENSIGN. Just briefly, I think it probably would have been smart politics to say to us, OK,

we want to study these States. If any of the States actually wants to be part of that study, we are going to put some incentives out there and have them say yea or nay. Nevada would have said nay back then. I mean, our citizens have been against this project from the very beginning.

So I think that would have been a little fairer process, but the bottom line is, even if that process had gone forward, Yucca Mountain has definitely proved that it is too costly, and that really isn't the best solution anyway. A deep geologic repository is not the best solution for nuclear waste.

In France, they predicted that this waste after they reprocessed it, and then classified it, they predicted that it would get warmer over time. In reality it has actually gotten cooler. And so the bottom line is, they have been doing it long enough where they have proven it safe. We in this country have 100 years to decide if we want to go and turn waste into glass as France did because dry cask storage is good enough to push this decision off into the future. Dry cask storage is very safe.

Senator REID. Senator Carper, if I could just say one additional thing here. There were no incentives offered, and I agree with Senator Ensign, in fact if there had been. But part of it is the way this matter has been handled by some of these people down in the bowels of the bureaucracy. Sweden does have an incentivized program, and some say that is working fine in Sweden, but as I said, it is 25 years ago that we started this, and Sweden is way ahead of us.

Senator CARPER. Madam Chair, if I could just wrap it up by simply saying, Senator Reid and Senator Ensign think it is unlikely that Yucca Mountain will ever be open for business as usual,

if you will. They may well be right. As Senator Ensign said, even if it were open, eventually there will have to be another Yucca Mountain. He may well be right there as well.

I just hope we are smart enough the next time we try to site one of these facilities, if we decide not to try to do all the siting onsite where nuclear power plants currently exist, if we try to do it, that we try to figure out what communities, what States would frankly welcome the investment—billions of dollars investment, billions of dollars worth of construction jobs.

Frankly, good-paying jobs going on for as far as the eye can see. And I think the potential for dramatically reduced costs of electricity. That has got to get somebody's attention, and I hope we are smart enough to figure out how to do that.

Senator REID. Senator, the problem with that now, though, is the 9/11 problem. Hauling it, that is the problem.

Senator CARPER. Madam Chair, I would just say this, I don't know who our next President is going to be, but whoever she turns out to be——

[Laughter.]

Senator CARPER. Whoever turns out to be our next President, I hope our next President will launch, I will call it a 21st century Manhattan Project where we actually go out there, put together the best smartest people we can fine, to figure out what to do with this waste, so we won't have to worry about it for 10,000 years. We may not even have to worry about it for 100,000 years. I just think the Nation that was smart enough to develop, to invent the airplane, to invent cars, automobiles, the Nation that was smart enough to invent the television and the internet, smart enough to put a man on the moon 10 years after we said we were going to, we have to be smart enough to figure this one out, too, and we just need to do it.

Senator CRAIG. Madam Chair.

Senator BOXER. Yes, Senator.

Senator CRAIG. Just a brief comment to both the Nevada Senators. They and I and others have debated this issue a long time, and while obviously it is a highly emotional issue for the State of Nevada. Both of them, Madam Chair, have been gentlemen in the debate. We have tried to deal with the issues and the science and the reality, and I thank them for that.

Senator Ensign mentioned recycling. I think all of us are looking at that most seriously today as a necessary step in the process of a nuclear renaissance for our Country, because certainly we want it to be a cleaner place. We want abundant energy, and right now the technology that offers that is nuclear.

Senator BOXER. Senator, we are not making statements.

Senator CRAIG. OK.

Senator BOXER. If you have a question, please direct it. If not, we have to get through our opening statements. Other people have to have a chance.

Senator CRAIG. I appreciate your tolerance, as you have done with Senator Carper.

Senator BOXER. Senator Carper, that is going to be his 5 minutes.

Senator CRAIG. Oh, excuse me then.

Senator BOXER. Yes.

Senator CRAIG. One brief question, without vitrification or classification and recycling, our scientists are still telling us we will need

some permanent repository for the last of the high level, although we have reduced its volume tremendously. Do you agree or disagree with that?

Senator ENSIGN. Well, first of all that is so far down the line, and what needs to be done can be studied over the next 100 years while the waste is being stored. First of all, other countries are so far ahead of us. The bottom line is we are a long way away of even needing to make that decision, but I think it absolutely needs to be studied. When we get to that study, something like what Senator Carper talked about with the incentives, might not be a bad thing to look at. But scientists are telling us that there needs to be some kind of a storage area, but I think we have quite a bit of time to study that.

Senator CRAIG. Thank you both.

Madam Chairman, thank you.

Senator BOXER. Sure.

Senator Reid, did you have an answer to the question? All right.

We thank our colleagues so much for your time. Thank you very much.

We will continue now with our opening statements. The next one would be Senator Barrasso.

**OPENING STATEMENT OF HON. JOHN BARRASSO, U.S SENATOR FROM THE STATE OF WYOMING**

Senator BARRASSO. Thank you very much, Madam Chairman. I look forward to becoming more informed today and educated toward the licensing process for the Yucca Mountain repository and the concerns that we are hearing about.

As a newcomer to this forum, it seems from the submitted testimony that the issue of a long-term nuclear waste storage has been discussed for some three decades. My fundamental concern is for the continuation of a fair, objective and informed process, a process that respects the advice of our best scientists, a process that allows a fair hearing of those most closely impacted, and finally a process that demonstrates accountability to both our taxpayers and our ratepayers' hard-earned money.

As policymakers, we do owe it to our constituents this careful review. This is true whether those constituents live near a nuclear facility with temporary onsite storage, or whether they live near a transportation corridor between a nuclear facility and a permanent repository, or if they live near a permanent waste repository. Oversight of this process is appropriate, as the environmental and domestic security stakes are high.

With that background, I feel compelled to point out a more immediately pressing observation, and that is as a member of both the Senate Energy and the Senate Environment Committees, I am increasingly struck by the policies that are presently being debated. I ask myself, are the policies properly harmonized between affordable secure domestic energy sources and preservation of our natural resources?

I note that we debate aggressive carbon limitations while simultaneously we struggle to adequately deal with the long-term storage of nuclear waste, as nuclear power is an energy source that doesn't emit carbon. I note as we discuss energy policy, we often

limit, rather than expand, domestic exploration, production, generation and development opportunities. Quoting from a recent Energy Information Administration report assessing one of the cap and trade bills that was introduced earlier this year, it states, "New nuclear plants are a key technology the power sector is projected to rely on to reduce greenhouse emissions." This Energy Information. Administration report projects that an estimated 145 gigawatts of new nuclear capacity will be added by 2030.

My point in these discussions regarding energy and the environment is that we need to explore and properly plan for all energy sources because we as a Nation are going to need all of the energy sources. We need investment in technology for renewable sources, technology for cleaner fossil fuel uses, and yes, technology and a predictable regulatory framework for nuclear energy and its accompanying waste.

I ask myself from where will we get the energy that we need tomorrow? Currently, fossil fuels and nuclear energy account for approximately 93 percent of our energy consumption. We will not be able to change that statistic overnight. In the meantime, it is our obligation to carefully and cautiously execute a national policy on long-term storage of nuclear waste. We should not saddle future generations with a strategy left unexecuted. A major component of that is a long-term, well-developed strategy to deal with our existing and our future nuclear waste in an environmentally and domestically secure fashion.

Thank you, Madam Chairman, for holding these hearings.

Senator BOXER. Thank you, Senator.

Senator Isakson?

**OPENING STATEMENT OF HON. JOHNNY ISAKSON, U.S. SENATOR FROM THE STATE OF GEORGIA**

Senator ISAKSON. Thank you very much, Madam Chairman.

I want to first of all associate myself with the remarks of Senator Carper with regard to this Country's need to establish a Manhattan-like project in terms of dealing with the storage of spent nuclear fuel. It is absolutely exactly the right approach we should have. I think the question is not whether or no we should expand our nuclear energy, but how we are going to be able to expand it and meet the demands of storage in the future. So I associate myself with that remark.

As far as the question of we have 100 years before we have to worry, whether or not that is true,

given both the geo-political issues that we have with fossil fuels, as well as the carbon issues that we debate in the Senate, there is no question that the immediacy of dealing with safe nuclear spent fuel storage is absolutely now today.

I look forward to listening to the testimony of the experts that will testify today on Yucca Mountain and will study it closely.

I will also follow up at the suggestion of Senator Reid, I will talk to our nuclear producers in Georgia and get their opinions with regard to Yucca. But it is absolutely critical that this Committee move forward and encourage the safe licensing and safe storage of spent nuclear fuel as quickly as we can because expansion of nuclear energy in the power sector alone will be the single largest component, as Senator Barrasso has said, to reducing carbon in the atmosphere and dealing with the geo-political issues of the impor-

tation of oil from the Middle East, both of which are serious political problems and serious health problems for us in this Country today.

Thank you, Madam Chairman.

Senator BOXER. Senator, thank you for your always thoughtful comments.

We are going to invite our second panel to come forward, Hon. Edward Sproat, III, and Robert J. Meyers and Michael Weber.

I am going to hand Senator Carper the gavel and ask if he will complete our hearing today. We

should get through this at 12:30 p.m. so we all have these other——

Senator CARPER. I would be happy to do it.

Senator BOXER. Thanks. All right, I am going to hand you the gavel and I am going to take my halo with me today.

Senator CARPER.

[Presiding] I don't get the halo?

Senator BOXER. No.

[Laughter.]

Senator CARPER. What is the old country and western song, She got the gold mine and I got the shaft? I get the gavel, you keep the halo. It is not right.

Senator BOXER. Let's discuss how you might get this halo.

[Laughter.]

Senator CARPER. I have my work cut out for me.

Senator CRAIG. Chairman Carper, she got the gold mine and you got Yucca.

[Laughter.]

Senator CRAIG. Same thing.

Senator CARPER. All right. Let's go to our witnesses.

I frankly don't have the——

Senator BOXER. Here is the list.

Senator CARPER. OK. Thank you.

I want to give our witnesses a good introduction.

Welcome, panel two. First of all, the Director of the Office of Civilian Radioactive Waste Management for the U.S. Department of Energy, Edward Sproat. Welcome, Mr. Sproat.

Our second witness is Robert Meyers, Principal Deputy Assistant Administrator for the Office of Air and Radiation at the U.S. Environmental Protection Agency. Mr. Meyers, it is nice to see you again. Welcome.

Our third witness on this panel is Michael Weber, who is the Director of the Office of Nuclear Material Safety and Safeguards at the U.S. Nuclear Regulatory Commission. Mr. Weber,

welcome. We are delighted that you are here.

Your entire testimony will be made part of the record. We will ask you to try to sum up in about five minutes and then we will turn to questions.

Welcome. Thank you.

**STATEMENT OF EDWARD F. SPROAT, III, DIRECTOR, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, U.S. DEPARTMENT OF ENERGY**

Mr. SPROAT. Thank you, Senator, and good morning fellow Senators. It is an honor to be here this morning to talk about where we stand with moving forward with Yucca Mountain.

I am here representing not only the President and the Secretary of Energy, but the 2,700

professional engineers and scientists that work for our national laboratories that have been working on Yucca Mountain for 30 years. I would like to address several of the points I have heard in the opening statements this morning and talk about specific issues that were raised, and maybe help clear up a few misconceptions regarding some of the points that were brought up.

I heard several times this morning about flaws in the Nuclear Waste Policy Act. I cannot, and I

am not here to defend how the Nuclear Waste Policy Act was developed. It was developed and passed when I was in my early 30's. So all I know is, my responsibility today for the Department of Energy is to follow and execute the plan that the Congress laid out for moving forward with disposal of the Nation's high level radioactive waste and spent nuclear fuel.

Now, that process, which has been going on now for 30 years since we did our first explorations at the Yucca Mountain site in Nevada, has been moving, has spent a lot of money, a lot of professionals, a lot of the best scientists in this Country have been working on it. I believe we have gotten to the point where that science and that technology is ready to be integrated and presented in an open and transparent process in front of the Nuclear Regulatory Commission so that their technical experts can determine whether or not the Yucca Mountain site can be licensed. That is what we are intending to do.

Now, there was some indication this morning that some people think we are rushing to get this done. Let me just say that this program is 30 years old. The license application is 6 years behind the schedule that the Congress told the Department of Energy that it wanted to follow in submitting the license application. We are now at the point where that science is ready. I have been very clear with my team and with the entire group of scientists and engineers that not only do we want to get this license application pulled together, because now is the time to do it, but because the quality and the safety of Yucca Mountain and the science behind it is absolutely critical.

So I have been very clear in the message I have been sending to the organization that they not only have to get it done with some schedule discipline, which quite frankly the management of this program hasn't had in the past, but with the quality and safety that is required of a Nuclear Regulatory Commission licensee. The people have responded to that message extremely well.

The second issue I would like to bring up is that I have heard a number of times that we really shouldn't proceed with Yucca Mountain. Let's leave it where it is for the next 100 years or so and then figure out where it goes from there. Let me just say that if you are not in favor of moving forward with this, then you are

clearly in favor of leaving it where it is indefinitely. This generation is the beneficiary of nuclear power. It is the generation that is generating the nuclear waste. It is the generation that has the responsibility to determine what to do with the nuclear waste and to move forward with it in a safe, responsible manner.

Now, right now, high level nuclear waste and spent nuclear fuel is at 121 different sites in 31

States. In the State of California, there are nine sites with 2,400 metric tons of uranium, spent nuclear fuel, and there are 23.1 million people living within 75 miles of those sites.

The third issue I heard talked about was transportation. I think most people aren't aware that since 1964, there have been over 2,800 truck shipments and over 500 rail shipments of commercial spent nuclear fuel in this Country safely and without an accident. And also, the National Academy of Sciences last year issued a report that determined that the transportation of spent nuclear fuel can be done safely by rail and by truck with no fundamental technical barriers.

The last issue that we heard about this morning was terrorism, and the opportunities for terrorism that transportation provides. All I would say is, if you are concerned about terrorism, what makes an easier target: 121 sites where the waste is stationary and everybody knows where it is, or waste that is moving with an armed guard and the only people who know where it is are the people who are guarding it?

So I would ask that question in response to the question of concern about terrorism.

Let me just conclude by saying that nuclear power needs to be a part of our national strategic energy mix. What to do with the waste is a part of that question and is an enabler of helping to make sure nuclear power is a part of the energy mix. It has to be an essential piece of our climate change strategy. The game plan and the law of the Country that has been passed by the Congress, approved by the executive branch, and upheld by the judiciary branch of this Government, says the next step in the process is to license Yucca Mountain, and that is what we are intending to do.

Thank you, sir.

[The prepared statement of Mr. Sproat follows:]

STATEMENT OF EDWARD F. SPROAT, III DIRECTOR, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, U.S. DEPARTMENT OF ENERGY

Madam Chairman, Senator Inhofe and Members of the Committee, I am Edward F. Sproat, III, Director of the Department of Energy's (DOE) Office of Civilian Radioactive Waste Management (OCRWM). I would like to thank the Committee for the opportunity to discuss the status of the Department's efforts to submit a license application to the Nuclear Regulatory Commission (NRC) for authorization to construct a repository for the permanent disposal of the Nation's spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nye County, Nevada.

Since my confirmation by the Senate in May of 2006, I have focused on developing a high-quality and docketable license application and submitting that application to the NRC in a timely manner. I set as one of my strategic objectives the submittal of that application no later than June 30, 2008 and we are currently on schedule to accomplish that objective. Today I would like to discuss the regulatory framework for the licensing of the Yucca Mountain repository and to provide a status of our commitment to submit that license application by June 30, 2008.

## THE FRAMEWORK FOR LICENSING THE YUCCA MOUNTAIN REPOSITORY

The Nuclear Waste Policy Act of 1982, as amended (the NWPA) established a process and schedule for the siting, construction and operation of a national repository for spent nuclear fuel and high-level radioactive waste. On February 15, 2002, the President submitted his recommendation to Congress recommending Yucca Mountain as the site for the development of a repository in accordance with the NWPA, and on April 8, 2002 Congress passed House Joint Resolution 87 approving the Yucca Mountain site as the location for the Nation's repository. This Joint Resolution was signed into law by the President on July 23, 2002.

Under section 114(b) of the NWPA, 42 U.S.C. 10134 the Department must now prepare and submit a license application to the NRC. The NRC will evaluate DOE's license application in accordance with the regulations developed pursuant to the NWPA and the Energy Policy Act of 1992, including 10 C.F.R. Part 63 (Disposal of High-Level Waste in a Geologic Repository at Yucca Mountain, Nevada). As part of the licensing process, DOE will be required to demonstrate that the proposed repository meets the regulatory radiation protection standards which have been established and adopted by the Environmental Protection Agency (EPA) and incorporated by the NRC into 10 C.F.R. Part 63 pursuant to the Energy Policy Act of 1992, which required EPA to set site-specific standards to protect public health and safety from releases of radioactive material stored or disposed of in the repository at the Yucca Mountain site.

Pursuant to the Energy Policy Act of 1992, EPA promulgated public health and safety standards for radioactive materials to be disposed of in the Yucca Mountain repository. 40 C.F.R. 197 (2001)(Public Health and Radiation Protection Standards for Yucca Mountain, NV); 10 C.F.R. Part 63 (2004). In 2004, in response to legal challenges, the U.S. Court of Appeals for the District of Columbia Circuit remanded the portions of those standards that addressed the period of time for which compliance must be demonstrated. In 2005, EPA proposed new standards to address the court's decision. Under the existing standards, estimated repository performance will be compared to a mean annual dose of 15 millirem for the first 10,000 years after closure. Under the proposed standards, estimated repository performance would be compared to a median annual dose of 350 millirem for the post-10,000 year period. The Department expects that EPA will issue its revised final radiation exposure standard in the near future and that NRC will subsequently adopt those regulations. While NRC will need to have adopted its corresponding final regulations before it can issue the construction authorization, DOE does not need the final radiation protection standard to develop or submit its license application.

Finally, under the NWPA the NRC retains National Environmental Policy Act (NEPA) responsibilities with respect to issuance of a license. However, the NWPA provides that any environmental impact statement that DOE prepares ". . . shall to the extent practicable, be adopted by the Commission in connection with the issuance by the Commission of a construction authorization and license for such repository." To the extent NRC adopts DOE's environmental impact statement, under the NWPA that adoption shall be deemed to also satisfy the responsibilities of the Commission under NEPA.

## CURRENT STATUS OF LICENSE APPLICATION

The Department is currently preparing its license application as required by the NWPA and plans to submit the application to NRC not later than June 30, 2008. Approximately 5 years will have elapsed between when the site recommendation was approved and submittal of the application. In working toward a submittal by June 30, 2008, DOE has not put schedule ahead of quality. Quality and timeliness are not mutually exclusive and our license application will be the product of a disciplined approach. Our application must be sufficient to withstand a thorough and rigorous adjudication by the NRC, with scrutiny by NRC's technical experts and with full opportunity for challenges by the State of Nevada and other interveners. The license application will integrate the results of over 20 years of scientific and engineering work which is now ready to be scrutinized by the NRC's technical experts and the public. When the EPA standard is final, NRC can finalize its corresponding regulation. NRC will then be able to examine the results of our analyses and determine, as part of NRC's decision as to whether the materials can be disposed of without unreasonable risk to the health and safety of the public. Therefore, NRC cannot reach its licensing decision on the safety of the facility until EPA standards and NRC regulations become final. I am confident that the analyses contained in our application will be sufficiently robust for NRC to be able to make that determination.

The Department has also prepared a Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Waste at Yucca Mountain, Nye County, Nevada (Final EIS) which was issued in 2002. On October 12, 2007, the Department published a Notice of Availability of a Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Draft Repository SEIS) which DOE also expects will be completed and submitted to NRC not later than June 30, 2008. This Draft Repository SEIS evaluates the potential environmental impacts of constructing and operating the Yucca Mountain repository under the repository design and operational plans that have been developed since the Final EIS was issued in 2002.

On October 19, 2007, the Department certified its document collection for the NRC's Licensing Support Network (LSN). The LSN is a web-based information system that makes electronically available documentary materials related to the Department's license application. As of today, DOE has made approximately 3.5 million documents, estimated to exceed 30 million pages, electronically available to the public on the LSN. These documents include scientific, engineering, and other documents related to DOE's license application. The Department will update its certification at the time of license application submittal as is required by NRC regulations, and we will continue to supplement the document production throughout the discovery phase of the NRC licensing proceeding.

In conclusion, I appreciate this opportunity to review the process to license the Yucca Mountain repository as defined in the NWPA and to provide an update on the progress we are making. Since the site was approved by Congress in 2002, the Department will have taken over 6 years to reach the next step—to file a license application with the NRC. I came to the Department to fulfill the congressional mandate to follow through with the application to the NRC and I plan to meet my commitment to submit the application to the NRC within the next 8 months.

RESPONSES BY EDWARD F. SPROAT, III, TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

*Question 1a.* In its 2002 Final Environmental Impact Statement for Yucca Mountain, the Department ofEnergy (DOE) concedes that groundwater beneath the repository surfaces in California at Franklin Lake Playa, and that 69,500 people could be exposed to contaminated groundwater 37 miles down-gradient in California. Does the DOE have any plan for remediation of contaminated areas in California?

Response. The Department ofEnergy's (DOE) 2002 Yucca Mountain Final Environmental Impact Statement does not concede that 69,500 people could be exposed to contaminated groundwater in California. Rather, the Final Environmental Impact Statement states that "[natural discharge of groundwater from beneath Yucca Mountain probably occurs farther south at Franklin Lake Playa and spring discharge in Death Valley is a possibility." (FEIS, p. 5–22)

The Environmental Protection Agency has established a groundwater protection standard with respect to potential releases from the Yucca Mountain repository

and the Nuclear Regulatory Commission (NRC) will decide if there is a reasonable expectation that the standard will be met at the 12-mile boundary from the repository in the direction of groundwater flow. If the standard is met at the 12-mile boundary, it will also be met 37 miles down-gradient in California and thus there will be no environmental damage to remediate nor need for a remediation plan. If the standard is not met at the 12-mile boundary, NRC will not authorize construction of the Yucca Mountain repository.

*Question 1b.* Does the DOE consider these impacts permissible?

Response. The Department has recently issued a Draft Supplemental Environmental Impact Statement for a Geolosic Repository for the Disposal ofSpent Nuclear Fuel and Hizh-Level Radioactive Waste at Yucca Mountain. Nevada County, Nevada (Repository SEIS). The information on which that draft Repository SEIS is based indicates that the groundwater protection standard will be met at the 12-mile boundary from the repository. Accordingly, DOEbelieves it is reasonable to expect there will be no impermissible impacts on groundwater 37 miles down-gradient in California.

*Question 2a.* What are the potential risks that groundwater in Death Valley National Park will be contaminated by seepage from the repository?

Response. The Environmental Protection Agency (EPA) has established a groundwater protection standard with respect to potential releases from the Yucca Mountain repository and the Nuclear Regulatory Commission (NRC) will decide if there is a reasonable expectation that the standard will be met at the 12-mile boundary from the repository in the direction of groundwater flow. If the standard is met at

the 12-mile boundary, it will also be met at Death Valley. If the standard is not met at the 12-mile boundary, NRC will not authorize construction of the Yucca Mountain repository.

*Question 2b.* Will DOEaddress this issue in its license application?

Response. The Department's license application seeking authorization to construct the repository will address the groundwater protection standard in the context of the 12-mile-boundary from the repository. The Department believes that examination of this issue at the point identified by the EPA provides reasonable assurance concerning the protection of groundwater at Death Valley.

*Question 3.* Is DOEconsidering the potential risks to the integrity of the repository from future drilling into the Lower Carbonate Aquifer for water to support population growth in Las Vegas? If so, please describe the risks and how DOEwill address them.

Response. No. Future drilling in the Lower Carbonate Aquifer would not compromise the integrity of the repository. Any drilling would be well away from the repository footprint and would not intersect the drifts containing waste.

*Question 4a.* My home State ofCalifornia is particularly concerned about the route waste will take on its way to Yucca Mountain. Does the DOEplan to release alternative truck shipping routes before submission of the license application?

Response. The Department has issued a Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal ofSpent Nuclear Fuel and Hieh-Level Radioactive Waste at Yucca Mountain. NNevada County, Nevada (Repository SEIS) which provides a discussion of representative routes nationally, and the public has been invited to comment on that document. In addition, the Department ofEnergy (DOE) has been engaged in development of criteria and methodologies for route selection with representatives from States and Tribes through whose jurisdictions shipments may be transported. This process will culminate in the selection of routes 3–5 years prior to the first shipment. DOE is

also committed to providing technical assistance and funds for training related to these shipments for local public safety officials along shipping routes. DOEnotes that currently individuals and States do not have the opportunity to address the shipment plans or routes for any other category of hazardous material shipped by rail in this country each year.

*Question 4b.* Has the department assessed the radiation exposure to workers and the public along the transportation corridors?

Response. Yes. The Department published its initial studies of the impacts associated with operating a national transportation system to ship spent nuclear fuel and high—— level radioactive waste to Yucca Mountain in the Yucca Mountain Final

Environmental Impact Statement that DOE issued in 2002. This document was recently updated in the Draft Supplemental EnvironmentalImpact Statement for a Geologic Repository for the Disposal ofSpentNuclear Fuel andHigh-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Repository SEIS). The draft Repository SEIS was issued in October 2007 for public review and comment.

*Question 5.* . Please furnish copies of all correspondence between DOEand EPAor NRC concerning the proposed EPA Yucca Mountain radiation standard rule.

Response. While no timeframe for this request has been specified, the Department assumes this document request relates to those documents generated after the ruling of the United States Court ofAppeals for the District ofColumbia Circuit issued on July 9, 2004, in Nuclear Energy Institute, Inc. v. EnvironmentalProtection Agency, Case No. 01–1258, and relating to the proposed rule issued by the Environmental Protection Agency (EPA) on August 22,2005. Attached are the Department's formal comments submitted to EPA on November 21,2005, on the proposed rule including print and electronic attachments that were submitted to the EPA(see Exhibit 1: Formal comments including a copy of any hard copy enclosures and a copy of the disk that accompanied the comments.). The Department is currently conducting a search for all responsive documents generated from July 9,2004, through the present. After the Department has completed its review, we anticipate providing the non-privileged responsive documents which have been identified as a result of this search to the Committee.

*Question 6.* Please send copies of all documents related to any meetings, conversations, or correspondence between DOEand either NRC or EPA concerning the proposed EPA Yucca Mountain radiation standard rule.

Response. While no timeframe for this request has been specified, the Department assumes this document request relates to those documents generated after the ruling of the United States Court of Appeals for the District ofColumbia Circuit issued on July 9,2004, in Nuclear Energy Institute, Inc. v. Environmental Protection Agen-

cy, Case No. 01–1258, and relating to the proposed rule issued by the Environmental Protection Agency on August 22,2005. The Department is currently conducting a search for all responsive documents generated from July 9,2004, through the present. After the Department has completed its review, we anticipate providing the non-privileged responsive documents which have been identified as a result of this search to the Committee.

*Question 7a.* Under the Nuclear Waste Policy Act the EPA is supposed to set the standards for licensing. Will DOEwait for those standards before it files its application, and if not, how can it proceed without them?

Response. The Environmental Protection Agency (EPA) is responsible for establishing the radiation protection standards for Yucca Mountain. The Nuclear Regulatory Commission (NRC) is then required to implement EPA standards by incorporating them into its licensing requirements. NRC's licensing requirements already incorporate the EPA standards for the period up to 10,000 years after closure of the repository. The current EPArulemaking only addresses establishment sofa peak dose standard for the period more than 10,000 years after closure of the repository. The Department of Energy (DOE) believes issuance of the EPA final rule will necessitate few, if any changes, to its license application since DOE already has incorporated the modeling assumptions that EPA set forth in the proposed rule. While NRC cannot determine whether to grant construction authorization until the peak dose standard is incorporated into its regulations, the DOE is not precluded from submitting its license application nor is the NRC prohibited from initiating its review.

*Question 7b.* Has DOE seen the final rule as it now stands?

Response. The Department has reviewed and commented on drafts of the final rule as part of the interagency review process.

*Question 8.* On what basis could DOEsubmit a license application in the absence sofa final EPAradiation standard?

Response. As noted in the answer to Q8a, the Nuclear Regulatory Commission licensing regulations are complete except for the incorporation sofa peak dose standard for the period more than 10,000 years after the closure of the repository. The Department is preparing its license application on the basis of those existing regulations plus the modeling assumptions concerning the period more than 10,000 years after the closure of the repository set forth in the Environmental Protection Agency proposal.

*Question 9.* DOE is preparing a "Vulnerability Assessment" that, in the words of its author, will document known vulnerabilities in the safety analysis in the NRC license application. Will DOEprovide the NRC, Nevada, and other interested stakeholders with a copy of this document when it submits its application? (Note: NRC regulations (10 C.F.R. 63.10) require that the application be complete in all material respects and make it unlawful for an applicant to withhold significant safety information).

Response. The "Vulnerablility Assessment" refers to a review of certain technical documents and not the draft license application. Documents relating to this assessment have already been placed on the Licensing Support Network.

*Question 10a.* There is no legal requirement to file your application on or before June 30,2008. The staff has been told that your scientists working on the application have been told they will be "all out sofa' if the June 30,2008 project deadline is missed. What is the significance of that date?

Response. he June 30,2008, goal for submission of the license application has been used as a management tool to focus the Program on an important near-term objective. All project employees and contractors have consistently been told that they are expected to develop a quality license application with schedule discipline.

*Question 10b.* What are the consequences of missing that date?

Response. Any delay in submittal of the license application essentially results in a day-for day delay in all subsequent activities including the Nuclear Regulatory Commission's docketing and review of the license application; issuance of the construction authorization; construction of the repository facilities; and initiation of facility operations and receipt of waste at the repository.

*Question 11.* Is DOEputting safety first with respect to its work to file a license application for construction for the Yucca Mountain by June 30, 2008? If so, how do you explain the fact that your scientists are being told that meeting schedules is more important that [sic] scientific defensibility or technical credibility?

Response. Meeting management timelines and producing high-quality products are not mutually exclusive objectives. Department of Energy senior management has consistently communicated to personnel working on the project that safety and

quality are not to be sacrificed for any reason, including the schedule. In finalizing the license application, the Department is following a disciplined approach and will not accept anything less than high-quality work.

*Question 12.* Does DOEhave any intentions fallowing the NRC, the State ofNevada, or the public to access its Total System Performance Assessment?

Response. DOEexpects to complete the Total System Performance Assessment report early next year, at which time DOE will place it on the Licensing Support Network through which the Nuclear Regulatory Commission, the State ofNevada and the public will have access to it.

*Question 13a.* Has DOE loaded all documents on which it will base its license application in the Licensing Support Network (LSN)?

Response. No. The Department is not required to have loaded all documents on which it will base its license application in the Licensing Support Network (LSN) at this time. In accordance with the Nuclear Regulatory Commission regulations, the Department will continue to add documents to its LSN collection as the documents are completed.

*Question 13b.* Does DOE expect to have more information to include in the LSN once EPA publishes its final radiation standard?

Response. The Department does not anticipate needing to add more documents to the LSN as the result of the issuance of the final Environmental Protection Agency (EPA) standard. However, if publication of the EPA standard results in the production of additional documentary material, the Department will place such material on the LSN.

*Question 13c.* How many documents has DOE included in the LSN?

Response. The Department has made electronically available over 3.5 million documents, estimated to exceed 30 million pages, including scientific, engineering, and other documents.

*Question 14a.* Recently, you have said construction will more likely be complete somewhere around the year 2022. What is the "most likely" date of completion?

Response. The Department is still evaluating the impact of the final fiscal year and fiscal year appropriations. It is likely but not yet certain that the Department will not be able to meet the "best-achievable schedule" of2017 for opening the repository. As a result of the expected delays due to limitations on funding and other factors, the Department's current most likely opening date for the repository is 2020.

*Question 14b.* Based on this schedule, when would DOE begin to accept nuclear waste and transport it to Yucca?

Response. Based on the above schedule, the Department would begin to accept nuclear waste around 2020.

*Question 14c.* How long would this waste be left onsite at Yucca Mountain prior to underground emplacement?

Response. The main waste streams received at the repository are DOEhigh-level radioactive waste (HLW) and Department ofEnergy spent nuclear fuel (DOE SNF), Naval SNF, and commercial spent nuclear fuel (CSNF). The Department currently anticipates that DOE HLW, DOE SNF and Naval SNF would normally be onsite from one to 8 weeks before emplacement.

Based on current planning, the CSNF would be transported to the repository for cooling and achieving the appropriate thermal load for the repository. Depending on the time since it was discharged from the reactor and burn up of the CSNF, some of the individual canisters would be emplaced in the near term while a limited number of individual canisters could be on an aging pad for up to thirty years.

*Question 15.* When the DOE submits its license application for construction of a repository at Yucca Mountain, will that act constitute a final agency action?

Response. The submission of the license application will not constitute a "final agency action." Rather, the Nuclear Regulatory Commission (NRC) regulations provide for a lengthy licensing proceeding during which NRCwill conduct a thorough and rigorous review of the application. NRC's final decision on whether to issue a construction authorization will be a "final agency action" that will be ripe for judicial review.

*Question 16.* Do you foresee any of this opposition on Yucca Mountain diminishing in the coming years based on any additional science or progress on the facility in that location?

Response. DOEexpects to submit its license application (LA) for authorization to construct the repository at Yucca Mountain, Nevada, to the Nuclear Regulatory Commission (NRC) by June 30, 2008. Upon acceptance of the LA, the NRC will begin formal proceedings that will afford the public and the scientific community the opportunity to witness a full and complete airing of the technical issues associated

with the Yucca Mountain repository. In these proceedings, the Department ofEnergy, the State ofNevada, and other interested parties will present their positions in a fair and open forum. The Department expects that public understanding of the science will advance through this process.

*Question 17a.* The late Edward McGaffigan, a former Nuclear Regulatory Commissioner, told reporters earlier this year that the flawed thinking of the Department ofEnergy is that opposition is eventually going to back down, but that it was his belief that Yucca Mountain is unlikely ever to open, and that we must begin looking at alternatives to Yucca. Mr. McGaffigan was the longest serving commissioner in NRChistory, appointed by both Presidents Clinton and Bush, and had received the Distinguished Service Award in 2006. Do you agree with his assessment that it's time to end the work at Yucca and pursue alternatives?

Response. The Department believes the Yucca Mountain repository is necessary for any future scenario and is committed to fulfilling its statutory obligations to obtain a license from the Nuclear Regulatory Commission and to construct and operate the repository.

*Question 17b.* What is the rationale for your response?

Response. The Department believes that a geologic repository constructed at the Yucca

Mountain site will meet or exceed all applicable licensing requirements and is essential for the disposal of commercial, Naval and DOEspent nuclear fuel, as well as defense high-level radioactive waste.

*Question 18.* How does the cost of alternative, secure spent fuel storage options, such as hardened onsite interim storage, compare with the future expenditures on Yucca Mountain over the next 20 years?

Response. The Department has not developed cost estimates for the development of hardened onsite storage facilities at each of the 121 sites that currently store spent nuclear fuel and high-level radioactive waste destined for geologic disposal. The Department has developed detailed estimates of the cost to construct and begin operations at the Yucca Mountain repository. Expending these funds will result in the development of a single remote, hardened facility that can receive and dispose of the spent nuclear fuel from all of the sites currently storing these materials. Leaving spent nuclear fuel onsite only defers but does not eliminate the need for a permanent repository and would clearly be more expensive than proceeding now with the Yucca Mountain Repository.

*Question 19.* What technical issues remain unresolved in determining whether Yucca Mountain is capable of safely storing spent nuclear fuel for thousands of years?

Response. The Department believes that a sufficient technical basis exists for the Nuclear Regulatory Commission to determine that a repository at Yucca Mountain can safely store spent nuclear fuel for hundreds of thousands of years.

*Question 20a.* Is additional scientific research being conducted to ensure that nuclear waste can be stored in Yucca Mountain without polluting aquifers and exposing nearby residents to toxic radiation and increasing their cancer risks?

Response. The Nuclear Regulatory Commission (NRC) has mandated that the Department conduct a performance confirmation program for the next 100 years to verify assessments of repository performance. Results of that activity will be reported on a regular basis to the NRCand the public. In addition to the Department of Energy's own investigations, cooperative agreements are in place with Nye County, Nevada, Inyo County, California, and the Nevada System ofHigher Education to provide independent research and review. As funding allows, the Department will also continue to support additional independent scientific investigations that can give greater understanding of the system and how its components interact over time.

*Question 20b.* If so, what efforts will be made to ensure that the results of this research are disclosed to the public?

Response. The Department intends to continue to publish its scientific work in both the government publications format, available in selected locations accessible by the public such as the library of the University ofNevada at Las Vegas, and it will also continue to encourage its participants to present and publish their scientific work to specialist and general audiences through professional and scientific forums and publications.

*Question 21.* If the political and technical issues associated with the Yucca Mountain project cannot be resolved, how can the search for a new site be implemented to avoid the pitfalls that have plagued the Yucca project and ensure a site selection based on sound science?

Response. The Department believes the Yucca Mountain Program will be successful and the Yucca Mountain repository will open around 2020. However, if the current 70,000 metric ton of heavy metal administrative limit on the capacity ofYucca Mountain is not lifted by Congress, the siting process for a second repository in another State will need to be undertaken based on the provisions of the Nuclear Waste Policy Act. The Department believes the best way to avoid the technical and political issues associated with siting a repository are to lift the 70,000 metric ton limit on the capacity of the Yucca Mountain repository.

*Question 22.* What is your view on using regional repositories instead of one repository for the entire country?

Response. The efforts to site and license regional repositories would offer substantial political and economic challenges. While the Department has not performed any cost estimates for this approach, the Department believes that the cost of siting, investigating, licensing, constructing and operating numerous sites would be substantially higher than the cost of proceeding with the licensing and development of a single geologic repository at Yucca Mountain. The Department believes that it would be most appropriate to proceed under the existing legislative and regulatory framework which has been established for the Yucca Mountain site and that there would be significant delay associated with development of a new legislative and regulatory framework that would be needed for the development of regional repositories in lieu ofYucca Mountain.

*Question 23a.* What studies or analyses have been conducted on the safety of transporting spent nuclear fuel or radioactive waste?

Response. A detailed study of the impacts associated with transporting spent nuclear fuel and high level radioactive waste to Yucca Mountain was published in the Yucca Mountain Final Environmental Impact Statement (FEIS) that the Department of Energy (DOE) issued in 2002. This document was recently updated in the Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal ofSpent Nuclear Fuel andHigh-level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Repository SEIS) and the Draft Environmental Impact Statement for a Rail Alignment for the Construction andOperation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada (Rail Alignment EIS). The draft Repository SEIS and draft Rail Alignment EIS were issued in October 2007 for public review and comment.

In addition, the National Academy ofSciences conducted a lengthy review of the safety of these shipments. The results of that study were published in the book: Going the Distance, The Safe Transport ofSpent Nuclear Fuel and High-Level Radioactive Waste in The United States". The study concluded that "[t]he committee could identify no fundamental technical barriers to the safe transport of spent nuclear fuel and high-level radioactive waste in the United States." Furthermore, the committee stated that "[transport by highway and by rail is, from a technical viewpoint, a low-radiological-risk activity with manageable safety, health and environmental consequences when conducted with strict adherence to existing regulations."

*Question 23b.* Has an analysis been done on whether it is preferable to transport these substances by rail, truck, or some other means of transportation?

Response. Yes, a detailed analysis of the shipping options was conducted as part of the Yucca Mountain FEIS that DOE issued in 2002. During the comment period on the draft FEIS, numerous respondents (including the State ofNevada) advocated for use of rail as the primary mode of transport. Based on the analyses in the draft FEIS and the stakeholder comments, DOEannounced its decision to use mostly rail as the mode of transport in a Record ofDecision issued in April 2004. The decision to use dedicated trains (trains that would transport only spent fuel and high-level radioactive waste and no other cargo) as the usual rail service was made as a matter of operational policy in 2006. In its study of the safety of these shipments, the National Academy ofSciences strongly endorsed DOE's decision to ship spent nuclear fuel and high-level radioactive waste to the repository by mostly rail using dedicated trains.

*Question 24.* According the National Academy ofSciences, the peak risks with regard to Yucca Mountain might occur hundreds of thousands of years in the future. Is it possible, given current technology, to build a repository that can maintain its structural integrity for hundreds and thousands of years?

Response. The National Academy ofSciences has long advocated geologic disposal precisely because a repository in rock, such as Yucca Mountain, can be expected to perform its function for up to a million years into the future. The designs and performance analyses included in the license application will allow the Nuclear Regulatory Commission to determine whether the combination of physical and engi-

neered barriers creates an expectation that the Yucca Mountain repository can safely isolate waste for a million years.

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RESPONSES BY EDWARD F. SPROUT III TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

*Question 1.* In Mr. Cook's written testimony, he characterizes shipments of spent fuel and nuclear waste as "extremely dangerous." Would you please summarize the industry's safety record and the precautions that will be taken to ensure that these materials will be safely transported?

Response. Government and industry have approximately four decades of successful spent fuel shipping experience, conducting more than 3,000 shipments of spent nuclear fuel without any harmful release of radioactive material. This is the best safety record of any class of hazardous material that is transported. The study of spent fuel transportation safety conducted by the National Academy ofSciences (Going the Distance, The Safe Transport ofSpent Nuclear Fuel andHigh-Level Radioactive Waste in The UnitedStates) found that there were ". . . no fundamental technical barriers to the safe transport of spent fuel and high level radioactive waste in the United States." Furthermore, the National Academy's study found that the current regulatory framework is sufficient to ensure future shipments can be conducted with manageable safety, health and environmental consequences. The shipments will be made with very robust casks certified by the Nuclear Regulatory Commission. In addition, the shipments will have armed escorts, and the Department has chosen to use dedicated trains as the usual mode of transport. This will enhance the safety, security and efficiency of transportation operations.

*Question 2.* In her testimony as Nevada's Attorney General, Ms. Masto indicates that the license application will be incomplete when it is filed. Please explain why this characterization is inaccurate and include examples of design aspects that are unnecessary for the NRC's consideration of the construction authorization application.

Response. The license application when filed will be complete pursuant to the requirements of 10 CFR63.21. Examples of design aspects that are unnecessary for the Nuclear Regulatory Commission's consideration of the construction authorization include, but are not limited to the following: design of structures non-important to safety such as administration and maintenance facilities, warehouses, etc. detailed design aspects such as rebar patterns and rebar corner details, individual wiring connection drawings, spool sheets, finishing details, etc.

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RESPONSES BY EDWARD F. SPROUT III TO ADDITIONAL QUESTIONS FROM SENATOR CLINTON

*Question 1a.* It is a well-established fact that the site selection process was intended to select the most appropriate geological repository.

In a May 21 letter, USGS Yucca Project branch chiefKenneth Skipper wrote to Andrew Orrell, senior program manager for the DOE lead laboratory, that preliminary data from a recent drilling phase indicate that the location of the Bow Ridge fault in the northern Midway Valley "may be farther east than projected from previous work in the area." As a result, in June, Yucca engineers changed where they planned to build the concrete pads for cooling thousands of tons of highly radioactive spent fuel before the canisters are entombed in the mountain, which lies 100 miles northwest ofLas Vegas.

It is clear that the DOEdoes not have a clear picture of the site's exact geological makeup, and that several other problems remain, including the dump's proximity to the water table and engineers' failure to forecast what will happen at the site, geologically or meteorologically, in the future.

Based on these emerging geological and scientific data, how can DOE continue to advocate their selection ofYucca Mountain as a valid geologic repository?

Response. The existence of the BowRidge Fault has been known for decades and does not in any way affect the safety of the repository. One of the reasons for the Department's drilling activity this past summer was to validate the surface projection of the BowRidge fault. New information regarding the Bow Ridge fault required a slight location change of the surface facility aging pads; this change was made as part of our conservative approach to this project. As new scientific information about the site becomes available, the Department will evaluate the impact on our estimates of performance and report results to the Nuclear Regulatory Commission (NRC). The Department continues to believe that a sufficient technical basis exists

for the NRCto determine that a repository at Yucca Mountain can safely dispose of spent nuclear fuel and high-level radioactive waste. The Department will provide its technical basis for NRC review in the license application next year.

*Question 1b.* Not including the engineered barriers, please provide a detailed report on what the best and worse case scenarios are for the geologic containment offered by the Yucca Mountain site. This report should include a review of groundwater migration, potential impact of changing environmental and meteorological patterns, and damage to the site from geological disturbances (e.g. volcanism and seismic events).

Response. The legal framework under which the Yucca Mountain repository will be licensed requires a determination of how the total repository system of engineered and natural barriers would function over time. The performance of the repository system under the conditions specified in this question will be evaluated in the license application, which will be available to the Committee.

*Question 2a.* DOE has acknowledged that it must pass so-called "fix Yucca" legislation in order to receive nuclear waste to store at Yucca Mountain. This legislation would provide DOEwith a land withdrawal for Yucca, and exempt the repository from environmental laws such as RCRA, among other things. Without passage of such legislation, can DOEeven begin construction of the proposed repository?

Response. The Nuclear Regulatory Commission (NRC) requires licensees to have ownership and control of the land for a nuclear facility. Accordingly, the Department believes it must satisfy this requirement through land withdrawal legislation before it can begin operation of the repository. In addition, adequate and sustained funding well above current and historic levels will be required if the repository is to be built and operated. The proposed legislation would enable the needed levels of funding and provide the necessary land withdrawal. Other elements of the proposed legislation would facilitate construction and operation of the repository. The standards of isolation and environmental protection offered by Yucca Mountain are significantly more protective then standards of protection offered by near-surface disposal sites for hazardous waste regulation by the Resource Conservation and Recovery Act. This provision of the proposed legislation would simplify the regulatory framework and eliminate lengthy largely duplicative reviews without compromising environmental protection or safety.

*Question 2b.* Can DOEactually begin transporting and storing nuclear waste at Yucca Mountain without this legislation?

Response. As stated in the previous answer, the Department must have ownership and control of the land before it can begin operations.

*Question 2c.* Please explain why the DOEwould need to exempt nuclear waste in its possession for the Resource Conservation and Recovery Act in order to store it at Yucca.

Response. The Department believes application of the Resource Conservation and Recovery Act to disposal at the Yucca Mountain repository would be duplicative and unnecessary. Specifically, NRChas a much more stringent regulatory regime for certifying transportation casks and for licensing the repository.

*Question 3a.* In the absence sofa NRCconstruction authorization for the repository, could DOE begin construction sofa rail spur to Yucca Mountain in Nevada?

Response. Yes. Construction of the rail spur would not be subject to the Nuclear Regulatory Commission licensing. The Department will pursue all necessary permits and authorizations for construction sofa rail line in Nevada.

*Question 3b.* When does DOEplan to begin construction of the rail line in Nevada? The current schedule calls for construction to begin after rail bed geotechnica! characterization and preliminary design work is completed in 2011.

*Question 3c.* How do the communities near potential rail routes feel about constructing a rail line to Yucca Mountain so close to them?

Response. The Department ofEnergy (DOE) will only be constructing one rail spur, and that will be in Nevada. Although some individuals oppose the siting of the rail spur, communities in rural Nevada have strongly advocated for rail alignments that pass as close as possible to their communities. In particular, the towns ofGoldfield and Caliente have strongly advocated for alignments that pass as close to their communities as possible. The draft Nevada Rail Corridor Supplemental Environmental Impact Statement and draft Rail Alignment Environmental Impact Statement are currently available for public comment and provide an opportunity for additional comments on this matter.

*Question 3d.* Didn't the Walker River Paiute Tribe tell DOE that it couldn't build the rail line to Yucca over the Tribe's reservation?

Response. Yes, the Walker River Paiute Tribe has informed the Department that it objects to the transportation of nuclear material through its Reservation. DOEhas identified the Mina corridor which crosses through the Reservation as nonpreferred because the Tribe has withdrawn its support for the EIS process.

*Question 3e.* What options, such as cross-country truck transportation, does DOEhave left and how much will it cost taxpayers?

Response. The DOE Record ofDecision on mode of transport for Nuclear Waste Policy Act shipments of spent nuclear fuel and high-level radioactive waste was issued in April 2004. DOEselected the "mostly rail" mode of transport both nationally and in the State ofNevada. There will need to be some truck shipments of spent fuel from reactor sites that either do not have rail access or do not have the crane capacities to handle large rail casks. DOEexpects that these truck shipments will make up less than 10 percent of the waste shipped. The National Academy of Sciences and stakeholders such as the State ofNevada have strongly advocated for use of rail as the primary mode of transport nationally and in Nevada. Using rail casks maximizes the amount of fuel moved in each cask, and reduces the overall number of shipments from over 53,000 legal weight trucks, to less than 3,200 trains. The costs for a mostly truck shipping scenario have not been calculated because of the preponderance of support for rail shipments, and the Record ofDecision to use mostly rail as the mode of transport. Taxpayers will only pay the costs of transporting defense program waste, not civilian nuclear fuel.

*Question 3f.* In addition, would the use of the Caliente option result in the rail shipments through downtown Las Vegas on the Union Pacific mainline to Caliente?

Response. The routes for truck and rail shipments have not been finalized, but standard rail routing practices maximize the use ofClass 1 Railroads, minimize the number of exchanges between railroads, and minimize the time and distance in transit. Using these rules, a portion of the shipments, including those coming from California, could travel through downtown Las Vegas on routes used by other hazardous materials currently shipped by rail.

*Question 3g.* Would DOEcontinue to pursue the Caliente option if construction costs, now estimated to be $2–3 billion, continue to escalate?

Response. The decision to use the mostly rail mode of transport nationally and in Nevada was not driven by cost. The decision was based on the impacts analyzed in the Yucca Mountain Final Environmental Impact Statement, and by stakeholder input-notably including both the State of Nevada and the National Academy of Sciences. Potential changes in cost estimates as the railroad design is refined are not expected to affect the decision to ship by mostly rail in Nevada, or the selection of the Caliente corridor for construction of the railroad.

*Question 3h.* What would DOEdo if the Caliente rail line cannot be built?

Response. There is no reason to believe the Caliente rail line cannot be constructed successfully. If foreseen circumstances were to prevent construction of a rail line along the Caliente corridor, DOE would consider other alternatives.

*Question 4a.* What effect will the proposed Transportation, Aging, and Disposal canister have on (a) the Total System Performance Assessment for Yucca Mountain, and . . .

Response. The Total System Performance Assessment (TSPA) model includes the Transportation, Aging, and Disposal (TAD) canister concept. The TAD canister is an internal part of the waste package and, other than the additional strength in resisting damage from seismic events and rock fall, it conservatively is assumed not to provide any additional long-term performance benefit in terms of preventing radionuclide releases. [What effect will the proposed Transportation, Aging, and Disposal canister have on] (b) the Key Technical Issue agreements with the NRC?

*Question 4b.* The Department has evaluated the effect of the TADcanister on the Key Technical Issue (KTI) agreements. The Department identified two KTI agreements now considered closed by the Nuclear Regulatory Commission that were likely to be impacted by the TAD canister: one was related to the probability of criticality before 10,000 years and the other dealt with chemistry inside the waste package. Preliminary analyses of conceptual designs for the TAD based on design specifications for the canister indicate that the probability of criticality can be maintained below regulatory levels and the in-package chemistry would not unfavorably impact waste form performance. Once the TAD designs are finalized, analyses will be performed to confirm the performance of the waste package with the TADcanister.

In addition, the evaluation by the Department identified nine other KTI agreements that could be impacted by the TAD canister. The evaluation showed that these agreements generally benefited from the added barrier provided by the TAD

canister for structural integrity or for corrosion performance of the waste package. In all cases, the final TAD designs will be evaluated to ensure the identified KTI agreement issues are adequately addressed.

*Question 4c.* When will TADs be commercially available to utilities, and how much will they cost utilities and ratepayers?

Response. The Department is in the process of finalizing the procurement of services for the detailed design, licensing and demonstration ofTAD-based systems. Successful completion of this effort should result in the availability ofTAD-based systems for use at utility sites beginning in 2011. The use ofTAD-based systems will result in the need for fewer, simpler facilities at Yucca Mountain which the Department believes will be easier to license and less costly to construct. The Department will provide TAD systems for shipping spent nuclear fuel from utility spent fuel pools to the repository. TADs used for onsite storage will be paid for in the same manner as utilities pay for current onsite storage systems.

*Question 4d.* How will the TSPA take canisters into account when there aren't even designs for them yet?

Response. A detailed design for the TAD canister is not required to model its performance attributes in the TSPA. The current TAD specification contains sufficient information to effectively model the inclusion of the TADcanister in the repository system.

*Question 4e.* What are DOE's assumptions regarding the protection that TADs will hypothetically provide?

Response. TAD canisters will provide assurance of no releases during transportation, aging, and packaging. Once underground, the TADs role is complementary to that of the waste package outer barrier in long-term radionuclide containment and release performance.

*Question 5a.* There are over 800 dual-purpose canisters in onsite dry cask storage (about 8000 metric tons of waste) that would have to be transferred to TADs at the reactor site or at the repository. Would this additional handling be safer than leaving the waste in NRC approved dry casks?

Response. The existing dual-purpose canisters currently in place at reactors sites are approved by the Nuclear Regulatory Commission (NRC) for above-ground storage and in some cases for transportation of spent nuclear fuel. Dual-purpose canisters were not designed to meet the requirements for permanent disposal at Yucca Mountain. As a result, these existing canisters will need to be repackaged prior to disposal, either at the utility site or at Yucca Mountain. The current repository design has the capability to repackage dual-purpose canisters at Yucca Mountain.

*Question 5b.* Who is responsible for making sure the TADs are properly loaded and welded at the reactor site?

Response. The Department is developing acceptance criteria that will ensure that all TAD canisters accepted for disposal at Yucca Mountain have been properly loaded and sealed. Whether these canisters are prepared at the reactor sites or the repository, the Department and utilities as NRC licensees are responsible for compliance with these requirements, and will be subject to oversight by the NRC. The Department will take appropriate steps to ensure that its requirements have been met.

*Question 5c.* DOEis referring to the use ofTADcanisters as its "current approach to disposal." Does this mean that its plans for using TADs for transportation, aging, and disposal could still change?

Response. The DOEdoes not plan to change its use ofTADs for transportation, aging, and disposal at Yucca Mountain.

*Question 5d.* Do the nuclear utilities generally support the idea of transferring their spent nuclear fuel into TAD canisters?

Response. In developing the technical requirements for the TAD-based systems, the Department had a number of discussions with nuclear utilities, trade organizations, and members of the spent fuel cask industry. Throughout these discussions, the participants expressed strong support for the TAD-based approach, and continue to support its implementation.

*Question 6a.* Has DOE loaded all documents on which it will base its license application in the LSN?

Response. No. The Department is not required to have loaded all documents on which it will base its license application in the Licensing Support Network (LSN) at this time. In accordance with Nuclear Regulatory Commission (NRC) regulations, the Department will continue to add documents to its LSN collection as the documents are completed.

*Question 6b.* Does DOE expect to have more information to include in the LSN once EPA publishes its final radiation standard?

Response. The Department does not anticipate needing to add more documents to the LSN as the result of the issuance of the final Environmental Protection Agency standard but as stated in response to Question 6a the Department will continue to add documents to its LSN collection including any that would need to be completed or modified as a result of the issuance of the final standard.

*Question 6c.* How many documents has DOE included in the LSN?

Response. The Department has made electronically available over 3.5 million documents, estimated to exceed 30 million pages, including scientific, engineering, and other documents.

*Question 6d.* If DOE is supposed to have placed all of the documents on LSN which it will use to defend its license application, does that mean that the documents currently on the LSN are sufficient to defend the license application?

Response. NRC regulations do not require that all of the Department's documents on which the Department will defend its license application to be completed and on the LSN at this time. In accordance with the NRC regulations, the Department will continue to add documents to its LSN collection as the documents are completed.

*Question 6e.* NRC's regulations specifically say that DOE must provide 6 months before it submits its license application, and "all documentary material" which it will use to support the application.

In 2004, the NRC's Pre-License Application Presiding Officer rejected DOE's certification of the LSN. What will DOE do if it happens again?

Response. On October 19, 2007, the Department submitted its LSN certification to the NRC after it met the regulations in 10 CFR 2, Sub-part J, Section 2.1003 "Availability of material" and Section 2.1009 "Procedures." Subsequently, the State of Nevada filed a petition with the NRC to invalidate the Department's document collection.

In December 2007, the Pre-License Application Presiding Officer Board denied the State ofNevada's motion to strike.

*Question 6f.* Will DOE miss the June 2008 deadline?

Response. The Department plans to submit the license application on or before June 30 2008.

*Question 7a.* How can DOE demonstrate that the engineered and natural barriers of the repository will satisfy an EPA Radiation Standard that has not yet been published?

Response. The license application will describe the methodology used to project the long term repository performance as required by current Nuclear Regulatory Commission (NRC) regulations and show the results of that analysis. Once the Environmental Protection Agency (EPA) standard is finalized, the NRC will be able to determine if the projected repository performance meets the final EPA standard.

*Question 7b.* Additionally, how will DOE be able to submit a "complete" application if it does not know well in advance the single most important criteria on which NRC will decide whether the repository should be licensed or not?

Response. See the response to Q7A. We have designed the repository to provide maximum isolation of radioactive waste from the environment. The license application will document that waste isolation capability, and the Department is confident that its performance will exceed the final EPA standard.

*Question 7c.* Has DOE been in contact with EPA at any time since the original Radiation Standard was promulgated to discuss Yucca Mountain or the Standard?

Response. The Department of Energy (DOE), NRC, EPA, Office of Management and Budget, and Department ofJustice have participated in a dialog that is part of the Interagency Review process under the auspices of each agency's General Counsel.

*Question 7d.* Have DOE and EPA ever discussed what it would take for Yucca Mountain to meet the Standard?

Response. DOE provided comments on the draft EPA standard including a simplified performance assessment addressing the million year period. EPA has studied past DOE performance assessments as part of its background work supporting the draft rule, as documented in EPA's Background Information Document.

*Question 7e.* Explain how DOE plans to use drip shields, when it plans to install them, and what assurances the agency can make that they will be installed?

Response. Drip shields will be installed at the time of final closure of the repository and are an integral part of the current design. Any major changes to that design would require the NRC to approve a licensing amendment.

*Question 7f.* How important to satisfying EPA's Radiation Standard is the installation of drip shields?

Response. Drip shields are an integral part of the current design and as such an integral part of the Total System Performance Assessment that will be used to demonstrate compliance with the EPA standard.

*Question 7g.* Will DOE run TSPA scenarios that specifically exclude the presence of the drip shields so NRC can evaluate the possibility that the government changes its mind about drip shields in 300 years?

Response. If the NRC grants a license to the DOE based on a design that includes drip shields, any change in the use of drip shields will need NRC approval.

*Question 8a.* When does DOE plan to complete the second repository report?

Response. The Department of Energy (DOE) intends to complete the second repository report by mid 2008.

*Question 8b.* Will a draft plan be made available for public comment?

Response. The Department does not intend to issue a draft report for public comment.

*Question 8c.* In DOE's Supplemental EIS for the proposed repository, you consider the possibility of expanding Yucca's capacity beyond the statutory 70,000 metric tons to 135,000 tons. Is this proposal in lieu of a of a DOE recommendation for a second repository?——

Response. The draft Repository Supplemental Environmental Impact Statement contains an analysis of the environmental impacts replacing up to 135,000 MTU in the Yucca Mountain repository. This analysis was done to bound the environmental impacts of a future decision to remove the limits on the quantity of spent nuclear fuel and high-level radioactive wastes that can be emplaced at Yucca Mountain.

The analysis of the environmental impacts of this potential action did not address the issues of the need for a second repository and does not obviate the need for the second repository report.

*Question 8d.* Hypothetically, if DOE were permitted to expand the cap on Yucca to 135,000 tons, how would this affect DOE's license application timeline?

Response. If the DOE were directed by the Congress to expand the capacity of the Yucca Mountain repository beyond its present statutory limit of 70,000 metric tons of heavy metal (MTHM), this likely would not impact the timeline for license application (LA) submittal absent a directive from Congress to delay submittal.

DOE likely would submit the LA for the 70,000 metric tons on schedule while initiating additional postclosure analysis to support the expanded use of the repository. DOE would then submit a license amendment for Nuclear Regulatory Commission (NRC) review and approval to reflect the expanded capacity.

*Question 8e.* Would DOE have to redo any of the technical work and designs to justify expanding the cap?

Response. If the 70,000 MTHM cap were lifted, additional engineering and scientific analysis would be required in order to support an application for a license amendment to the NRC.

*Question 8f.* Would DOE miss its June 2008 deadline for filing a license application?

Response. If DOE were directed by Congress to expand the capacity of Yucca Mountain repository beyond its present statutory limit of 70,000 MTHM, it is not likely to impact DOE's current timeline for LA submittal for the original capacity.

*Question 9.* DOE has faced significant quality assurance problems on the Yucca project because of its contractors, as demonstrated when DOE had to spend more than $25 million to review emails for falsified scientific data. The Nevada Attorney General recently filed a petition against Sandia-DOE's lead laboratory for the Yucca project. The AG's complaint alleges that "Sandia has subordinated safety and scientific accuracy to meeting an artificial deadline set by DOE." Apparently, Sandia has thrown quality and scope aside, in favor of meeting the DOE's deadline in order to satisfy the Department. Is DOE still confident in its lead contractor's work on Yucca?

Response. Yes. The Department is confident in the quality of the Lead Lab's work in support ofYucca Mountain. The Nevada Attorney General's "Petition for an Independent Investigation and Suspension of Sandia National Laboratories from Further Work on the Yucca Mountain Project" was denied by the Nuclear Regulatory Commission on November 15,2007.

*Question 10a.* There are concerns that the administration has restricted meaningful public participation in the Yucca Mountain licensing process by holding back important relevant information. The LSN is full ofdocuments—it has millions of them but the real important information seems like its being withheld. The EPA hasn't published its Radiation standard, DOE hasn't made its TSPA available, and there is no publicly available national transportation plan. How can the public play a

meaningful role in the licensing process when they aren't given access to the most important information?

Response. The Yucca Mountain licensing process is a regulatory process controlled by the Nuclear Regulatory Commission (NRC). The Department ofEnergy (DOE) is an applicant for an NRC license and, therefore, must submit documents on the public docket as required by NRC regulations. The Total System Performance Assessment (TSPA) that will support DOE's application for construction authorization is still in preparation. When it is finalized, the TSP A will be made publicly available on the Licensing Support Network (LSN). With respect to the radiation standard, DOE defers to the Environmental Protection Agency to comment on the availability of the standard. With respect to transportation, transportation nationally and in Nevada has been analyzed in both the 2002 Final Repository Environmental Impact Statement (EIS) and in the draft Nevada Rail Corridor SEIS and draft Rail Alignment EIS and with respect to those documents there has been meaningful opportunity for public participation, including participation in the scoping process and comment hearings as well as the opportunity to submit written comments. In addition, with respect to the draft National Transportation Plan, a draft was made available for comment, and it is currently being revised to address those comments.

*Question 10b.* DOE's public scoping meetings last year regarding the draft supplemental EIS's didn't even give stakeholders a forum to voice their concerns publicly. How will DOE improve this process so affected citizens can actually have their concerns considered in a public forum?

Response. Any concern that the Department has restricted meaningful public participation in the Yucca Mountain National Environmental Policy Act (NEPA) process is misinformed. During the scoping period for repository and the rail corridor supplemental EISs and the rail alignment EIS the Department held seven public scoping meetings in six cities in Nevada and one in Washington D.C. At these meetings the public was invited to submit comments in writing or in person to a court reporter. To improve this process the Department conducted eight public hearings on the draft NEPA documents where the public had the opportunity to provide comments orally to a court reporter, in writing, or in oral comments for the record in front of other hearing participants.

*Question 11a.* Does DOE intend to allow the NRC, the State ofNevada, or the public to access its Total System Performance Assessment?

Response. Yes. The Nuclear Regulatory Commission (NRC), the State ofNevada, and the public will have access to the Total System Performance Assessment (TSPA) report, which includes the results of our modeling work.

*Question 11b.* If yes, at what point in the process? If no, why not?

Response. The Department expects to complete the TSP A early in 2008, at which time it will be placed on the Licensing Support Network.

*Question 11c.* How can the Commission and other parties to the licensing confidently determine that DOE's conclusions based on the TSPA are accurate?

Response. The NRC, in its Rules ofPractice for Domestic Licensing Proceedings and Issuance ofOrders, defines the process by which parties can review and challenge the conclusions in the TSPA.

*Question 11d.* If DOE is considering using a new performance assessment model, such as the "next generation performance assessment," in its defense of the Yucca Mountain licensed application?

Response. The Department ofEnergy (DOE) is not developing a new performance assessment to support approvals by NRC to construct and to operate the Yucca Mountain repository.

*Question 11e.* It has been rumored that the DOE intends to submit a license application to NRC with this current version of a total system performance assessment ("TSPA"), and then, when serious questions are inevitably raised about its transparency and adequacy, switch to an altogether different version that DOE already considers more defensible, but which cannot be included in its initial application filing without delaying its artificial Yucca filing schedule. In short, DOE will use an inadequate performance assessment just to meet their self-imposed filing deadline and then, when proceedings are underway, switch to the "real" performance assessment. However, a September 13 letter from DOE to Bob Loux, seemed to rule out the possibility of a second version of the model. Can you confirm that there will be no bait and switch, and that the current TSP A is the one that the license will rely on?

Response. The license application will rely on the current TSPA and DOE has no intent to substitute a new TSP A during the consideration of the license application.

*Question 12a.* It is in all of our interest to give the communities who would host these shipments of highly dangerous nuclear waste an opportunity to play a meaningful role in the planning. What has the DOE done to inform affected communities that nuclear waste will be transported past their homes, schools and hospitals?

Response. The Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal ofSpent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Repository SEIS) provides discussion of representative routes nationally, and the public is invited to comment on that document. The Department of Energy (DOE) has not identified specific routes and is working with representatives from States and Tribes through whose jurisdictions shipments may be transported in development of criteria and methodologies for route selection. This process will culminate in the selection of routes 3–5 years prior to the first shipment.

*Question 12b.* Do residents have any forum to comment on transportation routes?

Response. The Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal ofSpent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Repository SEIS) provides a discussion of representative routes nationally, and the public is invited to comment on that document. In addition, the Department is productively engaged in development of criteria and methodologies for route selection with representatives from States and Tribes through whose jurisdictions shipments may be transported. This process will culminate in the selection of routes 3–5 years prior to the first shipment. DOE is also committed to providing technical assistance and funds for training related to these shipments for local public safety officials along shipping routes. DOE notes that individuals and States do not have the opportunity to address the shipment plans or routes for any other category of hazardous material shipped by rail in this country each year.

Senator CARPER. Thank you, Mr. Sproat.

Mr. Meyers, you are recognized. Your full testimony will be made a part of the record. I would ask you to summarize and try to stick within 5 minutes if you could.

## STATEMENT OF ROBERT J. MEYERS, PRINCIPAL DEPUTY ASSISTANT ADMINISTRATOR, OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. MEYERS. Thank you very much. I will do that.

I am pleased to be here before the Committee. In previous testimony before the Committee, EPA has described its responsibilities with regard to Yucca Mountain and why we have proposed revised standards. Just to review very briefly, though, the Nuclear Waste Policy Act of 1982 prescribed the roles and responsibilities of the Federal agencies in development of disposal facilities for spent nuclear fuel and high level waste.

In this, EPA was identified as the agency responsible for establishing standards to protect the general environment for such facilities. In the Energy Policy Act of 1992, Congress delineated EPA's roles and responsibilities specific to the Federal Government's establishment of the potential repository at Yucca Mountain. EPA's role is to determine how the Yucca Mountain high level waste facility must perform to protect public health and safety. Congress directed EPA to develop public health and safety standards that will be incorporated into the NRC's licensing requirements for the Yucca Mountain facility, and the Department of Energy would apply for the license to construct and operate the facility, and the facility would only open if NRC determines that DOE complied with NRC regulations, which incorporate EPA's standards as well as other requirements.

EPA established its Yucca Mountain standards in June 2001, as has been referenced earlier by the Committee, and as required by

the Energy Policy Act, these standards address the releases of radioactive material during the storage at the site and after final disposal.

The storage standard set a dose limit of 15 millirem per year for the public outside of the Yucca Mountain site. The disposal standards consist of three components, an individual dose standard, a standard evaluating the impacts of human intrusion into the repository, and a groundwater protection standard.

The individual protection and human intrusion standards set a limit of 15 millirem per year to a reasonable maximally exposed individual, or MEI, who would be among the most highly exposed members of the public. The groundwater protection standard is consistent with EPA's drinking water standards, which the agency applies in many situations as a pollution prevention measure. The disposal standards were to apply for a period of 10,000 years after the facility is closed. Dose assessment were to continue beyond 10,000 years and be placed in DOE's environmental impact statement, but they are not subject to the compliance standard.

The 10,000 year period for compliance assessment was consistent with EPA's generally applicable standards developed under the Nuclear Waste Policy Act, and also reflected international guidance regarding the level of confidence that can be placed in numerical projections over very long periods of time.

In July, 2004, in considering litigation filed on the 2001 standard, the Court of Appeals for the District of Columbia found in favor of the agency on all counts except one, the 10,000 year regulatory timeframe. The court found that the timeframe of EPA standards was not consistent with the National Academy of Sciences's recommendations. EPA proposed a revised rule in August, 2005 to address the issues raised by the Appeals Court. The proposed rule would limit radiation doses from Yucca Mountain for up to one million years after it closes.

Within that regulatory timeframe, we proposed two dose standards that would apply based on the number of years from the time the facility is closed. For the first 10,000 years, the proposal retained the 2001 final rule's dose limit of 15 millirem. This is a protection level at the most stringent radiation regulations in the U.S. today. From 10,000 years to 1 million years, we have proposed a dose limit of 350 millirem.

Basically, and I will try to sum up here, getting to the bottom line here, the public comment for the proposed rule closed in November 2005. We have considered and continue to consider the more than 2,000 comments we received on the proposed rule. A document describing our responses to all comments will be published, along with the final rule.

The draft final rule was submitted to OMB in December, 2006. Since then, we have engaged in productive discussions with other Federal agencies about the important and complex issues raised by setting a standard that will protect public health and safety and the environment. We look forward to completing these discussions and our analysis of the public comments and issuing a final rule.

This concludes my prepared statement and I will be happy to address any questions.

[The prepared statement of Mr. Meyers follows:]

STATEMENT OF ROBERT J. MEYERS, PRINCIPAL DEPUTY ASSISTANT ADMINISTRATOR FOR THE OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Madam Chairwoman and Members of the Committee, good morning. My name is Robert Meyers and I am the Principal Deputy Assistant Administrator for the Office of Air and Radiation at the United States Environmental Protection Agency ("EPA"). I am pleased to be here today to discuss the status of EPA's public health and safety standards for the proposed spent nuclear fuel and high-level radioactive waste repository at Yucca Mountain, Nevada.

In previous testimony before this committee, EPA has described its responsibilities for establishing standards for Yucca Mountain and why we have proposed revised standards. To review, the Nuclear Waste Policy Act of 1982 prescribed the roles and responsibilities of Federal agencies in the development of disposal facilities for spent nuclear fuel and high-level waste. EPA was identified as the agency responsible for establishing standards to protect the general environment for such facilities. In the Energy Policy Act of 1992, Congress delineated EPA's roles and responsibilities specific to the Federal Government's establishment of the potential repository at Yucca Mountain. EPA's role is to determine how the Yucca Mountain high-level waste facility must perform to protect public health and safety. Congress directed EPA to develop public health and safety standards that would be incorporated into the Nuclear Regulatory Commission's ("NRC") licensing requirements for the Yucca Mountain facility. The Department of Energy ("DOE") would apply for the license to construct and operate the facility and the facility would open only if NRC determines that DOE complied with NRC regulations which incorporate EPA's standards as well as other requirements. In establishing EPA's role, Congress also stated that EPA's safety standards are to be based upon and consistent with the expert advice of the National Academy of Sciences.

EPA established its Yucca Mountain standards in June 2001. As required by the Energy Policy Act, these standards addressed releases of radioactive material during storage at the site and after final disposal. The storage standard set a dose limit of 15 millirem per year for the public outside the Yucca Mountain site. The disposal standards consisted of three components: an individual dose standard, a standard evaluating the impacts of human intrusion into the repository, and a ground-water protection standard. The individual-protection and human-intrusion standards set a limit of 15 millirem per year to a reasonably maximally exposed individual, who would be among the most highly exposed members of the public. The ground water protection standard is consistent with EPA's drinking water standards, which the Agency applies in many situations as a pollution prevention measure. The disposal standards were to apply for a period of 10,000 years after the facility is closed. Dose assessments were to continue beyond 10,000 years and be placed in DOE's Environmental Impact Statement, but were not subject to a compliance standard. The 10,000 year period for compliance assessment was consistent with EPA's generally applicable standards developed under the Nuclear Waste Policy Act. It also reflected international guidance regarding the level of confidence that can be placed in numerical projections over very long periods of time.

Shortly after the EPA first established these standards in 2001, the nuclear industry, several environmental and public interest groups, and the State of Nevada challenged the standards in court. In July 2004, the Court of Appeals for the District of Columbia Circuit found in favor of the Agency on all counts except one: the 10,000 year regulatory timeframe. The court found that the timeframe of EPA's standards was not consistent with the National Academy of Sciences' recommendations. The National Academy of Sciences, in a report to EPA, had stated that the EPA's standards should cover at least the time period when the highest releases of radiation are most likely to occur, within the limits imposed by the geologic stability of the Yucca Mountain site. It judged this period of geologic stability, for purposes of projecting releases from the repository, to be on the order of one million years. EPA's 2001 standards required DOE to evaluate the performance of the site for this period, but did not establish a specific dose limit beyond the first 10,000 years.

EPA proposed a revised rule in August 2005 to address the issues raised by the appeals court. The proposed rule would limit radiation doses from Yucca Mountain for up to one million years after it closes. No other rules in the U.S. for any risks have ever attempted to regulate for such a long period of time. Within that regulatory timeframe, we proposed two dose standards that would apply based on the number of years from the time the facility is closed. For the first 10,000 years, the proposal retained the 2001 final rule's dose limit of 15 millirem per year. This is protection at the level of the most stringent radiation regulations in the U.S. today. From 10,000 to one million years, we proposed a dose limit of 350 millirem per year. The proposed long-term dose standard considered the variation across the country

of estimated exposures from natural sources of radiation. Our goal in proposing this level was to ensure that total radiation exposures for people near Yucca Mountain would be no higher than natural levels people live with routinely in other parts of the country today. One million years, which represents 25,000 generations, is consistent with the time period cited by the NAS as providing a reasonable basis for projecting the performance of the disposal system. Our proposal would require the Department of Energy to show that Yucca Mountain can safely contain wastes, even considering the effects of earthquakes, volcanic activity, climate change, and container corrosion over one million years.

The public comment period for the proposed rule closed on November 21, 2005. We held public hearings in Las Vegas and Amargosa Valley, Nevada, and Washington, DC. We have considered and continue to consider comments from the public hearings, as well as all of the comments submitted to the Agency's rulemaking docket, in preparing the draft final rule. More than 2,000 comments were submitted on the proposed rule. Commenters represented a variety of stakeholder perspectives, including industry, scientific bodies, State and local government, public interest groups, and private citizens. Comments primarily addressed one of three topics: first, the proposed post-10,000-year dose limit of 350 millirem per year, including the rationale for a higher long-term standard and the use of natural radiation levels to derive such a standard; second, the proposed use of the median value of the distribution of dose projections for comparison to the dose limit; and finally, the treatment of long-term events and processes, such as earthquakes and climate change. The comments on these and many other topics are directly related to the significant uncertainties in projecting the performance of the Yucca Mountain disposal system for up to one million years, and the challenges of interpreting those projections in a regulatory proceeding. A document describing our responses to all comments will be published along with the final rule.

The draft final rule was submitted for Office of Management and Budget (OMB) review in December 2006. We have engaged in productive discussions with other Federal agencies about the important and complex issues raised by setting a standard that will protect public health and safety and the environment for up to one million years after the Yucca Mountain repository closes. We look forward to completing those discussions and our analysis of the public comments and issuing the final rule soon.

Thank you again for the opportunity to appear before the Committee and present this update on EPA's Yucca Mountain standards. This concludes my prepared statement. I would be happy to address any questions.

## RESPONSES BY ROBERT J. MEYERS TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

*Question 1.* As I mentioned at the hearing, I understand that most countries looking at a geological repository for nuclear waste have set or proposed standards of 10 millirems per year. Are you aware of any other countries that have set radiation protection standards as high as those EPA is proposing—350 millirem per year? If so, what are those countries and what is the standard in each?

Response. The preferred approach internationally is to establish a firm risk or dose standard for an initial period after facility closure, and to rely upon more qualitative judgments that emphasize other factors contributing to safety thereafter. We are aware of only one country that has established a quantitative standard applicable beyond 10,000 years, as EPA has proposed to do. Switzerland applies a 10 mrem/yr standard without time limit, although there are provisions in the Swiss regulations that allow for a judgment of safety even if that level is exceeded. In making any comparison of dose or risk standards, it is important to consider the specified calculation method, the description of the designated receptor, the treatment of unlikely events and processes, and other aspects that can significantly influence the results of safety assessments.

*Question 2.* According to your testimony, EPA did not initially propose a radiation standard for Yucca Mountain after 10,000 years because there is a lack of confidence among individuals in the scientific community regarding the accuracy of projections over such a long period of time. Now that you have proposed standards, what happens if these projections for acceptable exposure between 10,000 and one million years are not met? Is there anything that can be done after the waste has been buried? What contingencies are included in setting the proposed standards?

Response. EPA's role under the Energy Policy Act of 1992 (EnPA) is to establish the "public health and safety standards" for the Yucca Mountain site. The Nuclear Regulatory Commission's (NRC's) role is to determine whether the Department of Energy's (DOE's) dose projections will comply with the standards. NRC will not au-

thorize construction until DOE demonstrates that compliance. NRC is in a better position to address the question of contingency planning (see, e.g., 10 CFR 63.111(e) regarding provisions related to retrievability of the waste for a specified period of time; also 10 CFR 63.51(a)(3)(iii) regarding DOE's continued oversight of the repository).

*Question 3.* Please furnish copies of all correspondence between EPA and DOE concerning the proposed EPA Yucca Mountain radiation rule.

Response. Formal correspondence between EPA and DOE related to the proposed Yucca Mountain rule (70 FR 49014, August 22, 2005) has been submitted to the docket for the rulemaking. For your convenience, we have attached an index of the materials currently in the docket.

*Question 4.* Please send copies of all documents related to any meetings, conversations, or correspondence between EPA and DOE concerning the proposed EPA rule.

Response. Please see the response to Question 3 above. Additionally, formal documents related to meetings between EPA and DOE regarding the proposed Yucca Mountain rule have been submitted to the docket for the rulemaking. For your convenience, we have attached an index of the materials currently in the docket.

Further, as discussed with your staff on November 29, 2007, EPA had been working to respond to a Freedom of Information Act (FOIA) request for documents concerning the proposed Yucca Mountain rule at the time of your request. As part of that discussion, Committee staff agreed to receive any information that EPA provided to the FOIA requester and, after review of the docket material and FOIA records, to inform EPA whether the Committee would seek any additional material. Copies of the documents EPA provided to the FOIA requester are enclosed.

*Question 5.* We heard late last year that EPA was ready to publish its final radiation standard for Yucca Mountain. Then we heard it was going to be published in January. It's now 10 months later and we still have no radiation standard. Where precisely in the rulemaking process is EPA's final radiation standard? When can Congress expect to see a final standard? How will EPA's anticipated new rule compare with the previous one that the D.C. Circuit rejected? How will the new rule compare to the draft radiation standard published by EPA?

Response. The radiation standard for Yucca Mountain has not yet been determined and is the subject of ongoing rulemaking proceedings. There are many complex issues involved in establishing regulations applicable for up to one million years that make it difficult to predict when these rulemaking proceedings will conclude. EPA continues to review public comments on its proposed rule and participate in the interagency review process pursuant to Executive Order 12866. Accordingly, EPA is not in a position to comment on the standard or the approach that it may adopt in its final rule.

*Question 6.* What is the lifetime fatal cancer risk to someone exposed to the median dose of 350 millirem per year for 70 years? How does this compare with the EPA's present guidelines for protecting the public? How does it compare with a lifetime exposure of 15 millirem per year, were it to be extended to the peak dose period without change from the first 10,000 years. Would the draft standard proposed for the period after 10,000 years be protective of future populations relative to present-day EPA criteria?

Response. For reasons discussed in the response to Question 5 above, EPA is not in a position to comment on the final standard. The final rule is expected to discuss the factors considered by EPA in arriving at its final standard. We also note that our August 2005 proposed rule discussed the approach for the proposed 350 mrem/yr standard (70 FR 49036-49038, August 22, 2005).

*Question 7.* How did EPA arrive at its long-term radiation dose standard of 350 millirems per year?

Response. In EPA's August 2005 proposed rule, we proposed a dose standard of 350 mrem/yr to apply for the period between 10,000 and 1 million years. The preamble to the proposed rule discussed at length the approach taken to arrive at the proposed 350 mrem/yr standard (70 FR 49036–49038, August 22, 2005). For reasons discussed in the response to Question 5 above, EPA is not in a position to comment on the standard or the approach that it may adopt in its final rule.

*Question 8.* Does the Nuclear Waste Policy Act create an "inferred deadline" that requires EPA to issue the rule governing the Yucca Mountain Repository before DOE files an application seeking a license to build the repository? If not, why not?

Response. The text of the Nuclear Waste Policy Act of 1982 (NWPA), Pub. L. No. 97–425, 96 Stat. 2201, does not contain a deadline on the subject of the question. In any event, the question pertains to administrative proceedings that NRC and DOE would be in a better position to address.

*Question 9.* If the EPA does not issue the Yucca Mountain radiation standard rule before DOE submits the license application to NRC, will the EPA's failure to do so impede, limit, or otherwise affect Nevada's ability to file a legal challenge against the license application?

Response. NRC would be in a better position to address whether, when, and to what extent a legal challenge may be made in the context of an administrative proceeding.

*Question 10.* Is the DOE's Total System Performance Assessment relevant to the rule? If it is relevant, how is it relevant?

Response. EPA's rule will not be based upon the results (dose projections) generated by the TSPA. EPA's proposed rule discussed modeling capabilities in general as a consideration in developing a regulatory standard to apply for up to 1 million years.

*Question 11.* Is the DOE's October, 2007 draft Supplemental Environmental Impact Statement relevant to the rule? If it is relevant, how is it relevant?

Response. Because the rulemaking process is ongoing, EPA is not in a position to State definitively whether or to what extent the October 2007 Draft Supplemental Environmental Impact Statement is relevant. We note that it does provide the public with information about DOE's current dose estimates that can be compared to EPA's proposed standards and NRC's proposed regulations.

*Question 12.* According to the OMB website, the Yucca Mountain radiation standard rule was submitted for final review on December 15, 2006. Does the fact that the rule was submitted mean that it is in its final form?

Response. The Yucca Mountain radiation standards are currently undergoing interagency review, which process is coordinated by the Office of Management and Budget. In light of the ongoing rulemaking, including interagency review (see the response to Question 5 above), the rule is not yet in its final form.

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RESPONSES BY ROBERT J. MEYERS TO ADDITIONAL QUESTIONS FROM SENATOR CARDIN

*Question 1.* In May, Senator Domenici introduced the Nuclear Waste Access to Yucca Act. Among the provisions included in the legislation is one which would lift the 70,000 metric ton cap on waste disposal, which could result in as much as 120,000 metric tons of waste being buried at Yucca Mountain. If Sen. Domenici's legislation were enacted, how would that effect EPA's environmental and public health radiation protection standards for Yucca Mountain?

Response. Neither EPA's 2001 standards for Yucca Mountain nor its proposed amendments are based upon the amount of waste in the repository. Senator Domenici's legislation regarding an expansion of the repository capacity would not be expected to affect EPA's 40 CFR Part 197 standards.

*Question 2.* What is the EPA groundwater standard for Yucca Mountain after 10,000 years?

Response. Consistent with the U.S. Court of Appeals for the District of Columbia Circuit decision, we did not propose to extend the ground-water compliance period beyond the 10,000 year timeframe. (70 FR 49022, August 22, 2005)

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RESPONSES BY ROBERT J. MEYERS TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

*Question 1.* In a hearing in March of 2006, Mr. Wehrum testified that the radiation standard would be finalized by the end of 2006. Your testimony merely indicates that it will be done "soon." Please indicate a date by which the rule will become final.

Response. Please see the response to Senator Boxer's Question 5, above.

*Question 2.* The draft radiation standard has been criticized as not being protective of public health during the period of ten thousand to a million years. Based on a report prepared for EPA, I notice that the background radiation level for the Yucca Mountain area in Nevada is 141 millirem and the background level for South Dakota is 500 millirem. If, ten thousand to a million years from now, the radiation exposure to people living around Yucca Mountain is 350 millirem, according to the EPA standard, they would still receive less radiation than people living in South Dakota. Please describe for me why you believe a radiation standard of 350 millirem ten thousand years from now is appropriate, or if you don't think so, please describe your recommendations for evacuating the State of South Dakota.

Response. The approach taken in the proposed rule described one way to consider natural background radiation exposures in developing a standard applicable for up to 1 million years. Pending the outcome of the rulemaking process, including interagency review (see the response to Senator Boxer's Question 5 above), EPA is not in a position to comment on the standard or the approach that it may adopt in the final rule.

*Question 3.* Why did EPA choose the median value, rather than the mean, when estimating peak doses for determining compliance with the radiation standard?

Response. As described in our proposed rule, we proposed using the median value of the distribution of dose projections as a way to address the propagation of uncertainties in projecting doses for up to 1 million years. (70 FR 49041–49046, August 22, 2005) Pending the outcome of the rulemaking process, including interagency review (see the response to Senator Boxer's Question 5 above), EPA is not in a position to comment on the standard or the approach that it may adopt in the final rule.

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RESPONSES BY ROBERT J. MEYERS TO ADDITIONAL QUESTIONS FROM SENATOR CLINTON

*Question 1a.* Late last year EPA informed the Committee that, it was ready to publish its final Radiation Standard for Yucca Mountain. Then we heard it was going to be published in January. It's now 10 months later and we still have no Radiation Standard. Where precisely in the rulemaking process is EPA's final radiation standard? When can Congress expect to see a final standard?

Response. Please see the response to Senator Boxer's Question 5, above.

*Question 1b.* Please provide to the Committee all correspondence between the EPA and DOE, NRC, and any other agency related to the Radiation Standard.

Response. Formal correspondence between EPA and DOE, NRC, and other Agencies related to the proposed Yucca Mountain rule has been submitted to the docket for the rulemaking. For your convenience, we have attached an index of the materials currently in the docket.

*Question 2a.* How will EPA's anticipated new rule compare with the previous one that the D.C. Circuit rejected? How will the new rule compare to the draft Radiation Standard published by EPA?

Response. Please see the response to Senator Boxer's Question 5, above.

*Question 1b.* Why does EPA have a two-tiered standard in the first place? If 15 millirems is safe for the first 10,000 years, why don't we just keep it there for the time period after? Why does EPA think it's OK to suddenly 1 day say that people can be exposed to 2200 percent more radiation than they were the day before? That seems just as arbitrary and capricious as the old standard that the D.C. Circuit rejected. If the final radiation standard extended the 15 millirem per year beyond 10,000 years, could Yucca Mountain comply and be licensed and why should that be the concern of EPA in establishing this standard?

Response. We discussed in the proposed rule the reasons for proposing a separate dose standard applicable for the period between 10,000 and 1 million years. (70 FR 49030–49032, August 22, 2005) Pending the outcome of the rulemaking process, including interagency review (see the response to Senator Boxer's Question 5 above), EPA is not in a position to comment on the standard or the approach that it may adopt in the final rule.

NRC is responsible for determining whether DOE's dose projections will comply with EPA's standards. The EnPA does not direct EPA to develop its standards based upon DOE's projections of disposal system performance.

*Question 3.* The EPA's draft Radiation Standard uses the median of the DOE calculations instead of the mean (average), as recommended by the National Academy and therefore required by law. Do you support this aspect of the EPA standard? Will EPA maintain this approach in the final Radiation Standard?

Response. Please see the response to Senator Inhofe's Question 3 above.

*Question 4.* What is the lifetime fatal cancer risk to someone exposed to the median dose of 350 millirem per year (taking into consideration the cumulative effect of background exposure)? How does this compare with the EPA's present guidelines for protecting the public against radiation? How does it compare with a lifetime exposure of 15 millirem per year, were it to be extended to the peak dose period without change from the first 10,000 years? Would the draft standard proposed for the period after 10,000 years be protective of future populations relative to present-day EPA criteria?

Response. Please see the response to Senator Boxer's Question 6, above.

*Question 5a.* In their comments to EPA regarding the proposed Radiation Standard, two prominent scientists called EPA's proposal "the worst radiation protection rule that has ever been proposed" because it "actually implies a massive increase in the level of cancer risk." They went on to say that, the second tier of the standard would pose a lifetime cancer risk of 1 in 36 for the general population and 1 in 30 for women. If true, this would be a terrible legacy to leave for future generations. Can you please comment on the possibility that the EPA Standard will lead to an increase in cancer risk.

Response. For reasons discussed in the response to Senator Boxer's Question 5 above, EPA is not in a position to comment on the final standard. The final rule is expected to discuss the factors considered by EPA in arriving at its final standard.

*Question 5b.* Is the second tier of the radiation standard any different from having no standard at all? At this high of an "acceptable" radiation exposure level, would DOE ever surpass it unless there was a major disaster at Yucca Mountain?

Response. EPA's final rule will adopt "public health and safety standards" for the Yucca Mountain site as required by the EnPA and is expected to discuss the factors considered by EPA in arriving at its final standard.

Relative to your second question, EPA's role under the EnPA is to establish the "public health and safety standards" for the Yucca Mountain site. NRC is responsible for determining whether DOE's dose projections in fact comply with EPA's standards. Thus, the conditions under which the standards may be exceeded will be considered during the NRC licensing proceedings.

*Question 6a.* How did EPA arrive at its long-term radiation dose standard of 350 millirems per year?

Response. Please see the response to Senator Boxer's Question 7, above.

*Question 6b.* According to this standard, wouldn't the total maximal exposure be the sum of both the natural radiation as well as the radiation leaked from Yucca, or up to 700 millirems per year? EPA was charged to develop a standard that is acceptable for the health and safety of the public, not by comparing it to what is already in the environment. Therefore, is doubling a person's radiation exposure the same as finding an acceptable level that can be released from Yucca without increasing the population's risk of cancer.

Response. In the proposed rule, we estimated 350 mrem/yr as the level of background radiation in Amargosa Valley today. Therefore, if exposures of 350 mrem/yr from Yucca Mountain were added to that background radiation, the total maximal exposure would be 700 mrem/yr. The approach taken in the proposal described one way to consider such natural exposures. Pending the outcome of the rulemaking process, including interagency review (see the response to Senator Boxer's Question 5 above), EPA is not in a position to comment on standard or the approach that it may adopt in the final rule. EPA's final standard will adopt "public health and safety standards" for the Yucca Mountain site, as required by the EnPA.

*Question 6c.* Including the contribution by an average natural background of 350 millirems per year, can you please provide a thorough scientific response analysis, based on current human health, animal studies, and biomedical data, as to whether the risks to susceptible populations (including pregnant women, children, and during fetal development) under the standard (in particular those exposed to the top 5 percent of the range) could include having children with serious birth defects, failed pregnancies, increased risk of cancer, or other negative health outcomes? How does the type of exposure pathway play a role in this increased risk and your risk assessments? Has this risk assessment included the potential for materials to enter the groundwater, and therefore for future exposure pathways to include ingestion of either low-or high-energy emitting particles?

Response. For the reasons discussed in the response to Senator Boxer's Question 5 above, EPA is not in a position to comment on the standard or the approach that it may adopt in its final rule. The final rule is expected to discuss the factors considered by EPA in arriving at its final standard. We also note that EPA presented information concerning its analysis of a 350 mrem/yr standard in its proposed rule (70 FR 49036-49038, August 22, 2005).

*Question 7.* How does EPA's draft standard for Yucca Mountain compare with the standard for the Waste Isolation Pilot Plant facility? How does it compare to other countries' radiation standards for nuclear waste facilities?

Response. Both the proposed Yucca Mountain and WIPP standards include a 15 mrem/yr standard to the designated receptor for 10,000 years after disposal, and include comparable ground-water protection standards for the same period. The standards applicable to the WIPP do not address the period beyond 10,000 years. For the reasons discussed in the response to Senator Boxer's Question 5 above, EPA is not

in a position to discuss the treatment of the period beyond 10,000 years in the final Yucca Mountain rule.

The final rule is expected to discuss the factors considered by EPA in arriving at its final standard.

*Question 8.* The US belongs to an international convention on spent fuel. The convention requires that long-term radiation standards be essentially the same for future generations as for the present one. How can you justify EPA's rule on that basis?

Response. For the reasons discussed in the response to Senator Boxer's Question 5 above, EPA is not in a position to comment on the standard or the approach that it may adopt in its final rule. The final rule is expected to discuss the factors considered by EPA in arriving at its final standard. We also note that a discussion of intergenerational equity was included in the proposed rule (70 FR 49035-49036, August 22, 2005).

Senator CARPER. Mr. Meyers, thanks very much for that testimony.

Mr. Weber, you are now recognized. Please proceed.

**STATEMENT OF MICHAEL WEBER, DIRECTOR, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, U.S. NUCLEAR REGULATORY COMMISSION**

Mr. WEBER. Good morning.

Senator CARPER. Good morning.

Mr. WEBER. Mr. Chairman, members of the Committee, I am pleased to appear before you today on behalf of the staff of the U.S. Nuclear Regulatory Commission to discuss the process that we will use to review and decide whether to authorize the Department of Energy to build a repository at Yucca Mountain. I have submitted my written testimony for the record.

Because of NRC's licensing and adjudicatory role in the national repository program, the NRC takes no position at this time on whether a permanent geologic repository can be constructed safely and securely at Yucca Mountain. That remains to be demonstrated by the Department. If DOE submits a license application, NRC will decide whether to authorize construction of the repository based on NRC's comprehensive and independent safety review and on the results of a full, open and impartial public hearing.

We have developed our high-level waste regulatory program consistent with our responsibilities under the Nuclear Waste Policy Act and under the Energy Policy Act of 1992. This legislation specified an integrated approach and a long-range plan for both storage, transport and for disposal of spent nuclear fuel and high-level radioactive waste.

The law prescribes the respective roles and responsibilities of the various Federal agencies. The Congress assigned to the NRC certain pre-licensing responsibilities and the regulatory authority to authorize construction of a repository at Yucca Mountain after deciding whether DOE's license application complies with applicable standards and regulations.

The Congress directed the NRC to establish safety and licensing regulations consistent with EPA standards for Yucca Mountain. As we have already heard by my colleague, in 2001, EPA published standards and NRC published conforming regulations. Both were challenged in court and, in 2004, both were upheld on all but one issue, namely EPA's specification and NRC's adoption of the 10,000 year compliance period.

In 2005, EPA proposed additional standards that would apply for the period between 10,000 years and a million years, and NRC proposed to incorporate these standards in our regulations.

NRC stands ready to conform our regulations in the final EPA standards as soon as they are published.

Turning now to DOE's anticipated license application for Yucca Mountain, NRC must decide whether or not to authorize the Department to build the proposed repository. NRC will base its decision on a comprehensive, independent safety review and on the results of a full and impartial public hearing before an independent panel of judges. Before we start our review, however, we must first decide whether we can accept DOE's application. NRC will determine whether the application, if submitted, contains the required information and whether DOE has complied with NRC's document access requirements. If the application passes this initial acceptance review,

which may take up to 6 months, NRC can begin its detailed technical review. If not, NRC will return the application to the Department.

The NRC staff is well qualified and prepared to conduct a detailed, independent technical review of the application. We are supported in our review by our Center for Nuclear Waste Regulatory Analysis. We will examine the license application to determine if the Department has demonstrated that the proposed repository will protect people and the environment in compliance with EPA standards and NRC's requirements.

We will document our conclusions in a safety evaluation report and, in addition, the NRC will provide an opportunity for formal, public, evidentiary hearings on DOE's application that will follow a well-established set of rules and procedures. NRC will decide whether to deny or authorize the construction of the proposed repository by objectively reviewing the information submitted, by making decisions on contested matters based on the record before it, and by maintaining an open, public, adjudicatory process.

NRC's high-level repository program is in the midst of an important transition, moving from our pre-licensing role to that of a more customary role as regulatory and as licensing authority. DOE

bears the responsibility for demonstrating that the regulatory and licensing requirements have been fulfilled. The Commission independently will decide whether to authorize construction within the three to 4 year period allotted by the Congress.

I thank you for the opportunity to discuss NRC's licensing and regulatory role, and look forward to answering questions that you may have.

[The prepared statement of Mr. Weber follows:]

STATEMENT OF MICHAEL WEBER, DIRECTOR, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, U.S. NUCLEAR REGULATORY COMMISSION

INTRODUCTION

Madam Chairman and Members of the Committee, it is my pleasure to appear before you today to discuss the process whereby the U.S. Nuclear Regulatory Commission (NRC) will review and decide whether or not to authorize the U.S. Department of Energy (DOE) to build a repository. Because of the NRC's licensing and adjudicatory role in the national repository program, the NRC takes no position, at

this time, on whether a permanent geologic repository can be constructed safely at Yucca Mountain, Nevada. That remains to be demonstrated by DOE. If DOE submits a license application, the NRC will decide whether or not to authorize construction of a repository upon NRC's comprehensive and independent safety review, and upon consideration of the results of a full and impartial public hearing.

## CONGRESS ESTABLISHED NRC'S HIGH-LEVEL WASTE REGULATORY ROLE

The NRC has developed and maintained its High-Level Waste regulatory program, consistent with our responsibilities under the Nuclear Waste Policy Act of 1982, as amended, and the Energy Policy Act of 1992. This legislation specified an integrated approach and a long-range plan for storage, transport, and disposal of spent nuclear fuel and High-Level Waste. It prescribes the respective roles and responsibilities of the NRC, the DOE and the U.S. Environmental Protection Agency (EPA) in the nation's High-Level Waste program. The

Congress assigned NRC certain pre-licensing responsibilities and the regulatory authority to authorize construction of a geologic repository at Yucca Mountain after deciding whether a DOE license application complies with applicable standards and regulations.

## NRC IS PREPARED TO IMPLEMENT FINAL EPA STANDARDS FOR YUCCA MOUNTAIN

The Congress directed NRC to establish safety and licensing regulations consistent with standards for Yucca Mountain set by EPA. EPA standards and conforming NRC regulations for Yucca Mountain were published in 2001. As you know, both were challenged in court, and, in 2004, both were upheld on all but one issue, namely the EPA's specification, and NRC's adoption, of a 10,000-year compliance period. In 2005, EPA proposed additional standards that would apply for a million years, and NRC proposed to incorporate EPA's additional standards in our regulations. NRC stands ready to conform our regulations to final EPA standards as soon as they are published.

## NRC IS PREPARED TO EVALUATE DOE'S LICENSE APPLICATION

NRC must decide whether or not to authorize DOE to build the proposed repository. If authorization is granted, NRC must assure that DOE complies with NRC's requirements. NRC will base its decision on DOE's anticipated application to build a repository at Yucca Mountain on a comprehensive, independent safety review and on the results of a full and impartial public hearing before an independent panel of judges. Before NRC may even start its safety review, however, we must first decide if we can accept DOE's application for review. NRC will need to determine whether the application contains the required information and whether there is enough supporting information to address the elements of DOE's safety case, DOE must also comply with NRC's document access requirements. If the application passes this initial review, which may take up to 6 months, NRC can begin its detailed technical review. If not, NRC will return the application to DOE.

The NRC staff is well qualified and is prepared to conduct a detailed, independent technical review of the application. NRC is supported in this effort by its conflict-of-interest free, federally funded research and development center at Southwest Research Institute, the Center for Nuclear Waste Regulatory Analyses. If necessary, the NRC staff is prepared to require more information from DOE and the NRC staff has the resources to perform independent analyses, as needed. In its review, the NRC staff will examine the license application to determine if DOE has demonstrated that its proposed repository will protect people and the environment, in compliance with EPA's standards and NRC's requirements. Once the NRC staff has completed its comprehensive review, it will document its conclusions in a Safety Evaluation Report.

The NRC will provide the opportunity for formal, public, evidentiary hearings on DOE's application that will follow well-established rules and procedures. Documents from all parties and potential parties to the hearing will have already been submitted to the Licensing Support Network to shorten the time spent on the exchange of documents that may be used as evidence in the proceeding. NRC will decide whether to deny or authorize construction of the proposed repository by objectively reviewing information submitted, by making decisions on contested matters based on the record before it, and by maintaining an open, public adjudicatory process.

SUMMARY

The NRC staff is in the midst of an important transition—from the pre-licensing, consultative role defined for NRC in statute, which was the NRC's emphasis for many years, to the role as regulator and licensing authority, as NRC prepares for DOE's license application. The DOE bears the responsibility for demonstrating that regulatory and licensing requirements are met to protect public health and safety and the environment. The Commission, independently, must assess and find that such a demonstration has been made before we can decide whether or not to authorize construction of the proposed geologic repository. NRC's ability to reach this important decision within the three to 4 years allotted by the Congress, depends upon: the issuance, by EPA, of final environmental standards, to which NRC can conform its regulations; receipt of a high-quality license application from the DOE that demonstrates that NRC regulations and licensing requirements have been met; and continued sufficient resources for the NRC to maintain its independent technical review capability and carry out its public hearing process. I want to thank you for the opportunity to discuss NRC's regulatory role for the proposed repository, and look forward to answering any questions you may have.

RESPONSES BY MICHAEL WEBER TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

*Question 1.* It is my understanding that DOE expects to only have about 35 percent of the designs complete for both sub-surface and surface facilities at Yucca Mountain when it submits its license application to the NRC in June •08, or earlier. During the question and answer period, you mentioned that this is not unusual. Please provide examples of other NRC applicants who have submitted applications with designs that are substantially incomplete, including the level of completeness for each application so filed.

Response. complete license application and how NRC decides that an application is complete enough to commence a safety review. Before beginning a safety review, NRC conducts an initial "acceptance review" of the application. The purpose of this review is to ensure that the application has all the information necessary for the staff to commence a detailed technical review. The NRC routinely performs acceptance reviews of the many different types of license applications it receives, including applications for construction and operation of nuclear power plants, fuel cycle facilities, and others. The acceptance review serves as a screening process for faulty license applications, and prevents NRC from spending resources on incomplete applications. If NRC finds that information is missing or inadequate, NRC notifies the applicant and asks the applicant to supplement or withdraw the application.

NRC will conduct such an acceptance review if it receives a license application for the geologic repository at Yucca Mountain. NRC's regulations at 10 CFR Part 63 contain detailed requirements for the content and scope of DOE's license application. NRC will perform an acceptance review against these requirements. If NRC finds that DOE has not provided enough information to satisfy the requirements in the regulations, the NRC can either reject the application as an insufficient submittal or provide DOE an opportunity to supplement or withdraw the application. NRC does not expect, nor will it accept, an application with incomplete safety information from DOE or any other applicant. NRC has an established process to ensure that any license application it receives from DOE or other applicants has the required level of detail to justify an NRC technical review.

Once the NRC staff begins its comprehensive review, there is no predetermined level of detail or prescribed percentage of compliance for safe operation of the proposed repository. NRC's regulations contain a comprehensive set of performance criteria and safety requirements with which DOE must comply before NRC can authorize construction. NRC will perform a technical evaluation of the information provided by DOE against the requirements set forth in the regulations. If NRC finds DOE demonstrates compliance with the regulatory requirements, it can issue a construction authorization. Otherwise, NRC can request more information or, in the absence of sufficient information, it can deny a construction authorization.

NRC's regulations do not require DOE to provide all aspects of the repository's design before receiving a construction authorization. DOE needs to provide sufficient detailed design information about those design aspects most important to radiological safety. While NRC will ensure that DOE meets all applicable regulatory requirements, its technical review will focus on the most important features or systems of the repository design. It is DOE's responsibility to determine the adequate

level of design detail that it will provide in its application and that it believes supports its compliance demonstration.

For instance, due to the arid desert environment at Yucca Mountain, the NRC anticipates that DOE plans to include dust suppression and control systems as a part of the overall repository design. However, if NRC confirms that DOE's safety analysis can show compliance with NRC's radiological safety requirements without these systems, NRC would not expect DOE to provide detailed design information for them.

To receive construction permits and operating licenses, applicants for the 104 currently operating nuclear power reactors were requested, in many instances, to provide additional information on structures, systems, and components important to safety to allow NRC to complete its review and finding. Applicants provided varying levels of design detail in their license applications. In most of these cases, NRC determined that more information was necessary and, accordingly, requested more information from the applicant before issuing a license. NRC's approach to its licensing review, including the separation of the acceptance review and the detailed technical review processes, ensures that the NRC's time and resources are spent efficiently and effectively, at the same time, ensuring that facilities licensed by the NRC protect public health and safety and the environment.

*Question 2.* The Nuclear Waste Policy Act directed the NRC to complete the repository licensing process within 3 years, with a possible 1-year extension. When does the 3 year clock start? And, what is the NRC's plan if any portion of the license review process takes longer than anticipated?

Response. The 3 year clock for the license review starts once the NRC announces its decision to accept the license application for review. After NRC receives a license application, the NRC staff will decide whether the application is sufficiently complete for NRC to begin its safety review. During this time period, the staff will conduct a separate review pursuant to 10 C.F.R. § 51.109 to determine whether it is practicable to adopt DOE's environmental impact statement. If the staff finds that it can accept the application for review, NRC will docket the application and publish a Notice of Hearing in the Federal Register.

NRC will take the time necessary to perform a thorough safety review. The NRC staff believes it has the necessary expertise and infrastructure to perform its technical review within the statutory time constraints. There is no easy way, however, to predict the issues that may arise during the licensing review, or the time it will take to address them. NRC will authorize construction of the proposed repository only if it finds that its regulations and requirements have been met.

If NRC finds that the established deadline is not sufficient for completing its licensing review responsibilities, then NRC will initiate the appropriate consultation with Congress about the schedule and the proposed completion of its review.

*Question 3.* During the question and answer period, I inquired as to whether there are any circumstances under which the NRC would decide not to issue a license for DOE to construct the Yucca Mountain repository. You indicated that NRC would have to satisfy each of the requirements in your regulations. Can you describe the key requirements that DOE will need to meet?

Response. NRC's regulations include specific safety criteria for the potential repository at Yucca Mountain and for assessments used to demonstrate that the repository can achieve those criteria. For example, DOE must demonstrate that during waste emplacement, and before final closure of the repository, no member of the public would receive a dose greater than 0.15 millisieverts (15 millirems) each year due to normal repository operations. DOE must provide a comprehensive safety analysis called a preclosure safety analysis, showing that operational dose limits will be met. DOE must also show that it will protect repository workers using the same standards that apply to workers at all other nuclear facilities licensed by NRC.

DOE must also demonstrate that projected doses, far in the future, will meet specific dose limits. DOE must show that for 10,000 years after disposal, a reasonably, maximally exposed individual would receive a dose no greater than 0.15 millisieverts (15 millirems) each year from the repository. EPA has yet to issue final standards that identify a limit for the period after 10,000 years. In 2005, EPA proposed additional standards to control potential doses that could occur beyond 10,000, up to one million years. NRC will modify its regulations to be consistent with EPA's additional standards as soon as they are promulgated.

DOE must show that releases from the repository system do not cause radioactivity in groundwater to exceed EPA limits that have been incorporated in NRC's licensing regulations. Separate standards for groundwater are designed to protect the groundwater resources near Yucca Mountain.

To show whether the proposed repository would meet these standards, NRC requires DOE to conduct a comprehensive performance assessment of how the repository will function after it is closed. Consistent with NRC regulations, DOE must identify and describe the capabilities of the barriers it includes in its Total System Performance Assessment (TSPA), and on which it relies to show compliance with the safety limits.

In addition to demonstrating compliance with EPA standards, as incorporated in NRC's regulations, DOE must also demonstrate compliance with detailed NRC regulations governing physical protection and security; emergency planning; retrieval of waste; monitoring and testing; and other aspects of safe waste disposal. For a more complete description, see the enclosed brochure, "Judging the Safety of a Repository at Yucca Mountain, Nevada: U.S. Nuclear Regulatory Commission Requirements."

*Question 4.* 1Has NRC met with EPA to discuss the proposed EPA Yucca Mountain radiation standard rule? If so, were these meetings open to the public?

Response. Yes, NRC staff members have met with EPA staff members to discuss EPA's proposed standards and NRC's proposed implementing regulations. The Nuclear Waste Policy Act directs the NRC to adopt EPA's final standard, once issued. Therefore, it is both appropriate and important for NRC to understand EPA's approach and to explain and discuss NRC's implementation issues and approach.

Although these intergovernmental meetings were not open to the public, it is important to stress that both the EPA's proposed standards and NRC's proposed regulations, including the rationale for each, were provided to the public for comment. After careful consideration of the public comments, both EPA and NRC will promulgate their final standards and regulations and explain how public comments were addressed.

*Question 5.* Please send copies of all documents related to any meetings, conversations, or correspondence between NRC and either EPA or DOE concerning the proposed EPA Yucca Mountain radiation rule.

Response. Enclosed are the appropriate NRC-generated documents. The remaining documents in our possession were either provided to the NRC by EPA or DOE, or are NRC-generated documents that would reveal the substance of the draft final rule, which is the responsibility of EPA to develop and promulgate. We request that you obtain these documents from EPA and DOE, the originating agencies.

*Question 6.* If the EPA does not issue the Yucca Mountain radiation rule before DOE submits the license application to NRC, will the EPA's failure to do so impede or otherwise affect, in any way, Nevada's ability to file a legal challenge against DOE's license application?

Response. 1No. If the EPA does not issue final radiation standards for Yucca Mountain before DOE submits a license application to NRC, it will still be possible for Nevada to request an NRC hearing on the DOE license application should the NRC decide to docket the application and publish a notice of hearing.

If DOE were to file an application in the absence of final EPA radiation standards, it may be necessary for DOE to amend its application once final standards are issued to address the provisions of the EPA rule. In this event, Nevada would have the opportunity, consistent with NRC regulations, to seek to raise new or amended contentions based on DOE's supplement to the application.

*Question 7.* Will the NRC docket the DOE's license application if the EPA has not yet issued the Yucca Mountain radiation standard rule?

Response. NRC could docket the application and commence its independent safety review. In the absence of final EPA standards and final NRC requirements that are consistent with them, NRC would not be able to complete its review or decide whether to deny or grant DOE authorization to construct the proposed repository. NRC's decision whether to docket the license application and begin the safety review under these circumstances will be based on consideration of all relevant information available and the circumstances at the time the license application is submitted.

Specifically, EPA's standards and NRC's regulations for a period up to 10,000 years are in final form. EPA has yet to issue final standards applicable to the period after 10,000 years. Thus, NRC could docket the license application and begin reviewing those portions of the license application not governed by EPA standards for the period after 10,000 years. Once final standards and regulations for a different timeframe are in place, DOE could supplement its license application as necessary and NRC could review those portions of the license application.

*Question 8.* If the EPA fails to issue the Yucca Mountain radiation standard rule before the DOE submits its license application, what steps, if any, will NRC take to ensure that the EPA's post-license application rule issuance does not prejudice the rule's challengers?

Response. NRC's regulations governing adjudications provide for situations where, for any number of reasons, applications may have to be supplemented. As stated in our response to an earlier question, NRC will reach no decision to either deny or grant a license application in the absence of final EPA standards and final NRC regulations that incorporate them. If NRC were to docket the license application, and commence its independent safety review, that part of the review would address only those aspects of the application not affected by EPA standards for the period after 10,000 years. For these reasons, NRC does not believe that those opposed to the provisions of the final rule would be prejudiced.

*Question 9.* Why does NRC insist that its staff be a party advocate in favor of DOE's application? Why must Nevada and other opponents have to battle two Federal agencies as opposed to just the one that has the burden of proof? Could NRC staff not offer evidence at the licensing hearing to help judges evaluate technical information without acting as a party advocate in favor of DOE's application?

Response. It is not the role of the NRC staff to act as an advocate for DOE or to defend the application on behalf of the DOE. An applicant, in this case DOE, bears the burden of establishing that its application satisfies all regulatory requirements. The NRC staff will present its own independent views in NRC's licensing proceeding. This ensures that the Atomic Safety and Licensing Board and the Commission have the benefit of the staff's expertise in its decision making process and should aid in the development of an adequate record upon which the NRC licensing decision will be based.

The NRC staff has participated in licensing proceedings before the agency since the inception of the Commission's regulatory program. Historically, the Commission has considered the role of the NRC staff in hearings and concluded that it is appropriate for the staff to be a party to provide its expertise and its independent analysis in the review of contested applications.

With respect to any Yucca Mountain Hearing, in a February 20, 2001 letter to Mr. Robert Loux, Executive Director of Nevada's Agency for Nuclear Projects, then NRC Chairman Richard Meserve said:

> . . . . As envisioned in [the] procedures [in 10 CFR Part 2, Subparts J and G] and in the Commission's regulations for the licensing of a repository, the NRC staff, with the assistance of the Center for Nuclear Waste Regulatory Analyses (CNWRA), will conduct an independent technical review of DOE's license application and Safety Analysis Report if and when they are received and will prepare a Safety Evaluation Report (SER) documenting the review and conclusions. Then, the NRC staff, as a party in the hearing, will independently present and support its technical analyses and SER insofar as it bears on the issues placed in controversy in a potential hearing and will take and support a position on those issues based on the staff's and CNWRA's expert analyses.
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> The staff's analyses, positions, and regulatory conclusions will be wholly independent of those of DOE. The Commission believes that the staff's participation as a party is useful to the Atomic Safety and Licensing Board, the other parties, and the public as it will provide an independent regulatory perspective for the record. Both the Commission and the NRC staff are fully aware of and committed to maintaining objectivity in regulating the activities of DOE or any other regulated entity. That objectivity will not be undercut—indeed, it will be enhanced—by the presentation by the staff of its independent views as a party in a potential hearing.

It has often been recognized that whatever appearance of staff-applicant agreement there may be, it is the result of a long and very public process. The core of this process is the staff's diligent and extended inquiry into the application, an inquiry that requires many meetings with the applicant; meetings that are routinely announced to the public, so that interested persons can attend and participate. In 1986, the Commission, addressing the appearance issue more generically, said:

> . . . . [The appearance] is attributable not to bias on the staff's part but to the nature of the staff's extensive prehearing review of the application. The applicant often makes changes in the application in order to secure the staff's approval, so that by the time the hearing commences, many of the staff's concerns have been accommodated.

*Question 10.* By only requiring that the DOE's computer simulation meet one test—that the predicted radiation dose to an individual 18 kilometers from Yucca Mountain stay below the EPA limit—NRC has effectively abandoned "defense in depth." How can you justify not having individual requirements on the separate safety features, as you do for reactors?

Response. NRC regulations contain multiple criteria against which DOE's performance assessment, including DOE's computer simulations, will be evaluated. Although DOE's total system performance assessment, or TSPA, must demonstrate

compliance with EPA's numerical limits, DOE's TSPA must also show that the proposed repository comprises multiple barriers (both engineered and natural or geologic) consistent with a defense-in-depth safety approach.

NRC regulations for the proposed repository at Yucca Mountain represent a unique application of NRC's defense-in-depth philosophy to a first-of-a-kind facility. While waste is being emplaced, and before a geologic repository is closed, its operation is readily amenable to regulation in much the same manner as any other large, NRC-licensed facility. Application of defense-in-depth principles for regulation of repository performance for long time periods following closure, however, must account for the difference between a geologic repository and an operating facility with active safety systems and the potential for active control and intervention. For the most part, the safety components of a nuclear power plant work or fail in a binary fashion, and extensive actuarial data exist to form the basis for estimating failure rates. The components of a repository, on the other hand, are expected to behave continuously over long timeframe for which performance data may be scarce or nonexistent. As a result, performance of repository safety systems and subsystems must be extrapolated from limited data. For example, the waste package is expected to go from a State of complete integrity and total containment of the waste to a State of very gradual failure over tens to hundreds of thousands of years. Assessment of the safety of such a system over long timeframe is best evaluated through consideration of the relative likelihood of threats to its integrity and performance, in the context of overall system behavior. For these reasons, NRC's regulations provide DOE flexibility to determine the types and capabilities of barriers it will rely on to demonstrate the repository will perform within the safety requirements.

The National Academy of Sciences in its report on Yucca Mountain Standards recommended that NRC not specify separate requirements for subsystems (i.e., individual barriers). Consistent with this NAS recommendation, and the reasons stated above, the NRC did not specify separate limits for individual barriers. Instead, NRC's regulations require DOE to identify and describe the capabilities of the barriers it includes in its TSPA, and on which it relies to show compliance with the safety limits. NRC will perform a risk-informed review of DOE's TSPA to decide whether DOE complies with applicable safety regulations. This means that NRC will review each barrier important to waste isolation with a rigor commensurate with the safety significance of the barrier.

The Commission considers this approach for multiple barriers and defense-in-depth in its Part 63 regulations both appropriate and protective. When NRC issued final Part 63 on November 2, 2001 (66 FR 55758), the Commission stated the goal of the regulations regarding multiple barriers and defense-in-depth and explained its reasoning for not specifying requirements for specific barriers:

> . . . [T]he emphasis should not be on the isolated performance of individual barriers but rather on ensuring the repository system is robust, and is not wholly dependent on a single barrier. Further, the Commission supports an approach that would allow DOE to use its available resources effectively to achieve the safest repository without unnecessary constraints imposed by separate, additional subsystem performance requirements. It is also important to remember that Part 63 requires DOE to carry out a performance confirmation program to provide further confidence that barriers important to waste isolation will continue to perform as expected (66 FR 55758).

The court addressed this same issue in Nevada's suit challenging the Part 63 rule:

> Specifically, Nevada contests NRC's use of defense-in-depth at the proposed Yucca Mountain repository through an overall system performance assessment rather than using the approach of its older regulations, which approach tests the individual performance of the repository's 'system elements.' [ . . . ] In light of NRC's detailed analysis supporting its decision to evaluate the performance of the Yucca Mountain repository based on the barrier system's overall performance, we believe that it adequately explained its change in course. [ . . . ] Accordingly, we conclude that NRC acted neither arbitrarily nor capriciously in rejecting Part 60's subsystem performance approach in favor of the overall performance approach. NEI v. EPA; 373 F.3d 1251, 1295-97 (D.C. Cir. 2004).

*Question 11.* Recent documents found on the NRC's Licensing Support Network reveal that DOE might be planning to unveil a new performance assessment model to replace the Total System Performance Assessment after the Department submits its license application. In what ways would such an action by DOE slow NRC's review of the license application? Would NRC have to re-consider its decision to docket the license application?

Response. NRC could reconsider its decision, depending upon the effect of the new model on DOE's compliance demonstration. If the new information were to dramati-

cally change DOE's application, the NRC staff could allow DOE to withdraw, revise and resubmit the license application. The staff would then begin a new acceptance review, once DOE resubmits its application. If the new information enhances, but does not fundamentally alter DOE's compliance demonstration, it would be possible for NRC staff to continue the review. Depending on the nature and extent of new information, and its effect on DOE's demonstration of compliance, NRC staff would consider whether adjustments to the review schedule would be needed.

*Question 12.* In its preliminary designs for the repository, DOE proposes to install titanium drip shields over the nuclear waste packages in order to keep water from corroding the packages. However, DOE has said that it would install them just prior to repository closure, 100 to 300 years after beginning waste disposal. Will NRC allow DOE to count on drip shields in its safety analysis for Yucca Mountain, despite the fact that the drip shields may never be installed?

Response. DOE must apply to NRC for authorization to build the proposed repository. Under NRC's regulations, DOE must show that its proposal will comply with specified performance objectives for the geologic repository after permanent closure. If DOE files an application, and if NRC accepts the application for review, NRC will begin a thorough safety review. In that review, the NRC staff will evaluate whether DOE's proposed design, including reliance on any specific design feature or component of the engineered barrier system, such as a drip shield, succeeds in making the required demonstration.

The NRC staff will then document its assessment in a public Safety Evaluation Report. If DOE's application fails to make the necessary demonstrations of compliance with the Commission's regulations, the NRC staff will not authorize construction. If the NRC staff recommends that NRC authorize construction, the NRC may specify license conditions, as needed, to provide reasonable expectation that relevant performance objectives will be met. NRC can only assess the need for such conditions, their reasonableness, and their potential to be enforced in the context of DOE's overall design as presented in a license application.

Once the NRC staff completes its review and documents its conclusions, NRC will hold formal, public, evidentiary hearings on DOE's application before an independent panel of judges. These hearings will afford potential parties, including the State of Nevada, with the opportunity to propose and justify contentions about the completeness and adequacy of the safety case DOE presents in its license application. If—based on its independent safety review and on consideration of the results of a full and impartial public hearing—NRC is able to authorize construction, NRC would oversee that construction to ensure DOE complies with NRC regulations and with conditions of its authorization.

Before DOE could actually begin disposal of waste at the repository, however, DOE would need to formally ask NRC to issue a license to receive and possess waste. Any decision by NRC to grant or deny this request would, itself, require consideration of another comprehensive, independent safety review, and opportunity for another public hearing. Under no circumstances would NRC permit DOE to receive and possess waste at a repository without finding that public health and safety and the environment are protected. If NRC allows DOE to operate the repository, NRC would oversee DOE operations to ensure DOE complies with NRC regulations and with all conditions of its license.

If DOE proposes to install drip shields and if the drip shields are considered important for waste isolation or repository performance, the installation of the drip shields at an appropriate time would become part of the license conditions. If DOE were to decide, at a later date, not to install the drip shields, the decision would require specific regulatory approval in the form of a license amendment which would be subject to technical review and the potential for a hearing as part of the amendment process. Alternatively, DOE may be able to demonstrate regulatory compliance without the drip shields but still propose to install the drip shields as an additional barrier. Under such circumstances, as long as DOE could demonstrate that the drip shields would not degrade the performance of the repository, installation of the drip shields would not be a requirement in the license.

*Question 13a.* Do you believe that the 20-year opposition by the State of Nevada regarding the Yucca Mountain project is a relevant factor for consideration?

Response. Under the national policy framework set forth by the Congress in the Nuclear Waste Policy Act (NWPA) of 1982, as amended, NRC must consider DOE's application, pursuant to NRC's authority under the Atomic Energy Act. NRC will decide whether to deny or grant the application only after it completes a comprehensive safety review of the application, and considers the results of a full and impartial public hearing. NRC has assured, through its hearing process, that Nevada, Affected Units of Local Government in Nevada and California, Affected Tribes, and

other potential parties will have opportunities to present their concerns about DOE's demonstration of compliance with applicable standards and regulations.

*Question 13b.* Do you believe that permanent spent nuclear fuel storage should be located in any State that has expressed overwhelming opposition to such a facility?

Response. As discussed above, this is a question of public policy that has already been addressed by the Congress. Consistent with statutory direction, NRC will deny or authorize construction of the proposed repository based on its determination of whether or not the health and safety of the public and the environment will be protected, in accordance with NRC's regulations.

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RESPONSES BY MICHAEL WEBER TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

*Question 1.* If EPA's radiation standard has not been finalized when DOE files the license application next year, what actions can NRC take on the application prior to finalization of the standard?

Response. NRC could docket the application and commence its independent safety review. In the absence of final EPA standards and final NRC requirements that are consistent with them, NRC would not be able to complete its review or decide whether to deny or grant DOE authorization to construct the proposed repository. NRC's decision whether to docket the license application and begin the safety review under these circumstances will be based on consideration of all relevant information available and the circumstances at the time the license application is submitted.

Specifically, EPA's standards and NRC's regulations for a period up to 10,000 years are in final form. EPA has yet to issue final standards applicable to the period after 10,000 years. Thus, NRC could docket the license application and begin reviewing those portions of the license application not governed by EPA standards for the period after 10,000 years. Once final standards and regulations for a different timeframe are in place, DOE could supplement its license application as necessary and NRC could review those portions of the license application.

*Question 2.* Ms. Masto contends that NRC staff will unfairly become an advocate for DOE during the hearing process following the Safety Evaluation Report. Will you please describe the role of NRC staff in the hearing process?

Response. The role of the NRC staff in the hearing process is to independently present and support its technical analyses and Safety Evaluation Report (SER) insofar as it bears on the issues placed in controversy in a potential hearing. An applicant, in this case DOE, bears the burden of proving its own case in a licensing proceeding. The NRC staff is free to present its own views in a proceeding regarding its review of a potential Yucca Mountain License Application. This freedom ensures that the Atomic Safety and Licensing Board and the Commission have the benefit of the staff's technical and regulatory expertise in the decision making process.

The NRC staff has participated in licensing proceedings before the agency since the inception of the Commission's regulatory program. Historically, the Commission has considered the role of the NRC staff in hearings and concluded that it is appropriate for the staff to be a party to provide its expertise and its independent analysis in the review of contested applications.

With respect to any Yucca Mountain hearing, in a February 20, 2001 letter to Mr. Robert Loux, Executive Director of Nevada's Agency for Nuclear Projects, then NRC Chairman Richard Meserve said,

> . . . . As envisioned in [the] procedures [in 10 CFR Part 2, Subparts J and G] and in the Commission's regulations for the licensing of a repository, the NRC staff, with the assistance of the Center for Nuclear Waste Regulatory Analyses (CNWRA), will conduct an independent technical review of DOE's license application and Safety Analysis Report if and when they are received and will prepare a Safety Evaluation Report (SER) documenting the review and conclusions. Then, the NRC staff, as a party in the hearing, will independently present and support its technical analyses and SER insofar as it bears on the issues placed in controversy in a potential hearing and will take and support a position on those issues based on the staff's and CNWRA's expert analyses.

The staff's analyses, positions, and regulatory conclusions will be wholly independent of those of DOE. The Commission believes that the staff's participation as a party is useful to the Atomic Safety and Licensing Board, the other parties, and the public as it will provide an independent regulatory perspective for the record. Both the Commission and the NRC staff are fully aware of and committed to maintaining objectivity in regulating the activities of DOE or any other regulated entity.

It has often been recognized that whatever appearance of staff-applicant agreement there may be is the result of a long and very public process. The core of this process is the staff's diligent and extended inquiry into the application, an inquiry that requires many meetings with the applicant, meetings that are routinely announced to the public, so that interested persons can attend and participate. In 1986, the Commission, addressing the appearance issue more generically, said,

. . . . [The appearance] is attributable not to bias on the staff's part but to the nature of the staff's extensive prehearing review of the application. The applicant often makes changes in the application in order to secure the staff's approval, so that by the time the hearing commences, many of the staff's concerns have been accommodated.

*Question 3.* In her testimony as Nevada's Attorney General, Ms. Masto claims that the licensing process is biased and denies Nevada due process rights. Would you please describe in detail the opportunities the State of Nevada will have to participate in the licensing process? Please include opportunities for participation all related agency activities in preparation for considering a construction authorization application.

Response. The NRC hearing procedures for Yucca Mountain are set forth in published Commission regulations, principally its Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders, which are published at 10 C.F.R. Part 2. Under these procedures, Nevada, as the "host State" may seek to participate as a Party to a Yucca Mountain licensing proceeding. Nevada does not need to establish standing, but must submit one admissible issue of law or fact, called contentions in the Commission's regulations, to be granted party status. In addition to contentions about the license application, the State, if it so chooses, may also file contentions that it is not practicable for NRC to adopt the DOE's Environmental Impact Statement. As a party, Nevada is entitled to litigate its contentions, and may engage in discovery, file motions, sponsor its own witnesses to support its position, participate in questioning witnesses of other parties, file briefs, and appeal Licensing Board decisions to the Commission.

In the alternative, if Nevada does not wish to participate as a party, it may also participate as an "interested government." As an interested government, Nevada would identify those contentions submitted by other parties that were admitted for hearing upon which it would participate. Nevada could then engage in discovery, introduce evidence, interrogate witnesses, file proposed findings and appeal Licensing Board decisions to the Commission.

Since the late 1970's, the Commission has expressed its support for the role and involvement of the State and of local communities affected by a potential repository. The Congress provided a role and funding for the State of Nevada, the Affected Units of Local Government, and Affected Tribes with the enactment of the Nuclear Waste Policy Act, as amended. For the past 20 years, NRC has conducted extensive public pre-licensing interactions with DOE, which representatives of the State have attended. State and affected government representatives have accompanied NRC staff at many observation audits of DOE's program. At the State's request, NRC staff conducted a workshop for the State's experts on NRC's Total-system Performance Assessment (TPA) computer code and on NRC's plan's for reviewing DOE's performance assessment.

Finally, the use of the Licensing Support Network (LSN) enhances the public's access to all documents that may be used during NRC's public hearing for the repository. The LSN is an Internet-based portal where all participants of the hearings will make their documents available. The portal is open to public access and can be used by anyone to search and view any document that hearing participants may use during the hearings.

*Question 4.* If new information is added to the license application after the deadline for filing contentions has passed, what opportunities will there be to dispute that new information?

Response. If new information were added to a license application after the deadline for filing contentions has passed, Nevada would have the opportunity, consistent with NRC regulations, to seek to raise new or amended contentions based on the information added to the license application.

*Question 5.* Lincoln County, Nevada, petitioned the NRC 6 months ago to allow Affected Units of Local Government to be represented in the licensing process by "duly authorized representatives" since Lincoln County does not have the resources to commit to experienced legal counsel. Resolution of this petition is crucial to Lincoln County's ability to represent its citizens in the licensing proceeding. Please describe how the NRC will address this petition expeditiously and afford Lincoln County the opportunity to participate fully given their limited resources.

Response. Because NRC's current regulations already allow Lincoln County the representation it seeks, the Commission recently denied the petition as unnecessary (December. 20, 2007 letter to counsel for Lincoln County, NV). Under NRC's regulations, any duly authorized individual may represent an Affected Unit of Local Government in NRC adjudications, including Lincoln County, so long as the representation complies with State law and any applicable local government charter. Lincoln County has a clear right under NRC's regulations to appear on its own behalf, as well as be represented by an attorney. Although the regulations do not define the extent of this self-representation right for government bodies, the Commission has decided that States and local government bodies (as defined in 10 CFR § § 2.309(d)(2) and 2.315(c)) may be represented in NRC adjudications by any duly authorized individual chosen in accordance with State law and any applicable local government charter. A Notice of the Commission's decision will appear in the Federal Register.

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RESPONSES BY MICHAEL WEBER TO ADDITIONAL QUESTIONS FROM SENATOR CLINTON

*Question 1.* It has been reported that at some point during NRC's review of the Yucca Mountain license application, the Commission's staff actually step in and defend the application on behalf of the DOE. This raises a number of troubling questions about the NRC's role in the process. Can you please explain the process in which NRC staff advocates in favor of licensing the repository before the Commission? Having NRC staff advocate for the DOE in this process seems to put DOE at a huge advantage of persuading the Commission to authorize construction. Do the staff that are defending the petition only make arguments in favor of licensing? If they identify a problem with the application or a reason why the repository should NOT be licensed, are they at liberty to inform the Commission? Why doesn't the Commission make DOE advocate for itself? Please answer these questions, and explain how this is a fair and public process.

Response. It is not the role of the NRC staff to act as an advocate for DOE or to defend the application on behalf of the DOE. An applicant, in this case DOE, bears the burden of proving its own case in a licensing proceeding. The NRC staff is free to present its own views in a proceeding regarding its review of a potential Yucca Mountain License Application. This freedom ensures that the Atomic Safety and Licensing Board and the Commission have the benefit of the staff's unhindered technical and regulatory expertise in the decision making process.

The NRC staff has participated in licensing proceedings before the agency since the inception of the Commission's regulatory program. Historically, the Commission has considered the role of the NRC staff in hearings and concluded that it is appropriate for the staff to be a party to provide its expertise and its independent analysis in the review of contested applications.

With respect to any Yucca Mountain hearing, in a February 20, 2001 letter to Mr. Robert Loux, Executive Director of Nevada's Agency for Nuclear Projects, then NRC Chairman Richard Meserve said,

> . . . . As envisioned in [the] procedures [in 10 CFR Part 2, Subparts J and G] and in the Commission's regulations for the licensing of a repository, the NRC staff, with the assistance of the Center for Nuclear Waste Regulatory Analyses (CNWRA), will conduct an independent technical review of DOE's license application and Safety Analysis Report if and when they are received and will prepare a Safety Evaluation Report (SER) documenting the review and conclusions. Then, the NRC staff, as a party in the hearing, will independently present and support its technical analyses and SER insofar as it bears on the issues placed in controversy in a potential hearing and will take and support a position on those issues based on the staff's and CNWRA's expert analyses.
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> The staff's analyses, positions, and regulatory conclusions will be wholly independent of those of DOE. The Commission believes that the staff's participation as a party is useful to the Atomic Safety and Licensing Board, the other parties, and the public as it will provide an independent regulatory perspective for the record. Both the Commission and the NRC staff are fully aware of and committed to maintaining objectivity in regulating the activities of DOE or any other regulated entity. That objectivity will not be undercut—indeed, it will be enhanced—by the presentation by the staff of its independent views as a party in a potential hearing.

It has often been recognized that whatever appearance of staff-applicant teamwork there may be is the result of a long and very public process. The core of this process is the staff's diligent and extended inquiry into the application, an inquiry that requires many meetings with the applicant, meetings that are routinely an-

nounced to the public, so that interested persons can attend and participate. In 1986, the Commission, addressing the appearance issue more generically, said,

. . . . [The appearance] is attributable not to bias on the staff's part but to the nature of the staff's extensive prehearing review of the application. The applicant often makes changes in the application in order to secure the staff's approval, so that by the time the hearing commences, many of the staff's concerns have been accommodated.

If the staff identifies a problem with the application or sees a reason why the repository should not be licensed, the staff will inform the Commission.

*Question 2.* DOE's Total System Performance Assessment modeling program for the proposed Yucca Mountain repository will form the basis for DOE's license application. Please explain in detail how NRC will review DOE's conclusions based on TSPA. I understand it takes hundreds of computers to run this program. Does NRC have this capability? Will NRC run this program to check DOE's results? It is my understanding that nobody outside of DOE—not NRC, not the State of Nevada, nor any other stakeholder—has access to DOE's TSPA. How similar is NRC's Total Performance Assessment system to TSPA?

Response.

NRC REQUIRES DOE TO CONDUCT A PERFORMANCE ASSESSMENT

To comply with NRC's regulations the U.S. Department of Energy (DOE) must conduct a performance assessment to provide numerical estimates of potential radiological exposures to future residents near Yucca Mountain. A performance assessment is a systematic analysis that identifies repository features, events, and processes that could affect performance of a repository; examines their potential effects on repository performance; and estimates potential radiological exposures.

NRC regulations specify what a performance assessment must include and how it should be performed. DOE's performance assessment will necessarily comprise many parameters, models and assumptions that will be represented mathematically in many 'computer files.' DOE refers to these components, collectively, as its Total System Performance Assessment, or TSPA. It is important to understand that TSPA is not a single computer program.

DOE's TSPA is expected to perform hundreds or more separate simulations, or "runs," to depict the different ways a potential repository could perform over time. The estimates of overall repository performance, expressed as dose estimates, are saved in separate computer files. TSPA creates still more files that preserve intermediate results (such as infiltration rates, degradation rates of waste packages, timing and release rates of radionuclides from waste packages, and timing and release rates of radionuclides from the saturated zone).

NRC STAFF WILL CONDUCT AN INDEPENDENT SAFETY REVIEW OF DOE'S TSPA

NRC staff will perform a careful, independent review of the TSPA computer software itself, and of the many files created during multiple runs. These reviews will allow NRC staff to follow and confirm the many calculations within the TSPA and to examine the component parameters, models, and assumptions on which DOE relies to assert compliance in its license application. Key elements of NRC's review of DOE's TSPA computer programs and files include:

1) Adequacy of scenarios evaluated in the TSPA

NRC staff will examine the models, parameters, and assumptions in the computer program to verify the scenarios DOE uses in its TSPA properly represent the potential evolution of the repository. For example, the TSPA must account properly for the possible occurrence and timing of disruptive events.

2)Credibility of TSPA representation of performance

NRC staff will review the computer programs and files of the TSPA to decide whether DOE has properly verified the TSPA. The goals of this review are to find out whether: (1) DOE's codes model the physical processes in the repository system in the manner DOE intends; (2) assumptions made within TSPA are internally consistent; (3) estimates of uncertainty in the results are consistent with the model and parameter uncertainty included in the TSPA; and (4) repository performance and the performance of individual barriers, as represented by DOE in the TSPA, are consistent and reasonable.

3)Statistical stability and consistency of resulting dose estimates

NRC staff will examine the overall dose estimates and the intermediate results of the TSPA to ensure that (1) the results are statistically stable; (2) the estimated annual dose curves reflect contributions from all the scenarios evaluated; and (3) repository performance and the performance of individual components or subsystems are consistent and reasonable.

NRC STAFF HAS PREPARED BY REVIEWING PUBLICLY AVAILABLE VERSIONS OF EARLIER TSPA MODELS

Although DOE's TSPA for the license application is currently not available, NRC obtained published versions of the TSPA used for the Final Environmental Impact Statement (FEIS), for the Site Recommendation (SR), and most recently for the Supplemental Environmental Impact Statement (SEIS) to gain insights into how DOE intends to use the TSPA in its license application. NRC staff members use commercially available desktop computers to examine the computer programs and files of the TSPA for the FEIS, SR, and SEIS. Specifically, the staff has examined the calculations, results, parameters, models and assumptions within the TSPA for the FEIS, SR, and SEIS. We understand that DOE has made published versions of the TSPA available to the State of Nevada.

NRC HAS DEVELOPED THE RESOURCES IT NEEDS FOR AN INDEPENDENT REVIEW OF DOE'S TSPA

Conducting hundreds of computer runs to support the license application in a timely manner, as well as saving intermediate data for NRC's licensing review, requires DOE's use of a massive computer system. It is DOE's responsibility as an applicant for an NRC license to run these TSPA simulations. It is NRC's responsibility to confirm their validity.

DOE's computer cluster allows DOE to perform a very large number of simulations in a very short period of time. It is not possible to perform such a large number of rapid, multiple runs on a desk top computer. However, the NRC is able and prepared to perform single simulations of DOE's TSPA. When examining DOE's TSPA for the FEIS and SR, NRC staff performed single simulations on a high-performance desktop computer. The information necessary to conduct such evaluations is expected to be in the license application, which will be available to all parties. The NRC is already performing limited simulations with the TSPA for the FEIS and SR to gain insights on the model using desktop computers. The NRC staff is exploring the potential for linking several computers to improve efficiency of the licensing review by shortening the time required to perform simulations. However, if additional analyses are necessary, the NRC will require DOE to perform additional analyses and submit them for staff review. The staff does not intend to perform its own multi-simulation runs of the TSPA. Simple execution of the computer model is no substitute for the understanding developed through the comprehensive review described in items 1 through 3, above.

NRC has developed its own independent performance assessment model as well as its own detailed hydrologic models that NRC will use to support its critique of DOE's TSPA. The NRC's independent Total-system Performance Assessment model (TPA) is similar to DOE's TSPA in that both include similar processes (e.g., corrosion of waste packages, seepage of water into repository drifts, transport of radionuclides in groundwater). In certain cases, however, the models represent some processes differently. Such differences are expected due to uncertainties and limitations in the information supporting the estimates of repository performance far in the future. The NRC's independent TPA model is publicly available. Over the past 20 years, the NRC staff has published several reports documenting its development of TPA and the insights gained from its use. NRC will use these insights to assist its review of DOE's TSPA. As necessary, the staff will request additional information from DOE.

The Commission is confident the NRC staff is prepared to review DOE's TSPA in support of the license application. This review process will be open to the public. The Commission intends to ensure that the public, at a minimum, will have access to any TSPA codes and data that are accessible to the NRC staff or that impact safety determinations, providing the data does not involve appropriately protected information.

*Question 3.* Recent documents found on the NRC's Licensing Support Network reveal that DOE might be planning to unveil a new performance assessment model to replace the Total System Performance Assessment after the Department submits its license application. In what ways would such an action by DOE slow NRC's re-

view of the license application? Would NRC have to re-consider its decision to docket the license application?

Response. NRC could reconsider its decision, depending upon the effect of the new model on DOE's compliance demonstration. If the new information were to dramatically change DOE's application, the NRC staff could allow DOE to withdraw, revise and resubmit the license application. The staff would then begin a new acceptance review, once DOE resubmits its application. If the new information enhances, but does not fundamentally alter DOE's compliance demonstration, it would be possible for NRC staff to continue the review. Depending on the nature and extent of new information, and its effect on DOE's demonstration of compliance, NRC staff would consider whether adjustments to the review schedule are needed.

*Question 4.* DOE plans to include the installation of the "drip shields" up to 300 years into the future to keep water off waste containers. This is so uncertain, it may not be physically possible, and it's enormously expensive. It seems like DOE shouldn't be permitted to count on drip shields in its safety analysis. How can NRC allow this?

Response. DOE must apply to NRC for authorization to build the proposed repository. Under NRC's regulations, DOE must show that its proposal will comply with specified performance objectives for the geologic repository after permanent closure. If DOE files an application, and if NRC accepts the application for review, NRC will begin a thorough safety review. In that review, the NRC staff will evaluate whether DOE's proposed design, including reliance on any specific design feature or component of the engineered barrier system, such as a drip shield, succeeds in making the required demonstration.

The NRC staff will then document its assessment in a public Safety Evaluation Report. If DOE's application fails to make the necessary demonstrations of compliance with the Commission's regulations, the NRC staff will not authorize construction. If the NRC staff recommends that NRC authorize construction, the NRC may specify license conditions, as needed, to provide reasonable expectation that relevant performance objectives will be met. NRC can only assess the need for such conditions, their reasonableness, and their potential to be enforced in the context of DOE's overall design as presented in a license application.

Once the NRC staff completes its review and documents its conclusions, NRC will hold public, evidentiary hearings on DOE's application before an independent panel of judges. These hearings will afford potential parties, including the State of Nevada, with the opportunity to propose and justify contentions about the completeness and adequacy of the safety case DOE presents in its license application. If—based on its independent safety review and on consideration of the results of a full and impartial public hearing—NRC is able to authorize construction, NRC would oversee that construction to ensure DOE complies with NRC regulations and with conditions of its authorization.

Before DOE could actually begin disposal of waste at the repository, however, DOE would need to formally ask NRC to issue a license to receive and possess waste. Any decision by NRC to grant or deny this request would, itself, require consideration of another comprehensive, independent safety review, and opportunity for another public hearing. Under no circumstances would NRC permit DOE to receive and possess waste at a repository without finding that public health and safety and the environment are protected. If NRC allows DOE to operate the repository, NRC would oversee DOE operations to ensure DOE complies with NRC regulations and with all conditions of its license.

If DOE proposes to install drip shields and if the drip shields are considered important for waste isolation or repository performance, the installation of the drip shields at an appropriate time would become part of the license conditions. If DOE were to decide, at a later date, not to install the drip shields, the decision would require specific regulatory approval in the form of a license amendment which would be subject to technical review and the potential for a hearing as part of the amendment process. Alternatively, DOE may be able to demonstrate regulatory compliance without the drip shields but still propose to install the drip shields as an additional barrier. Under such circumstances, as long as DOE could demonstrate that the drip shields would not degrade the performance of the repository, installation of the drip shields would not be a requirement in the license.

*Question 5.* If the final EPA radiation standard is not published by the time DOE submits its LA, will NRC be able to docket DOE's submission? How far along in the LA review process can NRC proceed without a final radiation standard? At what point in the process must NRC stop reviewing the license application before EPA promulgates a final standard? Must the Radiation Standard be subjected to judicial

review in Federal court, with a final decision made, before NRC may issue a construction authorization?

Response. NRC could docket the application and commence its independent safety review. In the absence of final EPA standards and final NRC requirements that are consistent with them, NRC would not be able to complete its review or decide whether to deny or grant DOE authorization to construct the proposed repository. NRC's decision whether to docket the license application and begin the safety review under these circumstances will be based on consideration of all relevant information available and the circumstances at the time the license application is submitted.

Currently, EPA's standards and NRC's regulations for a period up to 10,000 years are in final form. EPA has yet to issue final standards applicable to the period after 10,000 years. Thus, NRC could docket the license application and begin reviewing those portions of the license application not governed by EPA standards for the period after 10,000 years. Once final standards and regulations are in place, DOE could supplement its license application as necessary and NRC could review those portions of the license application.

Federal agencies implement their rules beginning on the effective date of the rule. Absent a court order enjoining the application of the radiation standard, the NRC could issue a construction authorization while any judicial challenges to the radiation standard are pending. However, judicial challenges could be filed as soon as the radiation standard is promulgated. If a lawsuit were filed shortly after promulgation, we would expect that the litigation would be completed prior to the Commission's issuing a licensing decision.

*Question 6.* The Private Fuel Storage licensing process required more than 8 years to complete. Can the NRC realistically expect to complete the review of the Yucca Mountain license application in 4 years or less?

Response. NRC's priority during the licensing process is to ensure that the proposed repository at Yucca Mountain is safe and secure and that it will protect public health and safety and the environment. However, the NRC recognizes that the three-to 4-year period mandated by the NWPA to complete the licensing process for Yucca Mountain will be challenging and will require a significant amount of resources to accomplish. To accomplish this goal, the NRC must first complete a comprehensive safety evaluation of DOE's application. Second, the NRC must evaluate and determine if it is practicable to adopt DOE's Environmental Impact Statement. Third, the NRC must hold a full and fair public hearing. The NRC will take the time it deems necessary to complete these milestones and make an informed and complete decision on the safety of the repository. If NRC finds that the established deadline is not sufficient for completing its licensing review responsibilities, then NRC will initiate the appropriate consultation with Congress about the schedule and the proposed completion of its review.

Nevertheless, the NRC has and continues to undergo significant preparations to support the mandated 3-or 4-year period for the completion of its licensing review. The NRC staff, with the assistance of the Center for Nuclear Waste and Regulatory Analyses (a federally funded research and development center) has had over 20 years of experience and pre-licensing interactions with the DOE on the technical and regulatory issues of the proposed repository in Yucca Mountain. These pre-licensing interactions enhance the NRC's understanding of the engineering and science matters associated with the proposed repository. The NRC has also made significant efforts to make the hearing process more efficient and open to the public. To shorten the time spent on the exchange of documents that may be used as evidence in a public hearing for the repository, all participants will make their documents available via the Internet-based portal known as the Licensing Support Network (LSN). The LSN provides a single place where participants of the licensing hearing can search for documents from any and all of those collections in a uniform way.

Although these NRC-initiated efforts increase its ability to meet the stated deadline, there are also external events that significantly affect this ability and must occur to support the schedule. First, the NRC must receive a complete, high-quality license application from DOE to meet this deadline. A high-quality license application from DOE will minimize the need to seek information through supplements or requests for additional information. Additionally, the NRC must receive the required appropriations from Congress to carry out its statutory responsibilities in this area.

The NRC is aware that the Private Fuel Storage (PFS) facility underwent a long and protracted licensing process. Licensing was protracted in part because the licensee made several significant changes to the application after NRC staff had already begun its technical review. In addition, the process was prolonged by a highly contentious and litigated public hearing. While NRC also expects a public hearing for the proposed repository to be highly contested, the NRC is preparing to complete

a public hearing within the period specified in the Nuclear Waste Policy Act. As stated earlier, the NRC has significantly streamlined the document exchange process through the use of information technology and the LSN. Additionally, the NRC will likely have multiple boards conducting hearings, possibly simultaneously. The NRC intends to use multiple boards while doing its best to avoid simultaneous evidentiary hearings. These efforts contrast significantly with those taken during the PFS hearing process. During the PFS hearing process, the use of information technology was not used as extensively. Additionally, the NRC did not convene multiple boards to conduct simultaneous evidentiary hearings. The additional resources that NRC will devote for a public hearing on the proposed repository will significantly assist NRC in preparing to meet the schedule specified in the Nuclear Waste Policy Act.

*Question 7.* By only requiring that the DOE's computer simulation meet one test—that the predicted radiation dose to an individual 18 kilometers from Yucca Mountain stay below the EPA limit—NRC has effectively abandoned "defense in depth." How can you justify not having individual requirements on the separate safety features, as you do for reactors? Bearing in mind that reactors are much better understood than the Yucca Mountain repository, why are you not applying a higher standard here rather than a weaker one?

Response. NRC regulations contain multiple criteria against which DOE's performance assessment, including DOE's computer simulations, will be evaluated. Although DOE's total system performance assessment, or TSPA, must demonstrate compliance with EPA's numerical limits, DOE's TSPA must also show that the proposed repository comprises multiple barriers (both engineered and natural or geologic) consistent with a defense-in-depth safety approach.

NRC regulations for the proposed repository at Yucca Mountain represent a unique application of NRC's defense-in-depth philosophy to a first-of-a-kind facility. While waste is being emplaced, and before a geologic repository is closed, its operation is readily amenable to regulation in much the same manner as any other large, NRC-licensed facility. Application of defense-in-depth principles for regulation of repository performance for long time periods following closure, however, must account for the difference between a geologic repository and an operating facility with active safety systems and the potential for active control and intervention. For the most part, the safety components of a nuclear power plant work or fail in a binary fashion, and extensive actuarial data exist to form the basis for estimating failure rates. The components of a repository, on the other hand, are expected to behave continuously over long time frames for which performance data are scarce or nonexistent. As a result, performance of repository safety systems and subsystems must be extrapolated from limited short-term data. For example, the waste package is expected to go from a State of complete integrity and total containment of the waste to a State of very gradual failure over tens to hundreds of thousands of years. Assessment of the safety of such a system over long time frames is best evaluated through consideration of the relative likelihood of threats to its integrity and performance, in the context of overall system behavior. For these reasons, NRC's regulations provide DOE flexibility to determine the types and capabilities of barriers it will rely on to demonstrate the repository will perform within the safety requirements.

The National Academy of Sciences in its report on Yucca Mountain Standards recommended that NRC not specify separate requirements for subsystems (i.e., individual barriers). Consistent with this NAS recommendation, and the reasons stated above, the NRC did not specify separate limits for individual barriers. Instead, NRC's regulations require DOE to identify and describe the capabilities of the barriers it includes in its TSPA, and on which it relies to show compliance with the safety limits. NRC will perform a risk-informed review of DOE's TSPA to decide whether DOE complies with applicable safety regulations. This means that NRC will review each barrier important to waste isolation with a rigor commensurate with the safety significance of the barrier.

The Commission considers this approach for multiple barriers and defense-in-depth in its Part 63 regulations both appropriate and protective. When NRC issued final Part 63 on November 2, 2001 (66 FR 55758), the Commission stated the goal of the regulations regarding multiple barriers and defense-in-depth and explained its reasoning for not specifying requirements for specific barriers:

. . . [T]he emphasis should not be on the isolated performance of individual barriers but rather on ensuring the repository system is robust, and is not wholly dependent on a single barrier. Further, the Commission supports an approach that would allow DOE to use its available resources effectively to achieve the safest repository without unnecessary constraints imposed by separate, additional subsystem

performance requirements. It is also important to remember that Part 63 requires DOE to carry out a performance confirmation program to provide further confidence that barriers important to waste isolation will continue to perform as expected (66 FR 55758).

The court addressed this same issue in Nevada's suit challenging the Part 63 rule:

Specifically, Nevada contests NRC's use of defense-in-depth at the proposed Yucca Mountain repository through an overall system performance assessment rather than using the approach of its older regulations, which approach tests the individual performance of the repository's 'system elements.' [ . . . ] In light of NRC's detailed analysis supporting its decision to evaluate the performance of the Yucca Mountain repository based on the barrier system's overall performance, we believe that it adequately explained its change in course. [ . . . ] Accordingly, we conclude that NRC acted neither arbitrarily nor capriciously in rejecting part 60's subsystem performance approach in favor of the overall performance approach. NEI v. EPA; 373 F.3d 1251, 1295–97 (D.C. Cir. 2004).

*Question 8.* It is a well-established fact that the site selection process was intended to select the most appropriate geologic repository. In a May 21 letter, USGS Yucca Project branch chief Kenneth Skipper wrote to Andrew Orrell, senior program manager for the DOE lead laboratory, that preliminary data from a recent drilling phase indicate that the location of the Bow Ridge fault in northern Midway Valley "may be farther east than projected from previous work in the area." As a result, in June, Yucca engineers changed where they planned to build the concrete pads for cooling thousands of tons of highly radioactive spent fuel before the canisters are entombed in the mountain, which lies 100 miles northwest of Las Vegas. It is clear that DOE does not have a clear picture of the site's exact geological makeup, and that several other problems remain, including the dump's proximity to the water table and engineers' failure to forecast what will happen at the site, geologically or meteorologically, in the future. Based on these emerging geological and scientific data, how can NRC approve the application for Yucca Mountain as a geologic repository for nuclear waste, when the data does not support this conclusion and DOE cannot guarantee containment of these materials without significant engineered barriers? Assuming Yucca Mountain will not function as a geologic repository, how will that fact be incorporated into the NRC's review of DOE's plan to use Yucca Mountain as a geologic repository?

Response. NRC would agree that the site selection process was intended to select an appropriate site for consideration as a possible geologic repository, subject to the independent safety review and determination afforded by NRC's licensing process. The basis for DOE's design and an evaluation of the repository's response to geologic hazards will be important parts of NRC's review of DOE's license application. NRC expects DOE to provide accurate geologic data, such as fault locations, to support its demonstration of regulatory compliance.

The Nuclear Waste Policy Act of 1982, as amended in 1987, directed DOE to characterize the Yucca Mountain site. As part of that characterization program, DOE developed geologic maps. In developing these maps, DOE used available information to infer the locations of geologic structures, such as faults buried under younger, unfaulted soil deposits. Typically, fault locations identified on these types of geologic maps are accurate only to within hundreds of feet. This is especially true for areas like Midway Valley, where faults are buried beneath younger, unfaulted deposits. Recently, DOE sought more information so it could characterize subsurface conditions and define fault locations more accurately to support its design of certain surface facilities. The resulting DOE drilling program revealed that the main part of the Bow Ridge fault is several hundred feet east of its previously mapped location. In response to this new information, DOE adjusted the location of some surface facilities to avoid intersection with the Bow Ridge fault.

The presence of geologic features, such as faults, does not necessarily imply a safety problem with the performance of the potential geologic repository. NRC regulations give DOE a range of options to consider when designing the repository system to mitigate the possible effects of geologic hazards and meet the safety standards. As noted above, the basis for DOE's seismic design, and an evaluation of the repository system's response to geologic hazards, will be important parts of NRC's review of the DOE license application. NRC expects DOE to provide accurate geologic data, such as fault locations, to support its demonstration of regulatory compliance. DOE's demonstration must consider, among other things, realistic uncertainties in the geologic data. Following a detailed review of DOE's application and a full and impartial public hearing, NRC would authorize construction only if NRC finds that public safety, common defense and security, and the environment will be protected.

Senator CARPER. Mr. Weber, thanks for that testimony.

I am going to yield to Senator Clinton, and then we will go to Senator Inhofe, and then I will ask a question or two, and then to Senator Craig and Senator Barrasso, and if he returns, Senator Isakson and others. We will go back and forth as they come back in.

Senator Clinton, you are recognized.

Senator CLINTON. Thank you very much, Senator Carper.

Thank you, gentlemen, for being here.

I must say that your respective testimony raises a lot of confusing questions. You know, if the EPA standards and NRC licensing regulations are not yet final, it is sort of hard on the matter of just logic to understand whether the NRC can properly docket and begin a substantive review of DOE's license application.

As you all noted in your testimony, EPA's radiation standard is still not final, yet DOE continues to prepare an application to meet this unknown standard. The NRC indicates that they will begin to process the license even if EPA has not finalized the radiation standard when it is received.

I do not believe that this comports with the process that the Congress set out. It certainly seems to be putting the cart before the horse. In a few minutes, we will hear from Nevada's Attorney General and her testimony makes clear that this kind of unclear process puts Nevada at a great disadvantage, and the Nevada Attorney General contends that the NRC should be prohibited from accepting DOE's license application for review until final EPA and NRC regulatory requirements are in place. That seems obvious to me.

So I have several questions about the process and about your testimony. I want to lay them all out and go through them quickly.

First, if I could, let me turn to Mr. Meyers. When will EPA finalize the radiation standard?

Mr. MEYERS. In my written testimony, I indicated it was our hope to get that done soon.

Senator CLINTON. And what does soon mean?

Mr. MEYERS. Soon means probably the normal meaning of the term is that it is our intent to continue to work on this and to get this done soon.

[Laughter.]

Senator CLINTON. That is very enlightening, Mr. Meyers, I must confess.

Now, when you get it soon, will soon be before the NRC has to act?

Mr. MEYERS. We are focused on our process, Senator Clinton, and completing our process.

Senator CLINTON. Well, that is the problem. You know, your final EPA standard is certainly key to any NRC action because if the standard is not finished soon, by the time the NRC acts, the NRC will be acting without the standard. Do you agree with that?

Mr. MEYERS. That could be hypothetically correct, but we intend to proceed with our standard and finish it.

Senator CLINTON. Second, let me ask you, Mr. Sproat, why is the Department of Energy rushing to finalize the license application by June of next year in the absence of a final EPA standard?

Mr. SPROAT. Good question, Senator.

I just want to make it clear. In terms of the NRC regulations that govern the licensing and the design requirements for Yucca Mountain, those regulations have been in place for almost a decade. There are literally hundreds of pages of those regulations. Our license application needs to address all of those.

One very small piece is the last piece that says what is the long-term radioactive release exposure rates that are potentially to emanate from Yucca Mountain out to a million years. That is the one last piece of literally hundreds of pages of regulation that isn't done yet.

For us, in preparing our license application, we need to do the calculations to determine how the repository will actually work. We are doing that. As a matter of fact, we published our preliminary results in our supplemental environmental impact statement that we released three weeks ago. It shows that the peak dose from Yucca Mountain, projected peak dose, will be in about 200,000 years from now, and be less than five millirem, which is the combined exposure of a round trip air trip between New York and Los Angeles.

Senator CLINTON. But you know, Mr. Sproat, what is suggested to me by the delay of the EPA's final standard is that perhaps the EPA doesn't agree with that. Clearly, this has been put on a fast track for this Administration. If the EPA had a sense of urgency about it and if Mr. Meyers were not put in the awkward position of having to play semantic games in trying to respond to my question, there would already be a radiation standard.

So what I am picking up is that there is a disagreement here, and that DOE is going full-fledged ahead and EPA is dragging its feet because EPA doesn't want to be on the record of either contradicting DOE or having to once again mangle science in order to get to some preconceived outcome that will suit those who wish to move forward on this.

But finally, let me ask Mr. Weber, why won't the NRC refuse to accept the application until after the EPA radiation standard, and your own standards, are complete? Because it is not only that we don't have the EPA radiation standard, we also don't have your standards either.

Mr. WEBER. Clearly, Senator, our preference would be to have the EPA final standard and NRC's requirements in place before the receipt of the application. Congress addressed this in addressing the legislation. We cannot make our licensing finding on the construction authorization until such time as we have in fact received the EPA standard and conformed our regulations, because the finding that the Congress charged the NRC to make is that among all the requirements that Mr. Sproat referred to, one of them is that the EPA standard has been satisfied.

Senator CLINTON. Well, does that mean, then, that you will delay accepting the application? Or you will delay acting on the application?

Mr. WEBER. If we receive the application, we will commence our review. We cannot complete that review and reach our regulatory decision until such time as we have the requirements in place.

Senator CLINTON. Thank you very much.

Senator Carper, I will be submitting additional questions for the record.

Senator CARPER. Fair enough. Thank you very much for those questions.

Senator Inhofe, you are recognized.

Senator INHOFE. Thank you, Mr. Chairman.

First of all, early on I asked that Ronda Hornbeck's statement be made a part of the record. She is a county commissioner, the Chairman of the Lincoln County Commission. It is already part of the record.

There is another one I neglected to get in, and that is Kevin Phillips, Mayor of Caliente, Nevada.

I ask that this be made a part of the record.

Senator CARPER. Without objection.

[The referenced document follows:]

STATEMENT OF KEVIN J. PHILLIPS, MAYOR OF CALIENTE, NV., LINCOLN COUNTY, NV.

I am Kevin J. Phillips, serving in my 14th year as mayor of Caliente, Nevada. Many citizens in Nevada and the Nation understand that nuclear energy is an essential component of our country's energy portfolio to provide for our base load energy requirements while minimizing harmful emission. Many Nevadans also believe that Nevada can and should play a major role in meeting our nation's needs.

Nevada's leadership would like the Congress to believe that all Nevadans adamantly oppose the development of the Yucca Mountain repository. This is not true. I personally know that most Nevadans are truly ill-informed as to the facts of this subject, and simply respond negatively to polls asking if they are in favor of the "dump." Who wouldn't respond this way when the question is framed in this manner, and in the context of their lack of knowledge regarding the issue?

There is a significant cross-section of the citizens of Nevada who want to help solve the national energy crisis and lead Nevada to become one of the most technologically and scientifically advanced regions in the world. These Nevadans are pragmatic, solution-oriented leaders who, first and foremost, want to ensure that the Yucca Mountain project is constructed in accordance with sound science and operated in a way that safety is always the No. 1 consideration. We agree with the president and with Congress that the science conducted at Yucca Mountain confirms it to be a suitable site for a geologic repository.

Furthermore, we recognize that the same amount of used nuclear fuel and high level radioactive waste that is to be shipped to Yucca Mountain has already been shipped nationally and internationally without a single radioactive release that has resulted in harm to the environment or any individual. In fact, immediately upon the commencement of the used nuclear fuel shipments along the Caliente Rail Line, my citizens will experience a decreased amount of risk from hazardous material shipments. As a railroad town with very little emergency response resources, the citizens of Caliente are at risk every day with chlorine cars and other volatile substances. The increased emergency response capability that will accompany the shipments to Yucca Mountain will greatly enhance the everyday safety of my citizens from a risk management perspective.

Congress has a tremendous opportunity to make Yucca Mountain one of the most important and successful public works projects in the history of human existence. Washington has been given all the information it needs to make smart decisions that accomplish this goal. You need to create an opportunity for real, meaningful economic diversification, and you need to start doing real things now rather than later. This project is far from being broken. Some synergy from you nudging this along is all that is required. If the Congress is truly committed to ultimate energy independence and energy security, this can be achieved.

I respectfully suggest that the Congress take the following steps:

• Change the name of the site at Yucca Mountain to the "National Energy Reserve at Yucca Mountain." This modification highlights the value of what we truly are dealing with. This name change, coupled with the following additional suggestions, changes the way this project is viewed by the citizens of Nevada.

• Build the railroad from the city of Caliente to the National Energy Reserve at Yucca Mountain. The Record of Decision issued by the Department of Energy refers

to this route as the "Caliente Corridor." The Department of Energy has released the Draft Rail Alignment Environmental Impact Statement naming the Caliente Rail Corridor as the preferred corridor. After the Final EIS has been completed, they need to issue the Record of Decision on the specific alignment within the Caliente Rail Corridor and they need the funding to commence construction of the railroad.

• Ship used fuel to the National Energy Reserve. Here the fuel can further cool in a remote protected environment. Litigation pressures are relieved. Enhanced safety is achieved. The fuel is collected in a central location awaiting re-use.

• Change the name of the "Caliente Corridor" to the "Central Nevada Energy Corridor." Numerous sites along this new rail line are prime locations for placement of new electrical generation power plants of various types. These "energy zones" could be pre-licensed and would provide for great incentive for companies to build new electrical generation resources, including nuclear, clean-coal, solar, wind and geothermal.

• Designate the National Energy Reserve as the location for the nation's used fuel recycling facilities. Build such facilities as soon as time and technology permits. Do this in conjunction with Nevada's university system. The Nuclear Waste Policy Act gives Nevada "preference" for such things. It makes total sense. Move the used fuel once. Recycle it. Place the small amount of "waste" left over deep underground in the repository. Move the new fuel assemblies to a nearby generation facility on the Central Nevada Energy Corridor and produce electricity.

The Nuclear Waste Policy Act was a progressive piece of legislation with many potential benefits for the State of Nevada. There are additional changes to the legislation that could minimize the risk for the citizens of the Nation and specifically of Nevada while maximizing the benefits for those citizens and local governments most significantly impacted by Yucca Mountain. I hope that I and other likeminded leaders in Nevada will continue to be invited to provide innovative solutions as the Yucca Mountain project progresses.

Senator INHOFE. Now, let me just read part of it here, because I am a little bit confused, and you might be able to clarify this. This is our of his statement. He is the Mayor of Caliente, Nevada.

"Nevada's leadership would like the Congress to believe that all Nevadans adamantly oppose the development of the Yucca Mountain repository. This is not true. There is a significant cross section of citizens in Nevada who want to help solve the national energy crisis and lead Nevada to become one of the most technologically and scientifically advanced regions of the world.

These Nevadans are pragmatic, solution-oriented leaders who first and foremost want to ensure that the Yucca Mountain project is constructed in accordance with sound science and operated in a way that where safety is always the No. 1 consideration. We agree with the President and with Congress that the science conducted at Yucca Mountain confirms it to be a suitable site for a geologic repository."

I guess I would start with you, Mr. Sproat. In your position, I am sure you have heard from a lot of people out in Nevada.

Mr. SPROAT. Senator, I have. I go out there. I spend 1 week a month in Nevada.

Senator INHOFE. Yes. What kind of response to you get? All we have heard prior to my seeing this is that they are all opposed to it.

Mr. SPROAT. I don't think that is a fair characterization. I would certainly say that Yucca Mountain, there is a substantial part of the population that when asked, would you like a nuclear waste repository in your State, their answer will be no. However, I can tell you I have quarterly meetings with the affected units of local government, which are the counties surrounding the Yucca Mountain site, as well as representatives from the State of Nevada. And Nye County, which is the host county, the county which has Yucca

Mountain inside its county borders, that county is in favor of moving forward with Yucca Mountain.

Senator INHOFE. Yes, I was out there some time ago, and that is the impression I got. That is not the impression we get here in Washington.

Let me ask you, I think Senator Clinton took a pretty heroic political position in saying that she is for leaving the waste in the existing States that are out there. Senator Reid made one statement that is I think the strongest of his testimony. I think he repeated it about three times, talking about the danger of transporting this around the Country. I have heard both sides of this thing.

He specifically talked about after 9/11, what terrorists might do.

I would like to have you take whatever time you need to describe to us what precautions are out there and what the risk is, and respond to that accusation. Because I think that was probably the strongest thing that he said in his opening statement.

Mr. SPROAT. Well, I would say first of all in terms of the regulations governing the transportation of spent nuclear fuel and high level waste, shared by both the Department of Transportation and the Nuclear Regulatory Commission, and the Department of Energy has responsibility for complying with their regulations, No. 1.

No. 2, this is not something new. This has been going on for over 40 years already, with a very, very high safety record. I cited in my oral testimony the number of shipments that have already taken place. I think the reason most people don't know it is happening is because it has been a tremendous safety record.

I would say that in terms of the security requirements associated with shipping high level nuclear waste and spent nuclear fuel, while there are a number of classified issues around that, what I can tell you is all those shipments are tracked by GPS tracking, have armed guards with the shipments, and the casks are designed for extremely severe accidents to prevent release of radioactivity.

Senator INHOFE. Yes, I can remember years ago, I guess 25 or 30 years ago, when I was Mayor of Tulsa, the thought was that it would be coming through and we did some checking at that time, finding it was very, very—well, let's say how would you compare that with the risk that is out there? There is risk in anything, I suppose, of Senator Clinton's response to, say, leaving it in the States that were mentioned by Senator Craig: New York, Iowa, South Carolina, and New Hampshire. In terms of relative risk, how would you measure that, between transportation and leaving it there?

Mr. SPROAT. All I would say, Senator, is first of all, I am a firm believer and I truly believe, coming from the nuclear industry and having been involved with interim storage at the plants I was involved with, it is safe where it is. I absolutely agree.

However, if you are going to raise the question and assume that it is a target for terrorist acts, I will reprise the statement I made in my oral testimony, which is which do you think makes an easier target to go after: a stationary target that is at 121 locations around the Country and everybody knows where it is? Or moving targets that the only people who know where they are the people who are directly involved with shipping them under armed guard?

That is a question I just leave to the Committee to answer.

Senator INHOFE. OK. Mr. Weber, and I have gone over my time here, but what is there for the NRC to do if this report doesn't come out? I have to say, Mr. Meyers, your predecessor, I guess you are the Acting Director right now, Mr. Wehrum, at one time, it was about a year and a half ago, said that we would have all this done by year end, the end of 2006, and it is still not done.

Now, what can the NRC do now in the absence of that?

Mr. WEBER. We have been closely interacting, Senator, with the Department of Energy to continue to stay up on the current status of their science and the engineering for the proposed repository. Our desire is to be as prepared as we can be so that when and if the application is received, we can act on that in a prompt and timely way.

Our whole focus is on safety and security, so our mission is to be ready to make the safety and the security findings that we need to make to support that license application review.

We are also closely coordinating with the EPA so that we can again be as prepared as possible to act promptly on our rulemaking to conform our regulations to the final EPA standard.

Senator INHOFE. All right. I appreciate that.

Mr. Chairman, I won't be able to be here during the third panel, but I was talking to Richard Burr yesterday, Senator Burr, and he has a rather elaborate introduction of Mr. Kerr, and I would ask that introduction be made a part of the record.

Senator CARPER. Without objection.

[The referenced document follows:]

INTRODUCTION OF JAMES Y. KERR, III, PRESIDENT, NATIONAL ASSOCIATION OF REGULATORY UTILITIY COMMISSIONERS, NORTH CAROLINA UTILITIES COMMISSION

Commissioner Kerr was appointed to the North Carolina Utilities Commission by Governor Mike Easley for an 8-year term that commenced on July 1, 2001 and expires on June 30, 2009. He is the First Vice-President of the National Association of Regulatory Utility Commissioners (NARUC), Chairman of its Executive Committee and Board of Directors, and a member of its Electricity Committee. Commissioner Kerr is a member of The Keystone Center Energy Board and the Advisory Council of the Electric Power Research Institute. Commissioner Kerr is a Past President of the Southeastern Association of Regulatory Utility Commissioners (SEARUC) and former is Co-Chair of the Alliance of State Leaders Protecting Electricity Consumers.

Commissioner Kerr has testified before Committees of the U.S. Senate and North Carolina General Assembly as well as the Federal Energy Regulatory Commission. He also has been a frequent speaker on regulatory issues to such groups as the American Bar Association, North American Energy Standards Board, Electric Power Supply Association, Edison Electric Institute, American Gas Association, National Cable & Telecommunications Association, and the Harvard Electricity Policy Group. In 2005, Commissioner Kerr was named the 2005 Bonbright Honoree by the James C. Bonbright Utilities Centre, Terry College of Business, University of Georgia.

Commissioner Kerr, a Democrat, was born on March 8, 1964 in Goldsboro, North Carolina. He graduated cum laude from Washington and Lee University in 1986. Following completion of his undergraduate degree, Kerr spent 3 years working for First Union Corporation (now Wachovia) in Charlotte and Atlanta. He received his law degree from the University of North Carolina at Chapel Hill School of Law, where he graduated with honors in 1992.

Prior to coming to the Utilities Commission, Kerr was a Partner in the law firm of Smith, Anderson, Blount, Dorsett, Mitchell, & Jernigan, L.L.P. His practice concentrated in civil and administrative litigation, with significant experience in the Trial Division of both the State and Federal Court systems, the Appellate Division of the State Court system, and the Utilities Commission.

Commissioner Kerr has been active in various bar-related and community service organizations, including the American Bar Association, the North Carolina Bar Association, and the North Carolina Association of Defense Attorneys. He has served

on the Board of Directors of the Triangle Division of the March of Dimes, the Board of Directors of the UNC School of Law Alumni Association, and currently he serves as a member of the Board of Directors of the North Carolina Museum of Art Foundation.

Kerr, his wife, Frances, and children, Yancey and Helen, live in Raleigh and are members of Hayes Barton United Methodist Church.

Senator CARPER. All right.

Gentlemen, I want us just to back up just a little bit. I would like for us to take a couple of minutes in the first part of my questioning, to just go back in time. Just go back to the 1980's when we were debating where to find a site, what might be an appropriate site. Maybe Mr.

Sproat, you might be the best person to do this, but just take us back in time and talk through the selection process, the legislative back and forth, the signing of the law, before we get into what happened in 2002, but just to back if you will, into the 1980's.

Mr. SPROAT. Senator, as I stated before, I was in my early 30's back then and wasn't directly involved in this process. So I am not the expert on this, but I do know a couple of pieces. When the National Academy of Sciences determined in the early 1970's that deep geologic disposal was the appropriate way to go for high level nuclear waste and spent nuclear fuel, that the Department of Energy, and I think at that point in time it was ERDA, began looking at a number of sites across the Country. Over a period of about eight to 9 years, that number of sites was winnowed down to three sites: one in Washington State, one in Texas, and one in Nevada, Yucca Mountain.

There were more detailed studies done on——

Senator CARPER. Is that Texas site close to Crawford?

[Laughter.]

Mr. SPROAT. I don't know where Deaf Smith County, Texas is.

Senator CARPER. I don't either.

Mr. SPROAT. There were more detailed studies done of those three sites over about a three to three and a half year period. At the end of that three and a half year period, and the Nuclear Waste Policy Act I think was originally approved in 1983, authorized the investigation of those three sites. Then there was a summary report of those investigations done that was given to the Congress in 1986. And when the Nuclear Waste Policy Act was amended in 1987 is when the Congress directed DOE to only continue studying the Yucca Mountain site.

What I have been told, and I haven't looked at the reports myself, that when those three technical reports were ranked, the Yucca Mountain site was ranked first technically. I can't speak directly to know if that in fact was the case because I haven't looked at those reports, but that is what I have been told.

Senator CARPER. All right. You were here in the room when I asked our first panel, Senator Reid and Senator Ensign, about whether or not the folks in Nevada were ever offered incentives to encourage them to accept this siting.

Mr. SPROAT. In the Nuclear Waste Policy Act, the Secretary of Energy was empowered to negotiate a deal with the State of Nevada, with various economic incentives and I think there was even a requirement for the potential deal to be approved, come back to the Congress for approval, and there were certain limitations on it.

That never happened. I certainly wasn't a party to those discussions, so I can't give you any kind of good answer as to what went on, who said what and how, but nothing ever came of it.

Senator CARPER. That is too bad. That is too bad.

May I direct a question, if I could, to Mr. Weber. Senator Voinovich and I lead a Subcommittee on this Committee whose responsibilities include nuclear security and nuclear safety. We have had a number of hearings where Commissioners from the NRC have come and testified at literally this table in the last several years.

One of the questions that we ask the Chairman and the other Commissioners is to tell us how we are doing at the NRC with respect to our human resources. I worry right now about having an adequate number of Commissioners. We have three now. We may by next summer be down to two. That is not a good situation. I am concerned about the turnover. We have an impending retirement of maybe as many as 25 percent or more of the current work force at the NRC. At the same time that this happens, we have 100 plus nuclear power plants to say grace over, and we have hopefully several dozen additional applications coming across the bow here for the NRC to consider.

On top of all this, we have the opportunity for the NRC to apparently receive an application of sorts from the Department of Energy and to scrub that closely in the months to come.

I would just ask you to take a minute or two and describe for us briefly the amount of resources that you believe you are going to need at the NRC, not to meet all those other responsibilities that I have talked about, but to meet the responsibility to be able to not just do this review of the Yucca Mountain, but for doing it very, very well.

I like to say, I have spoken here many times on this subject of nuclear energy, which I support, we have to be as close to perfect as we can be. There is no margin for error on this stuff, whether you are running these power plants, approving new ones, or in this case, siting, whether it is Yucca Mountain or some other site.

Please proceed.

Mr. WEBER. You are absolutely right, Senator. When it comes to safety and security, it is important to get it right. That is what we do at the NRC. We are having quite a bit of success in bringing in new people, anticipating the challenge with retirements. We are focusing on knowledge management so that people who have spent literally their entire careers working in preparation to conduct a licensing review for the Yucca Mountain repository can, if they are not going to be around when the application arrives, that they can convey their knowledge to their successors.

We have an active training program. We qualify our staff. We indoctrinate them into what is the background for the regulation, what is the background on an EPA standard, what are the tools that they will need to use to conduct their safety and security reviews. A large amount of the decisions for Yucca Mountain will be based on something called performance assessment.

Performance assessment integrates a large amount of information, scenarios, models, data. It is important that be done right.

So not only do we ensure that people joining the agency have the requisite professional skills, technical skills, but we also equip them with the additional skills that they will need to conduct their review. That is the same whether we are talking about the high level waste program at the NRC, or talking about the nuclear reactor safety program where I just came from earlier this year. I started my career 25 years ago working on the high-level waste program, so I was around working in high-level waste when the Congress enacted the Nuclear Waste Policy Act and the Amendments Act. I haven't been there continuously. I have moved around, but I think that is another feature of the NRC, that we try to broaden our staff so that they can do a variety of things. Those who choose to broaden themselves are able to have that opportunity, and people who really need to focus in on a specific area and want to be the world's expert on a particular topic—materials engineering, digital instrumentation control, high-level waste performance assessment—have that opportunity, because we need the whole range of administrative, technical and legal skills to conduct our job.

Senator CARPER. Thanks very much.

My time has expired. Let me turn to my colleague, Senator Craig, for any questions he might like to ask. Senator Craig, you are recognized.

Senator CRAIG. Thank you very much, Mr. Chairman.

To the panelists, the Chairman and I were not necessarily there at the beginning, but certainly about the time we came to Congress that whole debate was picking up. And yes, I was on the committee that made the final decisions based on the three sites, and what was the best geology known at the time in the selection of Yucca Mountain. The exploratory efforts to date have in no way denied the original arguments in large part.

Mr. Chairman, I think what is important today is not only to put in context the very open process we are now engaging in, because some would suggest that his is behind the scenes, that there is somehow a dark room. Gentleman, all three of you, would you discuss the very robust public process that we are going to be entering into as we work our way through to a final decision by the NRC?

Mr. SPROAT. Senator, let me ask Mr. Weber to answer that first because it is the NRC's process, and I would be glad to give you my perspective on it.

Senator CRAIG. Thank you.

Mr. WEBER. Senator, as I alluded to in my testimony, we have both a formal and an informal public process. In terms of an informal process, as a Federal agency, we owe it to the American public to keep them informed about what we are doing. We have nothing to hide when it comes to safety and security. It is important the public knows that, and that is why we try to be open to the extent we can.

We don't go so far as to release sensitive information pertaining to national security secrets or other information of that sort, but we do try to be as open as we can. In fact, that is one of the fundamental objectives that the NRC has. We do that through our website and we do that through public meetings. Our interactions with the Department of Energy are most typically open, unless—again—they are going to be discussing sensitive security informa-

tion or other proprietary information. That is all the informal process.

Beyond that, we also have the formal, adjudicatory process. As Mr. Sproat alluded to, there are affected units of local government that have been designated. Recently, the Timbisha Shoshone Tribe has been identified as an additional unit of local government affected in this proceeding.

The hearing process affords any interested member of the public, the State of Nevada, the industry, to come forward and petition through an evidentiary process, raise issues, and have their day in court, so to speak, and make certain that whatever concerns they have, if that is a challenge to the department's application or to a finding that the NRC has made, they have that opportunity to have that heard and have evidence presented. Ultimately, the board that hears that, being independent of the NRC staff, renders a decision, and that decision then goes to the Commission.

So, before I can sign a license to authorize construction authorization or operation of the repository, if it should come to that, all that process goes through, and there is ample opportunity for people both formally and informally to raise concerns and understand what NRC is doing as part of its review.

Senator CRAIG. From now and forward?

Mr. WEBER. It has been that way for the last——

Senator CRAIG. No, I understand that, but I am saying, in a second question, from now forward, with the understanding that the law requires EPA to develop a standard. This is not a hypothetical or a not so necessary thing. The law requires them to have a standard and you consider that standard in relation to the work of DOE. Is that not correct?

Mr. WEBER. Absolutely correct.

Senator CRAIG. So assuming, Mr. Meyers, you are timely—and we are going to assume that, you said you would be timely—and that standard is out and it is considered, could you walk us through this open timeframe before you make a final decision as to whether Yucca Mountain or could not be licensed?

Can you give us a reasonable timeframe based on what you all know?

Mr. MEYERS. That is actually not EPA's decision. That is the decision from the NRC. I would say with respect to our process, we are operating under Section 801 of the Energy Policy Act, and within normal administrative process. So previous to this, we of course published a notice in the Federal Register. We have received thousands of comments. We had public hearings in terms of a proposed standard. That is what we maintain, a public docket.

And what we are doing now is in the process of continuing to review those comments and everything that came in through our public process, in order to reach the point in time where we will have a final regulation for the standards. And then from there, the NRC essentially takes over.

Mr. WEBER. If I could just build on my colleague's remarks, Senator. If we had an EPA standard final promulgated out in the Federal Register in, let's say, November, next month, NRC would act on that promptly. I would expect, and it is ultimately the Commission's decision, not my decision, not the NRC staff's decision, but

I would expect that by the end of this calendar year, we could have a final rule in place, if the EPA standard is similar to what it had previously proposed, if it is not too dissimilar.

So we are poised to act promptly once we have that EPA standard to go forward and revise our regulations and put them out as a final rule in the Federal Register.

Senator CRAIG. Before I get back to you, Mr. Sproat, let me stay with you, Mr. Weber.

The first panel talked about all of the waste that is out there and that it is safe and that it is safe for 100 years and ought to stay where it is. That is an interesting thought, and most importantly, and I think you have alluded to it, Mr. Sproat, it is safe, and we shouldn't argue that it isn't. We have a very safe industry.

Has the NRC had anything to do with that safety and those casks and that storage facility that currently exists out there?

Mr. WEBER. Absolutely, Senator.

Senator CRAIG. Would you tell us that you have been involved there?

Mr. WEBER. That is part of our regulatory program. That is one of my responsibilities.

Senator CRAIG. Do you mean the cask that is currently being used as storage, that is good for at least 100 years, was established by regulations and determined by the NRC to be adequate?

Mr. WEBER. That is correct. And we would use the similar regulatory process in reviewing the adequacy of the construction authorization for the Department of Energy.

Senator CRAIG. OK.

Mr. Sproat.

Mr. SPROAT. Senator, I would just like to give a little perspective from one who has gone through the NRC licensing process before in the commercial industry, because that is my background and my experience.

During one of the statements earlier today, somebody used the term opaque in describing the NRC licensing process. I would strenuously disagree with that characterization. This is the most transparent regulatory process I think the Federal Government has. From my own experience, the Yucca Mountain licensing process is even more transparent than the usual commercial nuclear power plant licensing process for a particular reason.

The Congress made it very clear in the Nuclear Waste Policy Act that the interested individuals and affected units of government had a right to participate in the proceeding. It also required that the discovery process for this proceeding, for the hearings, be expedited by making all of the evidentiary material that we are going to rely on for our license application, available to the pubic on the internet. That is not done in normal commercial nuclear licensing proceedings.

So I found it a little interesting this morning when I heard a remark complaining that there was too much information on the licensing support network. We are required by the regulations to put that evidentiary material on there to make this process as transparent as we possibly can.

Let me just finish with one other point I would like to make. There was some innuendo also this morning that the DOE would

submit an incomplete license, that we would only have partial design and engineering complete. I want to make this very clear. The regulations of the Nuclear Regulatory Commission make it very, very clear as to the level of detail and the issues that we need to address in this license application. If we don't meet that standard, they won't docket it and they won't accept it.

It doesn't do me any good or the Department of Energy or this Country any good for us to develop a license application, give it to them, and have them reject it. That is not why I took this job and that is not why I am here. So I am here to make sure that license application has the level of completeness and the level of quality that is needed so they can docket this license application.

Now, you may hear later this morning that our engineering and our design work is only 30 percent to 40 percent complete. That is going to be about right, and that is also appropriate because when I say 100 percent engineering complete, I mean I have all the drawings done that I need to build the repository: the electrical connection diagrams, the rebar installation diagrams. I don't need that at this stage of the proceeding. Quite frankly, it would be a waste of ratepayers' and taxpayers' money to spend money doing that engineering at this stage of the game. I need to have the engineering done to a level that allows me to satisfy the NRC that we have done the level of engineering design and science to answer their questions, and that is what we are doing.

Senator CRAIG. Mr. Chairman, could I ask one last question? You have been very generous.

Senator CARPER. I am going to ask you to hold. We are going to have another round if you want to stick around.

Senator CRAIG. OK. Please proceed.

Senator CARPER. I came across an interview, I think it was in The Economist magazine not long ago, with a fellow from California whose name is Stewart Brand, a long-time environmentalist and environmental advocate. He was interviewed, and was asked in the course of the interview about nuclear power. This is what he had to say, and I will just quote him. He said, "Rather than asking how spent nuclear fuel can be kept safe for 10,000 to 100,000 years, we should worry about keeping it safe for only 100 years, because nuclear waste still contains an enormous amount of energy. Future generations may be able to harness it as an energy source through tomorrow's better technologies."

Let me ask our witnesses to respond to his comments in The Economist.

Mr. SPROAT. If I can, Senator, let me answer that first. There is no doubt in my mind there is a significant energy resource that resides in residual spent nuclear fuel. The question is when do we get to the economic tipping point when the recycling of that fuel makes economic sense, 1compared to the use of raw uranium right out of the ground. We are not at that stage yet. For the Administration, we believe that we will in the future get to that economic tipping point and recycling makes sense. So we do want to invest money in the technologies to do that, and we do want to absolutely keep that option open.

One of the things I think many people don't recognize about the Yucca Mountain regulations is that it requires us, for whatever

reason might be out there, that once the repository opens and we begin putting spent fuel in that repository, that we retain the capability to pull it back out, whether it is for recycling or whether it is because we found something else that we didn't know at the time of licensing that says we need to use that fuel for something else.

So I do believe we will eventually go to recycling. I don't believe it is going to be in the next 10 years or 20 years. And meanwhile, we still have a significant amount of high level waste that is not recyclable, spent nuclear fuel from the nuclear Navy, which is residing in Idaho and the vitrified high level waste from the Defense programs that is in Washington State and New York State and some others. That needs to go to Yucca Mountain and recycling is not an issue regarding the disposal of that material.

Senator CARPER. When you say it is not an issue, just what do you mean by that? I am sorry.

Mr. SPROAT. What I mean is it is not recyclable. It is a waste form that you can't recycle or it doesn't make any economic sense to try to recycle.

Senator CARPER. This may be an unfair question, but I will ask it anyway.

Mr. SPROAT. That is OK.

Senator CARPER. If you take the high level waste in Idaho that you have alluded to, and Washington State, and you add to that all of the other waste that is being generated in power plant storage onsite today, just roughly, what percentage would be the waste in Idaho that you have alluded to, the waste in Washington, of the entire amount? Just roughly.

Mr. SPROAT. Senator, I would rather take that question for the record and give you a good answer.

I don't know off the top of my head.

Senator CARPER. Less than half?

Mr. SPROAT. Yes, less than half.

Senator CARPER. Less than 25 percent?

Mr. SPROAT. For the Yucca Mountain repository, the 70,000 metric ton limit, we are expecting that approximately 25 percent of that capacity will be used for high level defense waste.

Senator CARPER. All right. Thank you.

Mr. Meyers, my original question was to ask you to sort of respond to the comments by Stewart Brand. Do you have any comment at all?

Mr. MEYERS. Well, having only completed about 1 year of physics in college, I don't think I am qualified to get into the technical aspects.

Senator CARPER. I understand you stayed last night at Holiday Inn Express, so——

[Laughter.]

Mr. MEYERS. I have two sick kids at home, so unfortunately no.

Senator CARPER. You probably wanted to spend last night at a Holiday Inn Express.

Mr. MEYERS. I would make this comment, which I do think is relevant. We have done other analysis for the Congress and Senate in particular, that I think the Senator is aware of, when we look at the various climate change legislation that has been introduced.

In these scenarios that we look to and try to look at ways to reach some of the targets that Congress is thinking about establishing, nuclear power plays a very important role. Under one scenario, I think it grows about 150 percent and we project. So I think regardless of the recovery in terms of the energy mix and in terms of our current analysis on how to address some of the issues that the Senate is looking at on climate change, nuclear power is very important to that, along with carbon capture and sequestration in the coal sector.

Senator CARPER. All right.

Mr. Weber, do you want to take a shot at it?

Mr. WEBER. Only briefly, Senator. The only thing I would add is, of course, the concept of recycling raises important public policy questions about nonproliferation, about economics, about safety and security. My agency, NRC, recently started interacting with the Department of Energy, as part of the Global Nuclear Energy Partnership, to become better acquainted with the technologies that are being reviewed, and ultimately should an applicant come forward and propose to recycle or reprocess spent nuclear fuel, NRC could be in a regulatory role for that. If that comes to pass, our focus will be on safety and security. Security there is writ broadly to include both international safeguards and domestic safeguards.

Senator CARPER. All right. Thank you.

Senator Craig, I have one more question I am going to ask of Mr. Weber, and then we will excuse this panel.

I would just say, I thought I saw Senator Isakson put his head in just a moment ago. Would somebody just check and see if he is interested in coming in and asking a question?

Senator Craig, you are recognized.

Senator CRAIG. The question I was going to ask has already been broached by the Secretary, and that is in relation to the other waste. We think of commercial waste. We fail to recognize there is Defense waste. Senator Domenici and I earlier this year introduced legislation. One principal provision of it was early receipt of Defense waste at Yucca. Part of the reason for that, Mr. Chairman, is exactly what the Secretary spoke to earlier, and that was the lack of recyclable capability, or within the structure or the cladding of that particular waste versus the commercial waste that we know about and are more focused on recycling in the future.

Would you speak to that a little more? You asked a question that you are going to get the hard facts. We believe Defense waste comparable to or comparative to commercial waste would represent about 10 percent, or somewhere in that realm of totality, but respond to that. You have spoken in the past in relation to what Senator Domenici and I had earlier proposed, your reaction to that.

Mr. SPROAT. Senator, in terms of, just to try and clarify what I said before, the responsibility we have at the Department of Energy is to take all the Nation's high level radioactive waste and spent nuclear fuel. There is a percentage of that inventory which is not recyclable. It is already in its final form. It is in vitrified glass form. That needs to be disposed of in the deep geologic repository per the Nuclear Waste Policy Act.

Commercial spent nuclear fuel from the nuclear power plants is recyclable, and maybe someday it will be not only economic to do so, but we will have the facilities in this Country to do that.

Those facilities don't exist right now. The regulatory framework for those facilities doesn't exist right now. The economic business case for building those doesn't exist right now.

So in terms of will we ever get there, I think the answer is yes. How long it will be, I think it is mere speculation at this stage of the game.

Senator CRAIG. But as it relates to waste, there are two types that oftentimes the discussion is glazed over. There is the current Defense legacy, if you will, of waste that speaks to the need for a geologic repository.

Mr. SPROAT. That is correct.

Senator CRAIG. Thank you.

Thank you, Mr. Chairman.

Senator CARPER. Mr. Sproat, if I could, one more question for you, and then I will telegraph my last question. I have two questions.

One, I would like for our witnesses to close by responding, thinking out loud with us, what are some of the most encouraging best practices, if you will, going on in other countries with respect to their nuclear waste that may hold the greatest promise for them and for us?

The other thing is, and I mentioned this to Senator Clinton before she left, if we actually could get this right in terms of how to deal with nuclear waste, not only would we solve a problem of storage around nuclear sites themselves, the need for a Yucca Mountain I and Yucca Mountain II, but also we would have a technology that we could sell all over the world and create jobs through the export of that technology. Other countries are going to build nuclear power plants, and again we would encourage most of them to do that.

But that will be my last question to Mr. Weber, so you all will be thinking about that. And in the meantime, Mr. Weber, I will ask you to respond to this one. If the final EPA radiation standard has not been published by the time that the Department of Energy submits its application to the NRC, will the NRC be able to make a determination on the completeness of the application and docket DOE's submission? And a second part to that question, if you will, is how far can the NRC proceed in reviewing DOE's application before final EPA radiation standards are issued, and the NRC conforms its own regulations to these standards.

Mr. WEBER. As I discussed previously, Senator, we can commence the review. We can complete the acceptance review, but there is a wild card there, and that wild card is, depending on the nature of the final EPA standard, if that introduces new aspects that haven't already been addressed as part of the application from the Department, that could impose a new information need that the department would have to address.

Similarly, as we modify our regulations in 10 CFR Part 63, to be consistent with those of the EPA standards, we may introduce new requirements that, again, the Department may have to come back and amend their application to address.

Now, should that take place during the licensing review, that will all be part of that formal adjudicatory process that I discussed before in response to Senator Craig's question. So there will be an opportunity for parties to petition to the board and to raise concerns and have those concerns freely and openly heard by the adjudicatory board.

Senator CARPER. All right. Thank you, sir.

Mr. Sproat, did you want to take a shot at my other question? Again, I am looking for best practices. We are looking for best practices around the world.

Mr. SPROAT. Your question is timely, Senator, because 2 weeks ago I attended a conference in Bern, Switzerland. This conference only occurs once every 4 years, and it is the third time it has been held. It is the International Conference on Radioactive Waste Disposal. This conference is attended by the senior ministers and government officials and private industry officials from across Europe and Japan to talk about what each country is doing in their best practices. So I got a pretty good understanding of what was going on internationally.

A couple of things struck me from that conversation. No. 1 was even in the countries that are supposedly anti-nuclear, broad consensus across these countries that it is up to this generation to decide what to do about nuclear waste and not push it off to future generations.

That was No. 1.

Second is that they all are utilizing what I would term a technically informed political process for selecting a site in their country. They are doing explorations. They are trying to characterize the site, but it is a technically informed political process. One of the things they try to do is to find a location where the people want to have the repository.

Now, I would point out that is certainly the optimum and best potential situation. I would point out, however, and I think a lot of people forget this, besides the fact that Nye County, which is the host county for Yucca, does in fact want the repository to proceed, the Nevada State legislature in 1975 issued a joint resolution inviting the Department of Energy to place the repository in Nevada. So things do change through a political process and we need to be aware of that.

So really, those best practices of trying to gain local acceptance is pretty much an international concept. But we are probably further along in the actual siting process and the licensing process than anybody else.

Senator CARPER. If I could, I would just like to conclude by two quick comments. One, earlier this year, in January, I was in Detroit. I was attending the North American Auto Show, something I go to about every other year. We have a GM plant in my State and a Chrysler plant in my State. The most exciting vehicle that I saw at the auto show was probably a GM product.

It was called the Volt, V-O-L-T. It is a Chevrolet product. It is one that is a flex-fuel plug-in hybrid vehicle. It is a concept car that they had on display, but they hope to have them on the highways in substantial numbers beginning in 2010. That will not be maybe

the first flex-fuel plug-in hybrid vehicle on our roads, but it won't be the last.

As we look to reduce our dependence on foreign oil, as we look to reduce the emissions of bad stuff up into our air, we are going to be moving toward those kinds of vehicles. People will be able to plug them in their garages or at their homes at night, maybe at work during the day, and they use a fair amount of electricity. They can go 40 miles on a charge of electricity, but we are going to need more electricity, and by using that additional electricity, be able to reduce again the import of foreign oil, stop paying $90 a barrel sending all this money, $250 billion a year for foreign countries for the oil that we are buying from them.

But we need a way to generate the electricity. Part of that can come from wind. We are trying to site a windmill farm in the State of Delaware. It can come from solar. It can come from finding a way to safely sequester carbon from coal-fired plants. It can certainly come from nuclear.

The big roadblock for us, in the minds of a lot of people, is not so much the safety of the actual plants themselves, although that continues to be a constant concern and a matter of constant vigilance, but how to safely dispose of the spent fuel.

So thank you for your responses to our questions. Our Chairman is back. She got the gavel back and she is not going to give me the halo. This is like Halloween and trick or treat. I will maybe find a halo at home when I go home.

Senator BOXER.

[Presiding] We are going to have to negotiate on other issues for the halo, working on other things.

Senator CARPER. All right. Fair enough. Thank you.

Senator BOXER. Thank you very much. Sorry I was gone. I am preparing for a big markup tomorrow.

It is my understanding that DOE expects to have about 35 percent of its design complete—I understand you said that in your testimony—for both subsurface and surface facilities at Yucca Mountain when it submits its license application to the NRC. Given the complexity and serious risk involved, I am concerned about efforts by DOE to push forward an application before it is ready. Why would DOE submit an incomplete application?

Mr. SPROAT. Senator, unfortunately I addressed this point, but I will do it again.

Senator BOXER. Well, you could do it again because I wasn't here.

Mr. SPROAT. Absolutely.

First of all, we won't submit an incomplete application. It does me no good. It does the Department of Energy no good to submit an application that is incomplete. The Nuclear Regulatory Commission has a very detailed set of requirements that we have to meet, and what we need to include in our license application for them to determine that it is in fact a complete application or not. If they determine it doesn't meet those very detailed criteria, they will reject it.

Senator BOXER. Yes, but you are giving me words. My understanding is that you expect to have 35 percent of the design complete. Is that correct? Now, if NRC says 35 percent equals 100,

then that is their problem and I will take it up with them. But I am asking you how much of the design is complete.

Mr. SPROAT. I don't need 100 percent of the design complete to license the repository. I need 100 percent of the design complete to build the repository.

Senator BOXER. Who said that?

Mr. SPROAT. Senator, I am a professional licensed engineer who has built and licensed nuclear facilities.

Senator BOXER. As big as this?

Mr. SPROAT. Yes.

Senator BOXER. Where is there another Yucca Mountain that takes this kind of waste? We have never had a facility like this.

Mr. SPROAT. Senator, if I spend taxpayer and ratepayer money developing detailed design for like wiring connection diagrams that are needed to build the repository before I even have a license to construct it, I think you would probably be arguing with me that I am wasting the money.

Senator BOXER. So you think it is perfectly fine in this enormous and complicated and controversial project, you admit it is very controversial, do you not?

Mr. SPROAT. Absolutely.

Senator BOXER. You admit that Republicans and Democrats elected to office oppose it. Correct?

Mr. SPROAT. I also admit that it has bipartisan support in the Congress.

Senator BOXER. We understand. You admit it is controversial and yet you would move forward when you only have 35 percent of the design completed.

Mr. SPROAT. Because that is all I need to meet the NRC regulations to submit a license application.

Senator BOXER. Well, that is a different situation. I will take that up with them next.

Mr. SPROAT. That is what is required by the law.

Senator BOXER. But in your view, that is all you need. So in your view, 35 percent. How about 25 percent, would that be enough?

Mr. SPROAT. No.

Senator BOXER. So it has to be exactly 35 percent?

Mr. SPROAT. No, it has to be the level of engineering that is required to allow us to show the NRC that we are able to meet their regulations.

Senator BOXER. OK. So the NRC says they only need to be 35 percent complete.

Mr. SPROAT. The NRC doesn't set a percentage-wise number. We determine what the amount of engineering and analysis that needs to be done to meet their regulations, and if we don't meet their mark, they will reject it.

Senator BOXER. Well, I don't understand why DOE would submit an incomplete application for one of the most controversial projects. How long does the waste last? How long does the waste remain radioactive? Do you know?

Mr. SPROAT. Several hundred thousand years.

Senator BOXER. Oh, OK. And yet you don't think it is prudent to finish your work before you go for a license. Is that right?

Mr. SPROAT. Not the engineering.

Senator BOXER. Several hundred thousand years.

How will the State of Nevada and other interested parties be able to evaluate the application if it is incomplete?

Mr. SPROAT. First of all, the application will be complete.

Senator BOXER. If it only covers 35 percent of the design, you call it complete. The average person who doesn't speak bureaucratic talk, would not agree with you.

Mr. SPROAT. Well, I am sorry.

Senator BOXER. I know. I am sorry, too. And I think you have to start realizing that people don't understand Government-speak. Thirty-five percent of the design is complete, and you say it is complete. It doesn't make sense. Either it is 100 percent complete or it is not complete, and the State of Nevada, you think they might take you to court over this?

Mr. SPROAT. That will be their decision.

Senator BOXER. Do you think it is a possibility? Excuse me?

Mr. SPROAT. They have taken us to court several times.

Senator BOXER. And they may certainly do it on this one.

Mr. SPROAT. They probably will.

Senator BOXER. If I was sitting on a jury, if it did go before a jury, sometimes it doesn't, and they said, well, they are saying it is complete, but it is only 35 percent complete. People know what that means. You don't go ahead and build a house until you have the design complete. And by the way, houses don't hold radioactive waste for hundreds of thousands of years.

So I don't understand your thinking. I think you are making matters worse for your case, in my own opinion.

So Mr. Weber, we turn to you. I understand that DOE expects to have about 35 percent of the design complete for both subsurface and surface facilities at Yucca when it submits its license application to the NRC. Is it common for other NRC applicants to submit applications that are only 35 percent complete?

Mr. WEBER. Depending on where they are, Madam Senator, in the process, yes.

Senator BOXER. OK. Would you please make available to me other facilities that have sent you designs that were 35 percent complete and you felt that was sufficient?

Mr. WEBER. I could turn to other staff, but if you look at the NRC two step licensing process for nuclear power plants, most plants in this Country were on that order when they submitted their construction permits. That is in advance of getting their operating license.

Senator BOXER. This isn't a plant. We are talking about Yucca Mountain. How long does the waste last?

Mr. WEBER. I think the issue, Senator, is "35 percent of what?" In fact, this issue came up in our last quarterly management meeting in September when we met with the Department in public.

We discussed this topic because it came up at a previous discussion that the Department had with the Nuclear Waste Technical Review Board.

We agreed that at our next quarterly management meeting, we would pursue this question, because depending on how Mr. Sproat and his team assemble their application, it may or may not be acceptable to the NRC. That is why we have to have a substantive

discussion about "will the information the Department is planning to include in their application be sufficient to address the requirements in our regulations?"

I think Mr. Sproat, at our last quarterly management meeting, laid out an approach that could be acceptable, but now we have to get into the specifics about what does it mean 35 percent or 40 percent complete? If that information is sufficient to address each of the requirements that are in our regulations, then we would accept the application and we would commence the review.

If it is not——

Senator BOXER. But you haven't made that decision.

Mr. WEBER. We have not made that decision.

Senator BOXER. So Mr. Sproat needs to know you haven't made the decision. Will you please send me those applications you have agreed to that have been 35 percent or less complete please?

Mr. WEBER. We would be happy to work with your staff, ma'am.

Senator BOXER. Thank you.

NRC rules require that license applications be complete and accurate in all material aspects. That is my understanding of your rules. Would the NRC consider the repository's engineered barriers to prevent leakage material aspects for the application?

Mr. WEBER. If the Department makes a compelling case that they satisfied the requirements in our regulations, and through our independent review, and through the Licensing Board review, the findings are upheld, then we would accept it.

Senator BOXER. Would these barriers have to be included in the initial application?

Mr. WEBER. The application has to address the engineered and the natural barriers that will be relied on to satisfy the performance objectives.

Senator BOXER. And is that done, sir?

Mr. SPROAT. We are including that design information regarding both the engineered barrier system and the natural barrier system in the license application to be able to meet their docketing requirements.

Senator BOXER. So you have addressed the issue of the leakage?

Mr. SPROAT. Yes, we have.

Senator BOXER. OK.

Are there any circumstances, Mr. Weber, under which NRC would decide not to issue a license for DOE to construct the Yucca Mountain repository? If so, what would they be?

Mr. WEBER. To satisfy the NRC that the construction authorization should be granted, the Department has to satisfy each of the requirements in our regulations. If they fail to satisfy those requirements, we will not issue the construction authorization.

Senator BOXER. I understand that most countries looking at it—this is for Mr. Meyers—I understand that most countries looking at a geological repository for nuclear waste have set or proposed standards of 10 millirem per year. Are you aware of any other country in this entire world that has set radiation protection standards as high as those EPA is proposing, 350 millirem per year?

Mr. MEYERS. I would like to provide a formal response for the record. I think that other countries have also—I am not aware that they have been dealing with a period of 10,000 year to one million

years that we are dealing with in this particular situation. They have established standards, a variety of different standards, but we can provide a detailed response.

Senator BOXER. So you don't know if any other country in the world would allow for that? Our research says it doesn't.

Mr. MEYERS. I am not aware, but I am also not aware that other countries necessarily, all other countries necessarily have any specific numeric standard covering the period of time.

Senator BOXER. OK, well why don't we share our information from our research, which shows that most countries looking at a geological repository have proposed standards of 10 millirem and we are 350 millirem.

Now, you are the Environmental Protection Agency. You have to protect the people, right? So can you talk to me about exposure to that level of radiation, 350 millirem?

Mr. MEYERS. Certainly. I think as we detailed in our proposal of 2005, exposure is based on essentially the reasonably maximally exposed individual who is somebody who is a rural resident of the valley. It is basically an exposure level that is equivalent to essentially the incremental exposure somebody would face by living in Denver, Colorado today, versus somebody who is living in the site.

Senator BOXER. Well, I will tell you, sir, I have been through this before. Increasing from 15 millirem to 350 millirem is a whole other ball game. I will provide you with the health information that I have received on this matter. So I hope you and I can have a conversation because there is no higher job than protecting the health and safety of the people of this Country, not just now, but in the future.

So I want to thank the panel very much. I am sorry I had to step out, but I am very concerned about it. This looks like a little cozy trio and I just don't feel that good about it. So fortunately, we will have other people watching your work, as well as this Committee.

Thank you very much.

And now we will have our third panel. The Honorable Catherine Cortez Masto, Attorney General, State of Nevada; Mr. James Kerr, President, National Association of Regulatory Utility Commissioners, North Carolina Utilities Commission; and Mr. Ken Cook, President, Environmental Working Group.

I want to welcome all of you. I want to thank everyone who has participated in this hearing, and this will be our last three panelists. Thank you very much for your patience, and we are going to open it up with you, Attorney General Masto.

Thank you so much. I want to note that the Governor was invited, but he sent a statement. So Attorney General, please go ahead.

## STATEMENT OF CATHERINE CORTEZ MASTO, ATTORNEY GENERAL, STATE OF NEVADA

Ms. MASTO. Thank you, Chairwoman.

For the record, I am Catherine Cortez Masto, the Attorney General of the State of Nevada. I appreciate this opportunity to appear before the Committee for the State of Nevada regarding the Yucca Mountain Repository Program.

Nevada has had a long history of opposing the development of the proposed high level nuclear waste repository at Yucca Mountain. The Yucca Mountain site is unsafe and incapable of geologically isolating nuclear waste. Not only is the site physically unsuitable for a nuclear waste repository, but the United States Department of Energy has repeatedly shown itself to be an unfit applicant for a license from the Nuclear Regulatory Commission.

Finally, the prospective NRC licensing proceeding is seriously biased and denies Nevada and other potential participants basic due process rights. The following summary highlights issues relating to the involvement of the U.S. Environmental Protection Agency and NRC in the Yucca Mountain repository licensing process. Nevada raises these issues to seek your guidance and to place public safety at the forefront of any decision regarding the disposal of the Nation's lethal high level radioactive waste.

The first issue of fact I would like to discuss, which we have talked about a little bit already, is the EPA standards and NRC licensing regulations are not yet final. This raises the issue of whether NRC can properly docket and begin substantive review of DOE's license application.

DOE plans to file a license application, as we have heard, relying on the proposed EPA standard by June 2008. NRC staff has said that it can begin its substantive review even without the final EPA standard because there are elements of the license application that are directly responsive to the EPA standard.

DOE's rationale for proceeding without a standard is that if the final EPA standard is different from what was proposed, DOE can simply amend its license application to respond to the new requirements. Before this can happen, however, NRC will have to revise its proposed rule written to conform to the proposed EPA standard. This will create an untenable situation where EPA and then NRC are revising their standards and rules while NRC is simultaneously reviewing DOE's license application.

Interested parties, including Nevada, will be prejudiced by this chaotic situation. We must begin our review of DOE's entire application at the time it is submitted because we only have 30 days after NRC dockets the application to file our contentions. It is both wasteful of limited resources and patently unfair that potential interveners, whose accepted or rejected contentions determine their party status, should be forced to review and entire license application that likely will 1undergo substantial amendment and change. The obvious solution is that NRC should be 1prohibited from accepting DOE's license application for review until final EPA and NRC regulatory requirements are in place.

The second issue that I would like to highlight today is the fact that DOE's rush to file its license 1application causes serious safety and completeness concerns. At a recent Nuclear Waste 1Technical Review Board meeting, DOE reported that the repository safety-related design for the operating service facilities and the underground disposal area will only be 35 percent to 40 percent complete at the time the license application is filed.

Similarly, the design of the waste canisters, the so-called TADs, which has become the centerpiece of DOE's waste handling transport, storage and disposal strategy, is not planned to be complete

until after the June, 2008 license application filing date. Additionally, legally required plans for recovery and mitigation of accidents and response to emergencies, necessary accounting for nuclear materials, security at the repository, and retrieval of waste will also not be included in the license application.

Clearly, concerns for public safety necessitate that these critical plans should be complete and reviewable by all parties and potential parties during the mandatory license application review.

The lack of complete design and planning information is wholly attributable to DOE's rigid insistence on its self-imposed June 2008 license application date.

And finally, the third thing I would like to highlight is the fact that the Federal Government plans to double-team the licensing hearing. Under NRC's current rules, NRC staff will be a party advocate along with DOE, the license applicant. Nevada and other potential parties will certainly be prejudiced by this procedural defect. Once the NRC staff has completed its review of DOE's application, has received acceptable responses from DOE for additional information, and has written a safety evaluation report supporting DOE's receipt of a license, NRC staff and attorneys then turn around and become party advocates for DOE as a prospective licensee.

This situation, where two powerful executive department agencies join together to overpower legitimate intervening parties, is palpably unfair. We believe the public would be infinitely better served if NRC staff maintained a more appropriate, neutral role during the hearing. The public's confidence will certainly be enhanced if NRC staff remains a neutral evaluator, rather than a redundant advocate and aggressive partner to DOE.

Thank you, Madam Chair, for the opportunity to speak to the Committee today.

[The prepared statement of Ms. Masto follows:]

STATEMENT OF CATHERINE CORTEZ MASTO, ATTORNEY GENERAL, STATE OF NEVADA

I am Catherine Cortez Masto, Attorney General of the State of Nevada. I appreciate this opportunity to appear before the Committee for the State of Nevada regarding the Yucca Mountain repository program.

Nevada has a long history of opposing the development of the proposed high level nuclear waste repository at Yucca Mountain. The Yucca Mountain site is unsafe and incapable of geologically isolating nuclear waste. Not only is the site physically unsuitable for a nuclear waste repository but the United States Department of Energy has repeatedly shown itself to be an unfit applicant for a license from the Nuclear Regulatory Commission. Finally, the prospective NRC licensing proceeding is seriously biased and denies Nevada and other potential participants basic due process rights.

The following summary highlights issues relating to the involvement of the U.S. Environmental Protection Agency and NRC in the Yucca Mountain repository licensing process. Nevada raises these issues to seek your guidance and to place public safety at the forefront of any decision regarding the disposal of the nation's lethal high-level radioactive waste.

The EPA Standards and NRC Licensing Regulations are not yet final.

This unexplained fact raises the issue of whether NRC can properly docket and begin substantive review of DOE's license application. DOE plans to file a license application relying on the proposed EPA Standard by June, 2008. NRC staff has said that it can begin its substantive review even without the final EPA standard because there are elements of the license application that are not directly responsive to the EPA standard. DOE's rationale for proceeding without a standard is that if the final EPA standard is different from what was proposed, DOE can simply

amend its license application to respond to the new requirements. Before this can happen, however, NRC will have to revise its proposed rule written to conform to the proposed EPA standard. This will create an untenable situation where EPA and then NRC are revising their standards and rules while NRC is simultaneously reviewing DOE's license application originally written to meet draft standards and rules which have been subject to extensive critical public comment. Interested parties, including Nevada, will be prejudiced by this chaotic situation. We must begin our review of DOE's entire application at the time it is submitted in order to file NRC-required contentions thirty days after NRC has completed its acceptance review and dockets the application. It is both wasteful of limited resources and patently unfair that potential interveners, whose accepted or rejected contentions determine their party status, should be forced to review an entire license application that likely will undergo substantial amendment and change.

The obvious solution is that NRC should be prohibited from accepting DOE's license application for review until final EPA and NRC regulatory requirements are in place. Then, an orderly and fair review can commence.

DOE's rush to file its License Application causes serious safety and completeness concerns.

At a recent Nuclear Waste Technical Review Board meeting, DOE reported that the repository safety related design for the operating surface facilities and the underground disposal area will be only 35 percent to 40 percent complete at the time the license application is filed. Similarly, the design of the waste canisters—the so-called TADs (Transportation, Aging and Disposal canisters)—which have become the centerpiece of DOE's waste handling, transport, storage, and disposal strategy, is not planned to be complete until after the June 2008 license application filing date. Legally required plans for recovery and mitigation of accidents and response to emergencies, necessary accounting for nuclear materials, security at the repository, and retrieval of waste will also not be included in the license application. Clearly, concerns for public safety necessitate that these critical plans should be complete and reviewable by all parties and potential parties during the mandatory license application review.

This lack of complete design and planning information is wholly attributable to DOE's rigid insistence on its self-imposed June 2008 license application date. Without access to key information, Nevada and other potential parties cannot adequately develop contentions. The obvious danger inherent in imposing an inflexible, artificial schedule is that meeting it takes on overriding importance and safety is short-changed.

The Federal Government plans to "double team" the licensing hearing.

Under NRC's current rules, NRC staff will be a party-advocate along with DOE, the license applicant. Nevada and other potential admitted parties will certainly be prejudiced by this procedural defect. Once the NRC staff has completed its review of DOE's application, DOE has provided acceptable responses to any staff requests for additional information, and NRC staff has written a Safety Evaluation Report supporting DOE's receipt of a license, NRC staff and attorneys then turn around and become party advocates for DOE as a prospective licensee.

This anachronistic situation, where two powerful executive department agencies join together to overpower legitimate intervening parties, is palpably unfair. We believe the public would be infinitely better served if NRC staff maintained a more appropriate, neutral role during the hearing. The public's confidence will certainly be enhanced if NRC staff remains a neutral evaluator rather than a redundant advocate and aggressive "partner" to DOE.

Thank you for this opportunity.

### RESPONSES BY CATHERINE CORTEZ MASTO TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

*Question 1.* The State of Nevada had a full opportunity to participate in the development of the regulations governing the licensing of a repository and to challenge those regulations through the administrative and judicial process. If the NRC and the courts found your complaints to be without merit, what conditions exist that warrant congressional intervention?

Response. The Senator appears to have received incorrect information on this matter. In Environmental Protection Agency v. Nuclear Energy Institute (EPA v. NEt). 373 F.3d 1251 (2004), the U.S. Court of Appeals for the District of Columbia Circuit ruled for Nevada in several critical respects. In particular, the core regulation affecting the safety of the Yucca repository—EPA's radiation standard for the project—was found to be contrary to law. Since NRC must adopt EPA's regulation for its Yucca licensing standard, the NRC's rule was also found to be contrary to

law, at least to the extent it relied on the EPA rule. EPA has since proposed a new Yucca rule. Nevada and others filed extensive comments on the current proposed rule identifying key scientific and legal defects. EPA has delayed issuance of the final standard for more than 3 years. Unfortunately, notwithstanding the absence of an EPA standard, DOE has stated its intention to file a Yucca license application by June 2008.

Moreover, the D.C. Circuit did not dismiss Nevada's extensive challenges to the environmental integrity of the Yucca project under the National Environmental Policy Act (NEPA), but ruled that they were not yet ripe. The Court invited Nevada to challenge any final agency decision concerning transportation, environmental and socio-economic impacts, and the no-action alternative which would allow continued storage of spent fuel at reactor sites. Nevada will certainly initiate such a challenge at the appropriate time.

Since DOE has yet to file an application for Yucca construction authorization, NRC has not yet considered, let alone ruled, on the merits of Nevada's innumerable challenges to the project. However, Nevada did challenge the integrity of DOE's document collection for the Licensing Support Network. In 2004, an NRC administrative law board struck DOE's initial document certification as unlawful. It took DOE more than 3 years to re-certify. Nevada has challenged DOE's recertification and will argue its motion on December 5, 2007. Thus, to the limited extent NRC has ruled on the merits of Nevada's challenges, it has come down squarely on the side of Nevada.

In Nevada's view, congressional intervention is needed because the Yucca Mountain project is unfeasible due to intractable scientific and technical flaws with the site and with DOE's work. In addition, myriad procedural irregularities and regulatory violations should doom the project. Further work on Yucca results in a colossal waste of taxpayer and electric utility ratepayer funds. This is especially true given the fact that commercial nuclear facilities are now storing spent nuclear fuel in safe. robust dry cask storage systems determined by NRC to be safe for at least a century. DOE also has represented that such dry cask storage facilities are safe for at least a millennium. In spite of this, DOE plans to submit a license application for Yucca Mountain with designs that are only 30 to 40 percent complete, and which will lack critical technical information necessary for NRC staff, Nevada, other interested parties and the public to fairly evaluate the project's safety. Moreover, Nevada has learned from recent documents that DOE itself believes its own computer model evaluating the safety of Yucca Mountain is obsolete, incomplete, and utterly lacking in transparency.

*Question 2.* The Nuclear Waste Policy Act requires the Nuclear Regulatory Commission to consider an application for all or part of a repository. Isn't it clear that Congress itself did not believe that every last detail needed to be included initially in the application?

Response. NRC's regulations at 10 C.F.R. § 63.10 require that DOE's initial Yucca Mountain license application must be "complete and accurate in all material respects."

Nevada is not asking that "every last detail" be contained in DOE's initial application to NRC for Yucca construction authorization. Rather, Nevada is demanding, as the regulations do, that the core technical and scientific documents and studies necessary to evaluate the safety and environmental consequences of the project be contained in the application so that NRC, Nevada, other interested parties, and the public can successfully gauge the integrity of the project. DOE's application will admittedly omit some 60 to 70 percent of the project's design detail. Much of what DOE plans to omit is considered by Nevada, as well as the congressional Nuclear Waste Technical Review Board and the NRC's Advisory Committee on Nuclear Waste, to be essential, core technical information. DOE 's recent recertification of its document collection, for example, excluded the critically important Total Systems Performance Assessment {TSPA) model as well as several key Analysis Model Reports (AMRs) that go to the heart of the repository's long-term safety performance.

NRC's Yucca Mountain Review Plan, NUREG 1804 (Rev. 2), contains a complete list of what NRC believes must be contained in DOE's initial Yucca license application. and prescribes NRC's review responsibilities with respect to those products. It is Nevada's understanding that DOE plans to omit substantial portions of all the materials listed in NUREG 1804 in its initial application.

*Question 3.* Given your concern about wasting financial resources and given the taxpayer[s] [sic] are already liable for at least $7 billion, wouldn't it be a better use of taxpayer dollars to begin the licensing process and let the NRC decide what additional information may be needed?

Response. Any submission by DOE to NRC that causes the agency to have to "stop and restart" the regulatory review process will result in exponential increases in the time and resources required to complete the licensing process. This is most likely to be the case with an incomplete or premature initial license application. Once DOE has submitted its Yucca license application, the Nuclear Waste Policy Act requires the NRC licensing process to be completed within 3 years, with a possible extension for a fourth year. This is an extremely tight window of time for such an enormous, unprecedented licensing project.

NRC's published guideline, NUREG 1804, already specifies the components necessary for a materially complete license application, as does regulation 10 C.F.R.§ 63.21. Thus, there is little question about "what additional information may be needed" to satisfy NRC requirements. DOE should already know what such information comprises. Rather, in order to meet its politically motivated project schedule, DOE apparently plans to submit a deliberately incomplete license application in the hope that NRC will nevertheless docket it and permit "seasonal supplementations" later. But this would have the effect of drastically extending and complicating NRC's review process, increasing costs and extending schedules for all parties concerned. Indeed, Nevada has learned from recently discovered documents that DOE may actually be planning to submit a knowingly deficient and incomplete application now while it quietly prepares for a later submission of its "real" application using a "second generation" repository performance assessment. This would cause the NRC's licensing boards and all parties to spin their wheels needlessly perhaps for years, only to face a much more serious application later, together with the prospect of having to return to square one for license review. It is hard to imagine a more needless waste of taxpayer and ratepayer resources. That is why DOE is, and should be, required to complete its application before filing it with NRC.

Senator BOXER. Thank you so very much.

Mr. Kerr.

Welcome.

## STATEMENT OF JAMES Y. KERR, III, PRESIDENT, NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS, NORTH CAROLINA UTILITIES COMMISSION

Mr. KERR. Good morning.

Madam Chairman, my name is Jim Kerr. I am a member of the North Carolina Utilities Commission and also serve as President of the National Association of Regulatory Utility Commissioners. On behalf of NARUC, as well as my colleagues in North Carolina, I very much appreciate the opportunity to appear before you this morning.

NARUC is a quasi-governmental non-profit organization founded in 1889. Our members include the State Public Service Commissions that regulate retail rates and services of electricity, gas, water and telecommunications utilities in this Country. I have filed more comprehensive testimony, and for purposes of summary, let me make a handful of basic points concerning NARUC's perspective on this matter.

First and foremost and perhaps most importantly, NARUC accepts and supports the right and responsibility of the State of Nevada to challenge the licensing of Yucca Mountain through participation in lawful procedures established by the Nuclear Waste Policy Act. As an organization of States that advocates the collective interests of State commissions in Federal agency proceedings, NARUC understands the need for vigorous advocacy when issues of critical importance to a State or States are at issue. In fact, under the Nuclear Waste Policy Act, funds paid into the fund by consumers across the Country are made available for just this purpose to the State of Nevada.

Second, NARUC has been laboring in this vineyard for decades. We have worked to be a constructive voice in addressing this complex issue. We are neither waste technicians nor nuclear engineers, but rather economic regulators charged with protecting the interests of consumers of the electricity generated on their behalf by nuclear power stations. Through payment of their electric bills to their local utility, these consumers have contributed with interest $27 billion to this program. Illinois has contributed $3.5 billion. My State, North Carolina, contributed $2.2 billion; California, $1.4 billion; and so forth and so on. Attached to my testimony at page six is a comprehensive list of the contributions made by the individual States across this Country.

To that end, NARUC's goal has been to advocate actions by Congress and Federal agencies,

DOE, EPA, and NRC, to foster a safe, efficient and cost-effective waste disposal program to discharge the Federal Government's promise and responsibility to manage the waste disposal challenge. On behalf of the American people, and more specifically consumers of nuclear power, Congress has made the decision to use a geologic repository, and further has designated Yucca Mountain as the location of the facility to be tested through the NRC licensing process.

In our view, it is time, indeed past time, for the process to move forward. I want to make the following point with respect to the nuclear waste fund. This is little talked about, but those dollars are not in a fund. Rather, those dollars have in fact been diverted for other budgetary purposes. The fund is nothing but IOUs that are owed by this Federal Government to the States, and more importantly to the ratepayers who have paid. Of the roughly $29 billion that has been collected, approximately $9 billion has actually been spent on its intended purpose. Because of budgetary restrictions, this Congress has taken roughly $20 billion of ratepayer money and used it for other purposes other than those which it was lawfully intended to.

At the end of the day, ratepayers, consumers of nuclear generation, end up paying three times for the storage of waste. First, they pay their assessment into the nuclear waste fund. Second, in their base rates they are paying for the interim storage on the sites that has been discussed so often today. And then third, as taxpayers of this Country, they pay for the liability of the DOE for the onsite costs related to the breach of the contractual obligation to take control of the waste.

One of my colleagues in testifying before this Congress said it much more simply than I have, and that is you have and are spending our money and we have your waste.

In conclusion, as has been referenced today in this Committee, and we hope to be part of that discussion as it deals with concerns about carbon-emitting generation. It is undeniable that nuclear generation is a part of that equation of solving that complex problem, and the nuclear waste question must be resolved as part of that discussion.

I thank you again for the opportunity to be with you to submit my testimony, and I am happy to answer any questions.

[The prepared statement of Mr. Kerr follows:]

STATEMENT OF JAMES Y. KERR, III, PRESIDENT, NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS, NORTH CAROLINA UTILITIES COMMISSION

Good morning Madame Chairman, Ranking Member Inhofe, Members of this Committee, and distinguished panelists. Thank you for holding this important hearing on one of the most critical issues facing our Nation's energy policy.

My name is Jim Kerr. I am a member of the North Carolina Utilities Commission (NCUC). I also serve as the President of the National Association of Regulatory Utility Commissioners (NARUC), and I am testifying today on behalf of that organization. In addition, my testimony reflects the views of the NCUC. On behalf of NARUC and the NCUC, I very much appreciate the opportunity to appear before you this morning.

I ask that my testimony be made a part of the record and I will summarize our views.

NARUC is a quasi-governmental, non-profit organization founded in 1889. Our membership includes the State public utility commissions serving all States and territories. NARUC's mission is to serve the public interest by improving the quality and effectiveness of public utility regulation. Our members regulate the retail rates and services of electric, gas, water, and telephone utilities. We are obligated under the laws of our respective States to ensure the establishment and maintenance of such utility services as may be required by the public convenience and necessity and to ensure that such services are provided under rates and subject to terms and conditions of service that are just, reasonable, and non-discriminatory.

Madame Chairman and Members of this Committee, NARUC's interest in this matter is simple. State utility regulators and the Nation's ratepayers more than 25 years ago bought into the basic agreement underlining the Nuclear Waste Policy Act of 1982: o The Federal Government is responsible for safe, permanent disposal of commercial spent nuclear fuel (and other government nuclear waste); and, o Utilities which produced the spent fuel in making electricity and—most importantly, their ratepayers—would pay a fee to cover disposal costs.

To date, the ratepayers and utilities have faithfully upheld their end of the bargain—paying more than $27 billion in fees and interest into the Nuclear Waste Fund. For your information, I have attached a listing of payments (page 6) into that fund for ratepayers in each State, for inclusion in the record of this hearing. These ratepayers have little to show for their "investment" as, by law, waste disposal was to have begun in 1998 and current Department of Energy schedules indicate such disposal will not occur before 2017. Unless Congress acts to allow full access to annual fee revenue for this program, even that date is not realistic.

As Congress is well aware, the Federal Government entered into contracts based on that 1998 acceptance schedule and Federal courts have found DOE to be liable for waste-acceptance delay costs which DOE estimates could be $7 billion or more. This all means that, right now, ratepayers are currently paying twice for spent fuel storage: they pay the utilities for their disposal fee payments, and they pay for storage of the waste that was to have been removed by now. Moreover, we find it unfair that while Congress appropriates a small fraction of the Nuclear Waste Fund annual fee revenue to the repository program, the balance of that revenue is used for other unrelated government activities while, in effect, accumulating $20 billion in "IOUs" in the Fund.

Madame Chair and Members of this Committee, the ratepayers of this country did not choose the site for this repository. Congress did that in 1987 and affirmed the suitability of Yucca Mountain by joint resolution in 2002. DOE seems at long last to be on the verge of submitting a license application to the Nuclear Regulatory Commission (NRC), the independent agency given the responsibility under the Nuclear Waste Policy Act to carefully examine the safety and other technical merits of the proposed facility. We understand the NRC will conduct its review process with public scrutiny and over a three-to 4-year period. We are aware of and fully support the right of the State of Nevada to raise contentions in the review process. State utility regulators do not have the skills or charter to evaluate the repository plans; we wish that others would withhold judgment until they see the application.

President Jimmy Carter said over 25 years ago that resolving civilian waste management problems shall not be deferred to future generations. Those who oppose building a repository at Yucca Mountain (the only site Congress directed be evaluated for this purpose), when asked what alternative they would propose, all seem to support variations of leaving it where it is, which was never the intent when these reactors were permitted nor does it heed President Carter's charge. If the repository solution is abandoned, what do we tell the communities adjoining the 72 reactor sites in 35 States where the spent fuel is stored today? What do the utilities seeking to invest in new nuclear power plants tell their prospective neighbors? What

do we tell the ratepayers that have already invested more than $27 billion? When will they get a refund?

There is another issue to consider in the context of this hearing. Madame Chair, your committee is moving forward on legislation that would place limits on the growth of carbon emissions. For States and regions such as the Southeast, where I am from, there is a definite need for nuclear generation to be part of a diversified generation strategy if we are to be serious about limiting the growth of carbon emissions. If Congress decides to place limits on carbon-emitting generation, then nuclear generation, renewables, energy efficiency, and conservation must all be part of the solution. This means that the question of nuclear waste must be resolved.

It is an open question as to what links there may be between "solving the waste problem" before considering investing in new or even replacement nuclear reactors. In the "nuclear world," where safety and reliability are cardinal principles, it seems ironic that the major element of unreliability facing the U.S. nuclear industry seems to be whether the Federal Government will provide the disposal "services" promised in law and contracts.

In conclusion, the ratepayers have been patient through the years of delay for this program and can probably wait for the NRC to carefully review a well-presented license application. But, in order for the NRC to review the license, the Department of Energy needs to execute their plan to submit the high-quality application they have pledged to do. Further delay only adds to the government liability, which will be paid out of the Federal Government Judgment Fund, not the Nuclear Waste Fund. This means that all taxpayers will bear this financial burden.

Ratepayers and neighbors of 104 reactors look for the utilities and the NRC to assure them that the spent fuel is safely and securely stored where it is today. NARUC intends to continue to press Congress to manage the ratepayers' investment in the Nuclear Waste Fund as it was intended in the Nuclear Waste Policy Act and to put a stop to the diversion of fee revenue to other unrelated uses.

Thank you for this opportunity to present our views. I look forward to answering any questions you have.

**NUCLEAR WASTE FUND**
**RATEPAYER PAYMENTS BY STATE**
**THROUGH 6-30-07 (MILLIONS OF DOLLARS)**

| STATE | PAYMENTS 1 mill/kwh, One Time+Int | RETURN ON INVESTMENTS as of 9/30/06 | TOTAL (PAY+RETURN) | DEBT* | FUND ASSETS** (TOTAL +DEBT) |
|---|---|---|---|---|---|
| AL | 477.5 | 307.2 | 784.7 | 0 | 784.7 |
| AR | 302.6 | 194.6 | 497.2 | 167.8 | 665.0 |
| AZ | 225.2 | 144.9 | 370.1 | 0 | 370.1 |
| CA | 896.0 | 576.4 | 1472.4 | 0 | 1472.4 |
| CO | 0.2 | 0.1 | 0.3 | 0 | 0.3 |
| CT | 257.8 | 165.8 | 423.6 | 343.0 | 766.6 |
| DE | 40.2 | 25.9 | 66.1 | 0 | 66.1 |
| FL | 754.8 | 485.5 | 1240.3 | 0 | 1240.3 |
| GA | 586.0 | 376.9 | 962.9 | 0 | 962.9 |
| IA | 217.2 | 139.7 | 356.9 | 43.3 | 400.2 |
| IL | 1587.1 | 1020.9 | 2608.0 | 930.7 | 3538.7 |
| IN | 216.5 | 139.3 | 355.8 | 220 | 575.8 |
| KS | 115.3 | 74.2 | 189.5 | 0 | 189.5 |
| KY | 126.8 | 81.6 | 208.4 | 0 | 208.4 |
| LA | 274.2 | 176.4 | 450.6 | 0 | 450.6 |
| MA | 309.2 | 198.9 | 508.1 | 156.3 | 664.4 |
| MD | 343.5 | 221.0 | 564.5 | 0 | 564.5 |
| ME | 47.2 | 30.4 | 77.6 | 111.8 | 189.4 |
| MI | 262.8 | 169.0 | 431.8 | 189.5 | 621.3 |
| MN | 286.3 | 184.2 | 470.5 | 0 | 470.5 |
| MO | 216.9 | 139.5 | 356.4 | 5.1 | 361.5 |
| MS | 141.7 | 91.1 | 232.8 | 0 | 232.8 |
| NC | 1340.5 | 862.3 | 2202.8 | 0 | 2202.8 |
| ND | 15.9 | 10.2 | 26.1 | 0 | 26.1 |
| NE | 168.8 | 108.6 | 277.4 | 0 | 277.4 |
| NH | 68.7 | 44.2 | 112.9 | 22.8 | 135.7 |
| NJ | 624.5 | 401.7 | 1026.2 | 188.2 | 1214.4 |
| NM | 65.5 | 42.1 | 107.6 | 0 | 107.6 |
| NY | 717.5 | 461.5 | 1179.0 | 483.5 | 1662.5 |
| OH | 392.2 | 252.3 | 644.5 | 31.2 | 675.7 |
| OR | 75.1 | 48.3 | 123.4 | 0 | 123.4 |
| PA | 1173.2 | 754.7 | 1927.9 | 63.6 | 1991.5 |
| RI | 4.7 | 3.0 | 7.7 | 5.8 | 13.5 |
| SC | 600.6 | 386.3 | 986.9 | 0 | 986.9 |
| SD | 5.7 | 3.7 | 9.4 | 0 | 9.4 |
| TN | 468.4 | 301.3 | 769.7 | 0 | 769.7 |
| TX | 652.7 | 419.9 | 1072.6 | 0 | 1072.6 |
| VA | 616.2 | 396.4 | 1012.6 | 0 | 1012.6 |
| VT | 87.8 | 56.5 | 144.3 | 135.5 | 279.8 |
| WA | 145.5 | 93.6 | 239.1 | 0 | 239.1 |
| WI | 383.6 | 246.8 | 630.4 | 0 | 630.4 |
| SUBTOTAL | 15292.1 | 9836.9 | 25129.0 | 3098.1 | 28227.1 |
| FEDERAL | 19.8 | 12.7 | 32.5 | 0 | 32.5 |
| INDUSTRY | 16.8 | 10.8 | 27.6 | 0 | 27.6 |
| TOTAL | 15328.7 | 9860.4 | 25189.1 | 3098.1 | 28287.2 |

*Funds owed for fuel burned before 1983 but not yet paid by utilities (as allowed by DOE contract)
**before withdrawals for expenditures by DOE
Prepared by Ron Howe, Michigan Public Service Commission, 517-241-6021, rhowe@michigan.gov

RESPONSE BY JAMES Y. KERR, III, TO AN ADDITIONAL QUESTION FROM SENATOR CARDIN

*Question.* Would the fees collected from ratepayers to cover the disposal costs at Yucca Mountain be sufficient for the design and use of long-term storage of spent fuel at reactor sites as proposed by Senators Reid and Ensign?

Response. 1We are not aware of any cost estimates that would allow us to have an informed opinion on this question. However, NARUC would strongly oppose such a "solution" because it is in fact no solution at all. Such an approach fails to fulfill the Federal Government's obligation to remove the waste and its policy to utilize centralized storage. In short, this type of proposal does nothing more than merely change slightly the oft-used phrase of, "You, Federal Government, have our money and we, the States, have your waste," to, "You, Federal Government, STILL have our money and we, the States, STILL have your waste."

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RESPONSES BY JAMES Y. KERR, III, TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

*Question 1.* If Yucca Mountain was not an option for storing nuclear waste, what alternative would you support? What should the Nuclear Waste Fund be used for if it could not be spent to build a repository at Yucca?

Response. In 1987, Congress made clear its intention that Yucca Mountain should be the only option considered for study, and, in 2002, Congress approved the site. Since that time, the National Association of Regulatory Utility Commissioners (NARUC) has held a consistent position that, based on an appropriate licensing process, it supports geological disposal at Yucca Mountain as the best way to isolate radioactive waste. Accordingly, it is NARUC's position that the licensing process should be allowed the opportunity to be initiated and completed. Based upon the findings of an open, public licensing process and review—and any appellate review of same—a decision should then be made to either move forward with Yucca Mountain or begin the process to find another site. The Nuclear Waste Policy Act (NWPA) remains the law and, should Yucca Mountain no longer be an option, Congress would then be responsible for choosing the new site.

Regarding the funding issue, the NWPA in Sec. 302(d) states that the Fund is to be used for the purposes of developing a geologic repository and emplacing spent fuel in it. Additionally, consideration should also be given for the use of the Fund to finance the cost to develop and operate central interim storage facilities, away from reactor storage sites, only until Yucca Mountain or alternative geologic repository/repositories are available. However, use of the Fund in this interim manner would require amending the NWPA.

*Question 2.* How does your association feel about DOE's proposal to place all spent nuclear fuel in Transportation, Aging and Disposal (TAD) canisters, at the expense of utilities, before transporting it to Yucca? Do you have any idea how much this could cost nuclear utilities? Is it cost-effective for utilities that already use dry cask storage to transfer that waste into TAD canisters?

Response. The concept of using a single canister for storage, transportation and disposal is appealing. We are pleased to see the reconsideration of this concept and the cooperative planning efforts being pursued by DOE and the nuclear industry on development of the TADs.

Under the "standard contracts" between each owner of spent nuclear fuel and DOE, the utilities are responsible for loading the spent fuel into casks provided by DOE. As we understand it, DOE intends to procure and deliver TAD canisters to the utilities when the waste acceptance schedule indicates spent fuel is ready to be accepted for geologic storage. There will likely be, however, a transitional period in which many of the utilities will need to remove additional amounts of spent fuel from cooling pool storage to be placed in dry-cask storage at the reactor site before DOE is ready to accept it. We understand that DOE seeks to have the utilities procure and use TAD canisters for this interim/transitional storage and to develop some equitable way of sharing these costs within the standard contract and in compliance with the NWPA. It must also be noted that, given the litigation over waste acceptance delay-related storage costs, the development and use of dry-cask storage—using TAD canisters or not—ultimately may be the government's liability from the Judgment Fund.

We have no informed opinion concerning the cost of loading spent fuel by the utilities into the TAD canisters, although we are comfortable in opining that it is likely to be nominal compared with the cost of procuring the TADs themselves. Cask procurement and transportation have always been repository program cost elements

and thus fundable from the Nuclear Waste Fund, except in the circumstance described in the previous paragraph.

We would note that DOE's plans for the Yucca Mountain surface facilities call for up to 90 percent of spent fuel to arrive in TADs, but there will be facilities there for the acceptance of spent fuel in non-TAD canisters and to transfer the contents into TADs at the repository. Many, if not all, of the nine sites where reactors have been decommissioned no longer have the equipment and infrastructure to transfer from existing dry-casks to TADs.

*Question 3.* 1DOE's liability for not accepting nuclear waste by 1998 is growing, and could cost up to $500 million per year. This will continue to grow until DOE takes ownership of spent nuclear fuel and finds a solution for it. Even if Yucca were approved by NRC, DOE admits that they could not have it constructed before 2022 under very optimistic conditions. Wouldn't a short term alternative that stops the mounting liability be cheaper for rate payers?

Response. Yes. One such short-term alternative NARUC has supported is the transfer of spent fuel from present reactor storage sites to one or more central interim storage facilities pending availability of a geologic repository. Legislation to do this at Yucca Mountain has been considered and rejected by Congress in the past. Other alternatives have been discussed to consider temporary storage at existing DOE sites that already store other radioactive waste. Another initiative directed DOE to consider whether communities seeking to host spent fuel reprocessing facilities under the Global Nuclear Energy Partnership (GNEP) program might take some spent fuel temporary storage as a condition to further GNEP candidacy.

Additionally, a group of utilities proposed to take spent fuel storage matters into their own hands until DOE accepted the fuel for permanent disposal. These utilities formed Private Fuel Storage PLC (PFS) and developed a plan to store up to 40,000 metric tons of commercial spent fuel from their member firms and other utilities on land to be leased from the Skull Valley Band of the Goshute tribe in Utah. PFS applied for a storage license and the NRC took 7 years to review the application. In 2006 the NRC granted approval over the objections of the State of Utah.

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RESPONSES BY JAMES Y. KERR, III, TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

*Question 1.* Several comments by committee members or witnesses were made recommending the Department of Energy take responsibility for spent fuel storage, keep it at reactor sites for up to 100 years, and abandon the development of a repository at Yucca Mountain. If, after spending 25 years and $6 billion dollars, DOE decided to abandon its effort at Yucca Mountain without even seeking NRC authorization, how do you think Governors and public utility commissioners would react?

Response. As we stated in response to the previous question, our belief is that such an approach is contrary to the NWPA and the obligations and responsibilities undertaken by the Federal Government in enacting this law. Given that the ratepayers in the States have fulfilled their responsibilities under the NWPA by providing the funding to solve this national problem, I would expect that many Governors and utility commissioners would be disappointed if the process established by Congress were to be circumvented. While I am certain that all States support the right of Nevada to protect its interests in an open and fair process, I am equally certain that they would object to aborting the repository project before the independent agency with the responsibility and the technical expertise to evaluate the license application has been given the opportunity to consider it on its merits..

*Question 2.* Although the purpose of the hearing was to discuss the Yucca Mountain licensing process, since other witnesses have expressed their opinions on broader aspects of the proposed repository, would you care to tell the Committee why the repository is needed?

Response. In the late 1970's this country determined that it would no longer pursue reprocessing of commercial spent fuel. After this decision was made, a Federal review panel determined that geologic disposal for all commercial spent nuclear fuel and other forms of high-level radioactive waste was the best way to move forward. This became official US policy and law upon the adoption of the NWPA in 1982, and it remains the law and policy of this country today.

With the adoption of the NWPA, Congress determined this to be a national problem, and it remains one today. Even if the commercial nuclear power industry did not exist, this country would still need a repository to store spent nuclear fuel from weapons and defense programs. Moreover, as we attempt to solve the many challenges facing our energy future, the failure of the Federal Government to fulfill its

responsibilities creates unnecessary uncertainty about the role of commercial nuclear generation going forward.

But let me be clear: NARUC would not support the disposal of nuclear waste at Yucca Mountain if the Federal agencies responsible for determining the safety and viability of the site conclude that it is unsafe for present or future generations. We look to the experts and policy officials at the Nuclear Regulatory Commission to rigorously review the repository license application. We accept the NRC assurance that present reactor-site storage is both safe and secure, but we would expect there would be greater security if more of the spent fuel could be placed more securely in the underground repository in a better-protected location.

*Question 3.* 1Utilities producing nuclear power make payments to the Nuclear Waste Fund of around $750 million a year and the Fund earns interest on the balance of approximately $1 billion each year, yet in the most recent full year Congress appropriated just $99.2 million from the Fund (and $346.5 million from the Defense budget) to the repository program. What do you recommend to address this problem?

Response. Congress should, as a first step, enact the provisions (Sec. 5) of the Nuclear Fuel Management and Disposal Act as proposed by the Administration this past March. Under that provision, fees collected and deposited in the Nuclear Waste Fund would be credited to the Fund as discretionary offsetting collections each year in amounts not to exceed the amounts appropriated from the Fund the same year. This, I am told, allows the annual appropriations be limited by fee revenue rather than be subject to other discretionary spending caps.

We agree with the position stated by House Energy and Commerce Committee Chairman Dingell that the proposal does not go far enough in that it does not address the question of how or whether the repository gains access to the more than $20 billion supposedly in the Nuclear Waste Fund "balance." Although the Department of Energy attempts to reassure us that the money is there—and even earning interest added to the balance—we remain uneasy about whether Congress will honor the IOU's that it has left for future Congresses to honor. In 2001, former Secretary of Energy Spencer Abraham submitted an excellent analysis and report on Alternative Means of Financing and Managing the Civilian Radioactive Waste Management Program. To my knowledge, Secretary Abraham's emphasis that the Nuclear Waste Fund "has lost its original funding intent and should be addressed immediately" was met with silence.

Senator BOXER. Thank you, sir.

Mr. Cook.

## STATEMENT OF KEN COOK, PRESIDENT, ENVIRONMENTAL WORKING GROUP

Mr. COOK. Madam Chair, thank you very much for the invitation to testify today. I will summarize my written testimony for the record, if I may.

I want to make three central points. First is that the American public has a fundamental right to know the full implications of thousands of potential shipments of lethal radioactive waste across this Country before central decisions are made that will determine that those shipments must take place: a fundamental right to know.

Second, we have to ask if it makes any sense to generate enormous additional quantities of waste before we have figured out these transportation and storage issues.

And finally, we are very concerned about what appears to be a rush to judgment to approve the license for Yucca Mountain, again before these important transportation questions have been raised.

Madam Chair, if I may direct you to our testimony, on the first couple of pages we have several maps. I apologize for the quality of one of these that depicts your home State of California. This is not the Environmental Working Group's map. This is a map from the appendix J, the official Government transportation route map would Yucca Mountain become operational.

What you notice about this map is there is only one city in your State on it: Sacramento. You will look in vain for San Francisco or Oakland or San Jose or Los Angeles or Fresno or Bakersfield or any number of other major cities in your State because in this map, they are not shown. I don't know if that was 36 percent that was the extra percent that they left off or not, but it would have been nice to have better maps.

We have tried to produce some of those using up to date technology, Google maps, that almost anyone has access to. But the question here is, would the people of California, 7.5 million of whom live within one mile of these proposed routes, maybe, knowing that they live there, knowing that there were dozens of schools and hospitals in their communities near these routes, maybe they would approve of the process of finalizing the Yucca Mountain and starting the shipments.

Maybe they would approve even if they knew that by generating additional waste through re-licensing or perhaps new reactors in your State or other States, that there would be a constant flow of waste over these highways for decades beyond what they have been given to understand.

Or maybe if they understood these implications, they wouldn't approve.

And maybe that is the case in Oklahoma. Maybe that is the case in New York. Maybe that is the case all over this Country. But the fact of the matter is, they by and large don't know because the Department of Energy has not told them, and that is our central point.

We have added some maps for some other cities here. I remember very well briefing Senator Carper on this. Yours was the only conference room that had a plasma display that allowed us to show these maps some years ago. We didn't get your vote, but we had your attention, Senator, and I appreciated that tremendously.

Look at some of these cities. This is just a few of them, where these waste routes will go. And people do not understand that. When I heard a representative of the Government today make the case that they have made time and again, isn't it better to have all of this waste in one place than in 123 places across the Country. I just want to underscore two points. One, if we continue operating these reactors by extending their licenses for 20 years, of course we will continue to have waste at those sites, plus we would have it on the roads.

The second point is, what is safer? I have not been to Iraq, Senator Boxer. I know you have and I presume you have, too, Senator Carper. Are you safer in the Green Zone which must be carefully guarded? Or are you safer on the road to Baghdad, Iraq airport? Are you really much safer traveling and moving? Or are you safer in one fortified position? I am not a military expert, but if you ask me, having both the stationary positions that are dangerous for decades, and moving waste along the roads that will be dangerous for decades, expands the risk. It doesn't reduce it. Just in conclusion, Senator, this is an industry that wouldn't split an atom without a subsidy.

They ask for subsidies for research, to deal with cleanup, to deal with waste disposal, and on and on. But probably the biggest sub-

sidy our Government is providing right now to the nuclear industry is the lack of information, the subsidy that they are providing in effect by not telling the American public the full implications of these decisions, leaving them with the risk, the expense and the unthinkable.

Thank you.

[The prepared statement of Mr. Cook follows:]

STATEMENT OF KENNETH COOK, PRESIDENT, ENVIRONMENTAL WORKING GROUP

Chairman Boxer, Ranking Member Inhofe, distinguished members of the Committee: Thank you for the opportunity to testify today on some of the crucial issues surrounding the licensing process for the proposed facility for long-term storage of lethal, long-lived nuclear waste at Yucca Mountain in Nevada. My name is Kenneth Cook and I am president of Environmental Working Group (EWG), a non-profit environmental research and advocacy organization that uses the power of information to protect public health and the environment. EWG has offices in Washington, DC and Oakland, California.

Since 2002, EWG has examined and assisted the public in understanding the transportation implications of nuclear waste routes that could be utilized to transport deadly radioactive material from around the United States, and through virtually every major city in the Nation, to Yucca Mountain, should the proposed repository there become operational.

I want to emphasize three main points in my testimony today:

1. The American public's fundamental right to understand the full implications of thousands of potential shipments of extremely dangerous nuclear waste across this country should be central to the government's process for licensing Yucca Mountain, for operating any other repository for this material, and for all decisions to relicense existing reactors or build new ones. The Federal Government has not respected that right to know.
2. It makes no sense to generate enormous, additional amounts of deadly nuclear waste when we haven't figured out what to do with the tens of thousands of tons already on hand. Our government has ignored that common sense precaution.
3. The government is rushing to approve the license application for Yucca Mountain before rudimentary, life and death questions have been resolved about transportation, storage, and a truly protective radiation safety standard.

Let me start with a vivid illustration of my first point.

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### California



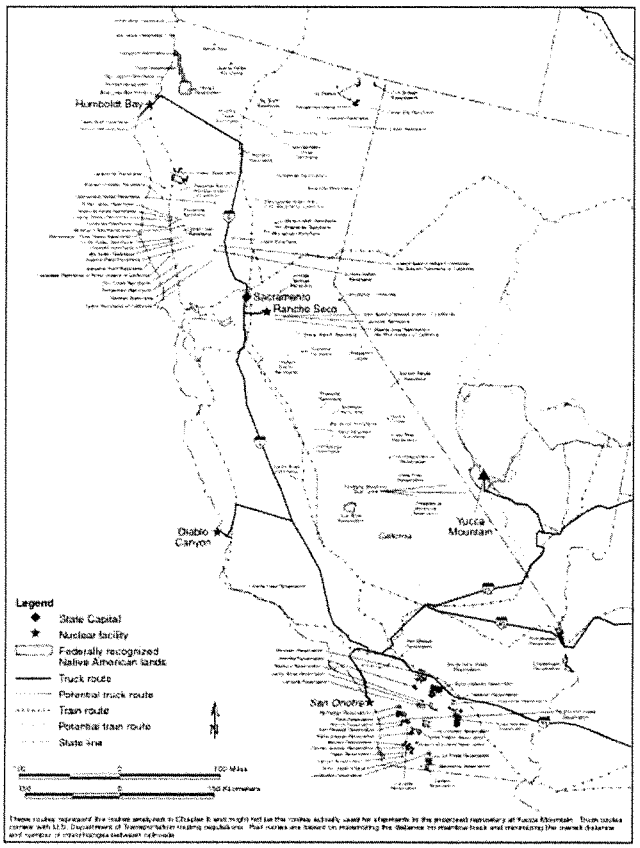



**Figure J-34.** Highway and rail routes used to analyze transportation impacts - California.



Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.
*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_CA.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

### Los Angeles, CA

on Roads
on Satellite
Glendale
Burbank
Pasadena
Los Angeles
Hollywood
Beverly Hills
Inglewood
Hawthorne
Compton
Downey
Whittier
Norwalk
Bellflower
Montebello
Monterey Park
Alhambra
Culver City
Marina del Rey
Playa del Rey
El Segundo
Manhattan Beach
Gardena
Lawndale
South Gate
Lynwood
Huntington Park
Maywood
Bell Gardens
Pico Rivera
Commerce
East Los Angeles
South Pasadena
Eagle Rock
Glassell Park
Studio City
Toluca Lake
Beverly Glen
Bel-Air
Westwood
Palms
Ladera Heights
View Park
Hyde Park
Florence
Walnut Park
Cudahy
Vernon
Clement Junction
Garvanza
Echo Park
Adams Square
Ivanhoe Junction
El Sereno
Happy Valley
Rosemead
South San Gabriel
Temple City
Arcadia
Sierra Madre
La Canada Flintridge
Montrose
Altadena
Briggs Terrace
La Crescenta
Van Nuys
North Hollywood
Ventura Fwy
Hollywood Fwy
Santa Ana Fwy
Glenn M Anderson Fwy
Artesia
Cerritos
Hermosa Beach
Redondo Beach
Lennox
Westmont
West Athens
Del Aire
Willowbrook
Watts
West Compton
Paramount
Studebaker
Santa Fe Springs
South Whittier
Los Nietos
Vista
Rosecrans
Aviation
Hawthorne
Mariposa
Rodeo
Pico
Olympic
Washington
Venice
Santa Monica Fwy
Pacific Coast Hwy
Sepulveda
Vermont
Figueroa
Alameda
Soto
Mission
Fremont
Fair Oaks
Lake
Rosemead
Santa Anita
Rosemead
Temple

I apologize for the exceedingly poor quality of the first of those two maps, in particular to you, Chairman Boxer, since it depicts your home State of California. This is the official transportation map, buried in Appendix J of the Department of Energy's (DOE) Environmental Impact Statement (EIS) for the proposed Yucca Mountain nuclear waste repository. More cartoon than cartography, this illustration depicts only one city in our most populous state: the capital, Sacramento. It also shows the location of facilities from which lethal radioactive waste would be shipped to Yucca Mountain if it is ever made operational, along with a few highway designations and some unnamed rail lines.

You won't find San Francisco, Oakland, San Jose, Los Angeles, San Diego, Fresno, Bakersfield or any other major California cities on this map of nuclear waste routes to Yucca Mountain. But DOE's prospective routes for shipping deadly nuclear reactor waste go through or near every one of those cities, or the suburbs around them, and countless more communities in California.

If the people you represent did somehow find their way to Appendix J of the EIS for Yucca Mountain, Chairman Boxer, they wouldn't find any telling details about how the potential highway or rail routes might wend their way through the towns and cities and communities of your state.

The people of California probably wouldn't realize that 7.5 million them live within a mile of those routes, or that there are over 1,500 schools or 130 hospitals also within a mile of those routes in your state.

Now, maybe, Chairman Boxer, your constituents, knowing all that, would still decide that it makes sense to put lethal radioactive waste on California's highways and rail lines, right near their homes and through their communities, en route to Yucca Mountain. Maybe Californians would come to that decision knowing that plenty of waste would still remain to be dealt with at reactors in the State once Yucca Mountain is filled to its current statutory limit. Maybe residents of California would still conclude that reactors in the state, or in states to the north that might route waste through your state, should operate for an additional 20 years, generating more nuclear waste and more shipments for decades. Maybe the people of California would approve of new reactors being built, creating yet more waste at reactor sites, and on highways and railways, for generations to come.

Or maybe they wouldn't approve at all if they really knew what approval meant. Californians have a right to know the implications of shipping waste to Yucca Mountain, or of expanding nuclear power and waste production, before decisions are made for them.

The second map was made by Environmental Working Group, using Google Maps after we painstakingly overlaid the rail and highway routes from that very same set of maps in the Yucca Mountain EIS. We are in the process of making maps like this available online for all of the proposed shipment routes to Yucca Mountain. Here are some other examples, with additional EWG maps presented on the charts before you.

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### Oklahoma



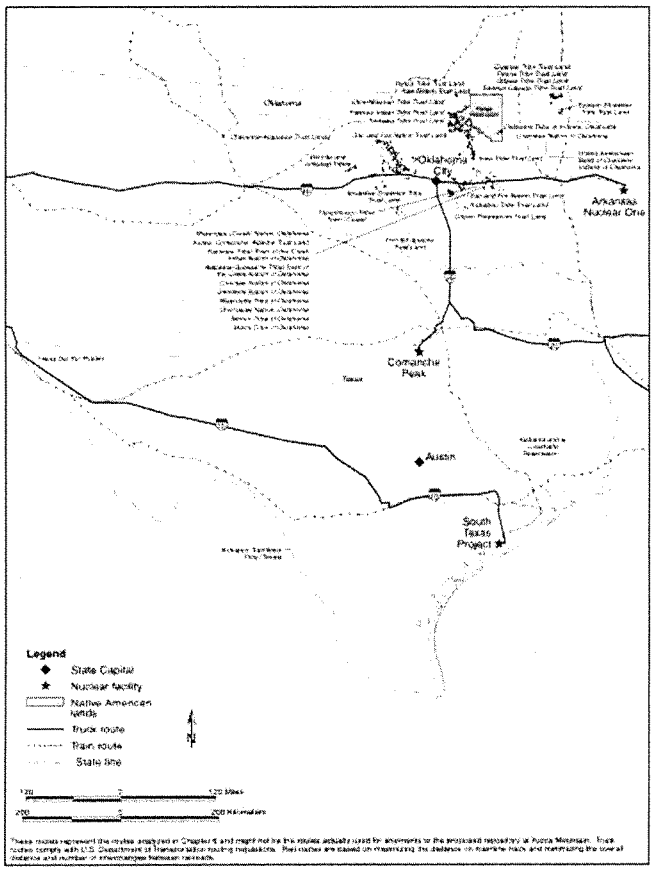


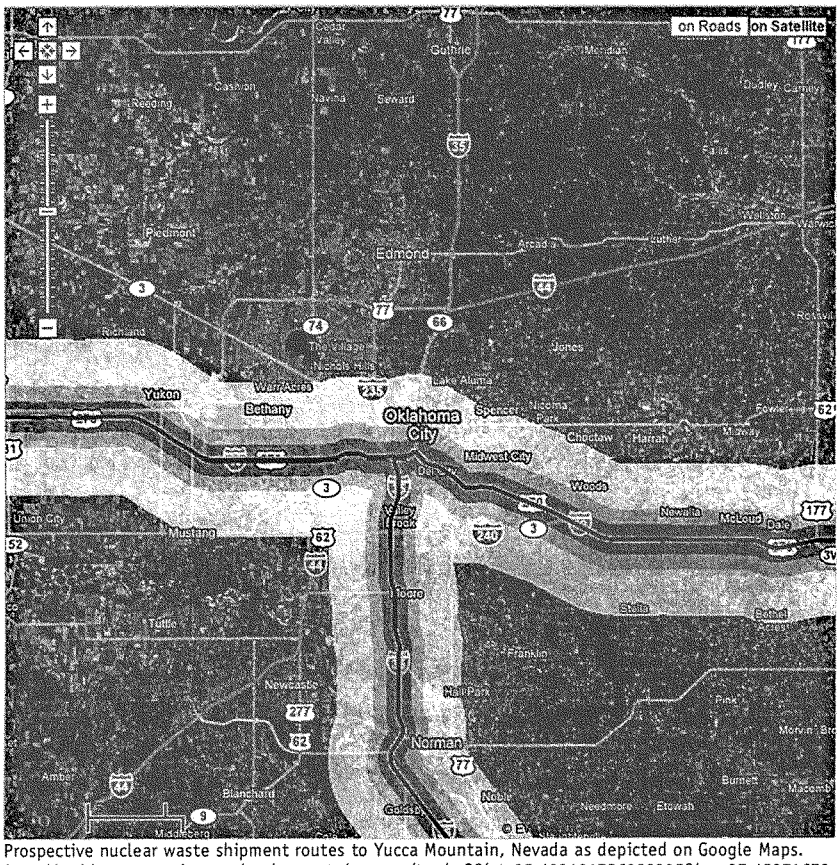

**Figure J-51.** Highway and rail routes used to analyze transportation impacts - Oklahoma and Texas



Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_OK-TX.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

**Oklahoma City, OK**




Prospective nuclear waste shipment routes to Yucca Mountain, Nevada as depicted on Google Maps.
*http://archive.ewg.org/reports/nuclearwaste/mapresults.php?&lat=35.493101786008395&lng=97.459716796875&z=10&type=on%20Satellite*

Distance to a proposed nuclear waste route

within 1 mile  within 2 miles  within 5 miles

rail  road

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### Washington, DC

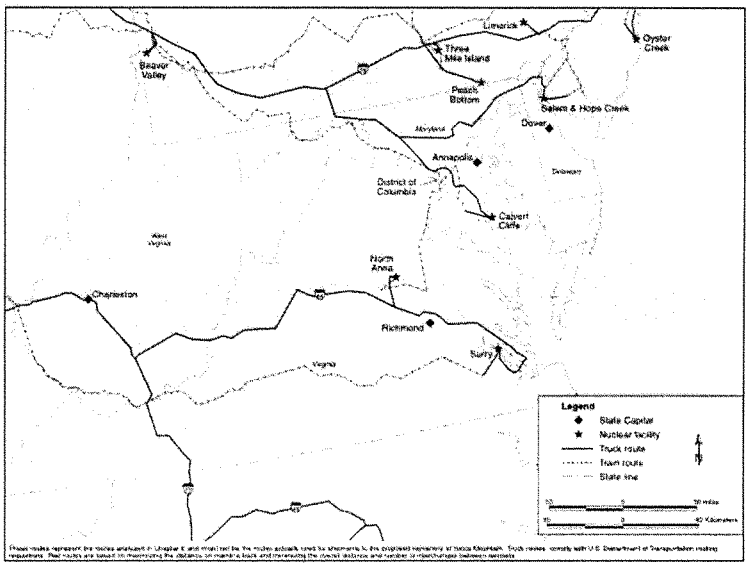
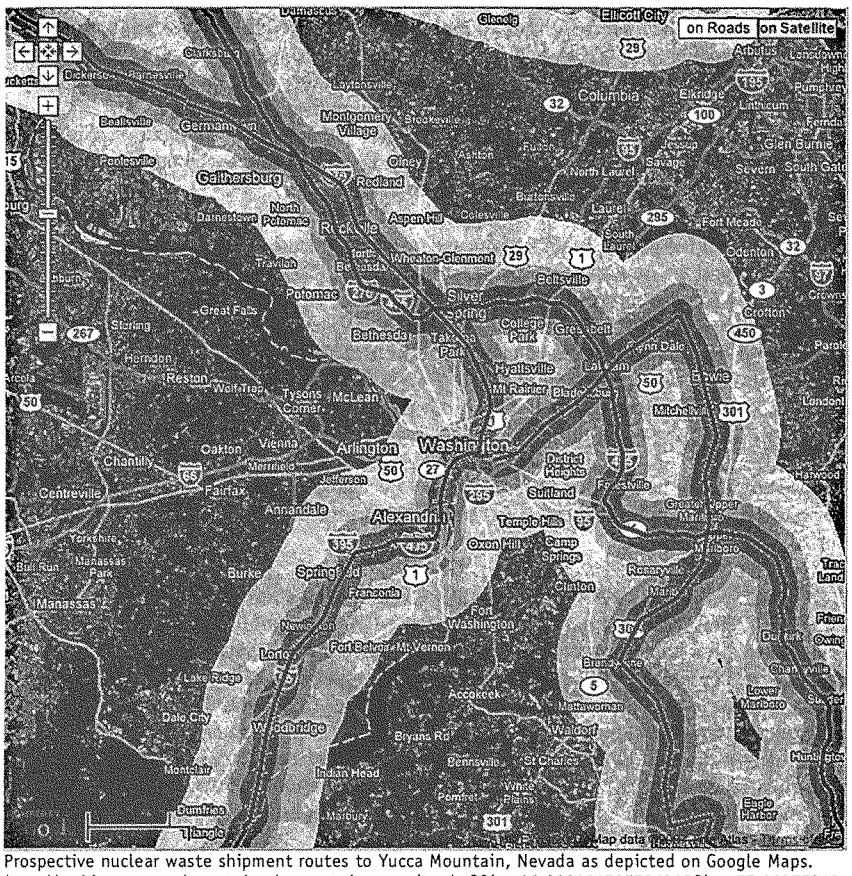



**Figure J-37.** Highway and rail routes used to analyze transportation impacts - Delaware, Maryland, Virginia, West Virginia, and the District of Columbia.

Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.
*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_DE-MD-VA-WV-DC.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

**Washington, DC**




Prospective nuclear waste shipment routes to Yucca Mountain, Nevada as depicted on Google Maps.
*http://archive.ewg.org/reports/nuclearwaste/mapresults.php?&lat=38.892101707724315&lng=77.02377319335938&z=10&type=on%20Satellite*

Distance to a proposed nuclear waste route

within 1 mile — within 2 miles — within 5 miles

rail — road

There are no operating nuclear power reactors in Oklahoma, something the State has in common with Nevada. But EWG estimates that 254,000 people live within 1 mile of the Department of Energy's proposed routes for the shipment of high level nuclear waste across Oklahoma from out of state; some 879,000 people live within 5 miles. Our geographic information system analysis also finds an estimated 99 schools within 1 mile of the Department of Energy's proposed high-level nuclear waste transportation routes and 289 schools within 5 miles. We also estimate that 14 hospitals are within 1 mile and 29 hospitals are within 5 miles. Again, localized, community-specific information of this sort might or might not affect the opinions of Oklahomans regarding the shipment through their cities and their communities of nuclear waste from other states. The only way we'll know if this information is important is if we entrust it to the people of Oklahoma before decisions that affect them are made.

My point is that the people of Oklahoma and every other State have a right to know and fully understand the implications for them of the Yucca Mountain nuclear waste repository before the license for the facility is finalized. And they have the same right to know what expansion of nuclear waste generation will mean for transportation through their State if reactors around the country are relicensed for 20 additional years of operation, or new reactors are constructed. They may or may not know that decisions made hundreds of miles away will have profound implications for the shipment of high-level, deadly nuclear waste through their neighborhoods for decades to come.

This right to know the implications of shipping nuclear waste to Yucca Mountain is not being respected by our government in its rush to approve the operating license for the Yucca Mountain facility.

CONCERNS ABOUT EPA RADIATION STANDARDS FOR YUCCA

In August 2005, the U.S. Environmental Protection Agency published its proposed, revised radiation protection standards for the proposed Yucca Mountain nuclear waste dump. These public health standards set the maximum allowable levels of radiation to which humans can be exposed and the maximum level of radiation that can be in groundwater from leakage from the proposed dump. Under the Energy Policy Act of 1992, these standards are required to conform to National Academies of Science's mandate that the standard protect human health during periods when leakage will cause peak levels of radiation.1 Unfortunately, EPA's standards neither protect public health nor meet the law's requirements.

EPA proposes a 15 millirems radiation dose limit for humans during the first 10,000 years of the proposed dump's operation (when no leakage from waste containers is expected), but would weaken the standard to 350 millirems after 10,000 years (when leakage is all but certain). In other words, at the time of the greatest threats to human health, EPA proposed weakening the standard by a factor of 23 times more lenient.

1 Energy Policy Act of 1992, Pub. L. 102–486; National Academy of Sciences, National Research Council, Technical Bases for Yucca Mountain Standards, 1995.

Notably, nowhere in its proposal does EPA discuss the increased risk to human health and safety from the higher levels of exposure at the 10,000-year mark, despite EPA's and NAS's acknowledgement of a linear-dose response relationship between radiation and cancer. The risk to public health increases at higher levels of radiation.

EPA also seems to be intentionally disregarding its legal obligations. EPA's original human dose standard was 15 millirems per year for the first 10,000 years. EPA proposed that there be no public health radiation standard in place after 10,000 years, the period in which leakage is expected from the repository. But since EPA had arbitrarily determined that this standard did not need to be in place when peak leakage will occur, the DC Court of Appeals invalidated it as inconsistent with the Energy Policy Act.

In addition, EPA proposes the same groundwater protection standard that the District Court voided in 2004. EPA proposes a 4 millirems standard for the first 10,000 years, and no groundwater protection standard at the time when peak exposure is expected to occur, after 10,000 years. Radiation from the proposed repository will travel through groundwater, and the groundwater under Yucca Mountain provides drinking and irrigation water to tens of millions of people throughout Amargosa Valley and Southern California.

Moreover, EPA will not consider public comment on the groundwater standard in the proposed regulation, despite the fact that the groundwater standard is integral to protecting public health and that the radiation standard is integral to determining the safety and integrity of the proposed dump.

CONCLUDING OBSERVATIONS

I think we are all aware that the U.S. nuclear industry wouldn't split an atom without a subsidy. They never have, and they never will.

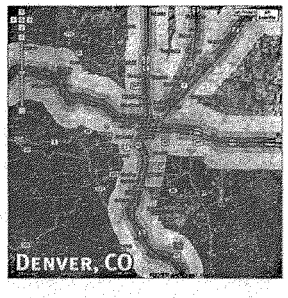
Nuclear energy companies never hesitate to lean on American taxpayers for money to conduct nuclear research, for indemnification in the event of horrific nuclear accidents, for money to clean up industry's lethal waste and cost overruns, or for the collateral of the public's purse—something the companies are seeking today to coax Wall Street out of its sober reluctance to invest in new nuclear reactors.

But the ultimate subsidy for the nuclear industry may well be our government's scandalous failure to fully inform our own people about the potential consequences of the Yucca Mountain repository until it is too late for the people to do anything about it but accept the risk, the expense, or the unthinkable.

I thank you, Chairman Boxer and Ranking Member Inhofe, for this opportunity to testify, and I look forward to answering any questions or providing additional information at the pleasure of the Committee.

I wish to thank colleagues at the Environmental Working Group for the research and analysis underlying my testimony today: Richard Wiles, Sandra Schubert, Sean Gray, and Chris Campbell; and former colleagues John Coequyt, Jon Balivieso, and Tim Greenleaf. We are also grateful for technical assistance provided over the years by experts at the Nuclear Information And Resource Service and in particular by Kevin Kamps, now on the staff of Beyond Nuclear. EWG is responsible for the contents of this testimony.

# NUCLEAR WASTE ROUTES



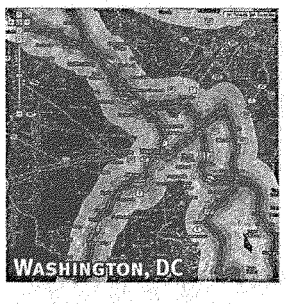
Distance to a proposed nuclear waste route

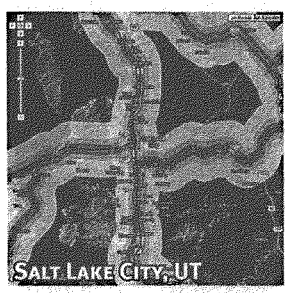
within 1 mile · within 2 miles · within 5 miles

rail · road

ENVIRONMENTAL WORKING GROUP

# NUCLEAR WASTE ROUTES





Distance to a proposed nuclear waste route

within 1 mile — within 2 miles — within 5 miles

rail — road

ENVIRONMENTAL WORKING GROUP

Senator BOXER. Thank you very much.

I want to pick up where Mr. Cook left off, because what seems to me to be bizarre is the fact that,

as Senator Carper said, these decisions were made 25 years ago. We were both in the Congress at that time.

Since then, we have had 9/11, and everyone agrees this was a moment where the whole world turned and it has changed our lives forever. Indeed, it has been used as a reason for war, the argument being made is we don't want to have the terrorists in any way get access to any nuclear materials. We hear it every day. Somehow we don't hear it in reference to Yucca Mountain.

Mr. Cook, do you know how many trips will be made in the course of the life of Yucca Mountain? How many trips there will be by truck or rail?

Mr. COOK. I wish we did know, Madam Chair. It is a fundamental question because they haven't decided whether they are going to mainly send it along highways or their preferred option, mainly send it along railroads. But either way, it will be thousands of trips, and thousands more as we extend licenses as we are doing for 20 years or build more reactors, thousands.

Senator BOXER. My understanding is there will be 9,500 rail casks and 2,700 truck casks, thousands of shipments. I am afraid most of them or a lot of them are through my State. You pointed that out. My State has a real problem with this, and that is why I have been outspoken for many years, not only dealing with the potential for an accident, one; two, a terror incident; and leakage into water that really is going to impact our water supply and destroy our drinking water.

So you know, Mr. Kerr talks about money that has been put in. You know, money, money, money. How much is your grandkid's life worth? You would say you can't put a number on that. So I think we can't talk about the possibility of terrorism and nuclear materials as it refers to things that are happening abroad, and have our mind closed to what we are doing right here.

Look, I don't want to frighten anybody, but I have seen the list of where the al Qaeda cells were before 9/11. It is not secret information. It is published. It was published by the State Department. There were more cells in America than almost any other place, OK, before 9/11.

That is a fact. And there were none in Iraq, just by the way. That is the Bush State Department's own document. I have it. You can all see it.

So you would think as we look through people's luggage, their purses, search them—I mean, I just had this whole body search the last time I went through—looking for is my perfume really my perfume, that the obvious somehow is in another compartment. It is over here at the DOE and the NRC. It is bizarre.

So I wanted to thank you, Mr. Cook, because for me, it is what I care about in this Committee, safety. This is the Environment Committee, Environment and Public Works. We want to do things the right way and we could get into an argument over pro-nuclear or anti-nuclear. I don't even think that is worth the time. The question is what is a safe project and is Yucca Mountain safe.

I want to ask Hon. Catherine Masto a question. I know you are following every line of this debate and every piece of paper that moves forward as the Bush administration, it seems to me, is rushing to get this thing done. You note that several legally required parts of the application, including accident mitigation and emergency response, security at the repository, and retrieval of waste, will not be included in the initial license application. That is why I took so much time on that point of the application. It is to me outrageous that the people who are living near this repository wouldn't be able to see accident mitigation, emergency response, security at the repository, retrieval of the waste.

Now, how will the State of Nevada and other interested parties draft challenges or contentions to DOE's license application if this information is not made available until after the application is filed? What do you do? Do you have to go to court more? Talk about money. How much more money are we going to have to spend on lawyers and such?

Ms. MASTO. Senator, thank you. That is a great question, because a lot of people don't realize when we talk about court, again the State of Nevada, just the process itself is inherently unfair because we can't go to District Court and get an evidentiary hearing to argue. We have to go to Appellate Court. So all of our legal challenges have been at the Appellate Court level, which limits our legal remedies.

With respect to the licensing application, where we go, we have heard, well, it is going to be fair; it is going to be fair;; it is an evidentiary hearing. It is before the NRC. Again, our concern is the NRC says they are going to be objective and fair, but their staff are the ones that are working closely with the DOE in moving this forward and working on the licensing application.

Senator BOXER. You know, I picked that up when I talked to the DOE. He kept saying, oh, we are going to be complete because the NRC is going to say we are complete. What is that? That was very odd. As a matter of fact, I have not seen that. I have always thought the NRC is going to be outside of this and be tough and say we need more information.

The DOE recently certified its submission of over 3.5 million documents to the NRC's licensing support network, or the LSN. That sounds like a lot of documents for interested parties to review.

Ms. MASTO. That is a lot of documents.

Senator BOXER. More than three million documents.

Ms. MASTO. And the question is whether all of the documents are there, and we contend they are not, and those are important documents that we need.

Senator BOXER. Tell me what documents do you think are not there?

Ms. MASTO. I have listed in my report here, but one of the key documents and one of the key concerns that we talk about is the TSPA. That was in my written document.

Senator BOXER. TSPA?

Ms. MASTO. Yes.

Senator BOXER. What is that?

Ms. MASTO. That is computer modeling and the information with respect to the basis for the computer modeling. The computer mod-

eling is based on having the DOE determine whether there are peak doses and the radiation and the EPA radiation standard, and they have to prove that it complies.

Well, we won't have access to any of the information that they based that on, the TSPA, or the TPSA. And so that is a concern of ours because we won't have information with respect to how they are making that determination on the peak dosage of the TSPA code. It is a modeling, a computer modeling. We won't have access to that. The NRC does not have access to that. The DOE is the only individual or the only agency that has access to that, can put the computer modeling and do the numerical——

Senator BOXER. Why do you think they wouldn't give that to you?

Ms. MASTO. They are afraid that we are going to challenge it. That is the only thing I can think of.

All along, this is supposed to have been an open process. My understanding, based on the previous testimony, based on the guidelines from the DOE and everything that has been written, it is an open process. We are supposed to have access to these documents, millions of documents because there are so many, so that we can complete this discovery period in a timely manner.

Senator BOXER. Why is this computer modeling—what does it show you? Why is it so crucial?

Ms. MASTO. The computer modeling is basically, and let me find it in my testimony here real quick. The computer modeling basically is the modeling that determines that peak dosage.

When we talk about the radiation standard——

Senator BOXER. When you say peak dosage, talk to me in English. What do you mean?

Ms. MASTO. OK. What happens is the radiation standard we are looking at, and we have heard 15 millirem for the first 10,000, 350 millirem after. But they had to comply with the National Academy of Sciences findings and recommendations. The National Academy of Sciences findings and recommendations was that after 10,000 years is where you are going to have the peak dosage of the radiation.

And so what we are contending is that if the peak dosage is after 10,000, why is the standard so high at 350 millirem? You would think it would be the 10 millirem that you are talking about, or 15 millirem, but instead it is a much higher standard which does not make sense. The TSPA modeling is based on that. The TSPA modeling, let me find this real quick.

So compliance with the EPA radiation protection standard is determined by calculation of the dose from repository releases to a member of the public at the boundary of the accessible environment determined by EPA to be a 11 miles. The EPA standard requires that the dose calculation be carried out using a probabalistic performance analysis. DOE has constructed this TSPA, which stands for total system performance assessment, to use as the tool for determining the dose calculation. So that is what the TSPA is, but nobody has access to the basis for it or the information going in, the formulas that are being conducted. We can't go in and do any information, take a look at what they are basing this on, and that is our concern.

And even if we do have access to this, it takes hours upon hours to even conduct any type of formula to go through this computer modeling. I am not the expert. I am just talking from what my experts tell me. I would be happy to provide more information to you, Senator, with respect to this issue.

Senator BOXER. Well, is your point that you want to know what the residents of Nevada today and in the future are going to be exposed to? What you are basically telling me is, you don't have the information you need to be able to make that judgment.

Ms. MASTO. That is absolutely correct.

Senator BOXER. Is that right?

Ms. MASTO. Absolutely correct. My main concern is for the safety and the welfare of the individuals in this State. Radiation and exposure to radiation is the most important thing we need to understand, and we won't be able to have that information. And if we do get it, it will be after the fact or within a limited period of time for us to be able to take advantage of our legal remedies.

Senator BOXER. And you have asked for it? And what did they say when you asked for the information?

Ms. MASTO. One minute. At this point in time, they are claiming it is privileged attorney-client product information, so we cannot have this until they are ready, if at all, to provide it to us.

Senator BOXER. What attorney-client, between what attorney and what client?

Ms. MASTO. I would assume—I don't have the answer to that other than the DOE is telling it to us, so I assume it is whoever attorneys they are talking with, the DOE attorneys.

Senator BOXER. So let me get this straight. The United States of America wants to put this enormous dump in your backyard. They are keeping information from you and when you ask for the information, they say we can't because you might sue us. Is that basically what we are seeing there?

Ms. MASTO. I think that is the concern there, absolutely.

Senator BOXER. Well, I just want to send the strongest possible message to DOE, to NRC, to anyone who has anything to do with this. We are turning against our own people. That is unacceptable. This is an outrage, to turn against our own people and keep information from our own people. It happens over and over and over again, whether it is the CDC that comes forward and has information about the public health impacts of global warming, and pages and pages get redacted, and we can't find the information. When we ask for it, we are told the same thing: it is privileged. Oh, gee, it is privileged.

Privileged? Aren't the American people—don't we say that they are privileged to live in America? Then they should be privileged enough to have this information. I mean, this is a misuse of, in my opinion, the law. I find that it is one thing to have a legitimate argument pro and con Yucca Mountain. It is another thing to keep information away from the very people who are going to be impacted by it.

I will do everything in my power as Chairman of this Committee to get you the information that you seek.

Thank you very much.

Senator Carper, the time is yours.

Senator CARPER. Thank you, Madam Chair.

I want to go back and revisit, we don't have on this panel anyone from the NRC or the DOE, but I just want to say, I guess for the record, that my understanding is when the NRC, I think we still have a witness in the audience from the NRC, when the NRC receives the Department of Energy's application in this case for Yucca Mountain, I believe the first thing that the NRC does is to determine its completeness. The way it is supposed to work, if the application is not complete, the NRC is required to send it back to DOE to ensure its completeness.

I would just say to my friends who might still be here from the NRC, we expect that to be the case. I know it is the case in other applications for plants and so forth. It had better be the case in this instance as well. I see several folks nodding their heads, so I think it is received.

Mr. Kerr, whose name is spelled Kerr, has you name ever been mispronounced, Mr. Kerr?

Mr. KERR. Just this morning, Senator. I think while you were out of the room.

[Laughter.]

Senator CARPER. I apologize for that. Our name has been mispronounced, too. In fact, we are called things you wouldn't want to repeat here in this hearing.

As you know, I think that a number of companies are preparing to apply for a license to build new nuclear reactors. We talked about that with the first panel of witnesses. I think one application has already been submitted from one utility. I guess from the perspective of a regulator—you are from North Carolina, aren't you? Whereabouts?

Mr. KERR. I live in Raleigh, but I am from Goldsboro.

Senator CARPER. My wife is from Boone. In fact, we own a little farm up there around Boone, so I guess you kind of work for us. That is good.

From the perspective of a regulator, utility commissioners, does the opening of Yucca Mountain impact the National Association of Regulatory Utilities?

Mr. KERR. Regulatory utilities.

Senator CARPER. Does it impact the NARUC's support of new nuclear power? How does it, if at all?

Mr. KERR. Well, those individual decisions about new reactors are made by State regulators based on the evidence of record and the individual applications at the State level. As a matter of national policy, what we have done is I think done two things. With respect to Yucca Mountain, and not really Yucca Mountain, but the Nuclear Waste Policy Act, and the point that I made in my opening statement is, you know, there are three parts to the Act. One is that this is a national problem. No. 2 is that the Federal Government should take responsibility for the waste.

And No. 3 is that the ratepayers, utilities really, the ratepayer should pay for it.

The point I made in my opening was I think one third of that triumvirate has been taken care of, and that is the ratepayers have paid the money that they are responsible for. So I don't think we are disposed to Yucca Mountain as opposed to any other sites. We

are disposed to the fulfillment of the basic roles assigned by the Act.

I would say that I think we inherently believe that the agencies who have been assigned the task, the Federal court system, and there is a process. What we want is the process to work itself out and to move forward. It is woefully behind for all the reasons that you are already aware of.

With respect to whether you license or site new plants, it would be ideal if we knew what the permanent solution is. I think that there is belief, as has been discussed here today, that interim storage onsite can be an interim and can continue to be an interim solution. There were certainly steps taken in the Energy Policy Act of 2005 to incent nuclear generation. So I think what you see is the companies and the regulators such as the North Carolina Commission, you are sort of caught. These things have long lead times. You are trying to forecast your ability to meet a growing demand out a decade or two decades in advance, and unfortunately, it is like planes landing at the airport. The issues are stacked up. We are doing the best we can.

It would certainly make it easier as we address climate change to understand the role nuclear generation can plan, and it is going to be essential. One of my concerns about Mr. Cook's comments is it presumes we are not going to need nuclear generation going forward because we can't transport it. I think that is not what I have heard from members of this Committee today.

But we have to have nuclear generation. If we could solve the storage problem as the Act requires, it would take one of the risk factors off the table and that is why we are supportive of doing what the law adopted in 1982 says. Can we get by for an interim period of time without an answer to Yucca Mountain or permanent storage, whether it is Yucca Mountain or something else, quite frankly I think we are going to have to, and we are going to find out.

Senator CARPER. Just a question if I could, you are a commissioner in North Carolina. I know in Delaware the Governor nominates people to serve on our Public Service Commission and the folks are confirmed by the State Senate or not confirmed. How does the process work in North Carolina?

Mr. KERR. We are appointed by the Governor. I was appointed by Governor Easley. We are confirmed by both Houses of our General Assembly.

Senator CARPER. What term do you serve?

Mr. KERR. We serve for 8 years.

Senator CARPER. And how long have you been serving?

Mr. KERR. For six and a half, I think.

Senator CARPER. OK.

Mr. KERR. My wife knows to the day.

Senator CARPER. Well, thanks for sharing with us, or with the people of North Carolina.

Let me just close, if I could, Madam Chair, with another question or two for the record. I want to thank our witnesses for being here, both panels for being here, and for your responses to our questions, and for your commitment and concern on these important issues.

My boys, one is in college now and the other is a senior in high school, but growing up they have been in the Boy Scouts, and one is an Eagle Scout and one is just about to become one. We are real proud of them. One of the things I do, I take our scouts to different service academies, military academies, Naval Academy, Merchant Marine Academy. We are going to do the Coast Guard Academy next.

But one of the other things I do, a couple of years ago I took them down to Norfolk Naval Station. We spent a weekend there with about 20 or 25 scouts, and maybe a half dozen or so adult leaders. We crawled all over ships and submarines and aircraft carriers. It was quite a treat for them, and I think for the adults, too. One of the ships that we visited was a carrier called the Teddy Roosevelt. The captain of the ship actually came and met us and took us up for a tour of the ship. We were up in one part of the ship and he said to the boys, he said, boys, the Teddy Roosevelt is 1,000 feet long, and the scouts went, oooh. He said, boys, the Teddy Roosevelt is 35 stories high, and the boys went, oooh. And he said, boys, when the Teddy Roosevelt goes to sea, we have 5,000 sailors aboard and 75 to 100 aircraft, and the scouts went, oooh. And he said, boys, my ships stops to refuel once every 25 years. And the adults went, oooh.

[Laughter.]

Senator CARPER. For us to somehow squander the opportunity that I think is there for our Country that nuclear energy provides for our Country, I think we make a big mistake. One of the surest ways that we can squander that opportunity is, and I see the NRC is still with us, and the folks who operate these plants, is to not operate safely, to make a mistake. I always like to say if it isn't perfect, make it better. And we just have to be vigilant every single minute of every single day with respect to this industry.

Part of the secret here is to figure out what to do with the spent fuel and to see if we can fine more opportunities to use the energy that is inherent therein. My hope is that we can. As a Nation, it is interesting, we had that Manhattan Project all those years ago and we almost need like a bookend, if you will, another Manhattan Project. The first one was to figure out how we could unleash the power of the atom. Maybe the second Manhattan Project is to figure out, now that we have unleashed the power of the atom, how can we make sure that we don't hand off a problem to the next generation as we dispose of the spent fuel.

Thank you, Madam Chair.

Senator BOXER. Thank you, Senator.

I drive a car that gets 52 miles per gallon. Oooh, it's good.

[Laughter.]

Senator BOXER. Let me just say, Attorney General, is your State getting the respect it deserves in terms of—and I just want to get this on the record—the information that you need at this point?

Ms. MASTO. No.

Senator BOXER. OK. Does your Governor share that view?

Ms. MASTO. Yes.

Senator BOXER. Is your Governor Republican?

Ms. MASTO. Yes.

Senator BOXER. Are you a Republican?

Ms. MASTO. Democrat.

Senator BOXER. You are a Democrat. So this is across party line. I really agree with that. It is an outrage not to give a State the information it needs and to almost act—scratch almost—to act in a secretive fashion, keeping information away from people when you are talking about disposing the deadliest waste that there is.

I went to France to visit the recycling there, the project that they have there. That was really interesting. I went in a room where they store these casks. They do recycle 96 percent of the waste. There is 4 percent left over. It is hot. It is very small. It is hot. And so I said, well, you reuse so much of the fuel, doesn't that mean you just need a small place to store the remainder, because it is only 4 percent? They said, well, no, because it is so hot that we need the same size. We can't even go to a smaller size, as if we were burying it all.

Now, there is a message there. This isn't just an everyday situation. The people who are close by, including by the way my people in California, there are boards of supervisors that have sent me resolutions in the past. They have strong opposition because of the leakage issue into the water table. Somebody said that, I think it was Senator Clinton, that there were earthquakes nearby. Is that accurate? Do you have that information, Attorney General?

Ms. MASTO. Yes, there are. In fact, there are earthquakes in Nevada, earthquakes near this site, and she in fact talked about the fact that where they were siting a concrete pad was on top of a fault line, so they have had to move that concrete pad, not far from the fault, but it is off of the fault line.

Senator BOXER. Only the Government could figure that out.

So if I could just be straightforward, we have a situation where a decision was made a couple of decades ago siting this nuclear waste dump. Since then, we have had 9/11 and we have been warned constantly that the combination of a terrorist attack and nuclear materials is the biggest thing we have to fear. And yet still this project moves forward. The people of the State of Nevada, Republicans and Democrats and every other stripe, have bonded together and said, we don't want this; this is dangerous for us; at the minimum give us information. You have not been respected. You have earthquakes, if not right on the site, near the site, and no one seems to pay attention to that.

What is wrong with this picture? Everything. I just simply do not understand some of the things that Government does. And again, I think the question of whether you are for nuclear power or against it is immaterial to me on this. It has nothing to do with it. Mr. Kerr said they are going to still support building more nuclear power. There is a window here. So it is not about that. It is about safety. It is about safety.

So I would just say as a message, and I am really happy the NRC has remained. I thank you so much, sir. We need to start having some independent review here because if we don't, the people of Nevada are going to stop us every step of the way, and I will support them because it is their lives and the lives of their grandkids and generations to come.

When I was a kid, my dad always said you want to leave this earth as least as good as you inherited it. That is something you

do. That is a responsibility, a spiritual responsibility and a citizenship responsibility. I intend to do that to the best of my ability, as one person working with some others that feel that way. Not everybody seems to see it that way, but that is OK. I think this issue is a seminal issue in terms of what are we going to leave future generations.

So I want to say to the State of Nevada, don't give up. You have friends here. You have a lot of friends here. Just keep on telling the truth. Keep on demanding the truth. Keep on demanding transparency. We will be behind you because you deserve to have information. No State should have something rammed down its throat that it doesn't want, especially when it has to do with such a potential health hazard as this dump might be if it is not done right and if the site itself is not amenable, which we have seen over and over again, whether it is earthquakes or leakage, we have seen that.

So I just want to thank you very much. I just want to correct the record. I think it was the EPA who said that the Denver level of radiation was 350 millirem. Wrong. It is 50. And at 10 millirem you get one cancer cases in 100,000. So you do the math of the cancer cases at 350, I say to the NRC.

So let's get real here. You know, sometimes you have to say, I was wrong. It is hard. Those words are very difficult for all of us to say, but this was wrong, and a rush to begin this licensing now I think would just lead to a circumstance that none of us will want to see.

Thank you very much, and we stand adjourned.

[Whereupon, at 12:56 p.m. the committee was adjourned.]

STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR FROM THE STATE OF MARYLAND

Thank you for holding this hearing today.

Nuclear power is a complex and emotional issue. That is as it should be. We are dealing with America's energy future and we are dealing with waste issues that will be with humanity for longer than recorded history.

We need to get it right, and it won't be easy. It certainly has not been fast.

A number of Federal agencies from the Department of Energy to the Environmental Protection Agency to the Nuclear Regulatory Commission have important regulatory and oversight roles. These organizations are dealing with the most complex issues they will ever face. Less than 2 weeks ago the Department of Energy announced that it has over 3.5 million documents exceeding 30 million pages of information in preparation of its license application to operate the Yucca Mountain facility. The proposed Yucca Mountain Repository Site is probably the most studied piece of real eState in America.

If we are to have nuclear power in this country, we need to decide upon a disposal location. With nuclear wastes posing radiation risks for tens of thousands of years, we should insist this be done with great care. This is as close to forever as we have ever done.

Senators Reid and Ensign have a different idea about how to handle spent nuclear fuel. They would prefer to keep the wastes at the sites of the power plants that generated them. They also raise legitimate concerns about how the Federal agencies have conducted themselves to date.

Madame Chairman, I am a supporter of the nuclear power industry. I think we need to have nuclear power today and as a bridge to an energy future that

- promotes our energy independence,
- reduces global warming gases, and
- helps move us away from a dangerous reliance on nations that do not support us.

But I am also a supporter of a robust Federal Government that safeguards the American people and our precious environment. We should insist that the Federal agencies execute their jobs with the highest levels of professionalism. Shoddy work

by Federal agencies or their contractors is simply unacceptable. It should be unacceptable to all of us, but especially those of us who support the nuclear industry.

I want to give today's witnesses fair warning that those of us who support the nuclear industry are likely to be their most persistent questioners.

I look forward to their testimony.

STATEMENT OF THE PRAIRIE ISLAND INDIAN COMMUNITY TRIBAL COUNCIL

Madam Chair and Members of the Committee:

This testimony is submitted on behalf of the Prairie Island Indian Community ("Prairie Island"). Prairie Island is a federally recognized Indian tribe located in southeastern Minnesota along the Mississippi River and just 600 yards from an above-ground temporary nuclear waste storage site owned by Xcel Energy. Prairie Island has a compelling interest in the safe, permanent storage of the nation's nuclear waste. As such, we respectfully request that this testimony be given due consideration and entered into the public record as part of the Senate Environment and Public Works Committee oversight hearing on the Yucca Mountain nuclear waste repository project.

SUMMARY STATEMENT

Prairie Island supports the development of a national nuclear waste repository at Nevada's Yucca Mountain and urges the Committee to exercise its oversight authority to help ensure the project meets all the necessary requirements to satisfy the Federal Government's commitment to the American people to develop a facility to safely store our nation's nuclear waste.

Developing a safe, permanent storage facility for spent nuclear fuel is critical to the health and welfare of the millions of Americans who currently live near temporary nuclear waste storage sites. The Federal Government must fulfill its obligation under the National Nuclear Waste Storage Act and subsequent acts of Congress to solve the waste disposal problem and move the nation's nuclear waste to a safe and secure facility.

PRAIRIE ISLAND BELIEVES:

- The indefinite storage of high-level nuclear waste at 121 different locations in 39 states poses a serious threat to national security and puts at risk more than 169 million Americans currently living within 75 miles of these temporary storage facilities.
- Yucca Mountain is a remote, militarily secure site that is designed to permanently store the nation's high-level nuclear waste, and it is a safer alternative to leaving nuclear waste under varying levels of security at multiple locations, near communities, rivers, and other natural resources.
- American ratepayers have contributed more than $28 billion to the national Nuclear Waste Fund, including $470 million from Minnesotans. The American public deserves results.
- Until or unless the Federal Government solves its nuclear waste problem, it is simply irresponsible to allow the construction of new nuclear power plants anywhere in the United States.

TESTIMONY OF THE PRAIRIE ISLAND TRIBAL COUNCIL

Prairie Island is a small Indian reservation located in southeastern Minnesota along the banks of the Mississippi River, approximately 50 miles from the Twin Cities of Minneapolis and St. Paul. Our reservation is home to nearly 300 of our community members.

Prairie Island is among the closest communities in the Nation to a nuclear power plant and an above-ground nuclear waste storage site. Twin nuclear reactors and nearly two dozen large cement nuclear waste storage casks sit just 600 yards from our homes. As many as 35 additional casks will be added in the coming years. The only evacuation route off our island reservation is frequently blocked by passing trains.

At any given time, as many as 8,000 people could be on Prairie Island. This includes our employees and guests of our casino as well as our tribal members, some of whom are elderly and disabled. Tens of thousands of people live in cities and towns just beyond our reservation.

Prairie Island is just one of thousands of communities in 39 different states located in close proximity to a temporary nuclear waste facility. There are presently 121 temporary nuclear waste storage sites scattered across the United States.

Twenty-five years after Congress passed the National Nuclear Waste Storage Act and mandated the establishment of an underground repository, the future of the nation's nuclear waste disposal program remains in doubt. Lost in the debate over Yucca Mountain are the communities that bear the burden of the Federal Government's inaction and failure to solve the nation's nuclear waste problem.

Public safety was a core justification for building Yucca Mountain. As President Bush correctly noted in his Feb. 15, 2002 letter to the Congress:

"Proceeding with the repository program is necessary to protect public safety, health, and the Nation's security because successful completion of this project would isolate in a geologic repository at a remote location highly radioactive materials now scattered throughout the Nation. In addition, the geologic repository would support our national security through disposal of nuclear waste from our defense facilities."

Congress later approved Yucca Mountain as the site for the nation's first permanent repository for high-level nuclear waste. However, in the years since, Yucca Mountain has suffered numerous delays and has been under-funded despite billions of dollars in contributions to the Nuclear Waste Fund from American ratepayers. The paramount public safety concerns that first compelled Congress to build an isolated storage facility seem to be fading as the issue slips from the American consciousness and gives way to talk of building new nuclear power plants.

Understandably, for most Americans the nuclear waste issue is not at the top of their minds. It's not an issue they are exposed to every day. For Prairie Island, the issue is more difficult to escape. We are reminded of our nation's nuclear waste problem whenever we look out our living room windows.

The talk of building new nuclear power plants is more difficult to forgive. The nuclear power industry, it's been said, is on the verge of a "renaissance." Dozens of new nuclear power plants are being proposed throughout the country—this despite the uncertainty surrounding the nation's waste disposal program and no firm answers for how to deal with the waste problem.

The Texas-based utility NRG has already submitted an application—the first in the U.S. in nearly 30 years—to build two nuclear power plants in south Texas. NRG's president was quoted recently in the Las Vegas Sun saying, "Whether Yucca Mountain happens or not plays no part in our calculation." He added that as far as he is concerned, the waste can stay on the company's property for the next century. (Lisa Mascaro, Las Vegas Sun, Sept. 26, 2007)

Permitting the industry to build new nuclear plants without any regard for a permanent, secure repository for the waste that will be generated removes the only real incentive the industry has for solving the waste problem. The Federal Government must get serious about solving its nuclear waste disposal problem, before allowing the construction of new nuclear power plants anywhere in the United States.

We believe the Federal Government must deliver on its promise to move the nation's nuclear waste to a safe, secure facility before it embraces this so-call nuclear power renaissance and turns to nuclear power as a preferred energy source for this country.

Our community leaders have visited Yucca Mountain several times, and we recognize there may be no perfect solution to the nuclear waste storage problem. Science can be twisted and used to prove or disprove the viability of virtually any proposed storage site on earth. However, we believe Yucca Mountain offers a reasonable solution. The facility is located many miles from civilians; it is below ground, militarily secure and designed for permanent storage. It is simply a better alternative to leaving nuclear waste where it is—in some cases—just yards from vulnerable communities like ours and essential waterways like the Mississippi River. Securing and defending one nuclear waste site has to be superior to securing and defending hundreds.

On behalf of the thousands of communities in the United States living in proximity to what are supposed to be temporary nuclear waste sites, the Prairie Island Community thanks the Committee for holding this oversight hearing and for bringing much needed attention to this important and unresolved problem.

# JUDGING THE SAFETY OF A REPOSITORY AT YUCCA MOUNTAIN, NEVADA

**The U.S. Nuclear Regulatory Commission must be convinced by the U.S. Department of Energy that a proposed repository at Yucca Mountain, Nevada will:**

- **Protect the public**
- **Protect site workers**
- **Protect the environment**

# Introduction

The **U.S. Nuclear Regulatory Commission (NRC)** will only allow construction of a **geologic repository** at Yucca Mountain, Nevada, if the **U.S. Department of Energy (DOE)** is able to convince **NRC** that **DOE** can build and run the repository safely and securely in compliance with **NRC**'s rules. That means **DOE** must build and operate the repository to protect the public, site workers, and the environment from the potentially harmful effects of **spent nuclear fuel** and **high-level radioactive waste**.

## This brochure answers the following questions:

- What standards and regulations will **NRC** use?
- What do **NRC** regulations require?
- Does **NRC** require more than just a strong **waste package**?
- What makes a **geologic repository** safe?
- What documentation is required of **DOE**?
- After **DOE** closes the repository, can **DOE** just walk away?
- Will **NRC** take **DOE**'s word for it that things are being done right?
- Can **NRC** say no?

This brochure includes a glossary at the end. Words that are explained in the glossary will be in **bold type** throughout the brochure.

# What standards and regulations will NRC use?

To demonstrate the safety of a potential repository at Yucca Mountain, **DOE** will have to comply with regulations set by **NRC** and with environmental standards set by the **U.S. Environmental Protection Agency (EPA)**. **NRC** published its rules for the safe construction, operation, and **closure** of a potential **geologic repository** in 2001. These rules are sometimes referred to as **NRC**'s *Part 63 regulations*. By law, these **NRC** regulations must be consistent with **EPA**'s standards for Yucca Mountain.

In 2005, **EPA** proposed additional standards that would apply for up to one million years. **NRC** will modify its regulations to include **EPA**'s additional standards as soon as they are formally issued. **NRC**'s regulations also include many other licensing requirements that **DOE** must meet before **DOE** can receive **NRC** permission to build a **geologic repository** at Yucca Mountain.

# What do NRC regulations

## Limits

Repository operations include receiving, storing and placing the waste deep underground for disposal. During operations, **DOE** must comply with safety limits in **NRC**'s regulations, which include the limits on the amount of radiation people could receive, or dose limits, set by **EPA**. **DOE** must show that no member of the public would receive a dose greater than 15 millirem each year due to normal repository operations. This amount of radiation is less than 5 percent of the average exposure people across the nation experience from natural sources, such as the sun, every year. **DOE** must provide a comprehensive safety analysis, called a **preclosure safety analysis**, showing that operational dose limits will be met. **DOE** must also show that it will protect repository workers using the same standards that apply to workers at all other nuclear facilities licensed by **NRC**.

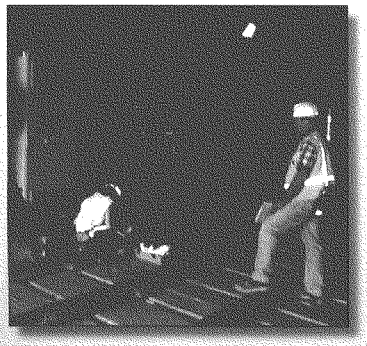
## Physical Protection and Security

**NRC** requires that **DOE** establish detailed security measures for physical protection of **spent nuclear fuel** and **high-level waste** comparable to those required for other large nuclear installations licensed by **NRC**. **DOE** must show how it will protect the repository against physical threats, theft of radioactive materials, and potential acts of sabotage.

## Emergency Planning

**NRC** requires that **DOE** prepare detailed plans for responding to and recovering from radiological emergencies or accidents that might occur during operations and before surface facilities are cleaned up and dismantled. Before **NRC** would allow waste to be received at a repository, **DOE** must demonstrate that it will take effective protective measures in the event of an emergency.

# require during operations?



*Scientists take measurements for an underground experiment at Yucca Mountain.*

## Retrieval

The repository must be designed so that **DOE** can retrieve the **waste packages** while they are being put in place, and throughout the completion of a **performance confirmation** program. Also during this period, **NRC** must be able to review and evaluate any new information obtained. Waste must be retrievable in the event that the **performance confirmation** program shows that the repository is not operating as designed and that retrieval is needed to protect public health and safety.

## Protection for Workers Who Raise Safety Concerns

**NRC** regulations specifically provide protection for "whistleblowers," or workers who report safety concerns or violations of **NRC** regulations. Workers cannot be discriminated against or lose their jobs based on providing such information.

## Land Ownership and Control

**NRC**'s regulations require **DOE** to show that the land used for the Yucca Mountain repository and surface facilities is legally under the jurisdiction and control of **DOE**. The land must be free from claims such as mineral rights and right-of-way easements. **DOE** must also show that it has the water rights necessary to operate and close the repository safely.

# What do NRC regulations

## Limits

After repository **closure**, when **DOE** is done placing waste for disposal, and all shafts, ramps and boreholes are sealed, **DOE** must show that projected doses, far in the future, will also meet specific dose limits. **DOE** must show that for 10,000 years after disposal, a **reasonably maximally exposed individual** who lives near the repository would receive a dose no greater than 15 millirem each year from the repository.

In 2005, **EPA** proposed additional standards to control potential doses that could occur beyond 10,000 years, up to one million years. **NRC** will modify its regulations to be consistent with **EPA**'s additional standards as soon as they are formally issued. To show whether the proposed repository would meet these standards far in the future, **NRC**'s regulations require **DOE** to conduct a comprehensive **performance assessment** of how the repository will function after it is closed.

## Performance Assessment

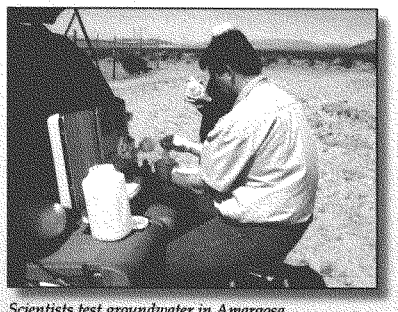
**Performance assessment** is a systematic method for understanding how well a **geologic repository** retains **high-level radioactive waste** and **spent nuclear fuel**. Many factors affect how well a repository will work to retain waste and to prevent harm to people. Among these are climate, water flow, rock chemistry, design and construction of the repository, strength of the **waste packages** and how well they resist corrosion, the nature of the waste, and natural events such as earthquakes and volcanic eruptions. These many natural features and man-made systems interact and change over time.

**NRC** must understand these systems and their complex interactions to assess the safety of a repository over many thousands of years. **Performance assessment** is a powerful tool for organizing and analyzing large amounts of information about how a repository works. **NRC**'s regulations include detailed requirements for the **performance assessment** that **DOE** must use to demonstrate that the proposed repository is safe.

# require after closure?

## Groundwater Protection Limits

**DOE** must also show that releases from the repository system do not cause radioactivity in groundwater to exceed **EPA** limits that have been incorporated in **NRC**'s licensing regulations. Separate standards for groundwater are designed to protect the groundwater resources near Yucca Mountain. To show that the proposed repository would meet these limits, **DOE** must estimate the concentrations of radioactive elements in groundwater using an analysis similar to the **performance assessment**.



*Scientists test groundwater in Amargosa Valley, Nevada.*

## Monitoring and Testing

If **NRC** authorizes construction and later authorizes placement of waste, **DOE** must continue to monitor the site, make observations, and conduct studies as part of a required **performance confirmation** program. **DOE** must show how the ongoing results of this monitoring program are consistent with assumptions made in the license application about the repository system performance. Should any significant differences arise, **DOE** must analyze them to find out how the safety of the repository might be affected.

# Does NRC require more than just a strong waste package?

Yes. **NRC** requires that the repository rely on multiple barriers to ensure that safety does not depend solely on any one barrier. A barrier is any material, structure or feature that prevents or slows movement of radioactive waste from the repository to the environment.

A barrier may be:

- A geologic feature, such as an absorbent rock layer in the mountain
- An engineered or man-made structure, such as a concrete slab
- A **canister**, the container in which the waste is stored
- A **waste form** with physical or chemical characteristics that significantly slow the movement of water or **radionuclides**
- Some material placed over and around the waste that delays movement of water or **radionuclides**

Barriers work to isolate waste in various ways. They can limit contact of water with the **waste packages** by blocking or slowing down water as it seeps from the surface to the depth of the repository. Barriers can prolong lifetimes of other barriers such as the **waste package**. Barriers, including the **waste form** itself, can limit the amount of waste that is able to dissolve in water. If the waste reaches the natural system, some portion will stick to rock and mineral surfaces, thereby restricting the waste's ability to travel away from the repository.

*The main tunnel under Yucca Mountain, showing ventilation pipes and train tracks.*

**NRC** requires **DOE** to demonstrate the capabilities of repository barriers for several reasons:

- Such a demonstration should provide **NRC** additional confidence that public health and safety are protected.
- It helps **NRC** focus its technical review of **DOE**'s license application on repository attributes that are essential for safety.
- Showing the full capabilities of multiple barriers illustrates how the repository could respond to unexpected events.

By requiring a repository system of multiple barriers, **NRC** expects that **DOE** will show that its repository design provides successive levels or layers of protection.

# What makes a repository safe?

## Multiple Barriers

**A safe repository provides both man-made and natural barriers.**

- **DOE** must design its repository system so that **engineered barriers** will work with the surrounding natural barriers to keep projected releases and radiological exposures within rigorous safety limits.
- **DOE** must identify which man-made features and which natural features in the geologic setting will prevent or slow the movement of the various components of radioactive waste.
- **DOE** must describe the capability of these barriers in great detail, taking into account the uncertainty in what is known about their properties and behavior over long periods of time.
- **DOE** must show that **NRC**'s rigorous requirements are met by using a comprehensive set of calculations called a **performance assessment**.

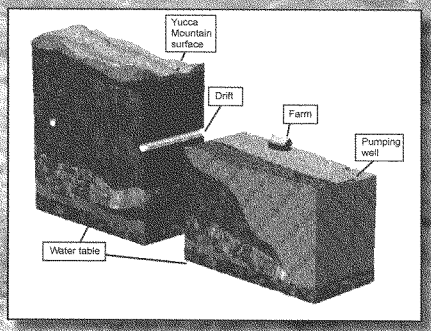



*Diagram of underground layers of Yucca Mountain which may serve as barriers.*

# Is DOE required to document and retain records of what it puts in the repository?

Yes. **DOE** must keep complete and comprehensive records of its repository activities and findings. These include:

- Site characterization
- Construction activities
- Repository design
- Laboratory tests
- Scientific studies
- Quality assurance
- Personnel training
- Operational procedures
- Inventories of waste
- Others

These documents must be accessible for **NRC** review. **DOE** also has to make the repository area, documents and facilities available for **NRC** inspections and reviews.

# After DOE closes the repository, can DOE just walk away?

No. **DOE** remains responsible for the safety and security of the repository after **closure**. By law, **DOE** must provide continued oversight and monitor the repository to prevent any activity at the site that could interfere with repository barriers or that could cause radiation doses to the public to exceed allowable limits.

Before **NRC** would allow **DOE** to close the repository, **DOE** must show that it has:

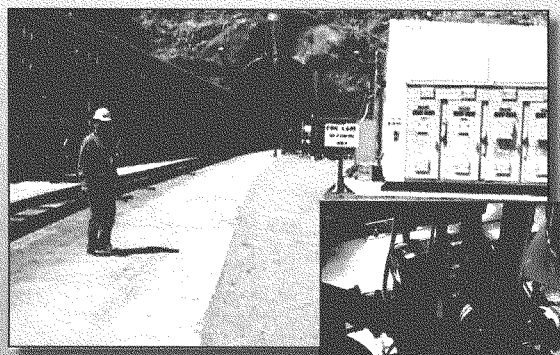
- Established a permanent oversight and monitoring program.
- Put suitable land use controls in place.
- Erected durable markers and monuments.
- Taken measures to preserve knowledge about the location and contents of the repository.

# Will NRC take DOE's word that

No. **NRC** has a rigorous inspection program to confirm independently that things are being done right. **NRC** also has the legal authority to enforce compliance with safety regulations through notices of violation, monetary civil penalties, or orders.

## Resident Inspectors

If **NRC** authorizes **DOE** to build a repository, **NRC** will assign resident inspectors to provide direct oversight at Yucca Mountain. These inspectors would live nearby and would oversee **DOE** operations on a daily basis. In addition to these routine daily inspections, teams of **NRC** experts would perform targeted inspections of construction and operational activities. As part of its safety mission, **NRC** has the authority to conduct announced and unannounced inspections of all licensed facilities at any time.



*NRC staff make inspections at Yucca Mountain and nuclear facilities to ensure that safety practices are being followed correctly.*

# things are being done right?

## Quality Assurance

Further, **NRC** regulations require that **DOE** have an acceptable "quality assurance" program in place. Quality assurance (QA) is a system of specific policies and procedures that must be followed and documented to provide confidence that construction and operation of a repository are completed correctly.

QA policies apply to every aspect of the repository that might affect safety. Some examples include checking the quality of materials used in construction, having proper administrative procedures, tracking and controlling documents, testing and calibrating equipment, confirming the accuracy of calculations and computer models, and verifying that materials and data are traceable. QA also means ensuring that the workers building and operating the repository are qualified and properly trained to do the job.

## Auditing

Auditing is another important part of quality assurance. Regular review of **DOE** documents, field activities, and laboratory activities by both **DOE** staff and external parties is important to ensure that **DOE** follows its procedures to assure quality.

## NRC's On-Site Representatives

To prepare for a licensing decision, **NRC** maintains a local, on-site representatives' office in Las Vegas, Nevada. A small staff of senior **NRC** professionals interact with **DOE** project staff at Yucca Mountain, in accordance with a public agreement. This agreement helps **NRC** prepare to review and judge, independently, the soundness of a potential license application. Reports of **NRC**'s on-site representatives' activities are available to the public on **NRC**'s web site at ***http://www.nrc.gov/waste/hlw-disposal/public-involvement/on-site-rep/reports.html***

## Continuous Review

**DOE** also must regularly review the status and adequacy of its QA program and cannot change the program without **NRC** approval.

*NRC's On-site Representatives' Office in Las Vegas, Nevada.*

# Can NRC say no?

*Absolutely.* **NRC** has three options once **DOE** submits an application to construct a repository:

1. **NRC** could deny the application.

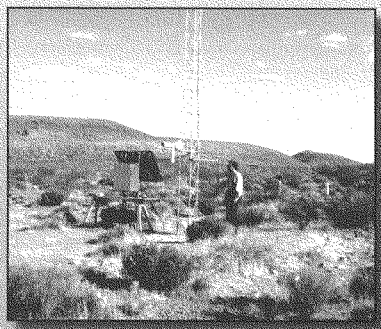
2. **NRC** could authorize **DOE** to construct a repository as described in **DOE**'s application.

3. **NRC** could allow **DOE** to build a repository subject to specific, enforceable conditions which **NRC** believes are necessary to ensure safety, security and environmental protection.

**NRC** will only allow **DOE** to build a repository at Yucca Mountain if it finds that **DOE** can build and operate the repository safely and securely, and in a way that meets **NRC**'s regulations. **NRC** will base its decision on a comprehensive safety evaluation of **DOE**'s application and on the results of a full and fair public hearing. Interested state, local and tribal governments can choose to participate in this hearing, whether or not they elect to contest the contents of **DOE**'s application.

If **NRC** approves construction of a repository at Yucca Mountain and if **DOE** builds one, **DOE** will again need to ask **NRC** for permission to receive radioactive waste for disposal.

**NRC** would make this second decision after inspecting the repository to ensure it was built in accordance with the conditions of **NRC**'s authorization. In addition, **DOE** would have to demonstrate that it can manage and dispose of waste safely at the repository, in compliance with **NRC**'s licensing regulations. Similar to the decision in granting permission to build the repository, **NRC** would base the decision of whether to allow **DOE** to operate the repository on a comprehensive, updated safety evaluation. **NRC** will also provide the opportunity to request a second full and fair public hearing.



*NRC staff observe a field test near Yucca Mountain.*

# Glossary

**Canister**. A cylindrical metal container used to handle, transport, store or dispose of high-level nuclear waste. Some types can be used for more than one of these tasks. When used for disposal, a canister may also be referred to as a waste package.

**Closure**. The sealing of shafts, ramps and boreholes, and final backfilling of the underground repository.

**DOE**. The U.S. Department of Energy; the agency responsible for designing, constructing and operating a repository.

**Engineered barriers**. The waste packages, other engineered (man-made) components such as drip shields, and the mined, underground facility consisting of tunnels and drifts.

**EPA**. The U.S. Environmental Protection Agency; the agency responsible for setting environmental regulations related to Yucca Mountain.

**Geologic repository**. A system intended for the disposal of radioactive wastes in excavated geologic media. A geologic repository includes the engineered barrier system and the surrounding rock.

**High-level waste**. Highly radioactive material resulting from the reprocessing of spent nuclear fuel; frequently abbreviated as HLW.

**NRC**. The U.S. Nuclear Regulatory Commission; the agency responsible for enforcing Yucca Mountain regulations and for granting or denying a license to DOE.

**Performance assessment**. A systematic analysis that examines what can happen at a repository, how likely it is to happen, and what can result.

**Performance confirmation**. The program of tests, experiments and studies that DOE must conduct to verify the soundness of the information used to demonstrate that the repository meets NRC's regulations.

**Preclosure safety analysis**. A systematic examination of the site, the repository design, and potential hazards that could result in the exposure of workers or the public to radiation while waste is received, handled and placed in the repository.

**Radionuclide**. A radioactive type of atom with an unstable nucleus that decays and emits ionizing radiation.

**Reasonably maximally exposed individual**. A hypothetical person living in the Amargosa Valley area used for estimating possible radiation exposure to people in the distant future.

**Spent nuclear fuel**. Fuel that has been irradiated and withdrawn from a nuclear reactor because it is no longer an efficient contributor to producing nuclear energy. Spent fuel is still highly radioactive.

**Waste form**. The radioactive waste materials and any encapsulating or stabilizing matrix. Spent nuclear fuel and reprocessed, radioactive waste glass logs are the two waste forms that DOE plans to put in a repository.

**Waste package**. The waste form and any containers, shielding, packing and other absorbent materials immediately surrounding an individual waste container.

**To learn more about NRC's high-level waste repository program, please visit our website at *http://www.nrc.gov/waste/hlw-disposal.html***

NRC is committed to openness in the performance of its regulatory duties. To that end, we hope this brochure has been informative and clear. Please help us improve the quality of our materials by answering a few questions.

**1. Did you find this brochure helpful?**

**2. Was there a topic we could have explained better?**

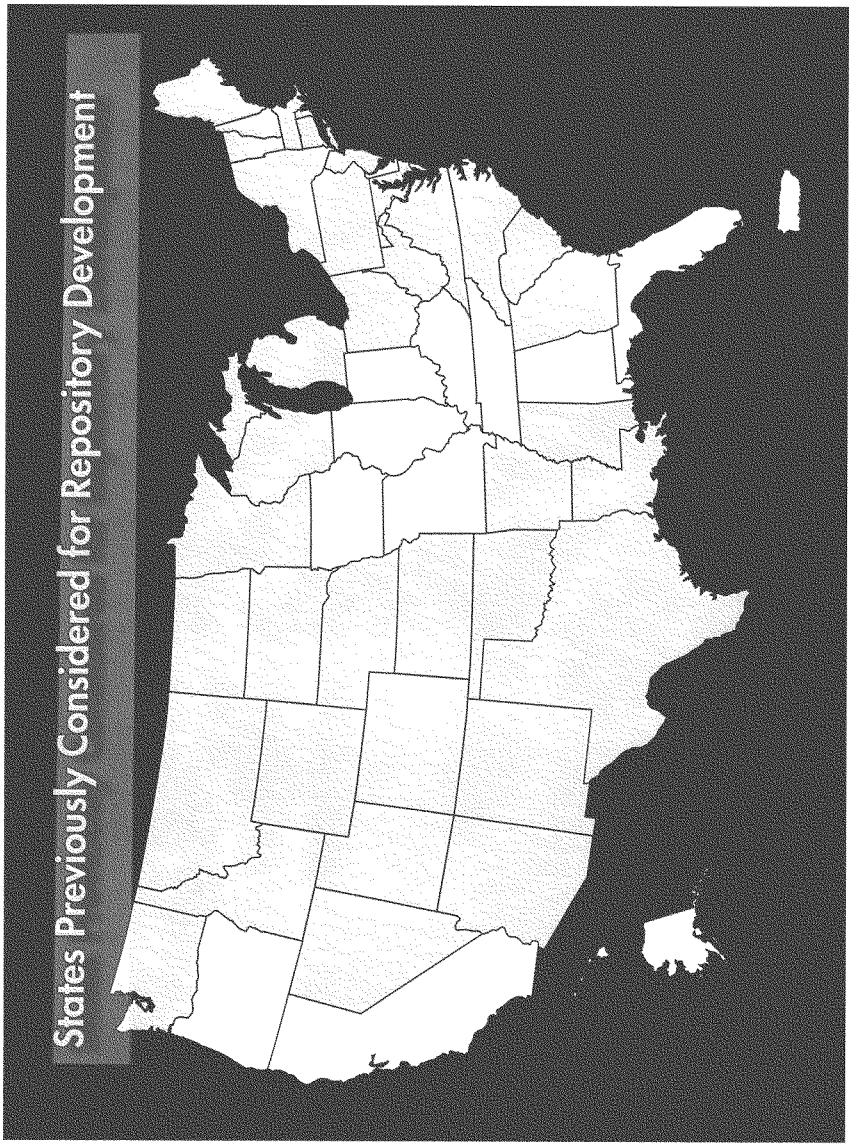
**3. Are there other questions about NRC's Yucca Mountain regulations that we should address in future revisions of this brochure?**

**4. Are there other aspects of NRC's program that you would like us to explain?**

Please fill in your responses, detach along perforation and mail this card, or send your replies by e-mail to JPK@nrc.gov. Thank you for your interest.

**DIVISION OF HIGH-LEVEL WASTE REPOSITORY SAFETY**

November 2006


States Previously Considered for Repository Development

# HEALTH PHYSICS SOCIETY

*"Specialists in Radiation Safety"*

**Kevin L. Nelson, PhD, CHP**
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November 19, 2007

The Honorable James M. Inhofe, Ranking Member
Environment and Public Works Committee
United States Senate
Washington, DC 20510

Dear Senator Inhofe:

Thank you for requesting the Health Physics Society's (HPS) position on comments submitted to the Senate Environment and Public Works Committee by Dr. Arjun Makhijani that includes the calculation of the risk of future radiation doses from the Yucca Mountain project. Dr. Makhijani's calculations of risk associated with the proposed Environmental Protection Agency's (EPA) radiation protection standards for Yucca Mountain are contained in the document "Comments of Dr. Arjun Makhijani on Yucca Mountain and the draft EPA standard submitted for the record of the Senate and Environment and Public Works Committee hearing on the 'Examination of the Licensing Process for the Yucca Mountain Repository'" dated October 31, 2007.

The HPS position is that calculation of risk associated with radiation doses for periods greater than 10,000 years into the future, like the calculations performed by Dr. Makhijani, are scientifically invalid. This position is contained in the HPS position statement "Managing Spent Nuclear Fuel", which I have attached and which can be found on at http://hps.org/documents/managing_spent_fuel_ps022-1.pdf. Specifically, the HPS position states

> "the HPS believes the scientific validity and reasonableness of assumptions regarding the estimation of cancer and genetic risk from radiation exposure only allows the risk estimates to be extrapolated out for a period on the order of several generations (that is, on the order of a hundred years) but no more than a few hundred years. The basis for this is that today's limited knowledge of radiation risk mechanisms results in the necessity of knowing the lifestyles and

> underlying cancer and genetic experience of the population for which the risk is being estimated, and it is unreasonable to think these can be known beyond a few generations."

This position is based on the previous testimony of Dr. Dade W. Moeller to the Committee. In his letter to you and Senator Jeffords dated April 7, 2006, Dr. Moeller answered questions in follow-up to his testimony at the Committee's March 1, 2006, hearing on Yucca Mountain. The scientific basis for the HPS position is contained in Dr. Moeller's answers to your first two questions regarding the possibility of quantifying risk from the EPA proposed standard and in his enclosure "Implications of Risk Quantification on the Ruling of the Court of Appeals." I have attached Dr. Moeller's cover letter and the responses that are pertinent to the question of the validity of calculating risk in the context of the EPA proposed standard, such as those calculations performed by Dr. Makhijani.

I hope this is helpful in the Committee's deliberation of the Yucca Mountain project and in the understanding that calculations such as those submitted by Dr. Makhijani for periods far into the future do not have scientific validity. Please do not hesitate to contact me if you have any further questions on this, or any other radiation safety issue.

Sincerely,

Kevin L. Nelson, PhD, CHP

Enclosures

PS022-1

HEALTH PHYSICS SOCIETY

# MANAGING SPENT NUCLEAR FUEL

POSITION STATEMENT OF THE
HEALTH PHYSICS SOCIETY*

Adopted: July 2006
Revised: June 2007

Contact: Richard J. Burk, Jr.
Executive Secretary
Health Physics Society
Telephone: 703-790-1745
Fax: 703-790-2672
Email: HPS@BurkInc.com
http://www.hps.org

The Nuclear Waste Policy Act of 1982 legislates a system of managing spent nuclear fuel that results in its permanent disposal in appropriate geological repositories. Although a repository site has been identified, studied, and mostly developed as provided for by this law, the actual completion and use of the repository is still decades off with the potential for public and legal actions preventing it from ever being operational. In the meantime, nuclear reactor technology, energy use and demand, energy production effects on the environment, public-policy mechanisms, and medical knowledge have all evolved and can be seen to continue to evolve such that the assumptions and basis for the Nuclear Waste Policy Act may no longer be appropriate for the current inventory of spent nuclear fuel. In addition, the proposal to change the nature of spent fuel management through the development of reprocessing techniques places new demands on managing possible spent fuel waste streams in the future.

In light of the current situation and prospect of future developments relevant to managing spent nuclear fuel, the Health Physics Society (HPS) takes the following **positions**:

1. The HPS believes the management of spent fuel from nuclear reactors should be conducted in a manner that (a) uses only scientifically valid and reasonable assumptions for setting protection standards, (b) adequately protects the public and environment from radiation exposure resulting from natural, accidental, or malevolent release of radioactive materials from the spent fuel, (c) accommodates evolving technologies, and (d) does not permanently dispose of potentially valuable material that is contained in a spent-fuel assembly.

2. The HPS believes that the development of new reactor technology that is intended for commercial production of electrical power must (a) integrate the characteristics of waste streams created by this new technology into the design of the new technology and process from the very beginning of its development, (b) design the framework to manage the new waste stream with equal importance to designing the technology itself, and (c) incorporate input and involvement from the regulatory authority that will regulate the technology and resulting waste stream once it is producing commercial power.

3. Regarding position 1.(a) above, the HPS believes the radiation protection standards recommended in its position statement "Ionizing Radiation-Safety Standards for the General Public" (HPS 2003) are appropriate for application to potential public exposure associated with management of spent nuclear fuel.

4. Regarding position 1.(b) above, the HPS believes the scientific validity and reasonableness of assumptions regarding the estimation of cancer and genetic risk from radiation exposure only allows the risk estimates to be extrapolated out for a period on the order of several generations (that is, on the order of a hundred years) but no more than a few hundred years. The basis for this is that today's limited knowledge of radiation risk mechanisms results in the necessity of knowing the lifestyles and underlying cancer and genetic experience of the population for which the risk is being estimated, and it is unreasonable to think these can be known beyond a few generations. Of course, this limitation may be changed as our knowledge of the radiation risk mechanisms improves, which is an example of needing to have a spent nuclear fuel management system that accommodates evolving technologies (i.e., position 1.(c) above).

Regarding positions 1.(c) and 1.(d) above, the HPS makes the following **recommendations**:

1. Spent nuclear fuel should be designated for monitored interim retrievable storage for a period intended to be at least 100 years but with a possibility of being as long as 300 years.

2. An independent expert study should be performed to inform a risk-based decision on whether the location of the interim retrievable storage for up to 300 years should be on-site where the spent nuclear fuel is generated, should be centralized in the Yucca Mountain repository, or should be in some other configuration or location. This study should evaluate if any of these options present an unacceptable risk to the public and the environment from radiation exposure due to the presence of the spent nuclear fuel and due to the natural, accidental, or malevolent release of radioactive materials from the spent fuel.

3. Radiation protection standards should be developed for the interim storage facility or facilities based on a 300-year storage period. Radiation protection standards should not be developed for final permanent disposal/disposition of the spent nuclear fuel or wastes produced by processing the spent fuel until technologies and knowledge advance to the point of allowing a scientifically valid decision on final disposition.

4. The storage facility or facilities should be designed to have appropriate monitoring to ensure the integrity of the storage containers and facility or facilities remain intact throughout the storage period.

**Reference:**

Health Physics Society. Position statement "Ionizing Radiation-Safety Standards for the General Public," last revised June 2003.

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* The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.

BARACK OBAMA
ILLINOIS

United States Senate
WASHINGTON, DC 20510

COMMITTEES:
HEALTH, EDUCATION, LABOR AND PENSIONS
HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS
FOREIGN RELATIONS
VETERANS' AFFAIRS

October 30, 2007

The Honorable Harry Reid
Majority Leader
528 Hart Senate Office Building
Washington, DC 20510

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

Dear Leader Reid and Chairman Boxer:

I understand that the Senate Environment and Public Works Committee is holding a hearing on October 31 entitled, "Examination of the Licensing Process for the Yucca Mountain Repository," at which Senator Reid is scheduled to testify. I know both of you have been working on this issue for many years, so I am writing to share my perspective on the issue given its importance to my home state of Illinois. Although I am no longer a member of the EPW Committee, I respectfully offer the following views and ask that they be included as part of the hearing record. Separately, I will be submitting questions for the hearing witnesses.

Given the nation's rising energy demand and the serious problems posed by global climate change, we need to increase the use of carbon-free energy sources, such as solar, wind, and geothermal energy. But we cannot deny that nuclear power is – and likely will remain – an important source of electricity for many years to come. How we deal with the dangerous byproduct of nuclear reactors is a critical question that has yet to be resolved.

As you may know, Illinois has 11 nuclear reactors – more than any other state in the country. Nuclear power provides more than 50 percent of the electricity needs of Illinois. Where and how we store spent nuclear fuel is an extremely important issue for my constituents. Currently, in the absence of any alternative, spent nuclear fuel generated by Illinois' reactors is stored in Illinois.

In 1987, Congress attempted to reach a national solution to the storage of spent nuclear fuel and other radioactive waste by abandoning the scientific consideration of a wide range of possible sites and instead unilaterally imposing a final decision to focus only on Yucca Mountain, Nevada. During the past 20 years, over the strong opposition of the people of Nevada, billions of dollars have been spent by taxpayers and ratepayers in the construction of this location. Millions of dollars have been spent on lawsuits, and hundreds of millions more will be spent in the future if the Department of Energy fails to meet its contractual obligations to nuclear utilities.

Proponents suggest Yucca Mountain will not be ready to accept spent fuel shipments for another 10 years; more realistic prognostications suggest we are at least two decades from Yucca Mountain accepting shipments.

Legitimate scientific questions have been raised about the safety of storing spent nuclear fuel at this location. With regard to Yucca Mountain, the National Academy of Sciences maintains that peak risks might occur hundreds of thousands of years from now. In 2004, a federal court questioned whether standards developed by the Environmental Protection Agency for the Yucca Mountain repository were sufficient to guarantee the safety of Nevadans.

Questions also have been raised about the viability of transporting spent nuclear fuel to Nevada from different locations around the country. Although it would seem to serve the interests of Illinois – and other states with nuclear reactors – to send our waste to another state, transporting nuclear waste materials poses uncertain risk. In fact, since a large amount of this spent fuel would likely travel by rail, this is a serious concern for the people of Chicago, which is the transportation hub of the Midwest.

Because of these safety issues and the unwavering opposition from the people of Nevada and their elected officials, there is strong reason to believe that many more billions of dollars could be expended on Yucca Mountain without any significant progress in moving towards a permanent solution to the problem of where to store spent nuclear fuel.

For these reasons, I believe that it is no longer a sustainable federal policy for Yucca Mountain to be considered as a permanent repository. Instead of re-examining the 20-year licensing process and the billions of dollars that have already been spent, the time has come for the federal government to refocus its resources on finding more viable alternatives for the storage of spent nuclear fuel. Among the possible alternatives that should be considered are finding another state willing to serve as a permanent national repository or creating regional storage repositories. The federal government should also redirect resources toward improving the safety and security of spent fuel at plant sites around the country until a safe, long-term solution can be implemented.

Regardless of what alternative is pursued, two premises should guide federal decision-making. First, any storage option should be supported by sound science. We need to ensure that nuclear waste can be safely stored without polluting aquifers or soil and exposing nearby residents to toxic radiation.

Second, we should select a repository location through a process that develops national consensus and respects state sovereignty, not one in which the federal government cuts off debate and forces one state to accept nuclear waste from other states. The flawed process by which Yucca Mountain was selected now manifests itself as a profoundly expensive endeavor of monumental proportion.

In short, the selection of Yucca Mountain has failed, the time for debate on this site is over, and it is time to start exploring new alternatives for safe, long-term solutions based on

sound science. I thank you both for your leadership on this issue, and I appreciate your consideration of my views.

Sincerely,

Barack Obama
United States Senator

STATEMENT OF JIM GIBBONS, NEVADA GOVERNOR

Honorable Madame Chair and members of the committee, it is my honor as the Governor of the State of Nevada to submit these written comments for the Committee's consideration. While I could not be present today to testify in person, I ask the Committee to carefully consider these written comments, as well as the comments presented by Nevada's Federal delegation and Nevada's Attorney General. I am pleased that all of us stand in unified opposition to the Yucca mountain project.

During my 10 years of service to the State of Nevada in Congress, I fought tirelessly against this flawed project. Now, as Governor, I appreciate the opportunity the people of Nevada have given me to continue the fight.

The Yucca mountain project always has, and always will, be based on unsound science, questionable legal interpretations, and poor public policy. I trust this Committee will carefully consider Nevada's views. As a matter of both science and law, and in the interests of State comity and sound national policy, Yucca Mountain should not be developed as a high-level nuclear waste repository.

Nevada has done more than its share with respect to exposure to high-level radioactive waste. Nevada served as a nuclear weapons testing area during the cold war. Hundreds of millions of radioactive curie contaminants from those tests remain embedded in Nevada soil to this day, exposing many Nevadans to serious health risks. Nevadans have not forgotten this legacy.

Now, the Department of Energy seeks to foist even more harmful contaminants on the people and lands of Nevada. Not only does the Department of Energy seek to store radioactive waste in Nevada, but by necessity, seeks to transport that same waste through Nevada, including through and near major metropolitan areas.

The Department of Energy has mismanaged this project from its ill-conceived inception. This mismanagement is well-documented and has been the subject of numerous legal challenges and repeated public testimony by Nevada public officials. The geologic issues at Yucca mountain are numerous and concerning. The Department of Energy has not been able to demonstrate that the planned repository is able to geologically isolate radioactive waste. The Nevada Nuclear Regulatory Commission has identified hundreds of technical issues that remain unresolved to this day. The Yucca mountain project site is located in an area that has been identified as prone to volcanic activity. Even more concerning is the seismic integrity of the site. Yucca Mountain sits in the heart of one of the largest earthquake fault zones east of California. Hundreds of earthquakes greater than magnitude 2.5 have occurred at the Yucca site just in the past 20 years. The Yucca mountain site is also prone to serious groundwater seepage. Recognizing the deteriorating effects groundwater can have on storage casks, the Department of Energy has suggested that a drip shield is appropriate. This Committee should ask itself, if this site is truly geologically appropriate, why does the Department of Energy need to spend billions of dollars on a man-made drip shield?

Against this backdrop are the recent and continuing disingenuous actions of the Department of Energy. Just this year, Nevada was forced to go to court to stop the Department of Energy from flaunting Nevada water law in an attempt to drill boreholes for soil samples at the Yucca site. The Department of Energy chose to ignore Nevada law and simply drilled numerous bore-holes without permission. Fortunately, a Federal district court recognized that the Department of Energy is required to follow Nevada water law just like everyone else, and the bore-hole drilling project was stopped. However, the cavalier attitude the Department of Energy has taken toward the State of Nevada is telling, and is certainly cause for grave concern.

In the next few days many of you will return to your homes thousands of miles away from Nevada, but for many in the hearing room today, Nevada is home. Nevadans are the ones who have to risk deadly exposures based on the Department of Energy's culture of ignoring science in favor of expediency. And I remind you that there is still no viable plan for transporting this deadly waste through our communities for thousands of miles. The safety of the American people along the transportation route is in jeopardy due to this moving hazard that too easily could be a moving target. It is my hope that our Federal public officials will fully examine this project in a common-sense and scientifically sound manner and be able to ignore the pressures of rubber stamping this project. It is Nevada's hope that you will see the flaws and the risks associated with opening Yucca Mountain and transporting high-level nuclear waste. It is our hope that you will protect the people of Nevada and of this great nation.

I thank you for you time today, and I respectfully request that these comments be introduced into the record.

CORRECTED STATEMENT OF KENNETH COOK, PRESIDENT, ENVIRONMENTAL WORKING GROUP

Chairman Boxer, Ranking Member Inhofe, distinguished members of the Committee: Thank you for the opportunity to testify today on some of the crucial issues surrounding the licensing process for the proposed facility for long-term storage of lethal, long-lived nuclear waste at Yucca Mountain in Nevada. My name is Kenneth Cook and I am president of Environmental Working Group (EWG), a non-profit environmental research and advocacy organization that uses the power of information to protect public health and the environment. EWG has offices in Washington, DC and Oakland, California.

Since 2002, EWG has examined and assisted the public in understanding the transportation implications of nuclear waste routes that could be utilized to transport deadly radioactive material from around the United States, and through virtually every major city in the Nation, to Yucca Mountain, should the proposed repository there become operational.

I want to emphasize three main points in my testimony today:

1. The American public's fundamental right to understand the full implications of thousands of potential shipments of extremely dangerous nuclear waste across this country should be central to the government's process for licensing Yucca Mountain, for operating any other repository for this material, and for all decisions to relicense existing reactors or build new ones. The Federal Government has not respected that right to know.
2. It makes no sense to generate enormous, additional amounts of deadly nuclear waste when we haven't figured out what to do with the tens of thousands of tons already on hand. Our government has ignored that common sense precaution.
3. The government is rushing to approve the license application for Yucca Mountain before rudimentary, life and death questions have been resolved about transportation, storage, and a truly protective radiation safety standard.

Let me start with a vivid illustration of my first point.

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### California



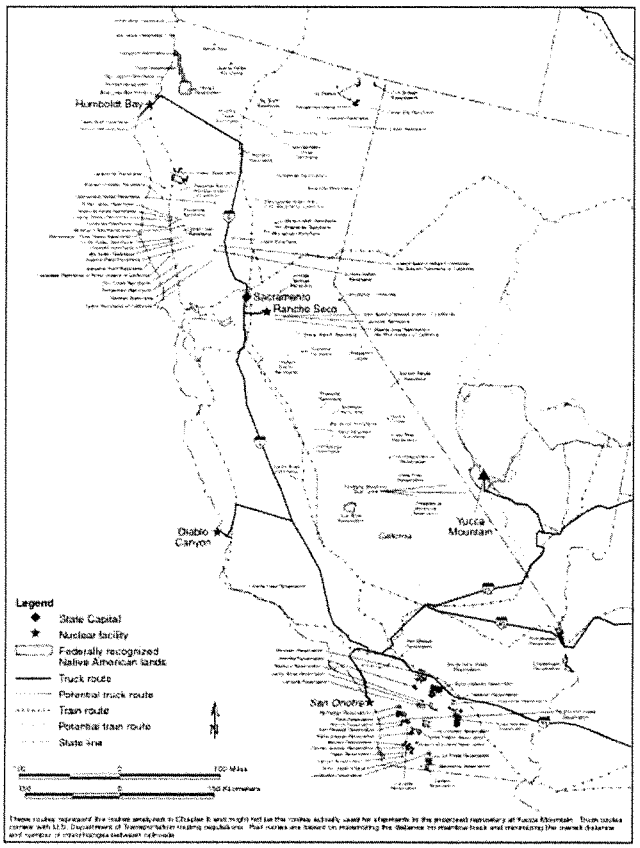



**Figure J-34.** Highway and rail routes used to analyze transportation impacts - California.



Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.
*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_CA.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

### Los Angeles, CA

on Roads
on Satellite
Glendale
Burbank
Pasadena
Los Angeles
Hollywood
Beverly Hills
Inglewood
Hawthorne
Compton
Downey
Whittier
Norwalk
Bellflower
Montebello
Monterey Park
Rosemead
Alhambra
Eagle Rock
Garvanza
Studio City
Toluca Lake
Culver City
Marina del Rey
Playa del Rey
El Segundo
Manhattan Beach
Lawndale
Gardena
Lynwood
South Gate
Huntington Park
Maywood
Bell Gardens
Cerritos
Artesia
Commerce
Vernon
East Los Angeles
South San Gabriel
Temple City
Arcadia
Sierra Madre
La Canada Flintridge
Altadena
Glassell Park
Echo Park
Silver Lake
Westwood
Bel-Air
Beverly Glen
Palms
Ladera Heights
View Park
Hyde Park
Florence
Walnut Park
Cudahy
Westmont
Lennox
West Athens
Willowbrook
Del Aire
Lomita
Harbor City
Rancho Palos Verdes
Rancho Dominguez
Paramount
West Compton
Roosevelt
Santa Fe Springs
South Whittier
Pico Rivera
Los Nietos
Vista
Studebaker
Glen M Anderson Fwy
Santa Ana Fwy
Hollywood Fwy
Ventura Fwy
Harbor Fwy
Pomona Fwy
Foothill Fwy
Golden State Fwy
Glendale Fwy
Pasadena Fwy
Adams Square
Ivanhoe Junction
Clement Junction
Happy Valley
El Serano
Briggs Terrace
Montrose
Crescenta
Eagle Rock
San Marino
East San Gabriel
East Pasadena
South Pasadena
Van Nuys
North Hollywood
Beverly Hills
Culver City
Inglewood
Hawthorne
Compton
Downey
Whittier
Norwalk
Bellflower
Cerritos
Artesia
Manhattan Beach
Lawndale
Gardena
Lynwood
South Gate
Huntington Park
Maywood
Bell Gardens
Commerce
Vernon
East Los Angeles
Montebello
Pico Rivera
Monterey Park
Rosemead
Alhambra
Temple City
Arcadia
Sierra Madre
Altadena
La Canada Flintridge
Glendale
Burbank
Pasadena
Los Angeles
Hollywood
Beverly Hills

I apologize for the exceedingly poor quality of the first of those two maps, in particular to you, Chairman Boxer, since it depicts your home State of California. This is the official transportation map, buried in Appendix J of the Department of Energy's (DOE) Environmental Impact Statement (EIS) for the proposed Yucca Mountain nuclear waste repository. More cartoon than cartography, this illustration depicts only one city in our most populous state: the capital, Sacramento. It also shows the location of facilities from which lethal radioactive waste would be shipped to Yucca Mountain if it is ever made operational, along with a few highway designations and some unnamed rail lines.

You won't find San Francisco, Oakland, San Jose, Los Angeles, San Diego, Fresno, Bakersfield or any other major California cities on this map of nuclear waste routes to Yucca Mountain. But DOE's prospective routes for shipping deadly nuclear reactor waste go through or near every one of those cities, or the suburbs around them, and countless more communities in California.

If the people you represent did somehow find their way to Appendix J of the EIS for Yucca Mountain, Chairman Boxer, they wouldn't find any telling details about how the potential highway or rail routes might wend their way through the towns and cities and communities of your state.

The people of California probably wouldn't realize that 7.5 million them live within a mile of those routes, or that there are over 1,500 schools or 130 hospitals also within a mile of those routes in your state.

Now, maybe, Chairman Boxer, your constituents, knowing all that, would still decide that it makes sense to put lethal radioactive waste on California's highways and rail lines, right near their homes and through their communities, en route to Yucca Mountain. Maybe Californians would come to that decision knowing that plenty of waste would still remain to be dealt with at reactors in the State once Yucca Mountain is filled to its current statutory limit. Maybe residents of California would still conclude that reactors in the state, or in states to the north that might route waste through your state, should operate for an additional 20 years, generating more nuclear waste and more shipments for decades. Maybe the people of California would approve of new reactors being built, creating yet more waste at reactor sites, and on highways and railways, for generations to come.

Or maybe they wouldn't approve at all if they really knew what approval meant. Californians have a right to know the implications of shipping waste to Yucca Mountain, or of expanding nuclear power and waste production, before decisions are made for them.

The second map was made by Environmental Working Group, using Google Maps after we painstakingly overlaid the rail and highway routes from that very same set of maps in the Yucca Mountain EIS. We are in the process of making maps like this available online for all of the proposed shipment routes to Yucca Mountain. Here are some other examples, with additional EWG maps presented on the charts before you.

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### Oklahoma



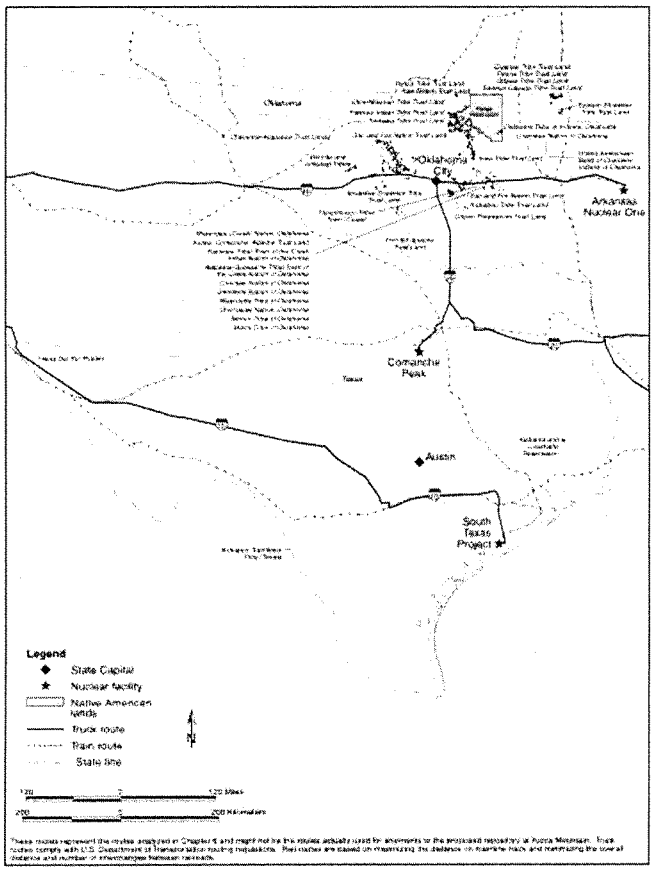


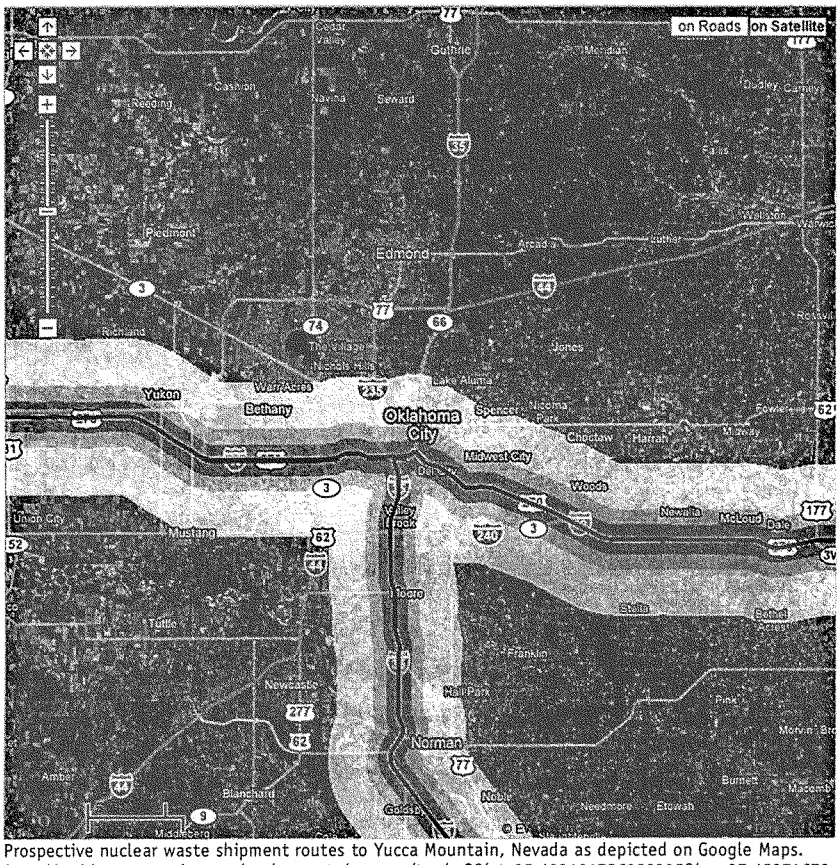

**Figure J-51.** Highway and rail routes used to analyze transportation impacts - Oklahoma and Texas



Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_OK-TX.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

### Oklahoma City, OK




Prospective nuclear waste shipment routes to Yucca Mountain, Nevada as depicted on Google Maps.
*http://archive.ewg.org/reports/nuclearwaste/mapresults.php?&lat=35.493101786008395&lng=97.459716796875&z=10&type=on%20Satellite*

Distance to a proposed nuclear waste route

within 1 mile  within 2 miles  within 5 miles

rail  road

## GOVERNMENT'S NUCLEAR WASTE ROUTE MAPS

### Washington, DC

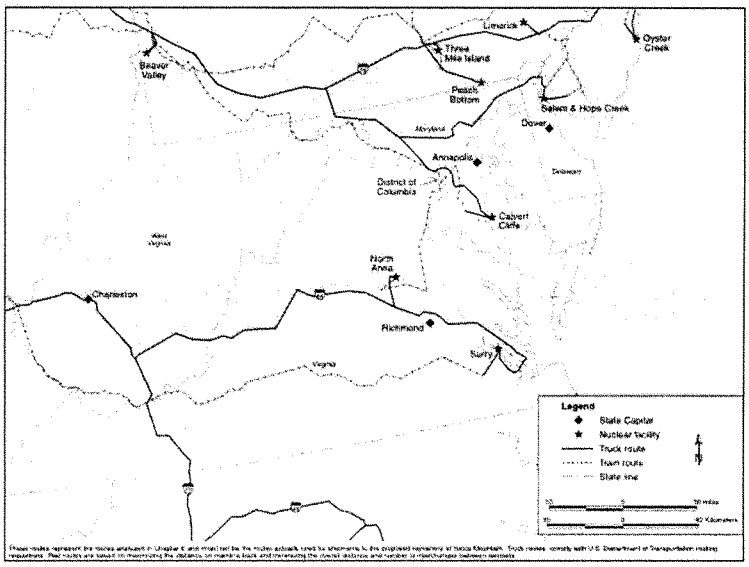
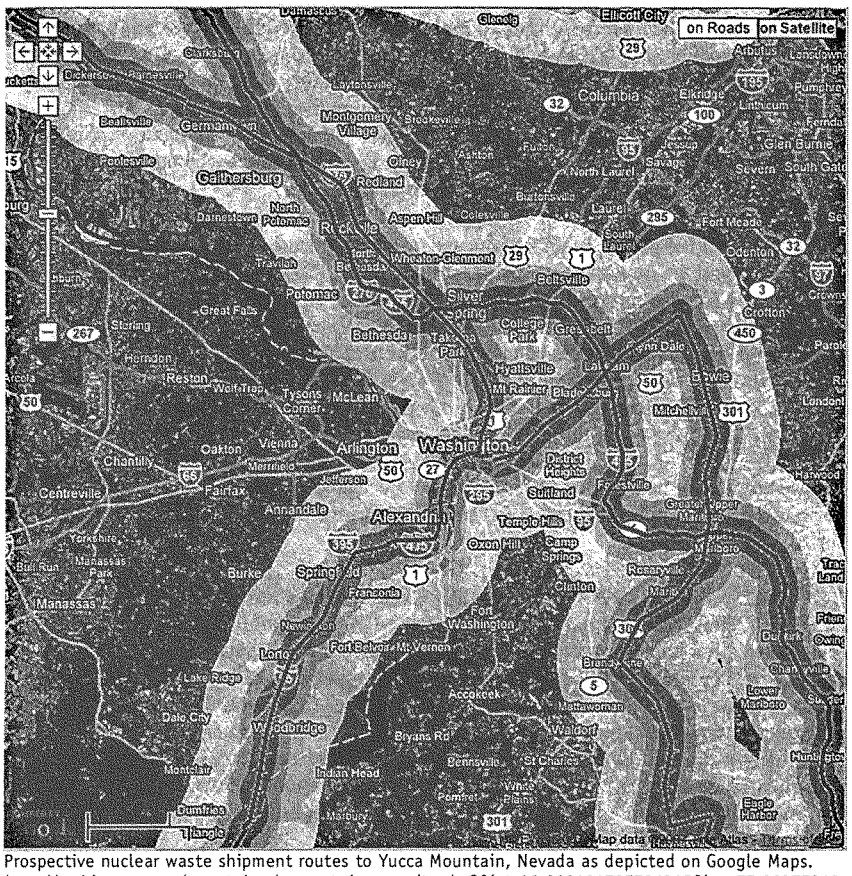



Figure J-37. Highway and rail routes used to analyze transportation impacts - Delaware, Maryland, Virginia, West Virginia, and the District of Columbia.

Official U.S. Government maps of prospective nuclear waste shipment routes to Yucca Mountain, Nevada.
*http://archive.ewg.org/reports/NuclearWaste/pdf/eis_j_DE-MD-VA-WV-DC.pdf*

## EWG NUCLEAR WASTE ROUTE MAP

### Washington, DC




Prospective nuclear waste shipment routes to Yucca Mountain, Nevada as depicted on Google Maps.
*http://archive.ewg.org/reports/nuclearwaste/mapresults.php?&lat=38.892101707724315&lng=77.02377319335938&z=10&type=on%20Satellite*

Distance to a proposed nuclear waste route

within 1 mile — within 2 miles — within 5 miles

rail — road

There are no operating nuclear power reactors in Oklahoma, something the State has in common with Nevada. But EWG estimates that 254,000 people live within 1 mile of the Department of Energy's proposed routes for the shipment of high level nuclear waste across Oklahoma from out of state; some 879,000 people live within 5 miles. Our geographic information system analysis also finds an estimated 99 schools within 1 mile of the Department of Energy's proposed high-level nuclear waste transportation routes and 289 schools within 5 miles. We also estimate that 14 hospitals are within 1 mile and 29 hospitals are within 5 miles. Again, localized, community-specific information of this sort might or might not affect the opinions of Oklahomans regarding the shipment through their cities and their communities of nuclear waste from other states. The only way we'll know if this information is important is if we entrust it to the people of Oklahoma before decisions that affect them are made.

My point is that the people of Oklahoma and every other State have a right to know and fully understand the implications for them of the Yucca Mountain nuclear waste repository before the license for the facility is finalized. And they have the same right to know what expansion of nuclear waste generation will mean for transportation through their State if reactors around the country are relicensed for 20 additional years of operation, or new reactors are constructed. They may or may not know that decisions made hundreds of miles away will have profound implications for the shipment of high-level, deadly nuclear waste through their neighborhoods for decades to come.

This right to know the implications of shipping nuclear waste to Yucca Mountain is not being respected by our government in its rush to approve the operating license for the Yucca Mountain facility.

CONCERNS ABOUT EPA RADIATION STANDARDS FOR YUCCA

In August 2005, the U.S. Environmental Protection Agency published its proposed, revised radiation protection standards for the proposed Yucca Mountain nuclear waste dump. These public health standards set the maximum allowable levels of radiation to which humans can be exposed and the maximum level of radiation that can be in groundwater from leakage from the proposed dump. Under the Energy Policy Act of 1992, these standards are required to conform to National Academies of Science's mandate that the standard protect human health during periods when leakage will cause peak levels of radiation.1 Unfortunately, EPA's standards neither protect public health nor meet the law's requirements.

EPA proposes a 15 millirems radiation dose limit for humans during the first 10,000 years of the proposed dump's operation (when no leakage from waste containers is expected), but would weaken the standard to 350 millirems after 10,000 years (when leakage is all but certain). In other words, at the time of the greatest threats to human health, EPA proposed weakening the standard by a factor of 23 times more lenient.

1 Energy Policy Act of 1992, Pub. L. 102–486; National Academy of Sciences, National Research Council, Technical Bases for Yucca Mountain Standards, 1995.

Notably, nowhere in its proposal does EPA discuss the increased risk to human health and safety from the higher levels of exposure at the 10,000-year mark, despite EPA's and NAS's acknowledgement of a linear-dose response relationship between radiation and cancer. The risk to public health increases at higher levels of radiation.

EPA also seems to be intentionally disregarding its legal obligations. EPA's original human dose standard was 15 millirems per year for the first 10,000 years. EPA proposed that there be no public health radiation standard in place after 10,000 years, the period in which leakage is expected from the repository. But since EPA had arbitrarily determined that this standard did not need to be in place when peak leakage will occur, the DC Court of Appeals invalidated it as inconsistent with the Energy Policy Act.

In addition, EPA proposes the same groundwater protection standard that the District Court voided in 2004. EPA proposes a 4 millirems standard for the first 10,000 years, and no groundwater protection standard at the time when peak exposure is expected to occur, after 10,000 years. Radiation from the proposed repository will travel through groundwater, and the groundwater under Yucca Mountain provides drinking and irrigation water to tens of millions of people throughout Amargosa Valley and Southern California.

Moreover, EPA will not consider public comment on the groundwater standard in the proposed regulation, despite the fact that the groundwater standard is integral to protecting public health and that the radiation standard is integral to determining the safety and integrity of the proposed dump.

## CONCLUDING OBSERVATIONS

I think we are all aware that the U.S. nuclear industry wouldn't split an atom without a subsidy. They never have, and they never will.

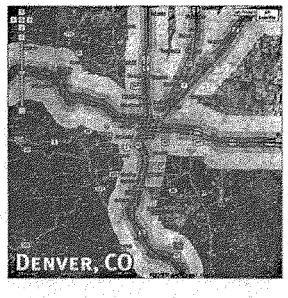
Nuclear energy companies never hesitate to lean on American taxpayers for money to conduct nuclear research, for indemnification in the event of horrific nuclear accidents, for money to clean up industry's lethal waste and cost overruns, or for the collateral of the public's purse—something the companies are seeking today to coax Wall Street out of its sober reluctance to invest in new nuclear reactors.

But the ultimate subsidy for the nuclear industry may well be our government's scandalous failure to fully inform our own people about the potential consequences of the Yucca Mountain repository until it is too late for the people to do anything about it but accept the risk, the expense, or the unthinkable.

I thank you, Chairman Boxer and Ranking Member Inhofe, for this opportunity to testify, and I look forward to answering any questions or providing additional information at the pleasure of the Committee.

I wish to thank colleagues at the Environmental Working Group for the research and analysis underlying my testimony today: Richard Wiles, Sandra Schubert, Sean Gray, and Chris Campbell; and former colleagues John Coequyt, Jon Balivieso, and Tim Greenleaf. We are also grateful for technical assistance provided over the years by experts at the Nuclear Information And Resource Service and in particular by Kevin Kamps, now on the staff of Beyond Nuclear. EWG is responsible for the contents of this testimony.

# NUCLEAR WASTE ROUTES



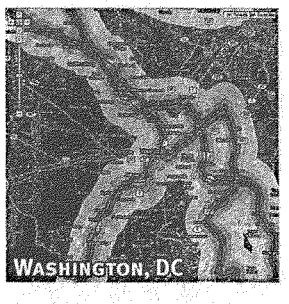
Distance to a proposed nuclear waste route

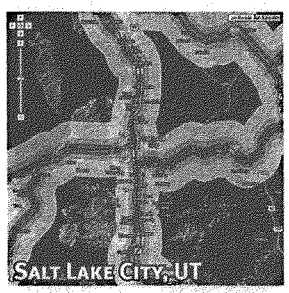
within 1 mile · within 2 miles · within 5 miles

rail · road

ENVIRONMENTAL WORKING GROUP

# NUCLEAR WASTE ROUTES





Distance to a proposed nuclear waste route

within 1 mile — within 2 miles — within 5 miles

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ENVIRONMENTAL WORKING GROUP

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**Comments of Dr. Arjun Makhijani on Yucca Mountain and the draft EPA standard submitted for the record of the Senate Environment and Public Works Committee hearing on the "Examination of the Licensing Process for the Yucca Mountain Repository," October 31, 2007**

Madam Chairman, I have prepared these comments on the proposed Yucca Mountain repository at the request of the staff of Senate Majority Leader Harry Reid. I appreciate the opportunity to present them for inclusion in the hearing record, should you so decide. My remarks are complemented by comments that Dr. Brice Smith and I prepared on the draft EPA Standard on Yucca Mountain in November 2005. I request that these comments also be included in the record.

I am president of the Institute for Energy and Environmental Research and have authored or co-authored articles, reports, and books on issues connected to nuclear waste and its management and on other radiation-related issues. I hold a Ph.D. from the Department of Electrical Engineering and Computer Sciences of the University of California at Berkeley (1972), where I specialized in controlled nuclear fusion.

I wish to note three things at the outset:

1. I support a sound repository program for spent fuel from presently licensed reactors. and Department of Energy high-level radioactive waste for nuclear waste from existing reactors.
2. The current Yucca Mountain program is far from sound. Yucca Mountain does not meet the most important criteria for a sound repository program. In my opinion, it is the worst repository site that has been investigated in the United States.
3. Whatever course is chosen for a repository program, decades of storage of spent fuel at reactor sites is a near certainty. On site storage should be hardened to limit the most severe kinds of damage that are possible from terrorist attacks or accidents.

Let me amplify on the second point, since it illustrates the whole problem of Yucca Mountain licensing and standards, and, indeed, why the United States needs to start afresh with a repository program, instead of throwing good many after bad. I will focus on the problems of Yucca Mountain in relation to some important criteria by which a sound repository program can be judged:

**1. Future radiation doses**

Maximum estimated radiation doses to future generations at the time of peak dose should be within the general limits that we set for protecting our own generation. If they are expected to be much higher, then the repository will not meet the test of inter-generational equity. Yucca Mountain fails this test miserably.

Peak doses to the most exposed people are expected to be much higher than the current norms of 10 to 25 millirem incorporated in EPA radiation protection standards relating to nuclear facilities. Table 1, appended to this statement, shows the various risks associated with the proposed EPA standard and with the peak doses (median and 95th percentile) estimated by the DOE in its 2002 Environmental Impact Statement.

The EPA's draft standard would limit radiation dose to 15 millirem per year for the first 10,000 years. Beyond that it would allow half the affected people to get more than 350 millirem per year and half less. This is far in excess of present-day radiation protection norms for the general public. Five out of every hundred people would be allowed to get radiation doses of 2,000 millirem per year or more. At this level, the lifetime fatal cancer risk for females (over a 70-year exposure period) would be about 1 in 10. The corresponding cancer incidence risk would be 1 in 5. These last numbers are not much different than the risk of Russian roulette.

The lifetime fatal cancer risk to females from the 95th percentile peak dose estimated by the DOE in its Final Environmental Impact Statement, about 600 millirem, would be 1 in 35. This means that five percent of women exposed to the effects of Yucca Mountain pollution at that time would be at greater risk, while 95 percent would be at lower risk. The risks for men and for the whole population would be somewhat lower, but still well above prevalent norms. For instance, the average population fatal cancer risk (males and females combined) at 350 millirem per year over a lifetime is about 1 in 71.

**2. Characteristics of the Yucca Mountain geologic setting**

A minimum requirement of the geologic setting should be that, when the containers fail and begin to leak (and it is a question is when not if), the geology of the repository should be conducive to retarding the movement of the radioactive materials and to preventing most of them from reaching groundwater or surface water resources. Materials produced by the DOE for the Nuclear Waste Technical Review Board (reproduced in the attached IEER comments on the draft EPA standard) show that the Yucca Mountain rock is practically useless in holding back radioactive materials. Almost the entire functioning of the repository depends on the engineered barriers, mainly the metal containers. Unless they function as predicted by the DOE, Yucca Mountain will not meet the draft EPA standard even for the first ten thousand years. And since these containers will eventually rust, all calculations show that the peak dose will greatly exceed EPA's norms for radiation protection today. For instance, the maximum routine exposure to the public from a single nuclear fuel cycle facility from all pathways, including air, water, and food, is limited to 25 millirem per year to any organ (except 75 millirem to the thyroid) or to the whole body (40 CFR 190.10(a)).

**3. The waste package**

The DOE is proposing to use metal containers as the central element of the waste package for spent fuel disposal. The Yucca Mountain geologic environment is oxidizing; it also has some humidity. The waste will be hot for an extended period and it will heat the surrounding materials and rock. This combination of heat, humidity, and oxygen is a recipe for rust. How fast the containers will corrode is a matter of some debate. The containers could, under some circumstances, corrode much faster than 10,000 years (the time the EPA proposes for a reasonably protective dose limit of 15 millirem per year. The metal alloy proposed for the containers is new – there is no long-term experience with its performance. As a result, there is a real possibility that DOE's silver bullet may turn out to be a dud. Since the repository location itself is not protective, a failure of the containers would lead serious pollution of the groundwater and render it useless in an area where water is very scarce.

**4. Water resources**

There are no surface water resources in the general region of Yucca Mountain. The only aquifer in the area is currently being used in Amargosa Valley, just 20 miles downstream from Yucca Mountain. The scarcity of water ensures two things. First, if the containers don't hold up, there will be little dilution and the water will be come very polluted. Second, the lack of alternative water resources makes it likely that future residents may unknowingly use the polluted groundwater. This is not a new finding. About a quarter of a century ago, the DOE had commissioned the National Research Council of the National Academy of Sciences to prepare a report that was supposed to guide it in its search for a sound repository. That report, published in 1983, four years before the 1987 legislation that restricted site characterization to Yucca Mountain, showed that radiation doses due to high-level radioactive waste disposal at Yucca Mountain could be very high, in large measure due to the scarcity of water.[1] To the best of my knowledge, the DOE does not appear to have used this report to guide its repository program, though it paid for it.

**5. Conclusions**

The evidence shows that Yucca Mountain is an unsound repository program that should not be pursued further. If there were a reasonably protective radiation standard – one that protected future generations to the time of peak dose according to present-day EPA norms – Yucca Mountain could not be licensed. Security, health, safety, and environmental considerations indicate that the Yucca Mountain program should be scrapped and replaced by a repository program based on sound science and public health protection criteria. It should be managed not by the DOE but by an institution that does not itself generate high-level waste or spent nuclear fuel. The same considerations also point to the need for Hardened On-Site Storage (HOSS) of spent fuel as an interim step.

Thank you for the opportunity to present this statement for possible inclusion into the record of the hearing. I would be happy to answer in writing any questions you may have for the record.

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[1] Waste Isolation Systems Panel, Board on Radioactive Waste Management, National Research Council. *A Study of the Isolation System for Geologic Disposal of Radioactive Waste.* Washington, DC: National Academy Press, 1983.

**Table 1: Cancer risks associated with the draft EPA standard for Yucca Mountain and with DOE estimated median and 95th percentile peak doses**

| | EPA draft std. 1st 10,000 yrs | EPA draft std. **median** after 10,000 yrs | EPA draft std. **95th percentile** value | DOE estimate **median** peak dose | DOE estimate **95th percentile** peak dose |
|---|---|---|---|---|---|
| Annual exposure, Effective dose equivalent, millirem/year | 15 | 350 | 2,000 | 140 | 600 |
| Lifetime dose over 70 years, millirem | 1,050 | 24,500 | 140,000 | 9,800 | 42,000 |
| Average Risk factor from EPA FGR 13, fatal cancers per mrem (males and females) | 5.75E-07 | 5.75E-07 | 5.75E-07 | 5.75E-07 | 5.75E-07 |
| Average lifetime fatal cancer risk | 6.04E-04 | 1.41E-02 | 8.05E-02 | 5.64E-03 | 2.42E-02 |
| **Average (males and females) lifetime fatal cancer risk, expressed as 1 in** | **1,656** | **71** | **12** | **177** | **41** |
| Average Risk factor from EPA FGR 13 for females, fatal cancers per millirem | 6.83E-07 | 6.83E-07 | 6.83E-07 | 6.83E-07 | 6.83E-07 |
| Lifetime fatal cancer risk for females | 7.17E-04 | 1.67E-02 | 9.56E-02 | 6.69E-03 | 2.87E-02 |
| **Lifetime fatal cancer risk for females, expressed as 1 in** | **1,394** | **60** | **10** | **149** | **35** |

Notes: 1. FGR 13 stands for EPA's Federal Guidance Report 13. It is an official EPA guidance report.
The DOE estimates that there will be many peaks of doses due to future climatic variations. The figures above represent the largest estimated values of the peak dose. They are estimated to occur hundreds of thousands of years from the present.

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**Comments on the U.S. Environmental Protection Agency's Proposed Rule for the Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada Submitted on Behalf of the Institute for Energy and Environmental Research**

Arjun Makhijani Ph.D. and Brice Smith, Ph.D.

November 21, 2005

The following are the comments on the U.S. Environmental Protection Agency's proposed rule for the public health and environmental radiation protection standards for the high-level waste repository proposed for construction at Yucca Mountain[1], henceforth referred to as the "proposed rule", on behalf of the Institute for Energy and Environmental Research (IEER). Based upon the analysis and comments presented below, it is our conclusion that the proposed rule should be rejected as insufficiently protective of the public health. The following comments contain specific criticisms of the proposed rule issued by the EPA as well as IEER's recommendations for a more equitable and scientifically justifiable regulatory standard.

## Summary of Main Findings:

It is our conclusion that the proposed rule is the worst radiation protection rule that has ever been proposed given that it is the first rule that actually implies a massive increase in the level of cancer risk. We have identified a number of areas in which the proposed rule is seriously deficient, including:

A. Relaxation of radiation protection standards for future generations who will not benefit from nuclear power plants that produced the waste is contrary to basic ethics, cost-benefit analysis principles, and internationally accepted radiation protection guidelines, including for radioactive waste. These widely accepted guidelines include those by the International Atomic Energy Agency and the International Commission on Radiological Protection and radiation protection authorities in other countries. This has been recognized by scientific bodies, including the National Academy and in the past by the EPA.

B. Indoor radon is a technological artifact and not part of natural background. Excluding the indoor radon component, but retaining all other aspects of the EPA proposed rule, would lower the limit from 350 mrem to approximately 100 mrem per year.

C. The Toxic Substances Control Act recognizes that indoor radon is an artifact of building construction and sets a long-term goal of reducing radon levels indoors to those experienced outdoors. Hence, including the present level of indoor radon in natural background is contrary to the intent of this law.

[1] EPA 2005

D. No country has proposed a standard as lax as that proposed by the EPA. No other standard that has been proposed for times beyond 10,000 years would allow such lax long term rules.

E. The proposed peak dose limit would pose a lifetime cancer incidence risk of 1 in 36 for the general population and 1 in 30 for women. EPA has previously stated that even 1 in 250 lifetime risk is unacceptable from a single facility.

F. The use of the median to set a dose limit from a combined distribution is inappropriate. The best estimate of the mean dose (give all uncertainties) would be considerably higher than the median. The 95th percentile dose of about 2 rem per year would create a lifetime fatal cancer risk for women of about 1 in 10 and a cancer incidence risk of about 1 in 5. This would make the proposed standard statistically about like Russian roulette rather than a radiation protection rule at least for some people.

G. The proposed standard is not in conformity with Executive Order 13045 for the protection of children because it fails to account for the disproportionate risk from radiation for exposures early in life.

IEER recommends that the EPA issue a final standard for the Yucca Mountain repository that includes the following elements:

1. The annual dose limit for all pathways should be between 10 and 25 millirem and should remain constant in time over the period of geologic stability at the site.
2. A separate sub-limit of 4 millirem per year to the most exposed organ from the drinking water pathway should be included over the entire period of geologic stability.
3. The radiological impacts on children should be explicitly considered in the Department of Energy's performance assessments in order to ensure that they are not disproportionately affected by the repository.
4. The impacts of future changes in climate should be taken into account explicitly in the DOE's performance assessments including the consideration of periodic cycling through different climate states on the performance of the isolation system.
5. The standard should recognize that the uncertainties in the estimated doses will increase with time and that the uncertainties beyond 10,000 years will become very significant. In this regard, therefore, we propose that the EPA adopt the French approach to waste repository standards[2] in which the doses beyond 10,000 years are calculated using scientifically reasonable, but highly conservative choices for the important parameter values in order to increase confidence that the ultimate impacts from the repository will be less than those predicted.

## Section One – Setting the "Acceptable" Level of Risk for Distant Generations:

The U.S. Environmental Protection Agency's proposed Yucca Mountain standard is the worst radiation protection rule that has ever been proposed by a regulatory body given that it is the first rule that would codify the acceptability of a massive increase in the risk of cancer from the exposure to anthropogenic radiation. It also represents the largest lifetime cancer risk that has knowingly been proposed for members of the general public, especially women, by the US government. Over the last five decades, radiation protection standards for the public have been progressively tightened because, as more information has been gained, the risks of exposure to radiation have been recognized to be higher and higher. This trend continues to this day. For example, the BEIR VII report from the U.S. National Academy of Sciences published in 2005 reports cancer incidence risks per unit of exposure that are more than one-third larger than the values reported by the EPA in its Federal Guidance Report 13 published in 1999.[3]

As summarized by the National Research Council in its 1995 *Technical Bases for Yucca Mountain Standards*, dose limits for exposure to radiation from a single source in Nuclear Regulatory Commission and Environmental

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[2] Règle N° III.2.f

[3] NAS/NRC 2005 p. 28 and EPA 1999 p. 182

Protection Agency regulations are typically in the range of 15 to 25 millirem per year. This range corresponds to an excess annual risk of developing a fatal cancer of approximately $8.6 \times 10^{-6}$ to $1.4 \times 10^{-5}$, while the risk of developing a cancer irrespective of its lethality would be approximately twice these values.[4] Lower annual dose limits have been set in certain circumstances (for example a dose limit of 10 millirem per year from airborne radionuclides except radon is included in the National Emission Standards for Hazardous Air Pollutants and a 4 millirem per year dose limit for beta/gamma emitters in drinking water is included in the National Primary Drinking Water Standards). However, higher dose equivalents corresponding to an annual fatal cancer risk of up to $4 \times 10^{-4}$ have been included in regulations and recommendations for exposure to indoor radon levels and for mill tailings.[5] The National Research Council committee also noted that "the risk equivalent of the dose limits set by authorities outside the United States is also in the range of $10^{-5}$ to $10^{-6}$ per year (except for exposure to radon indoors or releases from mill tailings)" and that "[t]his range is a reasonable starting point for EPA's rulemaking."[6]

The Yucca Mountain standard that EPA is now proposing, however, includes the following two-tier dose limit

> Compliance will be judged against a standard of 150 microsievert per year (15 millirem per year) committed effective dose equivalent at times up to 10,000 years after disposal and against a standard of 3.5 millisievert per year (350 millirem per year) committed effective dose equivalent at times after 10,000 years and up to 1 million years after disposal.[7]

The 350 millirem per year dose limit is 14 times higher than the dose limit contained in NRC regulations governing the disposal of low-level radioactive waste and more than twenty times higher than the dose limit previously proposed by the EPA as being protective of the public health (i.e. 15 millirem per year). Using the risk factors from the National Academy of Sciences BEIR VII report, we find that the excess cancer risk for an individual that would be exposed to 350 millirem per year over a 70 year lifetime would be more than 1 in 36. The risk to women from this level of exposure would be even greater, approximately 1 in 30. These risks are unacceptably high. As discussed in section three below, the EPA's choice of the median dose for determining compliance with the 350 millirem per year dose limit means that the upper bound doses actually received could be significantly higher.

In attempting to answer the question of what level of risk is acceptable, we must bear in mind the following central feature of the problem; namely that spent nuclear fuel is generated from nuclear power plants that provide us, the present generation, with electricity, and therefore we are getting the benefits from nuclear power, but the costs associated with the impacts of spent fuel disposal will be borne by generations far into the future. In fact, the peak impacts are not expected to occur for tens to hundreds of thousands of years. The implicit ethic in the EPA's proposed relaxation of the standard from 15 millirem to 350 millirem per year at 10,000 years is that the present generation should get all the benefits and pay the least costs, but generations far into the futures should get none of the benefits and pay the heaviest costs. This is undemocratic, unethical, and against any reasonable social norms. It is also against any reasonable concept of cost-benefit analysis.

It is therefore imperative that whatever the level of radiation dose is ultimately set that it should not increase over time. At worst it should stay constant and at best it should get more stringent. We recognize that making the level of protection provided to future generations more stringent than currently accepted radiation protection norms would be a difficult exercise. Therefore we accept that a standard for radiation protection for Yucca Mountain from now until the peak dose should be uniform and should reflect the level of radiation protection that we expect today. This principle is a generally accepted tenet of many radiation protection schemes that have been proposed by both national and international bodies. For example, in its 1999 *Radiation Protection Recommendations as Applied to the Disposal of Long-lived Solid Radioactive Waste*, the International Commission on Radiological Protection concluded that

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[4] Despite the higher cancer incidence risk estimates contained in the BEIR VII report, its average fatal cancer risk estimate is approximately equal to that used in the EPA Federal Guidance Report 13 due to the BEIR VII committee's assumptions regarding improved survival rates for cancer. (NAS/NRC 2005 p. 28 and EPA 1999 p. 179) From a public health perspective the correct value to consider is the risk of developing cancer not just the risk of dying from cancer.

[5] NAS/NRC 1995 p. 50

[6] NAS/NRC 1995 p. 5

[7] EPA 2005 p. 49014

> The principal objective of disposal of solid radioactive waste is the protection of current and future generations from the radiological consequences of waste produced by the current generation. However, permanent total isolation is not likely to be achievable and some fraction of the waste inventory may migrate to the biosphere, potentially giving rise to exposures hundreds or thousands of years in the future. Doses to individuals and populations over such long time-scales can only be estimated and the reliability of these estimates will decrease as the time period into the future increases. **Nevertheless, the Commission acknowledges a basic principle, that individuals and populations in the future should be afforded at least the same level of protection from actions taken today as is the current generation.**[8]

The ICRP went on to note that

> Nevertheless, the Commission recognises a basic principle that individuals and populations in the future should be afforded at least the same level of protection from the action of disposing of radioactive waste today as is the current generation. **This implies use of the current quantitative dose and risk criteria derived from considering associated health detriment.** Therefore, protection of future generations should be achieved by applying these dose or risk criteria to the estimated future doses or risks in appropriately defined critical groups.[9]

In its 2005 draft Safety Standard entitled *Geological Disposal of Radioactive Waste*, the International Atomic Energy Agency included the following among their nine "Principles Of Radioactive Waste Management"

> *Principle 4: Protection of future generations*
> **Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today**
>
> *Principle 5: Burdens on future generations*
> Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations.[10]

A number of other examples of the acceptance of this principle can be found. For example, in her presentation to the National Research Council committee, Margaret Federline [of the U.S. Nuclear Regulatory Commission] spoke about a "societal pledge to future generations" that would "provide future societies with the same protection from radiation we would expect for ourselves."[11] Michael P. Lee and Malcolm R. Knapp of the Office of Nuclear Material Safety and Safeguards in the U.S. Nuclear Regulatory Commission have stated that "[a] basic premise here [in defining an adequate level of safety] is that the standards should ensure that future generations are afforded the same level of protection we are afforded today."[12] Sören Norrby, the director of the Office of Nuclear Waste in the Swedish Nuclear Power Inspectorate, has stated that

> **One principle that is generally accepted is that we should offer the same level of protection to future generations as we require today.** The effects in different time frames must then be evaluated, and should in principle cover time periods during which the waste remains hazardous.[13]

Finally, Allan Duncan, the head of the Radioactive Substances Function at the U.K. Environment Agency, has noted that

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[8] ICRP 81 p. 13 (emphasis added)
[9] ICRP 81 p. 23
[10] IAEA 2005 p. 43 (emphasis added)
[11] NAS/NRC 1995 p. 56
[12] NEA 1997 p. 48
[13] NEA 1997 p. 22 (emphasis added)

> For the purpose of implementing Government policy on radioactive waste management, and after extensive consultation, the environment agencies have prepared Guidance on Requirements for Authorisation of Disposal Facilities on Land for Low and Intermediate level Radioactive Wastes. Amongst other things this Guidance sets out principles and requirements for disposal of low and intermediate level wastes in the first instance but it has regard to the presence of long-lived radionuclides in the wastes and so, in due course, will be broadly applicable also to the disposal of high level wastes.
>
> The essential principles are as follows:
>
> ...
>
> **Principle No. 2 - Effects in the future**
>
> Radioactive wastes shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.[14]

In the past, the EPA has been extremely specific about what it believes to be the level of risk from exposure to anthropogenic radiation that is acceptable today. In an April 1997 statement on the Nuclear Regulatory Commission's standard governing licensing termination which set a 25 millirem per year dose limit with the potential for exposures to go up to 100 millirem per year under certain conditions, Ramona Trovato, the Director of the EPA's Office of Radiation and Indoor Air, concluded that "a cancer risk of 1 in 250" would be "simply unacceptably high."[15] The EPA's statement went on to conclude that

> This draft rule [from the Nuclear Regulatory Commission] <u>would not</u> ensure adequate protection of the public health and the environment. It would not provide the public the level of protection from residual radioactive materials from NRC licensees that they are afforded for other environmental pollutants under EPA's remediation programs, including those that involve radioactive materials.[16]

An August 1997 memorandum from Stephen D. Luftig, the Director of EPA's Office of Emergency and Remedial Response, and Larry Weinstock, the Acting Director of the EPA's Office of Radiation and Indoor Air, reiterated these conclusions and included an analysis which stated that the 25 to 100 mrem per year dose limit proposed by the NRC was considered to "present risks that are higher than levels EPA has found to be protective for carcinogens in general and for radiation, in particular, in other others contexts."[17]

In setting previous regulatory standards, the EPA has repeatedly taken the position that a lifetime incremental risk greater than 1 in 10,000 would be unacceptable. This level of "acceptable" risk has been codified in the National Emission Standards for Hazardous Air Pollutants, the National Primary Drinking Water Standards, and the guidelines for cleanup of sites under the Comprehensive Environmental Response, Compensation, and Liability Act.[18] In addition, the draft federal radiation protection guidance proposed by the EPA on December 24, 1994 also specified a goal of limiting the lifetime risk from exposure to cancer to less than 1 in 10,000.[19] Finally, this level of "acceptable" risk is implicit in the use of the 15 millirem per year dose limit for Yucca Mountain during the first 10,000 years.

This issue was also addressed the National Research Council in its 1995 analysis of the Yucca Mountain standard. The NRC committee stated that

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[14] NEA 1997 p. 61 (emphasis in the original)
[15] Trovato 1997 p. 4
[16] Trovato 1997 p. 11-12 (emphasis in the original)
[17] Luftig and Weinstock 1997 Attachment B p. 7
[18] Fed Reg April 21, 2000 p. 21580, Fed Reg December 7, 2000 p. 76710 and 76716, Fed Reg March 8, 1990 p. 8716, Fed Reg December 15, 1989 p. 51655 to 51657, 51670, 51677, and 51688, and 40 CFR 300 2005 p. 70
[19] Trovato 1997 p. 5 and Fed Reg December 23, 1994

> Whether posed as "How safe is safe enough" or as "What is an acceptable level of risk?", the question is not solvable by science alone. The rulemaking process, directly involving public comment to which an agency must respond, is an appropriate method of addressing the question of an appropriate level of protection. Accordingly, we do not directly recommend a level of acceptable risk. We do, however, describe the spectrum of regulations already promulgated that imply a level of risk, all of which are consistent with recommendations from authoritative radiation protection bodies.
>
> For example, EPA has already used a risk level of $5 \times 10^{-4}$ health effects in an average lifetime, or a little less than $10^{-5}$ effects per year, assuming an average lifetime of 70 years, as an acceptable risk limit in its recently published 40 CFR 191. This limit is consistent with other limits established by other U.S. nuclear regulations, as shown in Table 2-4 [not shown]. In addition, the risk equivalent of the dose limits set by authorities outside the United States (shown in Table 2-3) [not shown] is also in the range of $10^{-5}$ to $10^{-6}$/yr (expect for exposure to radon indoors or releases from mill tailings). This range could therefore be used a reasonable statting point in EPA's rulemaking.[20]

The tables cited in the NRC report show that the highest level of "acceptable" risk relates to the EPA's recommendations for the indoor radon level which result in an annual risk of $4 \times 10^{-4}$ (about twice the annual risk of developing a fatal cancer from exposure to 350 millirem per year).[21] This fact is noted by the EPA in the proposed Yucca Mountain standard. The proposed rules states that

> The concentration at which EPA recommends action be taken to mitigate exposures is 4 pCi/l, which translates roughly to 800 mrem/yr. The Agency further recommends that homeowners consider taking action only if the measured concentration is between 2 and 4 pCi/l (i.e., above 400 mrem/yr).[22]

However, as the proposed rule goes on to clearly state

> It should be understood that this recommendation [regarding the mitigation of indoor radon] is not based solely on risk, but considers factors such as the voluntary nature of the exposure, the application to private property, and the capabilities of mitigation technology.[23]

Thus, the recommended action levels for indoor radon, which takes these multiple factors into consideration, is not a valid comparison for the determination of what constitutes an acceptable level of risk being imposed involuntarily on distant generations that gain no benefit either individually or societally from the exposures. The far more generally applied level of "acceptable" risk of $10^{-5}$ to $10^{-6}$ should serve as the basis for determining whether future generations are being given at least the same level of protection as is considered acceptable for the present generation. This choice is consistent with the conclusions of both the International Commission on Radiological Protection and the International Atomic Energy Agency which have both recommended using a risk equivalent of $10^{-5}$ per year as a reference value in setting limits for the geologic disposal of high-level waste.[24]

As noted above, the level of risk corresponding to the proposed 350 millirem per year dose limit would be far higher than what the EPA has previously considered to be acceptable in other contexts involving involuntary risks from exposures to carcinogens, including radiation. In attempting to address this conflict the proposed rule notes that

> It is clear that we struggled to reconcile the competing claims of confidence in projections and intergenerational equity. We sought an approach that would account for what we see as potentially

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[20] NAS/NRC 1995 p. 49
[21] NAS/NRC 1995 p. 5, 43-46, and 50 and NAS/NRC 2005 p. 28
[22] EPA 2005 p. 49038
[23] EPA 2005 p. 49038
[24] ICRP 81 p. 23 and IAEA 2005 p. 11

> unmanageable uncertainties, but did not depart from levels of risk that are considered protective today.[25]

And later that

> We believe the circumstances involved in today's proposal are significantly different from the situations addressed under Superfund or any other existing U.S. regulatory program, and that it should be clear that comparisons between the two are inappropriate.
>
> ...Rather, in establishing a standard to apply to the RMEI over unprecedented times, we believe it is reasonable to consider exposures incurred routinely today by people in other locations, which in our view do not "pose a realistic threat of irreversible harm or catastrophic consequences" to those people.[26]

However, comparisons between these regulatory frameworks are not only appropriate, but clearly inline with the international consensus regarding the need to protect future generations to at least the same level that we protect the present one. While there is ongoing debate over how to best implement this goal, there is broad agreement over the need to adequately implement it. The existence of large uncertainties in repository performance at long times is not a valid argument for relaxing the level of protection afforded to future generations. The 1 in 71 lifetime risk of death from cancer (1 in 62 for women) that would accompany exposure to 350 millirem per year, should certainly qualify as a "realistic threat of irreversible harm" under any reasonable interpretation. The rejection by the EPA of the international consensus regarding the appropriate level of protection to be afforded future generations (such as by its assertion that "there is no clear consensus regarding the extent of the claims held by future generations on the current generation"[27]) is a serious problem with the proposed rule. A dose limit that does not increase with time is a necessary element of any final standard issued by the EPA.

## Section Two – The Inclusion of Radon with "Natural" Background Radiation:

In the proposed Yucca Mountain standard, the EPA states that

> For purposes of this discussion, natural background radiation consists of external exposures from cosmic and terrestrial sources, and **internal exposures from indoor exposures to naturally-occurring radon**. Altitude and geology are two of the primary variables accounting for regional variations; however, there can be tremendous fluctuation even within a city or county, primarily due to variations in radon emissions.[28]

The inclusion of indoor radon levels as part of "natural background radiation" is not scientifically correct and fails to take into account both the letter and the spirit of current U.S. law (see below). This inappropriate inclusion of radon has led the EPA to draw erroneous conclusions regarding the regional variation in background exposures as part of the proposed rule.

The "average annual effective dose equivalent to individuals in the U.S. population" as estimated by the National Council on Radiation Protection and Measurements includes 200 millirem from radon and its decay products and 100 millirem from other sources such as cosmic rays and the ingestion of primordial radionuclides.[29] The DOE has estimated that the exposure of people in the Amargosa Valley is equal to the average exposure reported by the NCRP, while the EPA has estimated a higher radon dose of 250 millirem per year.[30]

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[25] EPA 2005 p. 49032
[26] EPA 2005 p. 49038
[27] EPA 2005 p. 49036
[28] EPA 2005 p. 49037 (emphasis added)
[29] NCRP 93 p. 59-60
[30] EPA 2005 p. 49037

The exposure to indoor radon, which accounts for two-thirds of the average population exposure in the United States, is, however, a result of human activities and not a result of natural processes alone. As noted by the National Research Council in 1999

> Many human activities – such as mining and milling of ores, extraction of petroleum products, use of groundwater for domestic purposes, and **living in houses** – alter the natural background of radiation either by moving naturally occurring radionuclides from inaccessible locations to locations where humans are present or by concentrating the radionuclides in the exposure environment.[31]

The National Research Council considered indoor radon to be a "technologically enhanced naturally occurring radionuclide [TENORM]."[32] The treatment of other TENORM from a radiation protection standpoint is thus illustrative in the present context. For example, playground equipment and fences contaminated with TENORM waste from the oil industry containing radium has been found at a number of locations in Mississippi and Louisiana. Earlier, a Federal Court held Chevron Oil liable for damages to workers at a salvage company for Chevron's failure to conduct adequate inspections of the equipment and to warn the workers about the possible risks.[33] Exposure to these TENORM materials were not considered to be natural background exposure despite the fact that the radionuclides involved were all naturally occurring. The EPA has itself referred to indoor radon as a technologically enhanced naturally occurring radionuclide and has highlighted the mechanisms by which the construction of homes and other buildings cause radon to build up to higher levels than would be experienced outside.[34] Because this exposure to indoor radon is a result of human activity, it is scientifically incorrect to combine it with the exposure to unavoidable background sources such as cosmic rays. Comparing indoor radon to background radiation is like comparing taking a shower to getting wet from rain.

Further, the inclusion of doses from indoor radon by the EPA in the proposed rule ignores the fact that, since 1988, it has been an explicit long-term goal in U.S. law to reduce exposures to indoor radon to the level of outdoor radon. Specifically, the Toxic Substances Control Act states that

> The national long-term goal of the United States with respect to radon levels in buildings is that the air within buildings in the United States should be as free of radon as the ambient air outside of buildings.[35]

It is reasonable to assume that this goal could be met within the next few hundred years as the building stock in turned over and that, therefore, long before 10,000 years, the average population exposure to the US population will have been reduced to something closer to 100 millirem per year from its current value of 300 millirem per year. Thus the inclusion of radon doses in the proposed rule appear to be inconsistent with both the spirit and the letter of this section of the law.

Following the passage of the section of the Toxic Substances Control Act in which the "national long-term goal" was set forth, the NCRP issued a report on radon control technologies in which they concluded that

> The information presented in this report shows that there is a variety of methods available for the control of radon inside houses. All systems can be effective when properly installed, but the best performance is achieved by active soil ventilation techniques. For new houses being planned or under construction, the installation of barriers between the soil and the house can be very effective. Properly done, this approach will solve the problem for the duration of the use of the house.[36]

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[31] NAS/NRC 1999 p. 1 (emphasis added)
[32] NAS/NRC 1999 p. 1-3 and 19-22
[33] EPA 2000 p. 37
[34] EPA 2000 p. 35-40, EPA 2001 p. 14-16, and EPA 2003 p. 2
[35] 15 USC 2661
[36] NCRP 103 p. 60

The EPA is aware of this legally mandated goal, and, since 1994, has published technical advice for how to limit radon levels in new and existing homes as well as in new schools and other large buildings.[37] In fact, the EPA's 2005 *Citizen's Guide To Radon: The Guide To Protecting Yourself And Your Family From Radon* notes that

> Radon reduction systems work and they are not too costly. Some radon reduction systems can reduce radon levels in your home by up to 99%. Even very high levels can be reduced to acceptable levels.[38]

Already, people living in well-constructed buildings on upper floors are exposed to indoor radon at a level that is not significantly different from outdoor levels.

Significantly, the exclusion of indoor radon from the assumed background radiation level is consistent with the recommendations of the International Commission on Radiological Protection. In its 1990 recommendations, the ICRP excluded the contribution from indoor radon in its choice to use 100 millirem per year as the typical average "annual effective dose from natural sources."[39] The ICRP was even more explicit in its view on this matter in its draft 2005 recommendations. In this report the ICRP stated that

> The Commission considers that the annual effective dose from natural radiation sources, and its variation from place to place, is of relevance in deciding the levels of maximum constraints that it now recommends. The existence of the natural background of radiation does not provide any justification for additional exposures, but it can be a benchmark for judgement about their relative importance and the need for action. **The Commission uses the background dose without the radon contribution because that component is significantly enhanced by human activities and is thus subject to recommendations from the Commission for its control at home and at work.**[40]

The Commission went on to caution that "[e]xposures that are within the natural background range are legitimate matters for concern, sometimes calling for significant action."[41]

There is no scientific or legal basis for the EPA to consider exposures to indoor radon as part of natural background radiation. The proposed rule has not cited any and has not addressed legal and scientific view to the contrary. The final rule should exclude the contribution of indoor radon from its discussion and use a reasonable value for natural background radiation of about 100 millirem per year as estimated by the National Council on Radiological Protection for the U.S. population and in line with the recommendations of the International Council on Radiological Protection for a global average. The use of 100 millirem would also be consistent with the estimated exposure from non-radon sources for people living in the Amargosa Valley reported by the DOE. The existence of this background radiation does not provide a justification for any increase in the allowable level of exposure for this or future generations.

### Section Three – Statistical Considerations:

The EPA has proposed that the 15 millirem per year dose limit for the first 10,000 years be measured against the "arithmetic mean" of the projected doses while the 350 millirem per year dose limit for the period between 10,000 to 1 million years would be measured against "the median of the distribution of projected doses."[42] The use of the median dose for times beyond 10,000 years means that half of the calculated doses from the DOE models would be greater than 350 millirem per year, while the other half will be less that 350 millirem per year. As the EPA has noted, the distribution in the projected doses results from the uncertainties involved in the assumptions in the model

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[37] See for example EPA 1994, EPA 2001, and EPA 2003
[38] EPA 2005b p. 3
[39] ICRP 60 p. 45
[40] ICRP 2005 p. 41
[41] ICRP 2005 p. 42
[42] EPA 2005 p. 49041 to 49046

of the system's performance. In light of those uncertainties, it is quite likely that significant portions of the population at the time of peak dose could experience doses far higher than 350 millirem per year. In fact, previous assessments of the Yucca Mountain site conducted by the National Academy of Sciences, Sandia National Laboratories, and the Electric Power Research Institute estimated peak doses on the order of several rem to several tens of rem or more were possible.[43]

The EPA has justified the use of the median by saying that it does not want the high values of dose to affect what it calls the "central tendency" of the distribution. Specifically, it notes that

> In fact, for early occurrences of disruptive events (human intrusion or igneous intrusion), DOE assessments show that at some periods of time the arithmetic mean of the projected doses can exceed the 95th percentile of the distribution of TSPA [Total System Performance Assessment] results.[44]

However, what the proposed rule dose not accurately take into account is that over the time periods of actual interest to the standard (i.e. less than 10,000 years and between 100,000 and 1 million years) the projected dose distributions are well behaved with the 95$^{th}$ percentile larger than the mean which is, in turn, larger than the median of the distribution.[45] Specifically, for times less than 10,000 years the peak 95$^{th}$ percentile dose for the proposed action is more than seven times higher than the peak mean dose while for times out to one million years the peak 95$^{th}$ percentile dose is more than four times higher than the peak mean dose. Reading off the graphs of projected doses in the DOE Final EIS, we can also estimate that the peak median dose at long times will be about a factor of three or four less than the mean.[46]

The well behaved nature of the distributions of projected doses over both short and long times is due to the fact that the peak doses are not dominated by "disruptive events," but by the natural processes of water infiltration, waste package corrosion, and radionuclide transport to the biosphere.[47] There is thus no scientific justification for accepting the use of the mean for times less than 10,000 years as representative while rejecting the mean dose at very long times. This conclusion is supported by the ICRP's *Radiation Protection Recommendations as Applied to the Disposal of Long-lived Solid Radioactive Waste*, which states that

> As general guidance, the Commission considers that its recommendations on the estimation of exposures in Publication 43 [*Principles of Monitoring for the Radiation Protection of the Public*] apply. **The Commission therefore continues to recommend that exposures should be assessed on the basis of the mean annual dose in the critical group**, i.e. in a group of people representative of those individuals in the population expected to receive the highest annual dose, which is a small enough group to be relatively homogeneous with respect to age, diet, and those aspects of behaviour that affect the annual doses received.[48]

In making use of different statistical measures for the dose limits, the proposed rule increases the disparity between the level of protection provided to distant generations compared to the present generation. Already the 350 millirem per year dose limit for times greater than 10,000 years is more than 23 times the 15 millirem per year dose limit for times less than 10,000 years. Taking into account the additional difference introduced by the choice of statistical measures would make the long-term dose limit about 70 times or more greater than that which is considered acceptable today. We recognize that the process of calculation is probabilistic and, therefore, there cannot be guarantees for everyone in the literal sense. But, if a statistical approach is used for the long-term, there is a strong case to be made that, whatever the value of the standard, the part of the probability distribution for the dose limit should not be the median or even the mean, but the 95$^{th}$ or 99$^{th}$ percentile, so that the vast majority of the population can be assured of protection. We recognized that the DOE projections of dose estimates are the result of Monte Carlo realizations and do not directly represent doses to fractions of the population. However, if the median of such

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[43] SDA 1995 p. 9
[44] EPA 2005 p. 49043 to 49044
[45] DOE FEIS 2002b p. I-77 to I-78
[46] DOE FEIS 2002b p. I-48 to I-49 and I-77 to I-78
[47] DOE FEIS 2002 p. 5-19 to 5-20 and 5-23
[48] ICRP 81 p. 14 (emphasis added)

realization is 350 mrem per year, the uncertainties in the parameters will create a significant likelihood that a large portion of the population will be exposed to more than that, and some exposed to much more. Given that the uncertainties at the high end of the doses are significant, the mean exposure could be much higher, perhaps several times higher, that the median. Hence, while considerably less than half the exposed population would be expected to be exposed to levels several times higher than 350 mrem/year, the risks to them would be very high indeed.

The large uncertainties at the high end can be interpreted as representing a significant chance that a small proportion of the population would be exposed to high levels or that there is a small chance that large numbers of people could be exposed to them at the time that the highest doses would occur. The interpretation would depend on the specifics of the scenarios that are being run. For instance, a 95 percentile value of peak dose of about 2 rem per year, which can be inferred from official DOE and contractor estimates,[49] could create great risk a small minority of exposed people. For women exposed to this level of radiation it would create lifetime fatal cancer risks would 1 in 10 and incidence risk would be about 1 in 5. This would make the proposed standard statistically about like Russian roulette rather than a radiation protection rule at least for some people. On the other hand, it can be interpreted as a small chance of creating very large risks for large numbers of exposed people, which is also unacceptable.

The final standard that is adopted by the EPA should not be set in a manner that would likely result in a significant portion of the population getting doses higher than the specified limit, particularly when the risks from such exposures are as unacceptably high as those in the rule currently proposed by the EPA. Proper standards should be set in a manner that reasonably insures protection of the entire population.

## Section Four – The Treatment of Climate Change:

Over the timescales under consideration for geologic disposal of spent nuclear fuel, the climate at the Yucca Mountain site will be expected to pass through a number of natural climate cycles as well as experience the impacts of anthropogenic climate change due to the buildup of greenhouse gases in the atmosphere. As described by the Department of Energy in 2002

> Estimates of future climatic conditions are based on what is known about the past, with consideration given to climate impacts caused by human activities. Calcite in Devils Hole, a fissure in the ground approximately 40 kilometers (25 miles) southeast of Yucca Mountain, provides the best-dated record of climate changes over the past 500,000 years. The record shows continual variation, **often with very rapid jumps**, between cold glacial climates (for the Great Basin, these are called pluvial periods) and warm interglacial climates similar to the present. Fluctuations average 100,000 years in length.[50]

However, despite this record of past climate changes stretching back half a million years (including evidence for "very rapid jumps" between different states), the EPA's proposed rule states that

> We are proposing today that DOE, based on past climate conditions in the Yucca Mountain area, should determine how the disposal system responds to the effects of increased water flow through the repository as a result of climate change. **We believe that the nature and extent of climate change can be reasonably represented by constant conditions taking effect after 10,000 years out to the time of geologic stability.** We are proposing to explicitly require that DOE assume water flow will increase as a result of climate change. We leave it to NRC as the licensing authority to specify the values to be used to represent climate change. However, we expect that a doubling of today's average annual precipitation beginning at 10,000 years and continuing through the period of geologic stability would provide a reasonable scenario, given NAS's statements regarding potential effects on recharge. NRC could also use the range of projected precipitation values for different climate states and specify a reasonable long-term average precipitation based

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[49] A number of official dose calculations are reproduced in SDA 1995, p. 9. See, for instance, the 1994 Sandia probabilistic results for peak dose.
[50] DOE FEIS 2002 p. 5-12 (emphasis added)

> on the duration of each climate state over the period of geologic stability. We believe that either approach will allow for a reasonable estimate of how water will impact the site without subjecting the assessments to speculative assumptions that may well be unresolvable, while providing a reasonable indicator of disposal system compliance.[51]

This treatment of climate change in the EPA's proposed rule is scientifically incorrect, will tend to underestimate the impacts from the disposal of spent fuel in the repository, and does not appear to be consistent with the recommendations of the 1995 National Research Council review as required by federal law.

In the executive summary to its *Technical Bases for Yucca Mountain Standard*, the NRC committee stated that

> We further conclude that the probabilities and consequences of modifications by climate change, seismic activity, and volcanic eruptions at Yucca Mountain are sufficiently boundable that these factors can be included in performance assessments that extend over this time frame [one million years].[52]

Later in the report, the NRC committee elaborated on the treatment of climate change that it felt should be included in the performance assessments and noted that

> Recent research has indicated that the past 10,000 years are probably the only sustained period of stable climate in the past 80,000 years. Based on this record, it seems plausible that the climate will fluctuate between glacial and interglacial states during the period suggested for the performance assessment calculations. Thus, the specified upper boundary, or the physical top boundary of the modeled system, should be able to reflect these variations (especially in terms of ground water recharge).[53]

Thus, the use of a constant value as proposed by the EPA would not be consistent with the NRC committee recommendations that the "probabilities and consequences" of future climates changes are sufficiently well understood to allow the "variations" in water infiltration to be taken into account. In fact, the DOE performance assessments as presented in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* published in 2002 already explicitly took into account the variation in future climate changes in its prediction of doses out to one million years.[54]

Beyond the issue of whether the proposed rule is consistent with the recommendations of the National Research Council as required, the use of a constant or average infiltration rate for the period from 10,000 to one million years is not scientifically valid and would not accurately represent the impacts of climate change on the performance of the repository. The response of the geologic system to increases in available water is not a simple linear one in which increased infiltration rates lead to a proportional increase in water flux through the repository. As summarized by Jane Long of the University of Nevada, Reno and Rod Ewing of the University of Michigan in 2004

> At present, there is no accepted conceptual model that explains the travel times and can consequently be used to infer the flux. If climate change were to produce a larger influx of water, saturation in the mountain could increase. Permeability under any proposed model increases nonlinearly with saturation. **Small increases in percolation flux could significantly increase fluid flow through the repository horizon. This nonlinear response is one of the greatest challenges in predicting the behavior of hydrologic systems over long periods.**[55]

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[51] EPA 2005 p. 49060 (emphasis added)
[52] NAS/NRC 1995 p. 9
[53] NAS/NRC 1995 p. 78
[54] DOE FEIS 2002 p. 5-23 to 5-27
[55] Long and Ewing 2004 p. 376-377 (emphasis added)

This issue of a non-linear response for the transport of water through the unsaturated zone at Yucca Mountain is well recognized and has been discussed by independent scientific bodies for at least a decade. In 1995 the National Research Council noted that

> Change to a cooler, wetter climate at Yucca Mountain would likely result in greater fluxes of water through the unsaturated zone, which could affect rates of radionuclide release from waste-forms and transport to the water table. Little effort has been put into quantifying the magnitude of this response, but a doubling of the effective wetness, defined as the ratio of precipitation to potential evapotranspiration, might cause a significant increase in recharge. An increase in recharge could raise the water table, increasing saturated zone fluxes.[56]

In a subsequent review, another National Research Council committee concluded that

> Models of varying complexity have been developed for preferential flow, but their adequacy for field-scale application requires further testing.... This issue is of particular concern in the fractured vadose zone because of the inherently nonlinear nature of processes involved. As flow conditions change, different flow and transport mechanisms, not represented in the model, may become important, leading to large errors in predictions.[57]

Similar concerns were raised by the Nuclear Waste Technical Review Board, a scientific advisory body created as part of the 1987 amendment to the Nuclear Waste Policy Act whose members are nominated by the National Academy of Sciences and appointed by the President. In their 1997 report to Congress, the Board noted that

> With increased precipitation and, therefore, increased net infiltration, the fraction of the total flux seeping into the drifts could increase nonlinearly. Thus, a future change to higher-precipitation conditions could cause a more than proportional increase in seepage into drifts and adversely affect repository performance.[58]

The issue of climate changes is of significant importance to the predicted long-term performance of the repository. The Total System Performance Assessment presented by the Department of Energy in its 2002 Final EIS for Yucca Mountain included a consideration of the transitions between future climate states, and found that the resulting dose predictions were also cyclical and that "[t]he multiple peaks occurring 200,000 years or more after repository closure are driven by transitions between climate states."[59] For a sense of the scale of these cyclical changes, the difference between the highest peak dose and the lowest value before the next peak in the DOE predictions was roughly a factor of ten (see the figure below).

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[56] NAS/NRC 1995 p. 91
[57] NAS/NRC 2000 p. 39-40
[58] NWTRB 1998 p. 38
[59] DOE FEIS 2002 p. 5-25

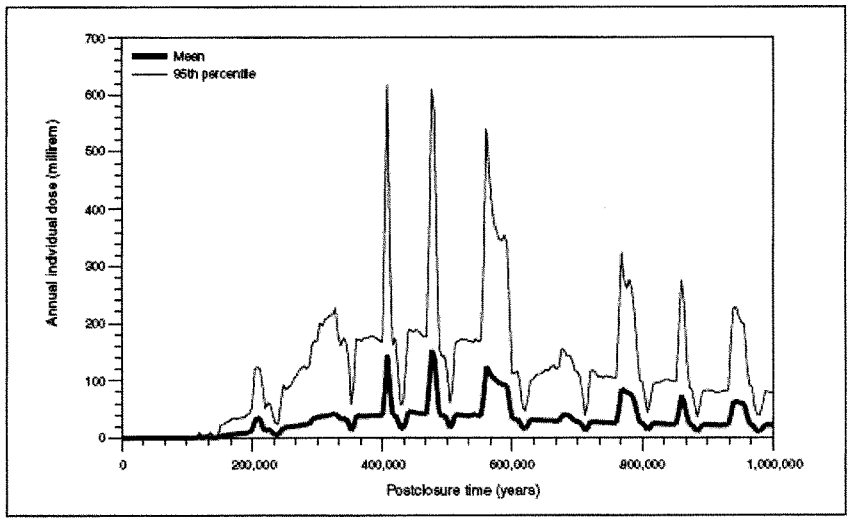


**Figure 5-4.** Mean and 95th-percentile (based on 200 simulations of the total system performance, each using random samples of uncertain parameters) annual individual dose at the RMEI location during 1 million years after repository closure for the nominal scenario under the high-temperature repository operating mode.

(Figure taken from the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* [DOE FEIS 2002 p. 5-26])

Not unexpectedly, the DOE found that "[t]he peak annual individual dose usually coincided with the occurrence of a wetter climate period."[60] The use of a constant climate state over the period beyond 10,000 years as proposed by the EPA would washout the important impacts brought about by the changes between climate states and would tend to underestimate the actual peak dose that would be expected from the repository. This underestimation would, along with the use of the median dose, lead to even larger risks for distant generations being possible under the proposed rule. This would further aggravate the issues of intergeneration equity discussed in section one. The final rule issued by the EPA should require the DOE to explicitly consider the long-term fluctuations in climate and to use conservative assumptions about the timing and duration of wetter climate states given the non-linear response of the transport models and the large influence of climate on the long-term performance of the Yucca Mountain repository.

## Section Five – The Continued Relaxation of Radiation Protection Standards at Yucca Mountain:

The relaxation of all radiation protection norms to well above anything now permitted, as proposed by the EPA for the period beyond 10,000 years, would be the third time that very major changes have been made to regulations in order to make it more possible to license a repository at Yucca Mountain once analyses came to light that indicated that such a repository could not be licensed under the then existing rules. This count does not include the wholesale abandonment of research on all other potential repositories locations in 1987 to focus solely on Yucca Mountain.

[60] DOE FEIS 2002 p. 5-26

The first time that existing standards and regulations were abandoned to accommodate the development of the Yucca Mountain repository was in relation to the EPA's carbon-14 emissions rules for high level waste disposal.[61] The EPA standard, originally promulgated in the 1980s, was to apply to all high level waste repositories, and included limits on carbon-14 emissions, among other radionuclides. Following the promulgation of this rule, a scientist at Lawrence Livermore National Laboratory realized that because Yucca Mountain was an unsaturated repository in porous rock that it might not be able to meet the carbon-14 emission standard.[62] The EPA constituted a subcommittee of its Radiation Advisory Committee to review the matter. One of the present authors, Dr. Arjun Makhijani, was on that subcommittee which reached a consensus conclusion that

> [I]t is not possible on the basis of presently available information to predict with reasonable confidence whether releases from an unsaturated repository would be less than or greater than the Table 1 (40 CFR 191) release limits. (The Table 1 Release limit is one-tenth of the inventory.)[63]

Instead of maintaining the rule for all repositories and trying to find a better site, Congress decreed that there should be a new rule for Yucca Mountain alone.[64] We call this the "Double Standard" standard.

The second time that radiation protection rules were relaxed was when the NRC abandoned its rules for the performance of the engineered barriers and the geologic setting in which they were to be placed.[65] Under the original rules the engineered barriers were to play an important role in preventing the release of significant amount of radionuclides, only for the first one thousand years. Beyond that period the geologic setting was to play the central role in preventing the radionuclides from reaching the human environment in significant quantities. In 1999 the Department of Energy presented five graphs to the Nuclear Waste Technical Review Board in order to illustrate the role of each element in the isolation system and its importance in determining the ultimate doses received by the public.[66] (See Attachment 1) From the information presented in these graphs, it was clear that the only element in the isolation system which plays a central role in meeting the proposed standard of 15 mrem within the first 10,000 years is the engineered waste canisters. The geologic setting of Yucca Mountain is shown to be practically useless in containing the radionuclides either before or after 10,000 years. Under the original Nuclear Regulatory Commission rule, Yucca Mountain could not have been licensed just as it would likely not have been licensed under the earlier EPA rule covering carbon-14 emissions. Again, instead of abandoning Yucca Mountain and finding a new repository location that could meet the then existing requirements, the NRC relaxed its regulations to what we now have which is to require the DOE to show only a "total system performance assessment." In this method of performance assessment, the performance of the repository can depend on just one element of the isolation system even if every other element is essentially non-performing. That is the case for Yucca Mountain as can be seen from the DOE's own figures from their 1999 presentation.

Hence a very critical system, estimated to cost between $60 and $100 billion is being built without any significant backup protection for the environment as part of its design. This is contrary to common sense and elementary engineering principles for complex, important systems which generally seek to rely on the principle of defense-in-depth. The proposed exposure limit of 350 millirem per year for times beyond 10,000 years, which is well beyond any established radiation norm, is therefore the third time that standards would be greatly relaxed in order to try and accommodate the licensing of a repository at Yucca Mountain. If a repository at Yucca Mountain, or any other site, cannot meet scientifically reasonable and socially acceptable performance criteria than it should be abandoned in favor of a more suitable site. The continued relaxation of regulatory requirements does not serve the public interest and should have no part in the final rule as adopted by the EPA.

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[61] 40 CFR 191
[62] Van Konynenburg 1991
[63] EPA 1993 p.2
[64] 42 USC 10141
[65] 10 CFR 60, 1984
[66] DOE 1999, and reproduced from Science for Democratic Action v.7, no.3, May 1999, pages 12-13.

**Section Six – The Risks to Children:**

Our final comment on the proposed rule relates to the following claim made by the EPA in its discussions of the standard's compliance with relevant Executive Orders:

> This proposed rule is not subject to Executive Order 13045 [Protection of Children from Environmental Health & Safety Risks] because it is not economically significant as defined in Executive Order 12866, and **because the Agency does not have reason to believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children**. The public is invited to submit or identify peer-reviewed studies and data, of which EPA may not be aware, that assessed results of early life exposure to radiation.[67]

It stretches credulity to believe that the EPA is unaware of the international scientific consensus that children, and particularly female children, are at significantly greater risk from radiation exposure compared to adults. Following the 1986 Chernobyl disaster there was finally a widespread recognition within the radiation protection community of the need to accurately determine the doses that are received by children from internally deposited radionuclides. The efforts undertaken in the wake of this accident were integrated with ongoing efforts of the International Commission on Radiological Protection leading to the development of age specific dose conversion factors for ingestion and inhalation.[68] These dose models were published between 1989 and 1996 as a series of five ICRP reports that reveled that, for many radionuclides, children can receive higher doses than adults for the same level of ingestion or inhalation.[69] These dose models have been adopted by the European Union's European Basic Safety Standards and the International Atomic Energy Agency's International Basic Safety Standards.

Following the publication of these ICRP reports, the EPA's 1999 Federal Guidance Report 13 included a discussion of the heightened cancer risk from radiation with decreasing age at exposure.[70] The CD supplement to Federal Guidance Report 13 issued by the EPA in 2002 included an extensive database of both dose and risk coefficients for ingestion and inhalation showing a heightened risk to children from exposure to many radionuclides.[71] Finally, the BEIR VII Committee has published the most up to date review of the available scientific information, and has made specific recommendations regarding age specific risk coefficients for exposure to low-level radiation. The figure below shows the rapid rise in risk with decreasing age at exposure as estimated by the U.S. National Academy of Science.[72]

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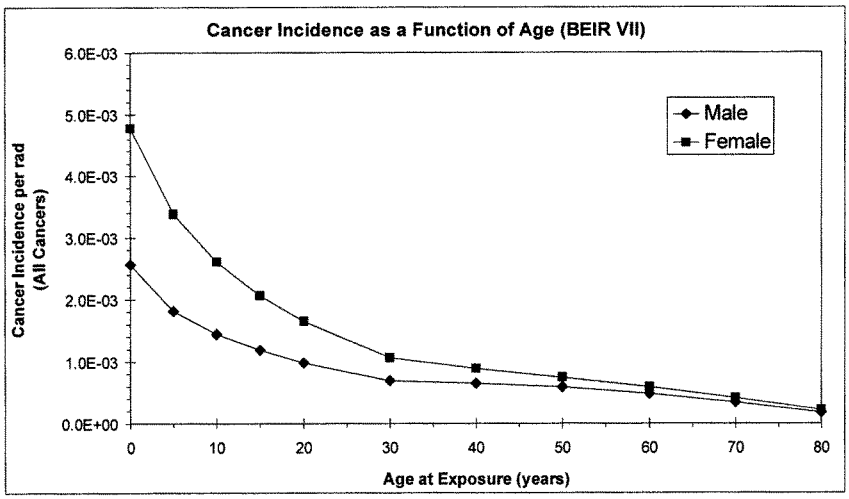
[67] EPA 2005 p. 49062
[68] ICRP 2005 and NCRP 128 p. 3 and 9
[69] ICRP 56, ICRP 67, ICRP 69, ICRP 71, and ICRP 72
[70] EPA 1999 p. 174-178
[71] EPA 2002
[72] NAS/NRC 2005 p. 550




To illustrate the conclusions of the BEIR VII committee in another way, we note that the risk of developing cancer for a child between 0 and 10 years old is more than two-and-a-half times the risk to a 25 year old adult from the same level of exposure. Finally, the disparity between the risk to men and women also grows more significant at younger ages as can be seen quite easily from the above figure.

The final rule should explicitly acknowledge the firmly grounded scientific consensus that children are, in fact, disproportionately at risk from exposure to radiation and reevaluate its compliance with Executive Order 13045 which states that

> A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because: children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; children's size and weight may diminish their protection from standard safety features; and children's behavior patterns may make them more susceptible to accidents because they are less able to protect themselves. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, each Federal agency:
>
> (a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children;
>
> and
>
> (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.[73]

[73] Executive Order 1997 p. 19885

**Section Seven – IEER's Proposal for a Final Rule:**

The Institute for Energy and Environmental Research recommends that the final rule as adopted by the EPA should include, at a minimum, the following elements:

1. The annual dose limit for all pathways should be between 10 and 25 millirem and should remain constant in time over the period of geologic stability at the site. This would be consistent with an implementation of the international consensus that future generations should be protected to at least the same level as is considered acceptable today.
2. A separate sub-limit of 4 millirem per year to the most exposed organ from the drinking water pathway should be included over the entire period of geologic stability. This would be consistent with the previously expressed EPA views that groundwater must be "protected as a natural resource" from radiological impacts and that "protecting ground water used as drinking water is a human health issue."[74]
3. The radiological impacts on children should be explicitly considered in the Department of Energy's performance assessments in order to ensure that they are not disproportionately affected by the repository. This would be consistent with the intent of Executive Order 13045 to protect the health of children regardless of whether or not the Yucca Mountain repository is considered "economically significant as defined in Executive Order 12866."
4. The impacts of future changes in climate should be taken into account explicitly in the DOE's performance assessments including the consideration of periodic cycling through different climate states. This would be consistent with the 1995 recommendations of the National Research Council as required by law.
5. The standard should recognize that the uncertainties in the estimated doses will increase with time and that the uncertainties beyond 10,000 years will become very significant. In this regard, therefore, we propose that the EPA adopt the French approach to waste repository standards[75] in which the doses beyond 10,000 years are calculated using scientifically reasonable, but highly conservative choices for the important parameter values in order to increase confidence that the ultimate impacts from the repository will be less than those predicted.

In contrast to the EPA proposed rule, the rule that we propose is in conformity with the NAS 1995 report, with international radiation protection guidelines, with cost-benefit principles, intergenerational equity, and the history and science of radiation protection. It also addresses the issue that uncertainties grow over the long term making a statistical approach more in the long-term more difficult and questionable. By adopting an approach of choosing fixed but conservative parameter values, a statistical approach is avoided, making the long-term result more robust than is obtained by the method suggested by the EPA.

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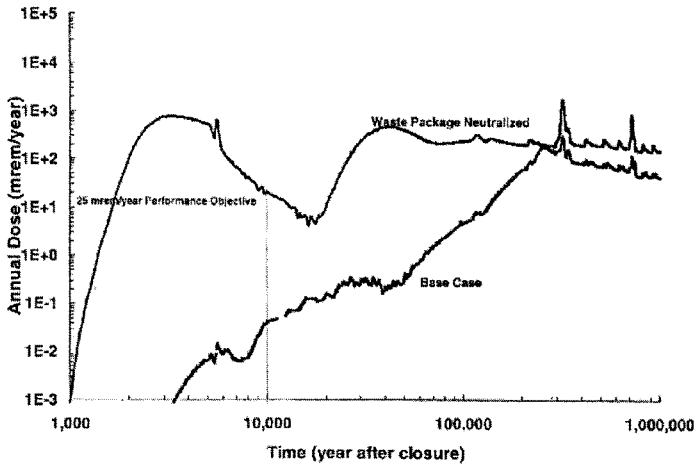
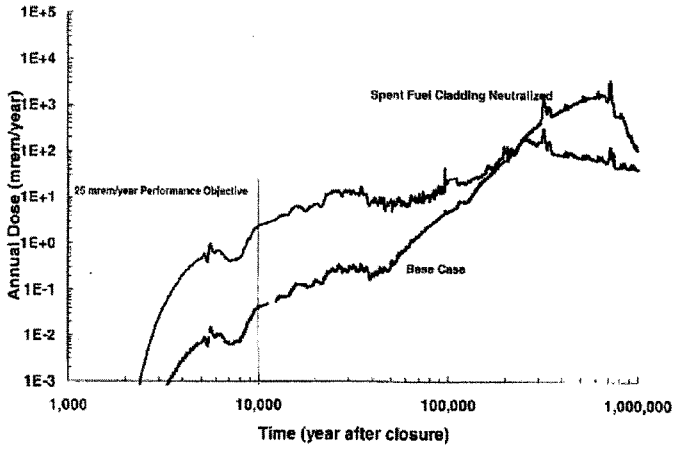
[74] Trovato 1997 p. 8-9
[75] Règle N° III.2

Attachment 1. Department of Energy Graphs as Presented to the Nuclear Waste Technical Review Board in 1999

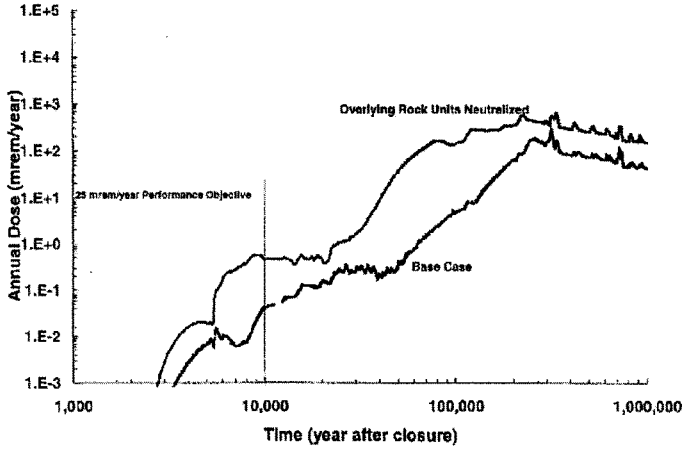
Graph A: Neutralize Waste Package



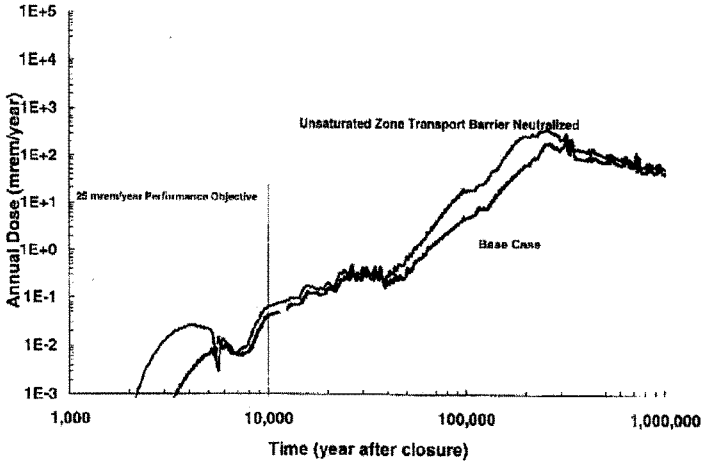

Graph B: Neutralize Spent Fuel Cladding



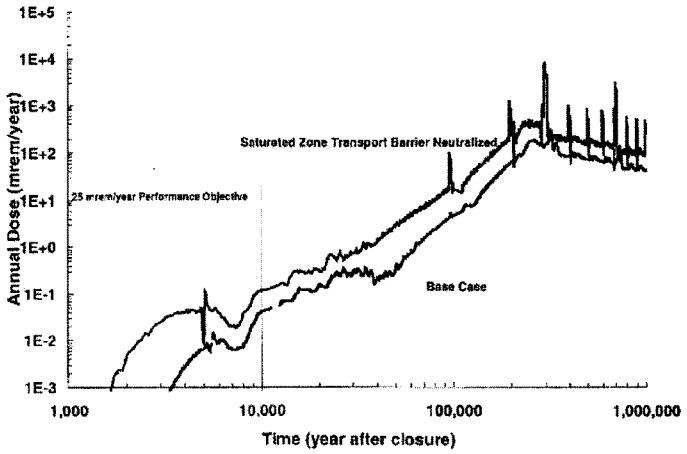
Graph C: Neutralize Overlying Flow Barriers




Graph D: Neutralize Unsaturated Zone Transport Barrier



Graph E: Neutralize Saturated Zone Transport Barrier




**Source for all graphs:** U.S. DOE Office of Civilian Radioactive Wate Management, "NWTRB Repository Panel meeting: Postclosure Defense in Depth in the Design Selection Process," presentation for the Nuclear Waste Technical Review Board Panel for the Repository, January 25, 1999.

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