

**UPDATE ON THE RESTORATION OF PUERTO
RICO'S ELECTRIC INFRASTRUCTURE**

HEARING

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND
INVESTIGATIONS

OF THE

COMMITTEE ON ENERGY AND
COMMERCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

APRIL 11, 2018

Serial No. 115-115



Printed for the use of the Committee on Energy and Commerce
energycommerce.house.gov

U.S. GOVERNMENT PUBLISHING OFFICE

31-134

WASHINGTON : 2019

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WEDNESDAY, APRIL 11, 2018

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 3:11 p.m., in room 2322, Rayburn House Office Building, Hon. Gregg Harper (chairman of the subcommittee) presiding.

Present: Representatives Harper, Griffith, Brooks, Collins, Walberg, Costello, Carter, Walden (ex officio), DeGette, Schakowsky, Castor, Tonko, Ruiz, and Pallone (ex officio).

Staff Present: Jennifer Barblan, Chief Counsel, O&I; Kelly Collins, Legislative Clerk, Energy/Environment; Lamar Echols, Counsel, O&I; Adam Fromm, Director of Outreach and Coalitions; Ali Fulling, Legislative Clerk, O&I, DCCP; John Ohly, Professional Staff, O&I; Dan Schneider, Press Secretary; Austin Stonebraker, Press Assistant; Christina Calce, Minority Counsel; Jeff Carroll, Minority Staff Director; Tiffany Guarascio, Minority Deputy Staff Director and Chief Health Advisor; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; Miles Lichtman, Minority Policy Analyst; Perry Lusk, Minority GAO Detailee; Jon Monger, Minority Counsel; and C.J. Young, Minority Press Secretary.

OPENING STATEMENT OF HON. GREGG HARPER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MISSISSIPPI

Mr. HARPER. The subcommittee convenes the hearing today entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure."

In September of 2017, Puerto Rico was hit by two unprecedented hurricanes in a 2-week period. On September the 6th, Hurricane Irma struck the island as a Category 5. Over 1 million residents lost power. While still recovering, Hurricane Maria ravaged the island on September the 20th, 2017. 1.47 million customers lost power as the storm brought 150-mile-per-hour winds and 25 inches of rain to the island. Regrettably, many Americans lost their lives while others went months without access to potable water or electricity. Over 50,000 residents still don't have power today.

On behalf of the committee, I want the citizens of Puerto Rico to know that our thoughts are with you as recovery efforts continue. This committee will continue working to ensure that everyone in

Puerto Rico has access to clean drinking water, healthcare, reliable telecommunications, and, of course, electricity. Today, we look forward to hearing about ideas that could prevent another prolonged loss of power like Puerto Rico is experiencing from happening again.

I am pleased that we are joined here today by Representative Jenniffer González-Colón from Puerto Rico. She has been a tireless advocate for Puerto Rico and has been on the front lines of hurricane recovery efforts since the very beginning. And I thank you for being with us today on this very important hearing.

I also want to thank Chairman Walden for his leadership on hurricane recovery issues, including holding multiple hearings and organizing a bipartisan group of Members to visit Puerto Rico last December to see the damage and challenges facing the island.

The recovery of Puerto Rico's electric infrastructure has been a challenge for a variety of reasons including bureaucratic issues, geographic isolation from responders and crews, difficult mountainous terrain, supply issues, and limitations of the existing electric infrastructure.

In the aftermath of the storm, the Puerto Rico Electric Power Authority, or PREPA, chose not to request mutual assistance from other utilities and instead relied on contractors to restore the grid. After the Governor of Puerto Rico requested the Federal Government to provide assistance in late September, FEMA tasked the U.S. Army Corps of Engineers with restoring the island's power.

Rebuilding an electric grid is not a mission typically undertaken by the agency. Yet the Army Corps has used its expertise to spearhead rebuilding efforts by hiring contractors and providing logistic support. On October the 31st, 2017, PREPA finally requested mutual assistance. But lacking existing assistance agreements, crews did not arrive until earlier this year.

Currently, restoration is coordinated by the unified command of FEMA, the Army Corps, PREPA, and a power restoration coordinator who is joining our second panel today. The Army Corps of Engineers' mission assignment, to rebuild the electrical grid ends on May the 18th of 2018. As of last week, power had been restored for 96.6 percent of customers.

The remaining work to be done, sometimes referred to as the last mile, is the difficult mountainous region often requiring the use of a helicopter to access work sites. We look forward to hearing from our witnesses today about what it will take to get 100 percent of the customers back online.

One of the goals of this hearing is to explore the future of Puerto Rico's electrical grid. How do we prevent another sustained loss of power? The tragic circumstances in Puerto Rico provide us with an opportunity to build an electrical grid that is more reliable and able to withstand future storms. The Department of Energy will play a key role developing this plan moving forward, and we are eager to learn more from DOE about how the role of Federal agencies will shift during the rebuilding phase of operations.

Finally, we look forward to hearing more about the report entitled "Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico." Written by numerous organizations from both the private and public sector, including Navigant Consulting, who

is joining us today, the report provides a detailed plan on how to establish an electrical grade in Puerto Rico that withstands Category 4 hurricanes at an estimated cost of \$17 billion.

I welcome and thank the witnesses and look forward to your testimony.

I now yield to the ranking member from Colorado, Ms. DeGette. [The prepared statement of Mr. Harper follows:]

PREPARED STATEMENT OF HON. GREGG HARPER

The Subcommittee convenes this hearing today entitled “Update on the Restoration of Puerto Rico’s Electric Infrastructure.”

In September 2017, Puerto Rico was hit by two unprecedented hurricanes in a two-week period. On September 6, Hurricane Irma struck the island as a Category Five storm. Over 1 million residents lost power. While still recovering, Hurricane Maria ravaged the island on September 20, 2017. 1.47 million customers lost power as the storm brought 150 mile per hour winds and 25 inches of rain to the island. Regrettably, many Americans lost their lives while others went months without access to potable water or electricity. Over 50,000 residents still don’t have power today.

On behalf of the Committee, I want the citizens of Puerto Rico to know that our thoughts are with you as recovery efforts continue. This Committee will continue working to ensure that everyone in Puerto Rico has access to clean drinking water, healthcare, reliable telecommunications, and electricity. Today, we look forward to hearing about ideas that could prevent another prolonged loss of power like Puerto Rico is experiencing from happening again.

I am pleased that we are joined here today by Representative Jenniffer Gonz lez-Colgn from Puerto Rico. She has been a tireless advocate for Puerto Rico and has been on the front lines of hurricane recovery efforts since day one. Thank you for being here with us for this important hearing.

I also want to thank Chairman Walden for his leadership on hurricane recovery issues, including holding multiple hearings and organizing a bipartisan group of members to visit Puerto Rico last December to see the damage and challenges facing the island.

The recovery of Puerto Rico’s electrical infrastructure has been a challenge for a variety of reasons, including bureaucratic issues, geographic isolation from responders and crews, difficult mountainous terrain, supply issues, and limitations of the existing electric infrastructure.

In the aftermath of the storms, the Puerto Rico Electric Power Authority, or PREPA, chose not to request mutual assistance from other utilities and instead relied on contractors to restore the grid. After the Governor of Puerto Rico requested the federal government to provide assistance, in late September FEMA tasked the U.S. Army Corps of Engineers with restoring the island’s power.

Rebuilding an electrical grid is not a mission typically undertaken by the agency—yet the Army Corps has used its expertise to spearhead rebuilding efforts by hiring contractors and providing logistic support. On October 31, 2017, PREPA finally requested mutual assistance, but lacking existing assistance agreements, crews did not arrive until earlier this year.

Currently, restoration is coordinated by the unified command of FEMA, the Army Corps, PREPA, and a Power Restoration Coordinator who is joining our second panel today. The Army Corps of Engineers’ mission assignment to rebuild the electrical grid ends on May 18, 2018. As of last week, power has been restored for 96.6% of customers.

The remaining work to be done—sometimes referred to as the last mile—is in the difficult mountainous region, often requiring the use of a helicopter to access work sites. We look forward to hearing from our witnesses today about what it will take to get 100% of customers back online.

One of the goals of this hearing is to explore the future of Puerto Rico’s electrical grid. How do we prevent another sustained loss of power? The tragic circumstances in Puerto Rico provide us with an opportunity to build an electrical grid that is more reliable and able to withstand future storms. The Department of Energy will play a key role developing this plan moving forward and we are eager to learn more from DOE about how the role of federal agencies will shift during the rebuilding phase of operations.

Finally, we look forward to hearing more about the report entitled Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico. Written by

numerous organizations from both the private and public sector, including Navigant Consulting who is joining us today, the report provides a detailed plan on how to establish an electrical grid in Puerto Rico that withstands Category Four hurricanes at an estimated cost of 17 billion dollars.

I welcome and thank the witnesses, and look forward to their testimony. I now yield to the Ranking Member from Colorado, Ms. DeGette.

Ms. DEGETTE. Thanks, Mr. Chairman.

Mr. Chairman, as you noted, the 2017 hurricane season was one of the most damaging on record for the United States and Puerto Rico and the U.S. Virgin Islands. Those two entities continue to reel from the catastrophic impact of Hurricanes Irma and Maria. I was part of that group that went to Puerto Rico and the U.S. Virgin Islands with Chairman Walden and Ranking Member Pallone in December very soon after the storm. And it is one thing to talk about the effects of the blackout and everything else. It is something else to actually go there and to talk to the people who are impacted by it every day. And the long-term crisis that has been caused by this—we just can't overestimate the impact. We have to have a reliable grid. It is fundamental to Puerto Rico's economy and all aspects of life on the island. They can't keep their businesses going. They can't keep their homes going if they don't have a reliable grid.

And even today, months later, with the new hurricane season starting in just a few weeks, thousands of people still don't have power today, more than 6 months after Hurricane Maria made landfall. And I still have concerns about the response, including the awarding of questionable contracts may have impeded or slowed down the response effort. We need to find out what we can do better. We have got to have a strong and effective Federal Government. We have got to have strong Federal leadership and commitment, not just to address the impending objectives but also the longer term recovery, including grid design and rebuilding efforts.

So I am hoping that our two panels today can help explain why it has taken so long to restore power in Puerto Rico, which is actually in charge of restoration efforts, both now and going forward, and critically, as you mentioned, Mr. Chairman, what it is going to take to build a 21st century grid that will help prevent Puerto Rico from suffering another devastating blackout in the future.

It appears to me that there is little effort being made to modernize the grid or otherwise increase its resilience as part of the restoration process that has been completed to date. FEMA's Federal coordinating officer in Puerto Rico actually described the restoration efforts as a "Band-Aid" and said that the system has "been patched back together." And that was sort of my impression when I was in Puerto Rico.

This situation does not call for a Band-Aid, but it requires building of a stronger and much more resilient grid. And when we were in Puerto Rico and also the U.S. Virgin Islands, we were talking together, as members of the delegation on both sides of the aisle, about what we can do to deal with Stafford Act requirements and how we need to go much further than those requirements in order to ensure a strong grid going forward. Because with projections for severe weather incidents coming up more and more, what we are going to be seeing, if we don't rebuild to a higher degree and to re-

silience, we are going to be seeing a repeat of this over and over again. So we need to make sure that whatever grid we put into place won't be vulnerable to future storms.

We are a long way from that goal, as I said. Even where power has been restored, service remains unreliable, and blackouts and service outages continue to affect hundreds of thousands of people. Businesses and facilities like hospitals, police stations, and water treatment facilities have generators on hand simply to ensure that, if the grid goes out, that they can continue to provide services. I am also concerned because many Federal contractors have already left Puerto Rico or will be leaving in the near future despite the fact so much remains to be done.

Now, the U.S. Army Corps of Engineers did recently announce they will be in Puerto Rico until May 18, but many contractors are leaving. I would like to know how that is going to impact our ability to restore power to everybody.

So, Mr. Chairman, building a grid for the 21st century is going to require significant resources and a strong and ongoing commitment by this committee and the full committee. As we consider innovative ways to rebuild the grid, we have got to ensure that the process is transparent, and we also have to include consumer protections. Mr. Chairman, we need to have ongoing oversight over this. We need to keep it on our radar screen. And I think we should even consider, as it goes along, having field hearings in Puerto Rico and the U.S. Virgin Islands to see how this is happening.

I want to finish by just also thanking Representative González-Colón who is here with us today and was there with us in Puerto Rico. I also want to thank Representative Plaskett who was with us in the U.S. Virgin Islands. And I want to thank Representative Nydia Velazquez, who has been a real champion for full remediation of all of these issues.

With that, Mr. Chairman, I yield back and look forward to hearing from our witnesses.

Thanks.

Mr. HARPER. The gentlewoman yields back.

I would ask unanimous consent that Chairman Walden's opening statement be made a part of the record and any other members' written openings also be made a part of the record.

Without objection, it will be so entered.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Last year, three powerful hurricanes—Harvey, Irma and Maria—wrought devastation across the Caribbean and southern United States. Between August and September, these storms left millions without power, dumped unimaginable rainfall and tested the capabilities and resolve of our local, state and national response functions.

Months later, many of our citizens—especially in hard hit communities like Texas, Florida and the U.S. Virgin Islands—continue to recover from the damage inflicted by these storms. In one U.S. territory, however, that road remains particularly long and challenging.

The island of Puerto Rico was still recovering from Hurricane Irma when it received a direct hit from Hurricane Maria. The massive Category Four storm made landfall on the southeastern coast of the island. Winds exceeding 150 miles per hour were fueled by the island's terrain, leveling structures and leaving large swaths of lush forests brown and barren. As it traversed the mountainous interior, torrential

rain rushed down steep hillsides where it met storm surge from the coast, creating substantial flooding. When the storm exited the northwest coast, it had been felt in all corners of the island.

The damage touched every aspect of life in Puerto Rico. Roads were impassable, bridges washed away, communications lost. Recovery was going to be long, even under good circumstances. The circumstances were not good in the effectively-bankrupt Commonwealth. And nowhere has this been more apparent than the storm's effect on the island's fragile electric infrastructure.

In Maria's wake, most of the nearly 3.4 million citizens of Puerto Rico were in the dark. The storm's high winds and flooding ravaged the aging and poorly maintained infrastructure of the island's public utility, the Puerto Rico Electric Power Authority (PREPA). Already nine billion dollars in debt, PREPA did little to upgrade or maintain the system as it struggled to provide reliable power to the island's residents and businesses. Transmission lines traversed steep mountains, surrounded by dense vegetation, with little set-back or right of way. Antiquated distribution stations remained situated in areas prone to flooding. These and other factors exacerbated the damage—and recovery.

Restoration efforts took time to gain momentum. A combination of questionable actions by PREPA, an unorthodox assignment for the U.S. Army Corps, geographical and logistical challenges, and other factors slowed the response. Over time, many of these challenges were overcome and, at its peak, the restoration involved the coordination of more than 6000 workers. Despite these efforts, over 6 months later more than sixty thousand citizens remain without power.

Going without power for more than 6 months is difficult to imagine for most of us. An outage lasting more than a week—such as Sandy or the 2012 Derecho here in DC—is rare. Two weeks after Maria, Puerto Rico was only scratching the surface.

Last December, members from this committee visited Puerto Rico and the U.S. Virgin Islands. It is one thing to read or hear about the damage but—until you see it in person, speak to the people on the ground—it is hard to appreciate just how devastating and far reaching the effects are on these communities. I learned a lot from that experience, but one thing stood out—the patience and fortitude of the citizens. If PREPA's grid had a fraction of the resilience demonstrated by Puerto Ricans over the past 6 months, we would be in a much different place.

We cannot change the past, but we can learn from it to create a brighter future. I look forward to learning more from our witnesses about why this has been such a challenge, what it will take to complete the “last mile,” and how we prevent such a protracted outage in the future. This last part is critical. Hurricane season is fast approaching, and the existing system is still being repaired. Hundreds of emergency generators remain in use or as backup at critical facilities due to the fragility of the system. What is being done to strengthen the system and improve our response in the event of another storm?

Ultimately, Puerto Rico needs a more robust and resilient electric infrastructure. This will be a complex, multi-faceted endeavor that is bigger than any one technology, generation source or institutional question—such as who owns and operates the infrastructure. I look forward to learning more about what is necessary to get this right for the people and long-term prosperity of Puerto Rico.

Mr. HARPER. The chair will now recognize Ranking Member Pallone for any opening statement that he may have.

OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. Thank you, Mr. Chairman.

It is time we begin to find a commonsense solution for creating a 21st century electric grid for Puerto Rico. And as our ranking member, Ms. DeGette, said, we witnessed the unprecedented destruction of the 2017 hurricane season when we traveled to Puerto Rico and the Virgin Islands with the committee. And I also want to thank Congresswoman Jenniffer González, first of all, for her hospitality, which was overwhelming, but even more important for her insight, because without her practical insight, I don't think we would have really understood what was going on and what we needed to do.

On our trip, we saw the massive devastation to all aspects of life on the islands, including widespread damage to the electric grid in Puerto Rico, which, in the immediate aftermath of the storms, brought to a standstill any semblance of normal life or commerce on the island. And responding to the unprecedented level of devastation caused by these storms I think would have been beyond the capacity of any State, territory, or local government. And quick decisive Federal assistance and leadership was required to address immediate response needs. However, I think the people of Puerto Rico received a visit where the President, as I saw on TV, tossed some paper towels into the crowd and sent tweets that suggested a lack of commitment by him to the response effort. And I do criticize the Trump administration, because I do think they should have done more to ensure that those who remain without power in Puerto Rico over 6 months after Hurricanes Irma and Maria made landfall, that power should be restored as soon as possible. And this administration isn't doing enough.

I am also concerned that questionable contracts and contracting practices may have delayed or undermined the response effort. While restoring power quickly is the most urgent concern, significant improvements to Puerto Rico's electrical infrastructure will be needed to build the resilient and modernized grid in the wake of both hurricanes. And replacing—I want to stress this—replacing the old grid as it stood before the storms is going to cost a lot of money and do nothing to make electricity in Puerto Rico more reliable or affordable. There are going to be major storms in the future, and this old grid is simply not up to the task of withstanding these storms. So we may have a disagreement over technical strategies for building a more reliable and resilient grid, but I think that it has to be done. And hopefully this hearing will shed some light on how to do it so we are not relying or trying to restore the old grid.

I also have serious concerns about how PREPA oversaw the effort to restore power in Puerto Rico but also regarding how PREPA has managed or, more accurately, mismanaged the grid in Puerto Rico over the years. Even before last year's hurricanes, PREPA was \$9 billion in debt, the electric grid was outdated, and customers on the island paid some of the highest electricity prices in the country. So, as we consider ideas for strengthening Puerto Rico's grid, we must contemplate alternatives to PREPA for overseeing the rebuilding and operation. All ideas from direct privatization to creation of a new Federal power, marketing administration, and all proposals in between should be considered.

So, whatever road we go down, building a grid for the 21st century will require collaboration with the Puerto Rican Government and the people as well as a sustained Federal commitment that extends beyond the completion of current power restoration efforts. And I pledge my support for that kind of a Federal commitment and hope that the witnesses will give us a better idea of how we can create a truly modernized grid, because that is what we need.

I yield back.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

Mr. Chairman, it is time we begin to on finding a common-sense solution for creating a 21st century electric grid for Puerto Rico.

I witnessed the unprecedented destruction of the 2017 hurricane season, traveling to the U.S. Virgin Islands and Puerto Rico with Chairman Walden, Ms. DeGette, and other members of this Committee.

We saw the massive devastation to all aspects of life on the islands, including widespread damage to the electric grid which, in the immediate aftermath of the storms, brought to a standstill any semblance of normal life or commerce on the island.

Responding to the unprecedented level of devastation caused by these storms would have been beyond the capacity of any State, territorial, or local government. Quick, decisive federal assistance and leadership was required to address immediate response needs.

Instead, the people of Puerto Rico received a visit where the President tossed paper towels into the crowd and sent tweets that suggested a lack of commitment to the response effort.

The Trump Administration can and should be doing more to ensure that those who remain without power in Puerto Rico—over 6 months after Hurricanes Irma and Maria made landfall—have their power restored as soon as possible.

Additionally, I am concerned that questionable contracts and contracting practices may have delayed or undermined the response effort.

While restoring power quickly is the most urgent concern, significant improvements to Puerto Rico's electrical infrastructure will be needed to build a resilient and modernized grid in the wake of Hurricanes Irma and Maria. Replacing the old grid as it stood before the storms will cost taxpayers more money, and do nothing to make electricity in Puerto Rico more reliable or affordable. There will be more major storms in the future, and this old grid is simply not up to the task of withstanding those storms.

While many experts agree on the technical strategies for building a more reliable and resilient grid, significant uncertainty exists as to how to implement the needed improvements given the financial and management problems of Puerto Rico's electric utility, PREPA.

I have serious concerns not only about how PREPA has overseen the effort to restore power in Puerto Rico, but also regarding how PREPA has managed—or more accurately, mismanaged—the grid in Puerto Rico over the years.

Even before last year's hurricanes, PREPA was \$9 billion in debt, the electric grid was outdated, and customers in Puerto Rico paid some of the highest electricity prices in the country.

As we consider ideas for strengthening Puerto Rico's grid, we must contemplate alternatives to PREPA for overseeing the rebuilding and operation of the grid. All ideas, from direct privatization to creation of a new, federal power marketing administration—and all proposals in between—should be considered.

Whatever road we go down, building a grid for the 21st century in Puerto Rico will require collaboration with the Puerto Rican government and the people, as well as a sustained federal commitment that extends beyond the completion of current power restoration efforts.

I look forward to hearing from our witnesses today about strategies for creating a truly modernized grid and what will be needed to implement these ideas. Thank you.

Mr. HARPER. The gentleman yields back.

Additionally, we also welcome non-Energy and Commerce Committee members who are with us today. Pursuant to House rules, Members not on the committee are able to attend our hearings but cannot ask questions.

We want to thank all of our witnesses for being here today and taking the time to testify before the subcommittee. Today's witnesses will have the opportunity to give 5-minute opening statements followed by a round of questions from members. Our first panel today for today's hearing includes Mr. Jeffrey Byard, Associate Administrator for the Office of Response and Recovery at FEMA; Mr. Charles Alexander, Director of Contingency Operations

and Homeland Security for the U.S. Army Corps of Engineers; and the Honorable Bruce Walker, Assistant Secretary of the Office of Electricity Delivery and Energy Reliability at the Department of Energy. I don't know how you put that on a business card, but thank you all for being here.

This is very important, and thank you for providing the testimony. We look forward to a very important update on your continued efforts in Puerto Rico. And you are each aware that this committee is holding an investigative hearing. And when so doing, it has been our practice to have witnesses testify under oath.

Do you have any objection to testifying under oath? The chair then advises you that, under the rules of the House, the rules of the committee, you are entitled to be accompanied by counsel. Do any of you desire to be accompanied by counsel during your testimony today?

In that case, if you would, please rise. I ask that you raise your right hand, and I will swear you in.

[Witnesses sworn.]

Mr. HARPER. You are now under oath and subject to the penalties set forth in title 18, section 1001, of the United States Code.

You may now give a 5 minute summary of your written statement. And so I will begin with you, Mr. Byard, and ask you to give us a summary of your testimony.

TESTIMONY OF JEFFREY BYARD, ASSOCIATE ADMINISTRATOR, OFFICE OF RESPONSE AND RECOVERY, FEDERAL EMERGENCY MANAGEMENT AGENCY; CHARLES R. ALEXANDER, JR., DIRECTOR, CONTINGENCY OPERATIONS AND HOMELAND SECURITY HEADQUARTERS, ARMY CORPS OF ENGINEERS; AND BRUCE J. WALKER, ASSISTANT SECRETARY, OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY, DEPARTMENT OF ENERGY.

TESTIMONY OF JEFFREY BYARD

Mr. BYARD. Thank you, Chairman Harper, Ranking Member DeGette, and members of the subcommittee.

Good afternoon, Chairman, Ranking Member DeGette, members of the subcommittee. As stated, my name is Jeff Byard. I'm the Associate Administrator for the Office of Response and Recovery for FEMA. It is my pleasure to be here on behalf the Secretary Nielsen, Administrator Long, DHS, and FEMA to share with you the opportunity to discuss the ongoing efforts to assist the power restoration in Puerto Rico and the U.S. Virgin Islands following the hurricanes of 2017.

As stated, last year's hurricanes were historic and a true test of our Nation's ability to respond and recover from multiple concurrent disasters. We estimate roughly 25.8 million Americans were affected by Hurricanes Harvey, Irma, and Maria. That's approximately 8 percent of the entire U.S. population. Within 2 weeks, last September, Hurricanes Irma and Maria devastated Puerto Rico and the U.S. Virgin Islands, leaving nearly all of Puerto Rico's 1.5 million electric customers and more than 100,000 U.S. Virgin Island customers without power.

FEMA was actively engaged with the Commonwealth and the territory prior to each hurricane's landfall. Federal resources and personnel were positioned in Puerto Rico and the U.S. Virgin Islands to coordinate with Commonwealth and territory officials. Within days of Irma's impact, hundreds of thousands of meals, liters of water, and other lifesaving commodities were delivered to survivors. One day after Maria's landfall, there were already 3,500 Federal staff on the ground in both Puerto Rico and the U.S. Virgin Islands. Within 10 days, there were more than 10,000 Federal staff on the ground working around the clock with the Commonwealth and territory officials to stabilize the situation.

Power restoration in Puerto Rico and the U.S. Virgin Islands has been and continues to be top priority for FEMA. The Puerto Rico Electric and Power Authority, or PREPA, and the Virgin Islands Water and Power Authority are ultimately responsible for the permanent repair of power generation, transmission, and distribution infrastructure. However, FEMA and our Federal partners, including the U.S. Army Corps of Engineers, the Department of Energy, are closing working to assist in those efforts.

The FEMA mission assigned the U.S. Army Corps of Engineers is to provide temporary power to both the Commonwealth and the territory. The Corps has installed more than 1,900 emergency generators in Puerto Rico and another 180 emergency generators in the U.S. Virgin Islands, prioritizing critical facilities, such as hospitals, police and fire stations, and water treatment plants. This temporary power mission is the largest in our agency's history.

FEMA has also issued a mission assignment to the U.S. Army Corps of Engineers—excuse me—U.S. Army Corps of Engineers to assist PREPA in emergency repairs across the island. Specifically, the U.S. Army Corps of Engineers was tasked to help develop a power restoration plan and execute temporary repairs to the grid to allow interim restoration until full electrical grid restoration can be implemented.

FEMA also mission assigned the Department of Energy to provide subject-matter expertise and technical assistance in support of the power grid damage assessment and power restoration efforts in both Puerto Rico and the U.S. Virgin Islands in coordination with the Army Corps of Engineers.

The Department of Energy is also working to identify various options for the long-term restoration of Puerto Rico's electric grid with added resilience. As of today, as stated, PREPA reports more than 90 percent—96 percent of the customers are able to receive power. And as of March 9th, 100 percent of the U.S. Virgin Islands' electricity customers have power.

FEMA's primary role of supporting the restoration of the Puerto Rico and U.S. Virgin Island power grids is through our public assistance program, which includes reimbursements for emergency work, which would also include temporary power restoration as well as permanent work projects.

In Puerto Rico, the Governor elected to use section 428 of the Stafford Act, which is the public assistance alternative procedures, to allow applicants to request and obtain funding based on certified cost estimates. As the Administrator announced this morning, FEMA and the Commonwealth have coordinated on the guidelines

for the permanent work. The goals of section 428 are to increase flexibility in the administration of assistance, expedite the delivery of assistance, and provide financial incentives for timely and cost-effective completion of public assistance projects. Once FEMA and the applicant agree on the damage assessment scope of work and estimated cost, a public assistance grant can be obligated.

Thanks to the action taken by Congress, the President signed the Bipartisan Budget Act of 2018 in February. And under these authorities given to FEMA, in this law, FEMA may provide funding in Puerto Rico and the U.S. Virgin Islands to rebuild damaged infrastructure without regard to its predisaster condition and to fund replacement of components that were not damaged but necessary to upgrade the system to industry standards. These new authorities allow FEMA to help Puerto Rico build more resilient infrastructure that will better withstand future storms.

The road to recovery will be a long one, but FEMA work with the Commonwealth and territorial partners as well as Congress throughout the recovery process. We will be in the impacted communities for as long as we are needed.

I am pleased again to be here today to represent the dedicated FEMA staff and for the opportunity to discuss this important mission. I am happy to take any questions the subcommittee may have at this time.

Thank you.

[The prepared statement of Mr. Byard follows:]

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STATEMENT

OF

JEFFREY BYARD
ASSOCIATE ADMINISTRATOR, OFFICE OF RESPONSE AND RECOVERY

FEDERAL EMERGENCY MANAGEMENT AGENCY
U.S. DEPARTMENT OF HOMELAND SECURITY

BEFORE
THE

COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C.

“Update on the Restoration of Puerto Rico’s Electric Infrastructure”

Submitted
By

Federal Emergency Management Agency
500 C Street, S.W.
Washington, D.C. 20472

April 11, 2018

Introduction

Good afternoon, Chairman Harper, Ranking Member DeGette, and members of the Subcommittee. I am Jeff Byard, the Associate Administrator for the Federal Emergency Management Agency's (FEMA) Office of Response and Recovery. On behalf of U.S. Department of Homeland Security (DHS) Secretary Nielsen and FEMA Administrator Long, thank you for the opportunity to discuss DHS and FEMA's ongoing efforts to assist with power restoration in Puerto Rico and the U.S. Virgin Islands (USVI) following the devastating hurricanes in 2017. One of FEMA's top priorities has been—and continues to be—the restoration of electric power across both territories.

2017 Hurricane Season

Last year's historic hurricane season was a true test of the Nation's ability to respond to and recover from multiple concurrent disasters. Three major hurricanes made landfall in the United States, which includes Puerto Rico and the USVI: Harvey, Irma, and Maria. The impacts of these events were substantial. Roughly 25.8 million people were affected by these three storms—roughly eight percent of the entire U.S. population.

In order to deliver disaster assistance to such a large and dispersed number of survivors, FEMA has worked in concert with our federal partner agencies; state, local, tribal, and territorial governments; and also non-governmental organizations (NGO) and the private sector to ensure a unity of effort that serves the needs of disaster survivors.

Unity of effort is required for disaster response and recovery on any scale. It has been—and will continue to be—especially crucial during response and recovery efforts following last year's hurricane season. All levels of government, non-profit organizations, private sector businesses, and even survivors—each drawing upon their unique skills and capabilities—will need to work together to meet the needs of disaster survivors.

Hurricanes Irma and Maria: Impacts and Federal Response

Hurricane Irma

On September 6, 2017, the eye of Hurricane Irma made landfall in the British Virgin Islands, just north of the USVI, as a catastrophic Category 5 hurricane. Extreme winds and heavy rainfall ravaged the USVI, particularly St. Thomas and St. John. Hurricane Irma then continued on its path of destruction, passing just north of Puerto Rico on September 7—still as a Category 5 storm—leaving more than one million customers without power.

President Trump approved an emergency declaration for the USVI on September 5 prior to Hurricane Irma's landfall, followed by a major disaster declaration on September 7. This major disaster declaration made federal funding available to affected individuals on the islands of St. John and St. Thomas through FEMA's Individual Assistance Program. It also made federal funding available to territorial and eligible local governments, and certain non-profit organizations, through FEMA's Public Assistance Program. Funding under the Hazard Mitigation Grant Program was made available for the entire territory.

Following an emergency declaration on September 5, President Trump approved a major disaster declaration for the Commonwealth of Puerto Rico on September 10, making Individual Assistance funding available to affected individuals in the municipalities of Culebra and Vieques. Public Assistance funding was also made available to the Commonwealth, eligible local governments, and certain private nonprofit organizations. Hazard Mitigation funding was made available throughout the Commonwealth. This disaster declaration was later amended to expand both Individual and Public Assistance to additional municipalities.

FEMA's National Response Coordination Center (NRCC) was activated to a Level I (the highest level of activation, with all Emergency Support Functions activated) prior to Hurricane Irma's impacts on the USVI and Puerto Rico. Federal personnel were also pre-positioned in the USVI and Puerto Rico to coordinate with territorial and municipal officials. This included FEMA staff that operate out of the Caribbean Area Division office located in San Juan, regional personnel from FEMA's Region II (which has responsibility for both Puerto Rico and the USVI), as well as Incident Management Assistance Teams (IMATs) that were deployed to both territories. Additional federal resources and personnel were strategically staged just outside of the storm's path, including ships from the U.S. Coast Guard and the Department of Defense. Once the storm had passed, these additional federal resources and personnel flowed into the territories as part of a unified federal response.

Within days of Irma's impact, more than 582,000 shelf-stable meals, 380,000 liters of water, and other life-saving commodities (cots, baby formula, temporary roofing materials, and other necessities) were delivered to the USVI National Guard for distribution at local Points of Distribution in St. John and St. Thomas. These items were also distributed to shelters operated by the American Red Cross and other recovery partners. More than 3,600 liters of water and other commodities were also transferred to Puerto Rico at the request of the Commonwealth, supplementing the resources already staged in FEMA's distribution center on the island. In addition, Disaster Survivor Assistance Teams were quickly on the ground in both the USVI and Puerto Rico to help assess needs of affected communities.

Hurricane Maria

On September 19—only two weeks after Hurricane Irma impacted the USVI and Puerto Rico—the eye of Hurricane Maria passed just south of the USVI on its way to making landfall in Puerto Rico on September 20. St. Croix and Puerto Rico were devastated by Hurricane Maria's powerful winds and heavy rainfall, which severely damaged communications and power grids, destroyed homes, and downed trees across both islands. In its wake, Hurricane Maria—the fifth-strongest storm ever to impact the United States and territories, and the strongest storm to strike Puerto Rico in nearly a century—left nearly all of Puerto Rico's 1.5 million electricity customers without power or communications.

President Trump approved major disaster declarations for both the USVI and Puerto Rico on September 20, making FEMA's Individual Assistance, Public Assistance, and Hazard Mitigation Grant Programs available for both territories. The federal government also immediately launched a massive and united response and recovery operation.

One day after Maria made landfall in Puerto Rico, there were already more than 3,500 federal staff on the ground in Puerto Rico and the USVI supporting response and recovery operations. These included a National Incident Management Assistance Team (N-IMAT) and FEMA Urban Search & Rescue (US&R) taskforces that were prepositioned to operate immediately following the storm's landfall. By September 29, there were more than 10,000 federal staff (including more than 800 FEMA personnel) on the ground in Puerto Rico and the USVI, working around the clock with territorial and local officials to stabilize the situation. To date, FEMA has delivered more than \$1 billion in food and water to Puerto Rico and the USVI in support of disaster survivors.

Hurricanes Irma and Maria: Power Restoration Efforts in Puerto Rico and the USVI

Temporary Power

Power restoration in Puerto Rico and the USVI has been a top priority for FEMA following Irma and Maria. On September 30, 2017, FEMA mission assigned the U.S. Army Corps of Engineers (USACE) to provide temporary power to both territories. In furtherance of the temporary power mission, USACE installed over 1,900 emergency generators in Puerto Rico and 180 emergency generators in USVI. The Hurricane Maria temporary power mission is the largest one in the agency's history.

FEMA, along with its federal and NGO partners, have also worked closely with the respective Governors and agencies in the USVI and PR to ensure that temporary power support continues to be prioritized for critical facilities such as hospitals, police and fire stations, communications facilities, and water treatment plants.

Emergency Power Grid Repairs

In order to provide a stable power solution for survivors, FEMA has also supported restoration of the electrical power grid on Puerto Rico and the USVI. On September 30, FEMA issued a mission assignment to USACE to assist the Puerto Rico Electric Power Authority (PREPA) on emergency repairs across the island. Specifically, USACE was tasked to help restore temporary power and "lead planning, coordination and integration efforts in preparation to execute electrical power grid restoration in Puerto Rico due to impacts caused by Hurricane Maria" and to "develop and execute applicable temporary repairs to the electrical grid to allow interim restoration of system segments as directed by FEMA until the full electrical grid restoration can be implemented."

As assigned by FEMA, USACE leads the federal effort to repair the hurricane-damaged electrical power grid in support of the Government of Puerto Rico. USACE is partnering with the Puerto Rico Electric Power Authority, the Department of Energy and FEMA to restore safe and reliable power to the people of Puerto Rico.

Puerto Rico has 2,400 miles of transmission lines across the island and 30,000 miles of distribution lines with 300 sub-stations. As of April 9, PREPA reports more than 96 percent or approximately 1.41 of the 1.47 million pre-storm customers who are able to receive electric power have their service restored.

In the USVI, FEMA has supported the Virgin Islands Water and Power Authority (VIWAPA) in its efforts to restore the power grid. By mid-November, expedited FEMA grants totaling more than \$75 million allowed VIWAPA to begin the emergency repair of transmission and distribution lines in St. Croix, St. Thomas and St. John. The power authority shipped in power lines and poles, as well as 500 linemen from across the United States, resulting in a ten-fold increase in local capacity compared to before the hurricanes. Power was restored to over 90 percent of customers in the USVI by the end of December. As of March 9, power has been restored to 100 percent of customers.

In addition to USACE, FEMA has also mission assigned the Department of Energy (DOE) to assist with power grid restoration. DOE is providing subject matter expertise and technical assistance in support of power grid damage assessments and power restoration efforts in both Puerto Rico and the USVI, in coordination with USACE. The Department of Energy is also working to identify various options for the long-term restoration and resilience of Puerto Rico's electric grid.

The Road to Recovery: Delivering FEMA's Infrastructure Assistance Programs

Public Assistance in Support of Power Restoration

PREPA and VIWAPA are ultimately responsible for the permanent repair of power generation, transmission, and distribution infrastructure. However, FEMA and its federal partners (including USACE and DOE) are closely supporting their efforts.

FEMA is primarily supporting the restoration of the Puerto Rico and USVI power grids through its Public Assistance program. As of April 5, FEMA has approved \$1.4 billion in Public Assistance emergency work for Puerto Rico and nearly \$450 million for the USVI. These amounts include funding for power restoration efforts in both territories.

FEMA is also working with Puerto Rico and the USVI on the development and execution of Public Assistance permanent work projects, which will include the restoration of utilities—including power. As of February 14, \$245 million dollars in federal assistance has been obligated for public works related to electrical utilities in Puerto Rico, and over \$180 million in the USVI.

On February 9, the President signed into law the Bipartisan Budget Act of 2018. Under authorities given to FEMA in this law, FEMA may provide Public Assistance funding for critical services to replace or restore the function of a facility or system to industry standards without regard to their pre-disaster condition. The law further allows FEMA to provide assistance for critical services to replace or restore components of the facility or system that are not damaged by the disaster when it is necessary to fully effectuate the replacement or restoration of disaster-damaged components to restore the function of the facility or system to industry standards.

FEMA will continue to work with our partners to effectively integrate and implement all of our disaster assistance programs in support of power restoration efforts in Puerto Rico and the USVI

to include working with the U. S. Department of Housing and Urban Development on its authority under the Bipartisan Budget Act of 2018 to provide up to \$2 billion in funding for enhanced or improved electrical power systems.

Public Assistance Alternative Procedures in Puerto Rico

On October 30, 2017, the Commonwealth of Puerto Rico elected to utilize Public Assistance Alternative Procedures for all large project Public Assistance funding for permanent work pursuant to section 428 of the Stafford Act. Under authorities granted to FEMA in the Sandy Recovery Improvement Act (SRIA), Public Assistance Alternative Procedures allow applicants to request and obtain funding based on certified cost estimates to repair, restore, or replace a damaged facility. Once FEMA and the applicant agree on the damage assessment, scope of work, and estimated costs, a Public Assistance grant can be obligated.

The goals of the Public Assistance Alternative Procedures are to reduce costs, increase flexibility in the administration of assistance, expedite the delivery of assistance, and provide financial incentives for the timely and cost-effective completion of Public Assistance projects. The alternative procedures also allow Public Assistance applicants to retain funding when there are cost underruns and utilize those funds for eligible additional hazard mitigation measures and for activities that improve future Public Assistance program permanent work operations.

Pursuant to the Governor's decision, FEMA will administer Public Assistance permanent work projects in Puerto Rico using the Alternative Procedures. As a condition of receiving funding under these procedures, the President required that the Commonwealth establish a grant oversight authority supported by third-party experts to perform the responsibilities of the grant recipient. On October 23, 2017, the Governor of Puerto Rico ordered the creation of the Central Recovery and Reconstruction Office (CRRO) of Puerto Rico. The CRRO will provide the required grant oversight authority. FEMA will also require that any cost estimate over \$5 million be reviewed by a third-party independent expert.

Long-Term Recovery

In order to meet the long-term recovery needs of Puerto Rico and the USVI, FEMA has fully implemented the structure and functions of the National Disaster Recovery Framework (NDRF) to ensure that federal recovery efforts remain coordinated and effective across all six Recovery Support Functions (RSFs). In particular, FEMA has leveraged the NDRF and the Recovery Support Function Leadership group to support the Infrastructure Systems RSF, which is led by USACE. In Puerto Rico, the Infrastructure Systems RSF has been split into five sectors—including a separate sector for energy—in order to address the magnitude of damage across multiple infrastructure systems.

Federal Disaster Recovery Coordinators (FDRCs) have been named for both Puerto Rico and USVI. These FDRCs will work closely with the governments of the USVI and Puerto Rico to facilitate disaster recovery coordination and collaboration among the territories, federal and municipal governments, private sector entities, and voluntary, faith-based, and other NGOs.

Conclusion

Within one month's time, FEMA was responding to three major hurricanes, two of which hit the USVI and Puerto Rico within two weeks. By the end of 2017, FEMA registered more than 4.7 million survivors for individual assistance—more registrations than for Hurricanes Rita, Wilma, Katrina, and Sandy combined. The Agency had also distributed more than \$2 billion in individual assistance to survivors, processed 133,000 flood insurance claims, and paid out more than \$6.3 billion to policyholders across the country.

In addition to providing financial support, FEMA also deployed thousands of our employees, mission assigned nearly 14,000 staff and service members from various offices of the Department of Defense, and—for the first time ever—the Secretary of Homeland Security extended the DHS Surge Capacity Force to all federal agencies in order to deploy an additional 3,800 employees from across 36 federal departments and agencies. We have also welcomed hundreds of new FEMA Local Hire and Reservist employees to assist with recovery efforts. I cannot recall a more challenging hurricane season, nor a more impressive whole community response, in my history of emergency management.

The road to recovery will be a long one, but FEMA will continue to work with its Federal, state, territorial and local partners, as well as Congress, throughout the recovery process. Though the power grids in both Puerto Rico and USVI were significantly damaged, we continue to see progress in power restoration every day. We will also be in the impacted communities for as long as we are needed.

I am grateful for the opportunity to appear before you today to discuss this important mission, and I am happy to respond to any questions the Subcommittee may have at this time. Thank you.

Mr. HARPER. Thank you very much.

Next we'll recognize Mr. Charles Alexander, Jr., Director of Contingency Operations and Homeland Security Headquarters, Army Corps of Engineers.

Thank you, sir.

TESTIMONY OF CHARLES R. ALEXANDER, JR.

Mr. ALEXANDER. Thank you, Chairman Harper, Ranking Member DeGette, and distinguished members of the subcommittee. Thank you for the opportunity to testify before you today. It's also good to see several of you that I accompanied you on your congressional delegation down to Puerto Rico. When you have a chance to get down there again, while we still have a lot to do, you will see we have come a long way.

The Corps conducts emergency response activities under two basic authorities: the Stafford Act and Public Law 84-99. Under the Stafford Act and the National Response Framework, we support FEMA as the lead Federal agency for Emergency Support Function 3, public works and engineering. ESF 3 provides for temporary emergency power, temporary roofing, debris management, infrastructure assessment, critical public facility restoration, and temporary housing. Under P.L. 84-99, we plan, we prepare for, and recover from disasters in coordination with local, State, and Federal partners.

When disasters occur, Corps teams and other resources are mobilized from across the command to assist the local office with a response to the event. As part of this mission, the Corps has more than 50 specially trained teams supported by emergency contracts which perform the wide range of ESF 3 support missions. The Corps uses these pre-awarded contracts so they can be quickly activated for mission such as debris removal, temporary roofing, and generator installation.

This past year, the Corps has supported FEMA, led Federal responses in recovery operations in support of multiple events, including wildfires in California and Hurricanes Harvey, Irma, and Maria. The Corps was given 47 Hurricane Irma related mission assignments at 181 million and 42 Hurricane Maria related mission assignments at 3.4 billion by FEMA. This included missions in all six ESF 3 mission areas to include navigation restoration, levee and dam safety under our Public Law 84-99 authority. As of this morning, the Corps has completed over 2,200 temporary generator installations in the Caribbean, including 180 in the U.S. Virgin Islands and over 2,000 in Puerto Rico. The mission in U.S. Virgin Islands is complete while in Puerto Rico 881 generators remain installed at critical facilities across the island.

Under FEMA authority, we continue to assist Puerto Rico with operation and maintenance of critical, non-Federal generators across the island. Four out of 10 1- to 2-megawatt micro grids installed in support of the power grid restoration remain in service. As of today, this includes one in Vieques. The Corps completed over 73,000 temporary roofing installations this storm season, and that includes 3,600 in the Virgin Islands and over 59,000 alone in Puerto Rico. All the temporary roofing missions are complete.

In the U.S. Virgin Islands, the Corps debris removal mission is 100 percent complete. In Puerto Rico, debris removal is 94 percent complete. We have removed over 3.9 million cubic yards of debris. We are still working on disposal, and that dialogue continues on what to do with it.

Our debris teams are actively working in 27 municipalities with debris removal complete in 28 municipalities. We expect to be complete with all debris removal and disposal by mid-June. The Corps worked closely with officials in Texas and Florida during their storm events. In Puerto Rico, the Corps dam and levee safety teams inspected over 17 priority dams and worked closely with the Puerto Rico Electrical Power Authority to stabilize a spillway failure at Guajataca Dam.

On 30 September 2017, the Corps was given a FEMA mission assignment under Stafford Act authority to assist the Commonwealth in conducting emergency repairs to the power grid itself. Unlike our ESF 3 mission areas, the Corps did not have pre-awarded contracts to use for this effort. Instead, we competitively awarded contracts for temporary power generation, line repair, and logistic support and transpiration. This included acquiring over \$240 million in materials critical to the restoration effort, many with unique specifications to Puerto Rico alone. The Corps is partnering with PREPA in this effort, and we have energized over 96.7 percent as of today of customers thus far. And we acknowledge that over 49,000 customers remain without power.

In coordination with FEMA, PREPA, and the Commonwealth, we have begun to gradually right-size our contracted workforce. On April 6th, we modified our ongoing contract with PowerSecure, allowing Corps contractors to continue to assist through May 18. The Corps will continue to operate mega generator gas turbines at Palo Seco and Yabucoa through late May as PREPA completes repairs to the plants at those sites. Remaining materials we use to complete grid repairs and replenish depleted inventories on the island through mid-May. The Corps remains fully committed and capable of executing its other civil works activities across the Nation despite our heavy involvement in these ongoing response and recovery operations. We also remain ready and poised to assist in future events as they occur.

This concludes my testimony. I look forward to answering any questions you may have.

Thank you.

[The prepared statement of Mr. Alexander follows:]

DEPARTMENT OF THE ARMY CORPS OF ENGINEERS

COMPLETE STATEMENT OF

CHARLES R. ALEXANDER, JR.

**DIRECTOR, CONTINGENCY OPERATIONS AND
HOMELAND SECURITY**

BEFORE

**COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
UNITED STATES HOUSE OF REPRESENTATIVES**

ON

**UPDATE ON THE RESTORATION OF PUERTO RICO'S ELECTRIC
INFRASTRUCTURE**

APRIL 11, 2018

Mr. Chairman and distinguished members of the Subcommittee:

I am honored to testify before you today to discuss the authorities and responsibilities of the U.S. Army Corps of Engineers (Corps) during disaster response and recovery operations. I am Ray Alexander, Director of Contingency Operations and Homeland Security, U.S. Army Corps of Engineers (Corps).

The Corps conducts its emergency response and recovery activities under two basic authorities: the Stafford Disaster and Emergency Assistance Act (Stafford Act); and Public Law 84-99 Flood Control and Coastal Emergencies, 33 U.S.C. 701n, as amended (PL 84-99). Under the Stafford Act, we and other Federal agencies support the Federal Emergency Management Agency (FEMA) under the National Response and Recovery Framework. In this capacity, the Corps is the lead Federal agency for Emergency Support Function 3 (Public Works and Engineering), and Recovery Support Function (RSF) – Infrastructure Systems but works under the Federal Coordinating Officer's (FCO) direction. ESF-3 provides temporary emergency power, temporary roofing, debris management, emergency infrastructure assessment, critical public facility restoration, temporary housing, demolition/structural stabilization, and support to FEMA command and control Nodes/ESF3. The Infrastructure Systems RSF works to efficiently facilitate the restoration of infrastructure systems and services to support a viable, sustainable community and improves resilience to and protection from future hazards. Under PL 84-99, we prepare for disasters through planning, coordination, and training with local, state, Federal partners. The Corps can also assist state and local entities in flood fight operations or through implementation of advance measures to prevent/reduce storm incident damages. After the emergency incident, PL 84-99 authorizes the Corps to repair damage to Federal flood infrastructure projects, and work with states/municipalities to rehabilitate and restore eligible non-Federal flood infrastructure to pre-storm conditions.

When disasters occur, Corps teams and other resources are mobilized from across the country to assist the local Corps districts that are responding to the incident. As part of this mission, the Corps has more than 50 specially trained response teams, supported by emergency contracts, to perform the wide range of public works and engineering-related support missions I just described. Additionally, the Corps uses pre-awarded contracts that can be quickly activated for missions such as debris removal, temporary roofing, generator installation, and dredging.

2017 Hurricane Season – With regard to hurricane activity, 2017 was an unusually active season. The Corps was, and continues to be, involved in the FEMA-led Federal response and recovery operations in support of multiple events, including Hurricanes Harvey, Irma, and Maria.

Hurricane Harvey – On August 25, 2017, Category 4 Hurricane Harvey made landfall along the central Texas coast near Rockport, Texas, between Port Aransas and Port O'Connor and the President approved a Major Disaster Declaration for Texas. Large amounts of rainfall fell across the greater Houston metropolitan area causing record

flooding. FEMA tasked 27 total mission assignments totaling \$126 million to the Corps to assist in Hurricane Harvey response and recovery efforts. Since August 22, 2017, nearly 1,000 Corps personnel have been deployed to support response and recovery efforts. Currently, 120 Corps employees are deployed supporting 11 active recovery mission assignments. Active mission assignments total \$39 million and are expected to be completed no later than June 30, 2018.

Temporary Emergency Power: The Corps completed its temporary emergency power mission assignment in Texas by completing 45 generator installations.

Temporary Housing: In the 31 disaster impacted Texas counties, more than 3,100 applicants are approved for FEMA Direct Temporary Housing Assistance to date. The Corps is inspecting approximately 400 haul and install unit installations a day and certifying approximately 150 mobile housing units as ready for occupancy per week. To date, the Corps has assessed over 3,300 private sites (homeowner property) and over 1,200 commercial mobile home parks. In addition to installing units on individual home sites, the Corps assessed more than 330 potential group site locations and completed construction of improvements to an existing group site.

Debris Management Oversight: Debris teams led by Corps subject matter experts continue to provide state and county officials with technical assistance in defining requirements and monitoring debris removal and disposal operations in 10 counties.

Critical Public Facilities: The construction of critical public facilities temporary buildings are still ongoing. The Corps was assigned a mission to construct four public facilities - installation of two temporary schools, a city hall and a volunteer fire department. Two of these facilities have been completed and two are ongoing.

Hurricanes Irma and Maria – Category 5 Hurricane Irma made landfall over the U.S. Virgin Islands on September 6, 2017, while also impacting Puerto Rico with Category 2 winds, 12 foot storm surge and up to 20 inches of rain. Hurricane Irma made landfall in southern Florida/Florida Keys on September 9, 2017. Soon thereafter, Category 5 Hurricane Maria made landfall over Puerto Rico on September 20, 2017, causing major damage to critical infrastructure and homes. FEMA has issued over \$3.6 billion in Mission Assignments for the Corps through ESF-3 to assist in Hurricanes Irma and Maria response and recovery (47 Mission Assignments totaling \$355 million for Hurricane Irma and 39 Mission Assignments totaling \$3.64 billion for Hurricane Maria). Currently, the Corps has over 1098 personnel supporting ESF-3 missions deployed in various locations supporting the recovery missions.

Temporary Emergency Power As of April 4, 2018, the Corps and its contractors have executed 2,110 of 2,163 taskings received (for temporary generators) in Puerto Rico and 2,023 generator installations; the Corps is continuing to support this line of effort and 875 generators are currently installed in the field. The Corps and its contractors concluded its temporary emergency power mission assignment in the U.S. Virgin Islands on February 20, 2018; the Corps installed 180 generators during this mission.

Fifteen generators remain installed and are managed under a FEMA contract to provide additional stability to critical facilities in the U.S. Virgin Islands.

Temporary Roofing: In order for the Corps and its contractors to install temporary covering (blue roof), the government and its contractors require validated rights of entry. The Corps completed its temporary roofing mission assignment in Florida with 13,370 blue roofs installed. In the U.S. Virgin Islands, the Corps installed 3,658 blue roofs over the course of the mission. In Puerto Rico, the Corps and its contractors completed 59,469 blue roof installations and collected over 60,683 rights of entry. The final roof was completed on March 21, 2018. Mission was complete as of April 3, 2018.

Debris Management: As of April 4, 2018, the Corps has removed approximately 3,856,528 cubic yards of debris in Puerto Rico. In the U.S. Virgin Islands, the Corps removed 822,000 cubic yards of debris. The Corps continues to provide technical assistance to U.S. Virgin Islands authorities conducting local debris removal. The Corps also continues to contract debris disposal solutions. In Florida and Georgia, Corps debris subject matter experts provided technical assistance to counties across Florida and Georgia in response to Hurricane Irma.

Dam and Levee Safety, Assessments, and Response: In Puerto Rico, Corps Dam and Levee teams inspected 17 priority dam locations and Guajataca Dam was the only site deemed in critical condition. Hurricane Maria caused a significant rise in the water level of the dam, and resulted in flow in the spillway. The spillway structure was compromised and the surrounding area began to erode, posing immediate safety risk to a 1,000 residents and severing water supply to 360,000 residents. Corps teams placed over 500 Jersey barriers and over 1,300 super sand bags to decrease erosion and allow for short-term repairs of the spillway. Additionally, the Corps teams cleared existing outflow conduits and placed piping and pumps to further reduce the water level in the dam to safe levels and provide water supply. Under a FEMA mission assignment, the Corps is in the process of contracting for four additional interim risk reduction (short-term) measures including grouting and anchoring spillway slabs, stabilizing dam slopes, and repairing an outlet works gate to reduce risk during Puerto Rico's wet season with a completion date for all of this work in July, 2019. The Corps has no authority for permanent repairs at the project.

Power Restoration Mission: On September 30, 2017, the U.S. Army Corps of Engineers was given a FEMA Mission Assignment, within the authority of the Stafford Act, to lead planning, coordination and integration efforts in preparation to execute electrical power grid restoration in Puerto Rico due to impacts caused by Hurricane Maria. Our priority is to safely restore power to the people of Puerto Rico as quickly as possible. As of April 4, 2018, 95.8% (1.41 million of 1.47 million) of customers that are able to receive power are energized. The Corps currently has 1,126 personnel on the ground, including more than 900 contractors, working to restore power to the people of Puerto Rico. (As of April 4). The Unified Command Group—comprised of the Corps, the Federal Emergency Management Agency, the Puerto Rico Electric Power Authority and the Island's Restoration Coordinator— along with the electric industry partners,

continually evaluate the ongoing work in order to restore electricity across the island. In support of this line of effort, through the Defense Logistics Agency as its contracting agent, the Corps has executed the procurement of over \$240 million of materials required in the restoration the power grid.

The Corps remains fully committed and capable of executing its other Civil Works activities across the Nation despite our heavy involvement in these ongoing response and recovery operations. We also remain ready and poised to assist in future events as they may occur. This concludes my testimony and I look forward to answering any questions you might have. Thank you.

Mr. HARPER. Thank you, Mr. Alexander.

The chair will now recognize the Honorable Bruce Walker, Assistant Secretary, Office of Electricity Delivery and Energy Reliability in the Department of Energy.

Welcome. You've got 5 minutes.

TESTIMONY OF BRUCE J. WALKER

Mr. WALKER. Thank you. And I would note, I think Mr. Alexander's title is just a little longer than mine.

Mr. HARPER. They both need a little work on the business cards.

Mr. WALKER. Absolutely. Thank you, Chairman Harper.

Chairman Harper, Ranking Member DeGette, and distinguished members of this subcommittee, I appreciate the opportunity to participate in this update on the restoration and recovery of Puerto Rico's electric infrastructure.

Upon being sworn into my current job as the Assistant Secretary for the Office of Electricity last fall, my first order of business was to travel to Puerto Rico and the U.S. Virgin Islands. During my 2 weeks in Puerto Rico and USVI, I was able to gain firsthand experience about how DOE could best assist in the emergency restoration and the following recovery efforts. The Office of Electricity is responsible for providing energy-related expertise to FEMA, inter-agency partners, and the administration as part of DOE's emergency response activities. DOE serves as the coordinating agency for Emergency Support Function 12, Energy, ESF 12, under the National Response Framework. In addition, DOE is the primary agency for the Infrastructure Systems Recovery Support Function under the National Disaster Recovery Framework.

As the lead for ESF 12, DOE is responsible for providing information and analysis about energy disruptions and for helping to facilitate the restoration of damaged energy infrastructure. The mission of the Office of Electricity is to develop innovative, cutting-edge solutions and strategies to ensure that our Nation's critical energy infrastructure necessary for national security are secure.

In order to fulfill this mission, DOE leverages the technical capabilities of the national laboratories and partnerships with key private stakeholders to focus on early stage research and transformative projects. It is this type of assistance the Department has provided and will continue to provide to Puerto Rico as it restores and improves its electric infrastructure.

Over the course of the 2017 hurricane season, the Department has provided personnel to support National Response Coordination Center and several regional response coordination centers in support of FEMA's response operations. These included bilingual public information personnel to provide life-safety and life-sustaining communications and subject-matter expertise as part of FEMA's incident management assistance teams. Likewise, we provided subject-matter experts to the Army Corps from our Power Marketing Administration utilities. And we sent line workers and equipment from our Western Area Power Administration to assist with the efforts on the ground in USVI.

DOE continues to maintain close coordination with FEMA, and three subject-matter experts from our Power Marketing Administration remain deployed to provide technical support to the Army

Corps with restoration planning, cost estimates, validation, and quality assurance. DOE also continues to have responders deployed under the National Disaster Recovery Framework to support FEMA recovery activities and to coordinate with industry about mutual assistance to support restoration efforts. Long-term recovery efforts will continue in the months and years to come, and DOE will work in partnership with Puerto Rico Electric Power Authority, PREPA, as they decide on the best paths forward for the island's electric infrastructure. In fact, just last night, I spoke at length with Walt Higgins, PREPA's new CEO. We discussed his vision and the opportunities for DOE to assist in that effort as we transition into the recovery phase. I applaud the board of directors' decision to bring Mr. Higgins on board and look forward to working with him and his team.

Additionally, DOE continues to work with stakeholders such as the Puerto Rico Oversight, Management, and Economic Stability board, PROMESA; the Puerto Rico Industrial Development Company, PRIDCO; and PREPA's Transformation Advisory Council, the TAC, board, to ensure their priorities and concerns are incorporated into all aspects of our work.

During my meeting last week with several TAC members, we had a very open and productive dialogue that will further inform DOE's efforts to provide technical assistance to PREPA in the recovery efforts. DOE will continue to leverage and capitalize on the investments made at our national laboratories in grid technology research, development, and deployment. One endeavor we are pursuing is to increase the resilience of Puerto Rico's electric infrastructure through leading-edge grid modeling. This modeling will provide technical insight into the resiliency objectives allowing for coordination and communication of potential solutions across stakeholder groups. More importantly for the future, the modeling will enable interdependency analysis of critical infrastructure, highlight operational next worst scenarios, and facilitate contingency planning for investments in operational maintenance.

Working in partnership with FEMA and the Department of Housing and Urban Development, this project will allow us to work with PREPA as they plan future investments and determine where financial resources will be optimized.

Working with our highly qualified team at the Pacific Northwest, Oak Ridge, Sandia, and Argonne National Laboratories will also be utilizing our microgrid design tool looking at feasibilities of grids and local citing of distributed energy resources. There will also be a focus on the potential utilization of microgrids around industrial sites due to the important role they play in the economy.

DOE is working in partnership with a variety of stakeholders to ensure long-term recovery efforts are conducted with input from a wide range of parties.

Recently, Secretary Perry and I met with Mississippi Governor Phil Bryant, the current chairman of the Southern States Energy Board. We met to discuss opportunities for SSEB to work with the Governor and the legislature of Puerto Rico to establish a reliable, affordable, and sustainable electric energy grid and to develop a policy and legal framework to provide a regulatory process for privatization.

After confirming Governor Rossello's desire to work with SSEB, my office awarded the strategizing electric energy regulatory framework in Puerto Rico contract to SSEB. DOE looks forward to working with SSEB to present Puerto Rico with various options and recommendations of the electricity and other sectors.

And with that, I am extremely proud of the work that my team at DOE has done, and I am encouraged to see that we were able to reach completely across the entire agency, bringing together resources from our headquarters, our PMAs, as well as our national labs, to bear down on this problem. The emergency restoration is nearing its conclusion, and now we must once again come together to ensure the recovery phase provides the value to our citizens in Puerto Rico and the U.S. Virgin Islands. We are committed to work with our partners to accomplish this.

I look forward to your questions.

[The prepared statement of Mr. Walker follows:]

Written Testimony of Assistant Secretary Bruce J. Walker
Office of Electricity Delivery and Energy Reliability
U.S. Department of Energy
Before the
United States House of Representatives
Committee on Energy and Commerce
Subcommittee on Oversight and Investigations
April 11, 2018

Chairman Harper, Ranking Member DeGette, and distinguished Members of the Subcommittee, I appreciate the opportunity today to discuss the hurricane response and recovery efforts in Puerto Rico and the U.S. Virgin Islands.

Upon being sworn into my current position as Assistant Secretary for the Office of Electricity Delivery and Energy Reliability (OE) last fall, my first order of business was to travel to Puerto Rico and the U.S. Virgin Islands (USVI). Arriving on October 23rd, I spent the next two weeks assisting with the response and recovery efforts. It was imperative to see firsthand the destruction wrought by Hurricanes Irma and Maria and to understand how the U.S. Department of Energy (DOE or Department) could continue to best assist our fellow Americans.

The mission of OE is to develop innovative, cutting-edge solutions to ensure that our Nation's energy infrastructure remains reliable, affordable, and resilient. In order to fulfill this mission, DOE leverages the technical capabilities of the National Laboratories and partnerships with key private sector stakeholders to focus on early-stage research and transformative projects.

Our organization is also the lead for providing energy-related expertise to the Federal Emergency Management Agency (FEMA), interagency partners, and the Administration as part of DOE's emergency response activities. DOE serves as the coordinating agency for Emergency Support Function #12 - Energy (ESF-12) under the National Response Framework and as the Sector Specific Agency for Energy under Presidential Policy Directive 21. In addition, DOE is a primary agency for the Infrastructure Systems Recovery Support Function under the National Disaster Recovery Framework. As the lead for ESF-12, DOE is responsible for providing information and analysis about energy disruptions and for helping to facilitate the restoration of damaged energy infrastructure.

Hurricanes Irma and Maria Response

In early September, Hurricane Irma, the first Category 5 hurricane of the 2017 hurricane season, swept through the Caribbean and into the southeast continental United States, causing billions of

dollars in estimated damages, millions of customer power outages, and tragically, over 100 fatalities.

Just two weeks later, while Puerto Rico and the U.S. Virgin Islands were still responding to Hurricane Irma, Hurricane Maria, the second Category 5 hurricane of the 2017 hurricane season, struck Puerto Rico and the U.S. Virgin Islands, bringing powerful winds and major flooding that rendered much of the Territories' transmission and distribution infrastructure inoperable and left virtually all 1.5 million electricity customers in Puerto Rico without power. By the end of January, over 99% of eligible customers in the U.S. Virgin Islands had been restored and following a "No Customer Left Behind" campaign by the Virgin Islands Power and Water Authority, all customers were restored by the beginning of March. In Puerto Rico, restoration efforts continue. As of April 3rd, 95.8% of customers (1.4 million) were restored and all 78 municipalities are at least partially energized.

In the wake of these catastrophic events, DOE has received \$17 million in mission assignments from FEMA to support hurricane response and recovery (Irma: 6 mission assignments, \$2.2 million; Maria: 12 mission assignments, \$14.8 million). Over the course of the 2017 hurricane season, the Department provided personnel to support the National Response Coordination Center and several Regional Response Coordination Centers in support of FEMA response operations, bilingual public information personnel to provide life safety and life sustaining communications, subject matter experts as part of FEMA's Incident Management Assistance Teams, as well as technical advisors in electrical distribution, transmission, generation, energy efficiency, renewable energy, and related topics to advise the United States Army Corps of Engineers (USACE) on the assessment, planning, and reconstruction of the electrical grid in Puerto Rico.

In the U.S. Virgin Islands, DOE deployed ESF-12 responders to both St. Croix and St. Thomas to support FEMA, as well as 25 personnel and 10 line-trucks from the Western Area Power Administration (WAPA), to provide mutual assistance through multiple DOE mission assignments from FEMA. The crews from WAPA were tasked with supporting the restoration of the transmission system on St. Thomas, which was completed in November 2017, and the ESF-12 responders on the USVI were demobilized in January 2018. A team from the National Renewable Energy Laboratory was also deployed to the USVI to perform a power generation assessment under a FEMA mission assignment and DOE worked closely with the USVI and private sector partners to facilitate additional mutual assistance from industry.

In Puerto Rico, DOE continues to maintain close coordination with FEMA and three subject matter experts from the Power Marketing Administrations remain deployed to provide technical support to USACE with restoration planning, cost estimates, validation, and quality assurance. DOE has also deployed a responder under the National Disaster Recovery Framework to support FEMA recovery activities and continues to coordinate with industry about ongoing mutual assistance to support restoration efforts.

Additionally, through DOE-funded projects, we are leveraging the expertise of our National Laboratories to develop potential long-term solutions to improve the resiliency of the Puerto Rican infrastructure. I want to assure the Committee that DOE will continue to support the work

needed to restore power to Puerto Rico. I'd also like to thank all of the utility crews and responders for their dedication and hard work in restoring power.

Resilience

The hurricane season of 2017 serves to highlight the need for a continued and adaptive focus on energy system resilience. The recent severe weather events, changing resource mix, and dynamic nature of grid technologies—including changes on the demand side—are bringing grid resilience to a new, more prominent place in the national dialogue. Specifically, as we keep one eye on day-to-day reliability and resource adequacy, we must also do better to incorporate resilience into the discussion.

As part of a comprehensive effort to reduce the impact of severe weather events, utilities in three hurricane-prone regions invested hundreds of millions of dollars over the last several years to improve their systems, including advanced communicating technologies across their transmission, distribution, and customer systems to mitigate and recover from grid disturbances.

In Florida, while it's difficult to compare storms, during Hurricane Wilma in 2005, more than 11,000 Florida Power and Light poles fell or snapped, and 241 substations experienced major damage while close to 100 transmission structures were damaged. However, grid hardening since Wilma limited the damage to less than 1,500 toppled poles, no major damage to substations, and no damage to transmission structures during Hurricane Irma.

In mid-to-late August 2017 in Houston, at the peak of outages, 306,000 customers were without power in Texas and Louisiana from Hurricane Harvey, whereas when Hurricane Ike hit Houston in 2008, 2.1 million customers were knocked offline. Some of this dramatic reduction was due to CenterPoint Energy's enhanced physical and remote operational protections to prevent damage at the vast majority of their 250 substations. CenterPoint's investment also built out their capability to safely reroute power around damaged grid equipment to maintain connections for more customers.

The immense challenges that New Orleans faced in the aftermath of Katrina were intensified by electric grid failures. System-wide power outages made it difficult to resume essential recovery activities such as flood control operations, water supply and treatment, transportation, emergency response, and banking. Even Memorial Medical Center had its backup generator fail 48 hours after the storm.

In January 2016, researchers at Sandia and Los Alamos National Laboratories teamed up with the City of New Orleans and other partners through DOE's Grid Modernization Laboratory Consortium to identify grid modernization priorities to minimize the negative consequences to particularly vulnerable communities. The analysis identified the lifeline services that receive greatest benefit from improved power resilience, and subsequently, identified clusters of high-impact infrastructure in those areas that can be served by advanced microgrids.

As a result of this research, the City of New Orleans is now equipped with a prioritization and implementation plan, developed in conjunction with the local utility and community stakeholders, to protect the grid that serves areas of most critical need.

Conclusion

I am grateful for the hard work of DOE's emergency responders during the 2017 hurricane season. We have made progress, but there is still more to do. Over the next several months, DOE's primary focus in Puerto Rico will be working with our partners to support the mission of restoring the power grid and critical infrastructure.

Secretary Perry and our DOE team look forward to a thoughtful conversation focused on our response to this season's hurricanes, and on the reliability, affordability, and resilience of the electricity system from hurricanes, as well as other extreme weather events.

Thank you, and I look forward to your questions.

Mr. HARPER. Thank you very much.

Mr. Walker, the “Build Back Better” report that was released in December provided a series of high-level recommendations of what is needed to rebuild Puerto Rico’s electric infrastructure to a level capable of withstanding a Category 4 storm. I understand DOE and some of the labs contributed to this report, and the recommendations align with the Department’s guidance relative to the hardening and resiliency. And I recognize that this report was drafted relatively early in the recovery process and, therefore, had to rely on initial assessments and high-level assumptions.

Based on what you know now, do you think the \$17 billion cost estimate remains realistic, or would it be more or less?

Mr. WALKER. We are working with the TAC committee, who also participated, our members participated in the work that was being completed under the “Build Back Better” plan to vet through the recommendations that were made in that plan and how in depth they went. So, as we work through that process, we’ll define what the overall cost will be.

There are other recommendations that are beyond the scope of the “Build Back Better” plan that will be incorporated into a more overall and comprehensive plan. So, until such time as we have been able to pull all those together, I don’t have an answer for the \$17 billion.

Mr. HARPER. So how long do you think it’ll take before you can reassess that?

Mr. WALKER. We’re working right now with the TAC committee and our national labs to pull together all the recommendations and vet through. So part of the concern we’ve got as we move forward is there are considerations that have to be undertaken, things like generation.

Mr. HARPER. Yes. And I understand that. All I was asking—

Mr. WALKER. We don’t have a model.

Mr. HARPER. Do you have a feel for—or are we talking another month, 2 months, 6 months, before you have—

Mr. WALKER. We’re shooting for 60 days to have the model done.

Mr. HARPER. OK.

Mr. WALKER. And the model will enable us to go through different assumptions. In other words, where do you put generation? What value does it add? Does it change the paradigm of power flow such that you can actually reduce the cost per kilowatt?

Mr. HARPER. Let me ask this: Are there specific aspects of that report you now feel exceed what is necessary to harden the electric grid in Puerto Rico?

Mr. WALKER. There are some traditional transmission and distribution investments that—if you look at a lot of the work that companies like FP&L, CenterPoint have done with regard to hardening, things like using concrete poles, guying your poles differently, there are some very, very obvious things that can be done, maintenance program on the transmission towers so the guying that goes into the ground, the bolts actually don’t rot away and the towers twist simply because one of the guys are broken. And so there is a number of those. And those are very, very quick wins. But recognizing there’s a lot of infrastructure. On a 3,500-square-mile island, you’ve got to go through a lot of poles to do the mainte-

nance, evaluate them, change them out, and do the things necessary to undertake that.

Mr. HARPER. Thank you.

Mr. Byard, last year, FEMA had tasked the Army Corps of Engineers with restoring power in Puerto Rico, as you know. That mission assignment ends May the 18th of 2018. Currently, approximately 50,000 customers are still without power.

Why is the Army Corps' role ending even though everyone may not have power on May 18th? And who made that decision?

Mr. BYARD. Yes, sir. As stated previously, the FEMA mission assigned the Corps to do the emergency power restoration. And if I may, we use words like "unprecedented" and "catastrophic," which all fits. Earthquakes such as Northridge, Andrew, Katrina, major storms, we've never had to rebuild an entire State or, in this case, commonwealth's infrastructure when it relates to power. We're rebuilding basically the entire thing, or the rebuild will be.

So the emergency power mission is there to provide that temporary power. It is not the end state of what the grid will look like. We traditionally—and working with PREPA through the Unified Command Group, a very unified effort—these are not agencies going down different paths. It's coordinated through the joint field office. We are at 95, 96 percent complete with that mission assignment. The remaining 5 percent—or 2 to 5 percent—is that difficult last file, the mountainous terrain.

So, ending the mission of the Corps, first and foremost, we do that. We extended it based on a request from the Governor. We want to transition that to PREPA because that's a good stage in recovery, in any operation. Regardless if it's the Commonwealth or Texas, or you pick a State, it's better for them to start leading the recovery efforts.

That doesn't mean we're leaving. That doesn't mean the unified command group's, you know, disbanding. There is a lot of work that will continue to go on.

Mr. HARPER. My time has expired.

And I'll now recognize Ranking Member DeGette for 5 minutes for questions.

Ms. DEGETTE. Well, I must say: I appreciate all of your agency's efforts. I do think it was a very, very devastating situation in both of these locations, but we're talking about Puerto Rico here. And I appreciate the efforts. But the fact remains that we still have 50,000 American citizens who don't have power. And there's a great deal of work that everybody agrees we need to do to improve the resiliency of the grid with hurricane season starting up again, as I mentioned, in just a few months, less than a few months.

And so I know, Mr. Byard, you talked to the chairman a little bit about how the division of responsibilities has happened. But what I'm wondering, maybe, Mr. Alexander, you can talk to me about what transition efforts are underway as part of the Army Corp's responsible draw down and if any of you can tell me what we're going to do to get this power restored to these 50,000 people. That's the most urgent. And we'll all stipulate, these are the people in the most remote and difficult areas of the island. But they still are without power.

I don't know who wants to talk about that.

Mr. ALEXANDER. I'll give it a shot, ma'am.

We began what we called an orderly draw down previously with a mission assignment for PowerSecure as work goes. And I think on 6 or 7 April, Fluor was our large contractor. Their period of performance ended. There was no additional money to keep them under contract. So they have redeployed, demobilized.

With the mod to our contract to PowerSecure, we still have 519 contractor crewmen on the ground. They have repositioned over to the eastern region to Humacao and Caguas, and are doing work in that very rough terrain, mountainous, jungle conditions. Much being done by use of rotor-wing aircraft.

PREPA, though, they still have significant resources in play. They've got over 800 personnel, and their contract for Cobra has an additional 600 plus as well.

Ms. DEGETTE. So is the concept that PREPA is going to be the agency that's going to finish the restoration of power to that last 50,000 citizens?

Mr. ALEXANDER. That's the path we're headed down to, ma'am. But we are going to get as much done between now and 18 May. PREPA—

Ms. DEGETTE. Do you have an estimate of how many people's power will be restored by then, May 18th?

Mr. ALEXANDER. Ma'am, our goal is 100 percent.

Ms. DEGETTE. Well, do you think you can reach that goal by May 18?

Mr. ALEXANDER. We're going to do our best. Material is no longer a limiting factor. It was for quite some time.

Ms. DEGETTE. Well, let us know what we can do to help because we feel quite strongly about that.

I just want to quickly, Mr. Byard, talk to you.

I understand the permanent work has not yet started in Puerto Rico. Is that correct?

Mr. BYARD. Yes, ma'am.

Ms. DEGETTE. OK. And I also understand that, this morning, Administrator Long announced procedures for funding the permanent work. Is that right?

Mr. BYARD. Yes, ma'am.

Ms. DEGETTE. And here's the thing I'm concerned about with that: I've got a copy of that, which we just got this morning. Here's the guide for permanent work. And here's what I'm concerned about is that it says here it's a 90-percent Federal cost share, which I assume that they're saying Puerto Rico's going to pay 10 percent. Well, I don't see where Puerto Rico's going to get that 10 percent. Perhaps you can tell me where they might be able to get it.

Mr. BYARD. Well, the Commonwealth has access to—as just noted—I don't know the figures, and I don't want to speak necessarily for the working of it. But \$20 billion, I believe it was, from HUD. They have access to community disaster loans upwards of a billion dollars.

But what I can speak to is the permanent reconstruction and the unique opportunity that we have. And when I say "we" in this, it's not FEMA. It's collectively with the Commonwealth. So what the

428 program will allow us to do, coupled with the Bipartisan Budget Act, is look at the permanent reconstruction.

Ms. DEGETTE. And improving it.

Mr. BYARD. Yes.

Ms. DEGETTE. But if you can have the agency, please, supplement your responses to give us some better sense of—

Mr. BYARD. Ma'am, by the law that guides us, the Stafford Act, we do not have the authority to increase the Federal cost share over 90 percent.

Ms. DEGETTE. So you think it's the Stafford Act that's with the 10 percent?

Mr. BYARD. The Stafford Act guides how far we—

Ms. DEGETTE. OK. And then Stafford Act says 10 percent. Is that what you're saying?

Mr. BYARD. The Stafford Act allows us to increase to a 90 percent if—

Ms. DEGETTE. Right. But not beyond the 90 percent.

Mr. BYARD. Not 100 percent.

Ms. DEGETTE. So you think it'd take an act of Congress—

Mr. BYARD. Yes, ma'am.

Ms. DEGETTE [continuing]. To fix that?

Thank you very much. That's very helpful.

Mr. GRIFFITH [presiding]. Now recognize the gentlelady of Indiana, Mrs. Brooks, for 5 minutes.

Mrs. BROOKS. Thank you, Mr. Chairman. And thank you so much for holding this really important hearing.

And although some of us haven't yet been to Puerto Rico, we certainly hear from constituents who have family still there, and we have certainly read a lot in the media as well. I want to thank our colleague, Representative González-Colón, for sharing with us on a regular basis what's happening. As a matter of fact, I recall, when we were all headed home for the holidays, she shared with us that she did not have power yet when she was heading home for the Christmas break. And that had been a couple of months. I believe you have power now. I believe she has power now. But obviously 50,000 constituents do not.

And I happened to fly out yesterday with the head of Duke, from Indiana. And Duke sent a number of people to the island but yet the challenges they experienced had to do with equipment, as I understand, getting equipment.

And can all of you share with us, what have we done in preparation either for the next hurricane or what kind of plans do we now have in place to get equipment there for these contractors who have gone in, for companies that have gone in to help to make sure that we have a new plan? Because the plan we had was incredibly frustrating and was very difficult because of the problems with it being an island and with it being—who would like to start?

Mr. BYARD. So, ma'am, you know, what we do know is that our ability to do logistics for an island has increased. And it's increased by the capacity we've been doing it.

So what we've done at FEMA, and as attested to here on the panel, we know where the emergency generation needs to be. We know where the generators are. We have the ability to ensure—again, all of us want a resilient grid. All of us want the power to

be 100 percent restored and stronger than ever by hurricane season. That's not going to happen. And so what we have to do is prioritize again the hospitals, fire stations, police stations, those critical nodes that are truly life safety after the event. And we've done that.

The other thing we've done is we have a large contingent of Federal resources on the ground in lieu of personnel, the joint field office, made up of the agencies represented here and more. FEMA has also currently just under 1,500 local hires, Puerto Ricans. I think the largest single employer on the island is 1,600. So we have a footprint. We have a means to move commodities in through our contracting with our barge, and we've gotten smart about how to do that and how to source those nodes.

The other thing, if I may, is our now strong and continuing strengthened relationship with the critical sector of the private sector, the communications sector, the power sector. Now we know we have to better synchronize with and understand what that means to move Verizon in, because 86 percent of the Puerto Ricans are on cell phones. These are the things that we traditionally don't, but we know now. We're smart now.

Mrs. BROOKS. Have there been any Federal restrictions, whether it's regarding wilderness or land use, anything that has impeded your rebuilding efforts?

Any of you. Have you encountered any Federal laws or Federal restrictions that have impeded your progress?

I'm taking that as a no?

Mr. ALEXANDER. Ma'am, the only thing I can think of, actually, is the environmental considerations with respect to debris reduction.

Mrs. BROOKS. You mentioned the massive amount of debris. And so what is that? You now have millions of acres of debris?

Mr. ALEXANDER. It's been a challenge to reduce and chip that amount of debris that's collected. Efforts to accelerate disposal through air curtain incineration have not gained traction, environmental concerns on both Puerto Rico and the U.S. Virgin Islands. And we're still waiting ultimately on disposition of where all this debris is going to go, literally. Particularly in the Virgin Islands, they have limited capacity to hold much more. That's the biggest challenge.

Mrs. BROOKS. What are the options right now being considered?

Mr. ALEXANDER. Well, there's options up to and including actually, by sea, taking this debris to several countries that have offered to take it and have a means to reduce it or use it in a purposeful fashion.

Mrs. BROOKS. OK. Thank you for your efforts.

I yield back.

Mr. WALKER. If I may add one, Congresswoman.

The Stafford Act doesn't contemplate rebuilding, as it's written, an electric system. And by virtue of the way the Stafford Act's written, it contemplates things being put back the way they were. That's not the way an electric system is typically—or it's not the way it's restored during an emergency. There are NESC codes that are required to be followed by utility workers. And when you are in an emergency, unless you absolutely can't follow it, when you set

poles and you run wire, you follow that national electric safety code. That's not contemplated in the law. And, as we look at that Stafford Act moving forward, looking at different types of disasters, particularly as they relate in the energy sector, I think there's a number of significant improvements we can make in contemplation of future events and having to utilize the Stafford Act again.

Mrs. BROOKS. Thank you. We would look forward to receiving your recommendations on those improvements.

I yield back.

Mr. GRIFFITH. I thank the gentlelady.

I now recognize the gentlelady of Florida, Ms. Castor, for 5 minutes.

Oh, OK. I'm happy to recognize the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. TONKO. I thank my friend for allowing me to go first.

And thank you, Mr. Chair.

And thank you to all of our witnesses for joining us this afternoon.

I know that a number of New York State utility workers, line workers, participated in the comeback. And I know that Ellen introduced me to a number of folks who are with us today that worked on that exercise. So I thank you for the work from many utility perspectives for sharing in this comeback.

It's been 6 months since Hurricanes Irma and Maria made landfall in Puerto Rico, and it is important that the committee conduct proper oversight of the Federal Government's response to these natural disasters.

I would like to take a few minutes to turn our attention to the Federal Government's role in the Commonwealth's long-term recovery. We have heard from individuals on the island that the PREPA electrical grid was in poor condition prior to the hurricanes making landfall, which made it especially susceptible to storm damage.

So, Secretary Walker, could you please describe how the poor condition of PREPA and its grid left it vulnerable to Hurricanes Irma and Maria?

Mr. WALKER. Sure. And I'll answer it more generically.

In the industry, there are typical practices that are common throughout the different types of utilities in the United States, whether they're APPA, NRECA or IIU members. Those standards involve things like operational maintenance practices that would have you go inspect your poles for their integrity. You would go inspect your guy wires on your transmission systems for integrity. You would clear your vegetation from a vegetation management strategy that comports with the criticality of the system working from transmission down into your distribution separately.

So, when you don't follow those practices over time, equipment deteriorates. It doesn't have the capabilities that they were necessarily designed with initially. And then when they're faced with 140-plus mile an hour winds, they'll fail.

Mr. TONKO. I thank you for that.

A resilient electrical grid is a crucial component of a successful long-term recovery. The "Build Back Better" report, which was issued by a number of entities including Navigant Consulting, that we will hear from during the second panel, set out a number of rec-

ommendations for building a 21st century electric grid on the island.

Again, Secretary Walker, could you please explain DOE's role in the long-term modernization of Puerto Rico's electrical grid as well as what the Department has done to modernize the electrical grid on the island to date?

Mr. WALKER. Sure. The work that DOE does is fundamentally providing the technical expertise and convening the right stakeholders to move these initiatives forward. We specifically have tremendous capability within our national labs to model and work through developing a model for Puerto Rico that it is enabled to do load flow analysis, short-circuit analysis, things that you would see in a utility like Con Edison or Southern Company or most utilities that model their systems so that they can really inform the decisions of the investments that they make.

And so we've already started working with FEMA developing a model that also incorporates a critical infrastructure. So the couple thousand generators that have been placed at various locations—those locations and the functions of the underlying clients who are served by those generators will now all be incorporated into this model. The model will also have capabilities to enhance their operational capability from the standpoint of, when an event occurs by exception, the model will be able to actually determine and alert the operators as to what the next worst-case piece of equipment to lose is, which is tremendously important when you're operating the system. And as was noted earlier, the citizens in Puerto Rico have experienced unreliability in the past. So this will help rectify that.

That notwithstanding, the other component, which is equally as important, is the contingency analysis which enables you to walk through in an iterative process and take every piece of equipment in and out of the system and then evaluate what load flow analysis what happens to the system when you do that. And you can expand it to actually have two pieces out. So an N-1 would be the typical study that—Congressman, you're very familiar with, these processes. And then you would do an N-1-1 on the transmission system. And these type of analyses and the requisite investment that come from that analysis will be what helps PREPA in the long run really make the right decisions going forward and being able to operate the system. And DOE is working on that. That model's already—the template for it exists. The critical infrastructure is in it. We've divided up the component pieces for the actual analysis and the algorithms for the load flow among a number of our national labs to complete that.

Mr. TONKO. I know that with some restoral scenarios in the past, they were able to invest to get the power back on but also with an opportunity in mind to upgrade the standards of the system. Has that been done here? Otherwise we can pour a lot more money into a system and say, this is as far as we're going to go.

Is it done with improvements in mind?

Mr. WALKER. You're talking about the restoration that's been done heretofore?

Mr. TONKO. Yes. Put the lights back on but keeping in mind a state-of-the-art opportunity that can serve as a prototype including distributed generation, microgrids.

Mr. WALKER. So generally—

Mr. TONKO [continuing]. Renewables.

Mr. WALKER. Right.

Generally speaking, no, from the standpoint of you're in emergency restoration mode. So it's not very feasible to redesign the system on the fly when you're really just trying to get the lights on. So the emergency restoration component is the component that we've been focused on up to this point. And, indeed, we still have 50,000, you know, customers that are still out of lights.

That being said, for the last 3 months, my team at DOE utilizing folks at our PMAs, as well as the national labs and in-house people here in D.C., have been working through the microgrid capabilities and designs particularly using our microgrid design tool kit that was developed by the Sandia National Lab. They've gone down to Puerto Rico. They've visited a number of sites in Puerto Rico where our capability to build microgrids can be utilized and accessed.

So there has been a significant amount of work done, very technical work, on looking at opportunities on the island for the integration of renewables in various forms. Modeling, working with other Federal agencies to understand.

Mr. HARPER. Sorry to cut everybody off, but we're on a fairly tight schedule. If we're going to get through this before votes, we're going to have to stay within the 5 minutes for future time. Thank you very much.

Mr. WALKER. Thank you, Mr. Chair.

Mr. HARPER. Thank you very much. At this time, the chair will recognize the vice chairman of the committee, Mr. Griffith, for 5 minutes.

Mr. GRIFFITH. Thank you very much, Mr. Chairman. Let me put in two pieces of information, if I might.

Our colleague from Puerto Rico got some changes made in the law. We took care of one of the problems, Mr. Walker. And that was restoring—because we saw that when we were down there on our tour—restoring the system without regard to predisaster conditions was put in as part of a third supplemental.

Also the disaster, not long term, but disaster was raised to 100 percent of the cost. Now long term, we're still looking at 90 percent, so you would be right on that.

But I don't think we took care of the issue you were talking about related to code and how you put the wires up. And, of course, the codes are put there for safety, but I would ask you, are you saying that there's some of that that we could eliminate in a disaster situation that would make it easier for you all and still maintain safety?

Mr. WALKER. I'm familiar with the language that came out through the supplement, and I think it's narrowly scoped. And I think, as we consider the different types of emergencies that we have in the energy sector—so it's not only the electric component; it's the gas, it's petroleum pipelines, it's the terminal ports, it's the L&G sites that we've got—as we consider those things going forward, I think the language needs to be expanded, and I'm happy to provide, you know, potential edits to this committee for reconsideration.

Mr. GRIFFITH. And let me say, we would love to see those suggestions, and so forth, because you might have been able to tell from the questioning, all of us on both sides of the aisle want to try to help these areas that were so devastated—

Mr. WALKER. Sure

Mr. GRIFFITH [continuing]. In the islands.

Mr. WALKER. I appreciate that opportunity.

Mr. GRIFFITH. Mr. Alexander, good to see you again. Did you have something else you wanted to add?

Mr. ALEXANDER. Yes, sir, if I may. While not the long-term resilient grid that we know we all need, the grid that we're restoring today is going to be in much better condition than the grid that was there last August.

We are repairing lines to code. Those crews would not work to any less standards for life, health, safety, and legal reasons.

There are new transmission and distribution lines. There are new lattice towers. There are new poles. So, again, while not anything has been done underground or to harden or to elevate power-generation facilities or substations, the work that we have done is not all for naught. It will be a much-improved grid to what was there previously.

Mr. GRIFFITH. And I'll open it up. I'm going to have a series of questions on microgrids. And I'll open it up to anybody. I had them drafted for Mr. Walker. But I actually am a big fan of microgrids, maybe more as a part of a mesh, but so, if there is a disaster, you can break that part off and still have functionality.

So that being said, I know that a lot were used. That's correct, isn't it—the microgrids concept was used a lot in the restoration, at least getting things going? Isn't that correct?

Mr. WALKER. That is correct.

Mr. ALEXANDER. Sir, we put 10 in place. Four still in operation.

Mr. GRIFFITH. And so how were these sites selected, and are these envisioned as permanent solutions? And keep in mind that maybe these aren't, but I think microgrids maybe ought to be a part of the long-term solution, because we're going to get more storms, and we might need to have those parts that can break out and be independent when needed.

Mr. WALKER. I'll take that. DOE absolutely believes that microgrids have an opportunity to play a strategic part here, as well as in other parts of the country.

I will say that part of what we're trying to work through is the development of a model to know where and how these microgrids will interact with the system.

So the concept of just dropping microgrids in and tie them together, just does not work.

Mr. GRIFFITH. Right.

Mr. WALKER. There are some basic physics problems that we've got to figure out how to overcome. And that's what that model enables us to do.

Mr. GRIFFITH. Well, one of the towns that we visited, at one time, it had a hydroplant.

Mr. WALKER. That's right.

Mr. GRIFFITH. And while it wouldn't supply everything, if that hydroplant had still been there, if we had maintained that as a

small microgrid, it could have at least maybe supplied the hospitals or one of the schools and an emergency evacuation center.

That's the kind of thing I'm looking at. And you indicated that it could be used in other parts of the country, and I think we should use Puerto Rico, as long as we're spending the money down there, which I think is the right thing to do, use that as a testbed for this technology so that we can start building it into other places that might be remote or have issues that are similar where you might have the hydro available or some other power source available that you could have as a backup in emergency situations.

Are you all looking at that?

Mr. WALKER. That's exactly what we're looking at.

We are looking at the different opportunities we have to integrate microgrids as well as other distributed energy resources in an approach where we can optimize the utilization of those types of sources and with a keen eye at driving the cost per kilowatt down on an overall basis while simultaneously improving the power quality.

The power quality is a major issue on that island, and nearly 50 percent of the island is manufacturing.

Mr. GRIFFITH. Right. And I appreciate all your hard work on this. And it's good team work that we have going forward.

Thank you. I yield back.

Mr. HARPER. The gentleman yields back. The chair will now recognize the gentlewoman from Florida, Ms. Castor, for 5 minutes.

Ms. CASTOR. Well, thank you, Mr. Chairman and Ranking Member DeGette, for having this hearing today, and for the work of the professional staff.

And it's nice to have you here, Ms. González.

And thank you to all of you for your hard work on this.

I am very heartened by the discussion of the fact that we're not totally weighed down by the Stafford Act that says you can only repair a grid and you can't build it back in a more resilient fashion with all of the modern technology we have, with all of the tools, with the major investments we make in our national laboratories.

Mr. Byard, it's very important for the Congress to understand this: We appropriate enormous sums for the top line research, the best in the world, and now to have it out in the field applied to protect the taxpayers from the next storm. This really hits home, coming from Florida, where I've seen damage like this. But we've never had devastation of electrical grid as we've had in Puerto Rico after Maria. So is it clear to you that, in the last supplemental appropriations package, that the Stafford Act did give you all of the authority that you do need to build the more modern, resilient grid that we've been talking about, what Mr. Griffith talks about, the microgrid to build in renewals?

Do you have all of that authority, noting that we may have to go back and do some things relating to electrical grids and other disasters?

Mr. WALKER. I'm aware of the authority. The issue is you just don't build a grid overnight and integrate all of these things together. You just can't. And we're further hampered by the fact that PREPA doesn't have a good model of their system that is able to demonstrate where you would place certain things so—

Ms. CASTOR. So how do you get to that model?

Mr. WALKER. We're building the model.

Ms. CASTOR. OK.

Mr. WALKER. We're building it for them.

Ms. CASTOR. All right.

Mr. WALKER. But it's a model that they would normally have so—

Ms. CASTOR. And that same model that's going to incorporate renewable energy and also improve resiliency so we don't get into the same issues of importing a lot of fuel as well?

Mr. WALKER. Well, those are a couple of questions mixed in. But the model will enable us to answer some questions like, where do I put generation, or do I need to replace generation? There's about 5,600 megawatts of name plate generation on the island. The peak load is roughly around 2,500 megawatts. Most of the generation is in the south. Most of the load pocket is up in the north in San Juan.

They've got reactive power flow issues—

Ms. CASTOR. So before the storms—

Mr. WALKER. That the model illustrates.

Ms. CASTOR. Before the storms, renewable sources generated a mere 2.4 percent of the island's electricity, and many of the renewable energy facilities that did exist on the island were damaged. And this really gives us a fantastic opportunity.

Working with the national labs, there are scientists at the University of Puerto Rico. They've initiated an oasis. I know that Navigant Study that Mr. Tonko talked about. Mr. Walker, can you go into greater detail about how renewable energy sources are incorporated now? And then maybe you all could talk about how we build those in to protect the taxpayer in the future.

Mr. WALKER. Fundamentally, I mean, on an aggregated basis, they are not built into the system today. Two percent of that system is very small, given the opportunity that was on the island, but those were the choices that PREPA made to not put those in.

Ms. CASTOR. But they have a renewable portfolio standard of a goal of 12 percent renewables by 2019. So how will all of our Federal efforts help ensure that Puerto Rico meets that goal?

Mr. WALKER. Well, as we build this model, the model will enable us to identify where we have opportunities to put renewable energy into the island.

So, for instance, I'll give you an example, and for those who had gone down there, there are right places to put solar, and there are wrong places to put solar, as I think we saw on the island. There are right places to put wind, and there are wrong places to put wind, which is why I suggest that you just don't put all of these things into a 3,500-square-mile island without understanding the impact to reliability, the impact to resiliency, how power flows. Things like what exists today, where you've got generation in the south and load in the north, just doesn't make sense with the system that they have.

So a significant amount of electrical engineering work has to go into making the decision. And we are keenly aware of that given the fact that, in the supplement, there's \$2 billion delegated to HUD for the electric system. And what we are doing and working

with HUD to help define that and working with PREPA to get the information to build their model.

Ms. CASTOR. Thank you, Mr. Chairman.

And I did want to thank Senator Eduardo Bhatia from Puerto Rico, who has been a good resource of information on this. And thank you very much.

Mr. HARPER. The gentlewoman yields back.

The chair would now recognize the gentleman from New York, Mr. Collins, for 5 minutes.

Mr. COLLINS. Thank you, Mr. Chairman.

Just out of curiosity, so we had couple thousand temporary generators. Are they all going to stay or—I'm just thinking financially, a lot of money.

Are they going to be remaining as backup power generators, or are they being removed?

Mr. BYARD. That's a good question. There will be a number of those that remain on the island for backup generation.

If I may, Ranking Member DeGette, I need to clear one misnomer up. The legislature can direct the 100 percent, and also, the President can direct the 100 percent. I did not say that earlier so I just needed to make that note.

I apologize for that, but I wanted to—

Mr. COLLINS. Yes.

Mr. BYARD. So the generation can—generators aren't built to run for 6, 7, 8, 9 months, as you know.

Mr. COLLINS. Right.

Mr. BYARD. So some of those will be taken offline. Some of those will be, we're actively maintaining. They're owned by various other entities, through the Corps and so forth. But on our most critical facilities, we want to remain—

Mr. COLLINS. Yes, well, that's good to hear. What about the microgrids? Same kind of question. We had 10 microgrids. Now you're saying there's four. What happened to the other six? Are they still there?

Mr. ALEXANDER. They came offline as the grid was restored to those areas and those facilities that were placed there to begin with.

We've got what we call two mega-generation gas turbine-type plants, if you will, located in Palo Seco and Yabucoa that I believe will remain. Right now, we have continued to operate and maintain them, I think through the end of May. It is PREPA's intent, we understand, to ultimately purchase that equipment and use it to assist in stabilizing the power and backup to those power plants as they operate and maintain.

I don't know the future as far as the remaining four.

Mr. COLLINS. OK.

Mr. ALEXANDER. We just commissioned the one on the island of Vieques yesterday, which was welcome news to all of us.

Mr. COLLINS. Go ahead.

Mr. BYARD. I was just going to follow up a little bit further. We are working through the Unified Power Command Group on a transition of materials, on a transition of the maintenance and operating requirements to PREPA. So, again, I want to reiterate that it's not kind of handing the football off and turning around.

It is a team effort—

Mr. COLLINS. OK.

Mr. BYARD [continuing]. Throughout the push.

Mr. COLLINS. So the \$64,000 question, to use that term, as we're heading into hurricane season again—it's hard to imagine, but in 3, 4 months, we'll be there—and while, clearly, what we've done to restore power, as you've indicated, has also to some extent, hardened and improved, the question would be hard to put into terms—better off now if we got hit again this coming September? Would the island sustain the same kind of hit after all the moneys and all the effort come this September? I know you can't give a definitive answer.

Mr. WALKER. I would like to answer that.

Number one, I would like to point to Mr. Alexander's comment regarding the 50 megawatts of generation that are, in Yabucoa and 50 megawatts of generation in Palo Seco. Both of those alone changed the dynamics of the system.

Part of the slow restoration of the system early on was the lack of generation in Palo Seco. So it was one of the plants that they didn't maintain the way they should have, and 550 megawatts is offline.

So that alone—and again Yabucoa being on the southeastern portion of the island becomes a critical component. So just having those 200 megawatts of generation is very significant from an operating-the-system perspective. And then the fact that things were built back where they could be to National Electric Safety Code is important because that increases the resiliency as well.

Mr. COLLINS. I think that's the kind of answer we were kind of hoping for. We don't want to face this again, this year, next year, the following year. And I would like to think, as you're now indicating, we are better prepared. And certainly from Puerto Rico's standpoint, if we get hit again, we want to be back up a lot sooner. Is that right? Yes, there we go.

Anyway, thank you all for what you've done. I think it was a situation we've never seen before. Hope to not see again. But thank you for all your efforts. I yield back.

Mr. HARPER. The gentleman yields back.

The chair will now recognize the gentleman from California, Mr. Ruiz, for 5 minutes.

Mr. RUIZ. Thank you for being here. Thank you, Mr. Chairman.

Last year, I traveled to Puerto Rico and saw firsthand the disastrous consequences of Hurricane Irma and Maria, and I left the island heartbroken.

I visited shelters, toured hospitals, and met with survivors, doctors, and public officials, and even took care of a patient who had a seizure right in front of me. I'm a doctor, emergency medicine doctor, and had a seizure in front of me. She was at a shelter that was an elementary school turned into a shelter.

And one of their greatest needs was energy in restoration. And one of my constituents contacted my office concerned about her mother's health and well-being without power if she can't store her medications that need to be chilled and all the other medical necessities that she had.

So, to many, having energy was a matter of life and death. And it is of the utmost importance, not simply to restore energy in the islands, but to build an energy infrastructure that can respond to future natural disasters. It doesn't make sense to build it vulnerable once again.

And the other thing that I just really want to note is, when I was there, people would say, "Yes, this community has power now," but I visited those communities, and I visited those clinics. And yes, they might have electricity, but only 30 percent of what they needed. So only the lobby and one exam room had electricity, but they needed full electricity to meet the demands of their patients.

The second thing is that one can say, "Well we've got them back online," but if their generators keep breaking and they have to wait 1 week or 2 weeks to get them maintained, then that's difficult to really be assured that in reality what you're telling us that, we've got 95 or plus percent people now have power, what does that mean? Because does that mean they have 10 percent spotty power that breaks and they need a generator that also breaks? Or what does that mean?

So I think that the goal should be to have full, consistent, adequate, and resilient power so that this doesn't happen again.

I'm concerned about some of the more remote areas like Vieques and Culebra. Reports indicate that power has only recently been restored to a number of smaller outlying areas in Puerto Rico, such as Vieques and Culebra. And each day that the power was out in these towns carried significant consequences for members of these communities, including shuttering hotels and other businesses which employed significant number of people on the island.

So I would like to take a few minutes, ask Mr. Alexander: According to the grid restoration plans for Vieques and Culebra, the Army Corps was to establish generator-powered microgrids on the islands by April 10. Did it accomplish that goal?

Mr. ALEXANDER. Sir, the microgrid was commissioned yesterday.

Mr. RUIZ. So it has not—

Mr. ALEXANDER. Yesterday was 10.

Mr. RUIZ. OK. So it was commissioned yesterday.

Mr. ALEXANDER. Yes, sir.

Mr. RUIZ. All right. Does this mean that everyone on this island now has power? No.

So, when you say "commissioned," what do you mean by commissioned?

Mr. ALEXANDER. It means we have a microgrid in operation that is—

Mr. RUIZ. So everybody on the island has power?

Mr. ALEXANDER. I can't answer to that right now.

Mr. RUIZ. OK. And are these microgrids designed to serve as a lasting permanent solution for restoring power, or is this a temporary measure?

Mr. ALEXANDER. It's a temporary measure. I think, like all generators, they have a certain amount of life in there.

Mr. RUIZ. OK. All right. So, as I mentioned earlier, the Army Corps established the microgrids on Vieques and Culebra. However, the Army Corps is now conducting a responsible drawdown from the island.

Mr. Alexander, who will take over the operation and maintenance of these microgrids once the Army Corps' drawdown is complete, and how will this transition occur?

Mr. ALEXANDER. Well, our drawdown is associated with the end of our mission assignment and the funds associated with it.

It was recently extended to 18 May.

Mr. RUIZ. Sir, I'm concerned that these are temporary measures and you guys are leaving—you just mentioned you don't know if everybody still has power. So who is going to maintain these, and how is this transition going to occur?

Mr. ALEXANDER. Well, the orderly drawdown is ultimately—PREPA assumes operations, maintenance. They assume the restoration of the remaining percentage of service to customers.

Mr. RUIZ. And have they told you they have the capacity to do that right now?

Mr. ALEXANDER. They are part of this Unified Command Group. You will have a member of that command group testify in your second panel here this afternoon, but that is the plan.

PREPA dictates the priorities with respect to line assignments. And so this transition, it's planned. There should not be any gaps.

Mr. RUIZ. OK. So we haven't fully restored yet, and I hope the transition is adequate. So thank you.

Mr. HARPER. The gentleman yields back. We'll let members know that votes have been called about 5 minutes ago, but I think we will try to conclude here.

And I'll recognize the gentlewoman from Illinois, Ms. Schakowsky, for 5 minutes.

Ms. SCHAKOWSKY. Thank you very much.

I've been in close touch with the mayor of San Juan who—and I was watching some clips the other day where FEMA, a woman representing FEMA, said that Puerto Rico was a “good news story.” This was when people were dying, without electricity. I do want to talk about electricity. But in general, let me ask you, from FEMA, do you think the way things were handled in Puerto Rico is a good news story?

Mr. BYARD. Ma'am, what I know is Puerto Rico was devastated by a 1-mile per hour under a Category 5 storm.

The island, all 3,500 square miles of the island was impacted by a storm.

What I can tell you from FEMA's perspective is we were there before the storm hit. We moved a tremendous amount of resources, tremendous amount of personnel collectively from the Department of Defense to the Department of Energy to massive amounts of nongovernmental NGOs. All on an island with limited air capacity, limited port capacity that had to be sequenced in and moved in.

FEMA traditionally comes in to any State, as we did in Texas, in Harvey—and no two disasters are alike—and we supplement the local and State efforts.

In this situation, we quickly had to realize that we were the final mile for a long time.

I think there's a lot of work to do, ma'am, in the books not written on the unique opportunity that we have to recover Puerto Rico in a more resilient fashion.

Ms. SCHAKOWSKY. Well, I want to try and get a better understanding of FEMA and the Army Corps efforts to restore the electrical grid on the island.

Last October, Major General Donald E. Jackson, the Army Corp's Deputy Commanding General for Civil and Emergency Operations, told the Senate Homeland Security and Government Affairs Committees that the Army Corps is responsible for restoring Puerto Rico's electric grid to "pre-storm condition."

So, Mr. Alexander, can you please elaborate on what pre-storm condition means and provide us with an update on the Army Corps' progress.

Mr. ALEXANDER. Pre-storm condition would be, in essence, what we put it in place, is exactly what the grid was like before the storm. And the reality is, as I mentioned earlier, that is not in fact the case.

We have put in place new transmission, distribution lines, new towers, new poles, other power generation equipment. It is not the resilient grid that we all recognize is needed, but it is in much better condition.

Ms. SCHAKOWSKY. So you're saying actually it's better than pre-storm condition.

Mr. ALEXANDER. It's no secret that the grid was in very poor condition before the storm hit. It is in much better condition today. We are at 96.7 percent. We still have 49,000 customers without power.

That number is connected to the meters. Now whether residents or businesses inside those dwellings have the capability to draw that power or not, I can't speak to that.

Ms. SCHAKOWSKY. OK.

Mr. ALEXANDER. But that's where we're at. Our mission assignment is extended to the 18TH of May. We've got over 500 contractors remaining under our control. PREPA has an additional 800, plus 600 contractors.

Ms. SCHAKOWSKY. So do you think everything will be fully restored then by May, that May date?

Mr. ALEXANDER. Ma'am, we're going to do everything possible to get as close to 100 percent as possible.

This is the most difficult terrain. The production rates are going to be hard to estimate. Much of the work has to be done by using helicopters and inserting crews and material. So you have air control issues there in terms of people working—

Ms. SCHAKOWSKY. So, if it's not done, are you out of there, anyway?

Mr. ALEXANDER. Excuse me, ma'am?

Ms. SCHAKOWSKY. If it's not done, are you out of there anyway?

Mr. ALEXANDER. Ma'am, that's probably a narrative that I would like to correct. It's not the Corps' decision whether to stay or leave. We are there under a FEMA mission assignment.

Ms. SCHAKOWSKY. OK.

Mr. ALEXANDER. We will stay as long as we have to and we have the authority and the resources to do.

Ms. SCHAKOWSKY. No, that was just a question. I don't know. I didn't know that. So, it's not—

Mr. ALEXANDER. We have never unilaterally said, "We're going home on this date," and we've done all the deliberate planning to

properly transition and turn over equipment and lines in the event, 18 May does come, and we do depart.

But 18 May will come, and that means crews will stop work, but then there will be an orderly demobilization. Corps personnel will still be there, working with, advising, consulting with our inter-agency partners and with PREPA and with the Commonwealth government.

Ms. SCHAKOWSKY. OK. My time is expired. Thank you.

Mr. HARPER. The gentlewoman yields back.

Ms. SCHAKOWSKY. I'll submit some more questions for the record.

Mr. HARPER. And any questions that are submitted, we would ask, in very short order, that you respond to those.

Seeing there are no further members wishing to ask questions, I want to thank each of our witnesses on our first panel for being here with us.

Ms. DEGETTE. Can I say something for the record?

Mr. HARPER. Certainly. I would now recognize Ranking Member DeGette.

Ms. DEGETTE. Sorry. I just really want to echo what I had said before. We are asking tough questions because we want to get the right answers for Puerto Rico, but we really appreciate the work all of your agencies are doing. And we saw that when we went down and visited. Thanks.

I want to yield back.

Mr. HARPER. Well said. And I want to thank you for your time today.

It gives us a lot of details to get that update that's so important to where we are. So that concludes our first panel. We will now set up for the second panel while we go vote and come back. And so the subcommittee stands in recess.

[Recess.]

Mr. HARPER. Our second witness panel for today's hearing includes Mr. Carlos Torres, Puerto Rico Power Restoration Coordinator and Consultant for Edison Electric Institute; and Mr. Gene Shlatz, Director at Navigant Consulting.

I want to thank both of you for being here. I apologize for the delay. Some of this is just outside of our control, but thanks for your patience today in joining us.

And you're aware the committee is holding an investigative hearing, and when doing so, we have the practice of taking testimony under oath. Do you have any objection to testifying under oath?

The chair then advises you that, under the rules of the House and the rules of the committee, you're entitled to be accompanied by counsel. Do either of you desire to be accompanied by counsel during your testimony today?

In that case, if you would, I would ask that you please rise and raise your right, and then I will swear you in.

[Witnesses sworn.]

Mr. HARPER. You may be seated. Thank you.

You're now under oath, and subject to the penalties set forth in title 18, section 1001, of the United States Code. We're going to allow you to give a 5-minute summary of your written statement. And, Mr. Torres, we will recognize you first for 5 minutes. The buzzer or the light system in front of you, when you've gone 4 min-

utes, the yellow light will come on. And then, at 5, the red light will come on. So thank you very much.

You may proceed, Mr. Torres.

TESTIMONY OF CARLOS D. TORRES, POWER RESTORATION COORDINATOR, EDISON ELECTRIC INSTITUTE; AND GENE SHLATZ, DIRECTOR, NAVIGANT CONSULTING.

TESTIMONY OF CARLOS D. TORRES

Mr. TORRES. Thank you. Thank you, Chairman Harper, Ranking Member DeGette, and the members of the subcommittee.

Thank you for having me here today. My name is Carlos Torres, and I am testifying in my capacity as a Consultant with the Edison Electric Institute.

Since November 17th, I have served as a Power Restoration Coordinator in Puerto Rico and as a Member of the Unified Command Group. Prior to my position, I worked for more than 30 years for Consolidated Edison in New York. During my career, I've managed emergencies and storm restoration efforts and oversaw Con Edison's response to major storms, including Con Edison's response to major storm—Superstorm Sandy, Hurricane Irene, and emergencies such as the 9/11 attacks, and the 2003 Northeast blackout. Those events were certainly challenging.

However, the storm damage caused by Hurricane Maria is unlike anything that I or any of us in this industry has ever seen on the mainland United States.

This powerful storm affected 100 percent of the island's power generation, almost 90 percent of PREPA's transmission facilities, and 80 percent of the distribution system. Without a doubt, this power restoration mission has been the most challenging of my career.

Having lived on the island now for more than 5 months, I can tell you that the people of Puerto Rico are the most resilient that I have ever met in my life. While the resiliency is admirable, nobody deserves to be without electricity for this long.

I, and everyone involved in this restoration effort, remain committed to work as one team with one mission: restoring power safely and as quickly as possible to our fellow citizens in Puerto Rico. When I say "one team, one mission," I mean the partnership between PREPA, FEMA, DOE, the United States Army Corps of Engineers, the contractors, and the many mutual assistance crews from the electric companies on the mainland who have worked tirelessly to restore power to the people of Puerto Rico.

My written statement goes into more detail about the restoration timeline. And we do have photos running on the screen to help put in perspective the devastation and to provide a sense of the scope of the restoration effort.

So today marks 202 days since Maria made landfall in Puerto Rico. Every meeting that I start in Puerto Rico starts with "how many days since the storm hit Puerto Rico," and that's important because that puts context to the work that we're doing.

As of last night, PREPA reports that 96.67 percent of its more than 1.47 million customers who can receive electricity have had their power restored. So restoring power to the remaining cus-

tomers, most of whom are in the hardest hit and most remote areas, remains challenging and labor- and time-intensive. As mentioned before in the prior panel, it's important to note that one customer equals one electric meter, but the meter may serve several people.

PREPA made its initial ask for mutual assistance from the mainland industry on October 31st. I arrived on November 3rd with my colleague Manny Miranda, senior vice president of power delivery at Florida Power & Light.

Working closely with the Unified Command, we started to formulate a comprehensive massive restoration plan. Given the intensive and extensive damage to PREPA's transmission system, it was critical that the transmission reestablishment plan and the distribution and subtransmission plan be well-coordinated to restore power safely to the island.

Typically, when a storm or an incidence occurs, electric companies utilize a mutual assistance process to increase their workforce. It is important to remember that crews do not arrive automatically. A formal request for mutual assistance must be made by the affected electricity provider. The recipient of the assistance pays for it. The companies providing the mutual assistance are compensated on a not-for-profit basis for providing this service. I'll say that again: the companies committed to this mutual assistance effort are doing this at cost.

To date, nearly 60 investor-owned electric companies and the public power utilities have committed personnel, equipment, and materials to the effort. Overall, approximately 3,000 industry line workers and the support personnel have been involved in the restoration effort to the island.

The challenges that we have encountered during this restoration mission are numerous and too detailed in the 5 minutes that I have, but I am proud to say that the difficulty of this work has been met with professionalism and determination by the men and women that work day in and day out to restore power.

Every single effort, a point has been reached when a substantial amount of work is completed and the type of workers needed to complete the job are reassessed. In many cases, more people simply does not mean that work gets completed faster. This is especially true in Puerto Rico's mountainous regions and roads.

I like to use the analogy that you can only fit so many mechanics around an engine of a car. As of today, mutual assistance crews have finished their mission and have returned to the mainland, and the restoration plans that PREPA and the remaining contractors will now converge to the hardest hit areas to restore power.

In closing, the 2017 storm season in general and the experience in Puerto Rico specifically has been historic.

I firmly believe that no one company has done this alone, and I am honored and humbled to have been involved as a team member in this mission.

I look forward to your questions.

[The prepared statement of Mr. Torres follows:]

“Update on the Restoration of Puerto Rico’s Electric Infrastructure”

Carlos D. Torres

Consultant, Edison Electric Institute

Power Restoration Coordinator, Puerto Rico

Summary

Since November 2017, I have served as the Power Restoration Coordinator in Puerto Rico and as a member of the Unified Command Group.

Prior to my current position, I worked for more than 30 years for Consolidated Edison in New York. During my career, I managed emergency and storm restoration efforts and oversaw Con Edison’s response to major storms including Superstorm Sandy and Hurricane Irene, and emergencies such as the 9/11 attacks and the 2003 Northeast blackout.

However, the damage caused by Hurricane Maria is unlike anything any of us in the industry has ever seen on the mainland United States. Without question, this power restoration mission has been the most challenging of my career.

Having lived on the island now for more than five months, I can tell you that the people of Puerto Rico are the most resilient people I have ever met in my life. While their resiliency is admirable, nobody deserves to be without electricity for this long, and I and everyone involved in the restoration effort remain committed to working as one team, with one mission—providing power to our fellow citizens in Puerto Rico.

As of April 8, PREPA reports that 96.4 percent of its customers—or approximately 1.42 million out of more than 1.47 million customers—who can receive electricity have had their power restored. While significant progress has been made across the island, restoring power to the remaining customers, most of whom are in the hardest-hit and most remote areas, remains challenging and labor- and time-intensive.

To date, nearly 60 investor-owned electric companies and public power utilities have committed personnel, equipment, and materials to the effort. Overall, approximately 3,000 industry lineworkers and support personnel have been involved in the restoration effort on the island. That spirit of “mutual assistance” is a hallmark of our industry.

Testimony for House Energy and Commerce Committee
Oversight and Investigations Subcommittee
“Update on the Restoration of Puerto Rico’s Electric Infrastructure”

Carlos D. Torres
Consultant, Edison Electric Institute
Power Restoration Coordinator, Puerto Rico

Chairman Harper, Ranking Member DeGette, and Members of the Subcommittee, thank you for inviting me today. My name is Carlos Torres, and I am testifying in my capacity as a consultant to the Edison Electric Institute (EEI). EEI’s member companies provide electricity for 220 million Americans and operate in all 50 states and the District of Columbia. In addition to the investor-owned electric companies EEI represents, the electric power industry includes public power utilities and electric cooperatives, which are represented by the American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA), respectively.

Since November 2017, I have served as the Power Restoration Coordinator in Puerto Rico and as a member of the Unified Command Group working to restore power to the island following Hurricane Maria. Also serving on the Unified Command Group are senior officials from the Puerto Rico Electric Power Authority (PREPA), the Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers (USACE).

Prior to my current position, I worked for more than 30 years for Consolidated Edison in New York, retiring in October 2017 as Vice President of Emergency Preparedness & Business Resiliency. During my career, I managed emergency and storm restoration efforts and oversaw Con Edison's response to major storms (including Superstorm Sandy and Hurricane Irene) and emergencies such as the 9/11 attacks and the 2003 Northeast blackout.

Since those events, our industry has worked hard to improve our disaster preparedness, response, and recovery efforts. Based on my personal experience, I believe we have never been tested more than in the response and recovery effort in Puerto Rico following Hurricane Maria.

As you may know, March 20 marked the six-month anniversary of the day Hurricane Maria made landfall in Puerto Rico. On September 20, 2017, this devastating Category 4 hurricane swept over the island, impacting all critical infrastructure, including the energy grid. Puerto Rico has 2,400 miles of transmission lines across the island and 30,000 miles of distribution lines with 300 substations. It is estimated that at least 80 percent of the grid was affected by the storm.

As of April 8, PREPA reports that 96.4 percent of its customers—or approximately 1.42 million out of more than 1.47 million customers—who can receive electricity have had their power restored.¹ While significant progress has been made across the island, restoring power to the remaining customers, most of whom are in the hardest-hit and most remote areas, remains challenging and labor- and time-intensive.

¹ It is important to remember that there will be some customers who will not be able to receive power due to the severity of damage to their homes and businesses. As of April 8, PREPA reports that current load was 96.4 percent of the average pre-storm load.

Having lived on the island now for more than five months, I can tell you that the people of Puerto Rico are the most resilient people I have ever met in my life. Every single person on the island was impacted by Hurricane Maria, and many continue life today, dealing without power, without water. While their resiliency is admirable, nobody deserves to be without electricity for this long, and I and everyone involved in the restoration effort remain committed to working as one team, with one mission—providing power to our fellow citizens in Puerto Rico.

The damage caused by Hurricane Maria is unlike anything any of us in the industry has ever seen on the mainland United States. Without question, this power restoration mission has been the most challenging of my career. Hurricane Maria caused historic damage to Puerto Rico's infrastructure, creating considerable logistical challenges that complicated how crews, equipment, and materials were mobilized.

My testimony seeks to explain the role that the industry on the mainland has played in the power restoration mission; enumerate the complexities and challenges on the island; and identify lessons that can be gleaned from this extraordinary event. I'd like to share with the Subcommittee where we are today, how we got here, where we are going from here, and what lessons we have learned. To be clear, my work in Puerto Rico has been focused exclusively on the short-term restoration. I will leave it to others to address the future.

The Puerto Rico Response

I know first-hand from my years of handling storm response for Con Edison, mutual assistance is a cornerstone of electric company operations during emergencies and is essential to contingency

planning.² The mutual assistance network—a voluntary partnership of electric companies from across the country and Canada—helps to speed restoration whenever and wherever assistance is needed, when it is safe to do so.

Typically, when major storms or incidents occur, electric companies utilize the mutual assistance process to increase their workforce. It is important to remember that crews do not arrive automatically; a formal request for mutual assistance must be made by the affected electricity provider. The recipient of the assistance pays for it, and companies providing the mutual assistance are compensated, at cost, for providing service.

Each segment of the industry—investor-owned, cooperative, and public power—has a mutual assistance network of crews and contactors. All three networks work together to ensure customers, regardless of their electric company’s ownership type, have their power restored safely and as quickly as possible.

Soon after Hurricane Maria made landfall, President Trump signed a major disaster declaration for Puerto Rico to provide federal assistance with the storm response and recovery efforts. On September 26, the President announced that the federal government would cover 100 percent of the costs associated with debris removal and various emergency protective measures in Puerto Rico for the first 180 days of the response mission. On February 23, the President extended the

² The natural gas and steam sides of the electric power industry also utilize mutual assistance. In addition, nearly 140 electric and natural gas companies from all segments of the industry have joined an industry-wide cyber mutual assistance program that will help companies restore critical computer systems following significant cyber incidents.

100-percent cost share for emergency protective measures, including emergency power restoration, an additional 60 days.

In the initial days and weeks after Maria, the government's focus was on damage assessments, life-saving rescues, and medical missions, as well as providing emergency support, temporary power, food, water, and other commodities for devastated communities. At the same time, Puerto Rico Governor Ricardo Rosselló entered into intergovernmental agreements with the governors of New York and Florida, which led to electric power industry subject matter experts, damage assessors, and crews from New York and Florida being deployed to Puerto Rico to conduct damage assessments and assist with the initial response efforts.

PREPA did not make an official request for mutual assistance until October 31, when EEI and APPA received a letter asking for support on the island. On November 4, PREPA expanded its aid request to include NRECA.

Since then, EEI, APPA, and NRECA have been working together and with their member companies, PREPA, and federal government partners to support this mission. Companies from across the country have responded to the call for help. Nearly 60 investor-owned electric companies and public power utilities have committed crews, equipment, and/or materials to the emergency power restoration mission.

Following is a brief timeline of the mutual assistance response.

November-December 2017

Within days of receiving the request for mutual assistance, EEI asked me to deploy to Puerto Rico to assess the situation on the ground. I was joined by Manny Miranda, Senior Vice President for Power Delivery at Florida Power & Light Company, and we arrived on the island on November 3. We began assessing storm damage and met with officials from PREPA, FEMA, USACE, and the Department of Energy (DOE). Working closely with these stakeholders, we started to formulate a comprehensive master restoration plan. Given the extensive damage to PREPA's transmission system, it was critical that the transmission reestablishment plan and the distribution/sub-transmission plan be well-coordinated to restore power safely to the island.

On November 22, I was appointed by Governor Rosselló to serve as the Power Restoration Coordinator to oversee the multi-pronged restoration effort. As a first step, Manny and I worked to create an incident command structure that included a command staff based in San Juan. An incident command structure did not exist at PREPA prior to Maria. Incident command structures commonly are used to manage large restoration efforts on the mainland and are essential to effective, efficient, and safe power restoration.

Because mutual assistance plans were not in place in Puerto Rico as they were in Houston and Florida (during Hurricanes Harvey and Irma), for example, our command staff team first had to build operating infrastructure—logistics, supply chains, housing and food, etc.—before deploying restoration personnel. Applying the lessons we learned from our experiences, we recommended to PREPA that it create seven regional incident management teams (IMTs) to align with its already-existing seven regions (see map) to expedite the restoration. These IMTs

arrived in December and worked with PREPA, FEMA, and USACE to coordinate and support the restoration effort.³

This first wave of mutual assistance was designed to enhance the organizational structure and to get needed personnel, equipment, and materials to the island.



January-April 2018

Once the incident command structure was in place with the central IMT and the regional IMTs were in place and fully staffed, the industry deployed additional crews, equipment, and materials in January to accelerate the ongoing power restoration efforts across the island. Nearly 1,500 additional restoration workers and support personnel from investor-owned electric companies were deployed to the island to work under the direction of the seven IMTs; public power utilities

³ Logos in map correspond to the regional IMT organization.

also sent mutual assistance crews.⁴ Nearly 20 barges carried more than 1,000 trucks and other equipment. The arrival of crews from mainland electric companies was the culmination of months of critical—but much less visible—work necessary to make this effort a success.

In addition to sending crews, trucks, and equipment, companies also identified and shipped from their stocks critical materials, including poles, transformers, insulators, wire, and other hard-to-manufacture components. It is important to note that some of the material needed on island was time-consuming to manufacture and that the availability of some supplies and materials was strained due to the earlier hurricanes and the wildfires on the mainland.

The deployment of additional crews represented the next phase in the mutual assistance response. With this new wave, the power restoration workforce grew to nearly 6,000 and included the resources already working on the island from PREPA's own crews, PREPA's contractors, the contingent of crews from New York who were working as part of the intergovernmental agreement (an Emergency Management Assistance Compact), and crews mobilized under contracts awarded by USACE.

The deployment of mutual assistance crews was facilitated through a memorandum of understanding (MOU) agreement that was developed by APPA, EEI, and NRECA. The MOU is structured on existing mutual assistance agreements and allows electric companies on the mainland (that are members of APPA, EEI, or NRECA) to enter into emergency agreements to provide resources and workers to PREPA on a not-for-profit basis. The MOU signed by PREPA

⁴ Overall, approximately 3,000 industry lineworkers and support personnel have been involved in the restoration effort on the island.

and the companies providing mutual assistance also requires that this assistance be provided on a not-for-profit basis.

As of April 8, 96.4 percent of customers across the island have had their power restored, and I truly believe that the resources, equipment, and people put in place under the organizational structure helped to accelerate the restoration process and timeline.

As of April 9, most mutual assistance crews have finished their mission and have returned to the mainland. About 90 industry representatives remain on the island through the New York contingent. It is common in any restoration effort (in Puerto Rico or on the mainland) for mutual assistance crews to be released as the restoration work winds down. The restoration plan ensures that PREPA and the remaining contractor crews now will converge into the hardest-hit areas and that the right number of crews/workers remain actively engaged and continue to work safely and as quickly as possible.⁵

In every single restoration effort, a point is reached where a substantial amount of work is completed and the amount and type of workers needed to complete the job are reassessed. In many cases, more people simply does not mean that work gets completed faster. This is especially true in Puerto Rico's mountainous regions with their narrow roads, where only so many trucks and so many workers can fit into one space at a time. Access to materials, not the size of the workforce, at times has slowed the restoration, but we have seen a steady

⁵ It is important to note that many of the contractors released by the mutual aid companies to PREPA will continue to work for Cobra Contracting and PowerSecure, two companies that have been contracted by PREPA.

improvement in materials being delivered to the island, and the remaining crews are well-positioned to continue making progress.

Again, this deliberate right-sizing of the workforce is typical and necessary. As is the case with all restorations, the final customers are the most difficult and time-consuming to restore; in this case, the terrain on the island is a recurring challenge.

One Team, One Mission

A restoration of this complexity and magnitude demands a response to match it. It also requires an unwavering commitment to safety. I cannot overemphasize the focus that I and my team have placed on safety throughout the entire restoration effort. My goal was—and continues to be—to ensure that everyone involved in power restoration gets home safely at the end of each day and at the end of this mission.

The partnership among our industry, PREPA, FEMA, USACE, and the government also has been critical. I have said all along—this is truly one team with one mission: to restore power to the people of Puerto Rico. So, if there is one message that I leave the Subcommittee with today, it is that strong partnerships result in strong response and recovery.

EI and the industry appreciate the Administration's ongoing support throughout the emergency response mission. In particular, President Trump's extension of the 100-percent cost share allowed crews already on the island to continue working without interruption.

One of our key partners, the DOE, is the presidentially and congressionally directed Sector Specific Agency for the energy sector. Like FEMA and USACE, DOE has been a great partner with us at every step, and I thank the agency for its role in ensuring unity of effort across government and industry responders.

What's Next?

I know there is a desire to know what lessons have been learned from Puerto Rico and how another situation like this can be avoided. This is understandable, especially given that the start of the 2018 hurricane season is less than two months away. While there is always an urge to compare storms, I have learned from experience that each storm is different and has its own set of unique circumstances and challenges.

In this case, juxtaposing the responses to hurricanes Harvey and Irma on the mainland with the response to Maria in Puerto Rico illustrates the value of mutual assistance and how preparation enables effective restoration. It also demonstrates the need for resilient infrastructure and ongoing investments in the energy grid, the importance of having a plan in place for response and recovery, and the value of a strong industry-government partnership.

In our industry, our mantra is that we want to be better today than we were yesterday, and better tomorrow than we are today. This means that, after storms or major events, we compile lessons learned and create strategies to close gaps and identify areas for improvement. Every incident tests this industry, and the 2017 hurricane season is no different. No two storms are the same, but

I know the entire industry and its government partners will use the Puerto Rico restoration, as well as the great work done after Hurricanes Harvey and Irma, to get better.

Electric companies routinely drill and exercise for all threats as they constantly strive to apply lessons learned and to enhance their response and recovery capabilities for the benefit of customers. As an example, since Superstorm Sandy, our industry has worked even more closely together and with government partners to apply lessons learned from that significant storm, to streamline restoration efforts, and to improve how the industry prepares and responds safely to large-scale major events that cause significant outages.

Companies also continue to make significant investments to harden the energy grid and to make energy infrastructure more resilient. Since Superstorm Sandy in 2012, investor-owned electric companies have invested more than \$230 billion in their transmission and distribution systems.

While it is too early to launch a formal examination into lessons learned from Hurricane Maria, I believe there are a few practices on the mainland that could have allowed for a more efficient restoration in Puerto Rico.

Assessments: Knowing specifically what part of the energy grid is damaged, and where that equipment is located, is the first step in any restoration. Damage assessments allow crews to know where to work and to prioritize work more effectively. The damage assessment process was hampered in Puerto Rico, first because of impassable roads and other logistical challenges, then because different organizations did their own assessments in their own ways. The creation

of the “unified command” was a critical step to achieving a common understanding of the damage and, thus, to developing the restoration plans to fix the system.

Pre-positioning of Crews: Hurricanes, while devastating, typically are forecast in advance and give electric companies time to plan. When responding to Irma in Florida, for example, crews mobilized days in advance and were pre-positioned just outside the impact zone to go to work once the storm cleared. While pre-positioning is a profound challenge in an island situation—companies do not want crews to become victims—it is a key element to initiating a quick restoration process.

Access to Equipment and Materials: Having access to materials is critical to any restoration. There were limited equipment reserves (e.g., poles, wire, transformers, insulators, etc.) in place in Puerto Rico prior to Maria and certainly not enough to support an emergency power restoration effort of this magnitude. This dearth of materials on the island, combined with the strong demand for material on the mainland and the fact that materials from the mainland had to be flown or barged to Puerto Rico, made everything more time-consuming. Companies on the mainland, particularly those in hurricane-prone areas, stockpile as much material as possible so that mutual assistance crews have what they need to support the recovery. Again, this was not the case in Puerto Rico.

Investments in Grid Hardening: Investments in grid hardening and smart meters reduced the number of outages and expedited restoration efforts following Harvey and Irma. There were no such investments made in Puerto Rico, and vegetation management had not been done in years.

Conclusion

The 2017 storm season in general, and the experience in Puerto Rico specifically, has been historic. I firmly believe that no one company could have done this alone, and I am honored and humbled to have been involved as a team member in this mission.

I also know there are many conversations underway about the future of Puerto Rico and the structure of PREPA. Again, my focus over the past five months has been on the short-term emergency power restoration.

I have notified Governor Rosselló that I plan to wrap up my duties as the Power Restoration Coordinator in the coming weeks. I have discussed this with PREPA's newly appointed CEO, Walter Higgins, and the rest of the Unified Command Group, and we all agree that the responsibility for the long-term management of the island's energy grid ultimately must be borne by PREPA. My team on the island and I have been transitioning with PREPA to "dress them for success" to complete the mission of restoring power to the remaining customers and to prepare the company for its next phase of recovery and mitigation.

Thank you again for having me here today, for the Committee's interest in Puerto Rico, and for your support of the restoration. I look forward to your questions.

Mr. HARPER. Thank you, Mr. Torres.

The chair would now recognize you, Mr. Shlatz, for 5 minutes for the purposes of a summary of your opening statement.

TESTIMONY OF GENE SHLATZ

Mr. SHLATZ. Thank you, Mr. Chairman.

Chairman Harper, Ranking Member DeGette, and subcommittee members, I appreciate the opportunity to appear before you today.

My name is Gene Shlatz. I'm employed by Navigant Consulting, an independent consulting firm headquartered in Chicago, Illinois. I work as the director in Navigant's global energy practice.

I have over 35 years' experience addressing challenges that are facing the electric utility industry today.

My testimony supports findings and recommendations contained in our December 11th, 2017, report titled "Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico" that Navigant and a working group comprised of industry experts performed on behalf of the Governors of the State of New York and Puerto Rico.

Our report provides an initial assessment of the electric power damage caused by Hurricanes Maria and Irma and proposes redesign and rebuild recommendations to strengthen the electric grid in Puerto Rico.

The damage caused by Irma and Maria was extensive and affected a substantial portion of Puerto Rico's electric generation and power delivery system with an attendant loss of electric service to over 1 million customers.

The magnitude of the devastation, while unprecedented, still provides or now provides an opportunity to rebuild and transform the system to one that is hardened, smarter, more efficient, cleaner, and less dependent on fossil fuels.

The estimated cost and schedule to rebuild the system and achieve this vision is \$17.6 billion over a period of 7 to 10 years.

Our recommendations, outlined in the report, include the use of modern technology and incorporation of lessons learned from successful rebuild efforts undertaken in other regions following the natural disasters such as Hurricane Sandy in New York and New Jersey.

The rebuild recommendations also align with the Department of Energy's recommendations for power system hardening and resiliency.

In short, we recommend that Puerto Rico implement resiliency and hardening measures to increase the capability of the power grid to withstand future storms.

These include modernizing the electric grid by using proven technologies to better contain outages, reduce recovery times and lower operating costs.

These actions will also enable the system to accommodate greater amounts of sustainable and renewable energy resources that in turn will reduce reliance on imported fuel.

In addition to the increased use of renewable energy resources, such as wind and solar, we recommend incorporating new distributed energy resource technologies, such as energy storage and microgrids, to provide greater reliability and resiliency. There was

significant discussion from panel 1 on that topic today, and we certainly support those efforts.

For example, microgrids would be, we would recommend, installing those critical facilities, such as hospitals, water treatment facilities, police stations, emergency shelters, and remote community most susceptible to sustain interruptions.

Turning to the transmission and distribution system, the T&D lines and substations that deliver power from generating stations to Puerto Rico's residences and businesses suffered severe damage.

As most equipment was built 40 or more years ago or longer, they were not designed or built to current industry standards and, at the time, codes and could not withstand hurricane force winds and flooding.

Consequently, many transmission lines, including critical north to south lines traversing mountainous terrain suffered catastrophic failure. Electric substation equipment damage was extensive as high winds, mudslides and water intruded into sensitive equipment.

Thus, we recommend several short- and long-term design and rebuild objectives that should be considered to build back the system to current day standards.

Specifically, the working group in Navigant recommends that PREPA's bulk power system should be designed and constructed to withstand an upper Category 4 event, meaning 150-mile-an-hour winds and heavy flood waters.

Turning to the generation system, many generating plants also encounter significant damage, particularly along coastlines where storm surge and high winds resulted in the partial or complete loss of output from these stations. Many of these generating plants that were damaged were older and less efficient than modern generation. The units also mostly burn oil and do not meet, to my understanding, current mercury and air toxic standards.

Thus, based on the initial damage assessment, the working group also established a set of priorities and recommendations, including identifying opportunities to increase the use of renewables and distributed resources; shifting fossil fuel generation to mostly dual-fuel units with natural gas as a primary fuel; reducing the reserve margin by retiring older, less-efficient units; and hardening the remaining generating facilities that remain in service.

In closing, transforming and modernizing the Puerto Rico electric grid will not be easy. An ongoing commitment by affected stakeholders, including State, Commonwealth, and Federal agencies is essential to ensure a successful outcome as the complexity of rebuilding an island grid requires a coordinated and sustained effort to undertake projects that collectively may take 10 years or more to complete.

With that, I thank you for this opportunity to speak to you today, and I am prepared to answer any questions you may have.

[The prepared statement of Mr. Shlatz follows:]

TESTIMONY OF EUGENE L. SHLATZ
BEFORE THE U.S. HOUSE COMMITTEE ON ENERGY AND COMMERCE
“UPDATE ON THE RESTORATION OF PUERTO RICO’S ELECTRIC INFRASTRUCTURE”

Summary

My name is Eugene L. Shlatz and am employed by Navigant Consulting, Inc. an independent consulting firm headquartered in Chicago, Illinois. I work as a Director in Navigant’s Global Energy Practice, the largest energy management consulting firm in the industry. We collaborate with utilities, government, investors, manufacturers, oil and gas companies, and major corporations to help them thrive in the rapidly changing energy environment. I have over 35 years’ experience addressing challenges facing the electric utility electric industry, including working in a senior management position for an electric utility. I have testified as an expert witness on a range of electric utility matters before state regulatory commissions and the Federal Energy Regulatory Commission.

My testimony supports findings and recommendations contained in the December 11, 2017 report titled “Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico” that Navigant prepared on behalf of the Governors of the State of New York and Puerto Rico. My role in this undertaking was to provide subject matter expertise and help develop recommendations for many of the topics addressed in the report. Our report provides an assessment of the electric power system storm damage caused by Hurricanes Maria and Irma, and proposes redesign and rebuild recommendations to strengthen the electric grid of Puerto Rico. A copy of our report is attached as an exhibit to my testimony.

The damage caused by Irma and Maria was extensive and affected a substantial portion of Puerto Rico’s electric generation and power delivery system, with a loss of electric service to over 1 million customers. The magnitude of devastation, while unprecedented, now provides an opportunity to rebuild and transform the system to one that is hardened, smarter, more efficient, cleaner, and less dependent on fossil fuel imports. The cost to rebuild the system and achieve this vision is \$17.6 billion. Transforming and modernizing the Puerto Rico electric grid will not be easy. An ongoing commitment by affected stakeholders, including state and federal agencies is essential to ensure a successful outcome, as the complexity of rebuilding an island electric system requires a coordinated effort to undertake projects and initiatives that, collectively, are expected to take 10 years or more to complete.

The Navigant Team and Working Group Objectives

Navigant worked closely with a Working Group (i.e. the Puerto Rico Energy Resiliency Working Group¹) comprised of industry experts to develop rebuild recommendations.² The primary goal of the Working Group's recommendations is to support the Puerto Rico Governor's Office, PREPA, interested stakeholder agencies, and the Federal Emergency Management Agency in defining first level funding requirements and electric power system rebuild recommendations. Recommendations include the use of modern technology and incorporation of lessons learned from successful rebuild efforts undertaken in other regions following natural disasters such as Hurricane Sandy in New York. Importantly, the rebuild recommendations align with the DOE's recommendations for power system hardening and resiliency.³

Navigant's report provides a roadmap outlining short-term, mid-term and longer-term actions to implement resiliency and hardening measures designed to increase the capability of Puerto Rico's electric power grid to withstand future storms. These measures include modernizing the Puerto Rico electric grid by leveraging proven power system technologies to better contain outages, reduce recovery times, lower operation costs. These actions will also enable the power system to accommodate greater amounts of sustainable energy resources that, in turn, will reduce reliance on imported fuel. This is an important public policy objective, as Puerto Rico currently relies heavily on fossil fuel, mostly oil, to run its generating plants.

In addition to the increased use of renewable energy resources, such as wind and solar, we recommend incorporating new distributed energy resource technologies, such as energy storage and microgrids to provide greater reliability and resiliency to future storms for critical infrastructure and facilities; for example, hospitals, water treatment facilities, police stations, emergency shelters and remote communities most susceptible to sustained interruptions.

¹ The Working Group included the following representatives: New York Power Authority, Puerto Rico Electric Power Authority, Puerto Rico Energy Commission, Consolidated Edison Company of New York, Inc., Edison International, Electric Power Research Institute, Long Island Power Authority, Smart Electric Power Alliance, U.S. Department of Energy, Brookhaven National Laboratory, National Renewable Energy Laboratory, Grid Modernization Lab Consortium, Pacific Northwest National Lab and PSEG Long Island, an agent for and on behalf of the Long Island Lighting Company d/b/a LIPA.

² Navigant provided power system subject matter expertise, project management and report development as a consultant to the Working Group.

³ *Hardening and Resiliency: U.S. Energy Industry Response to Recent Hurricane Seasons*, Infrastructure Security and Energy Restoration, Office of Electricity Delivery and Energy Reliability, US Department of Energy, 2010.

Proposed Rebuilds and Grid EnhancementsTransmission and Distribution System

The transmission and distribution lines and substations that delivery power from electric generation stations to Puerto Rico's residences and businesses suffered severe damage from hurricanes Irma and Maria, as most equipment was not designed and built to withstand hurricane-force winds and flooding. The Working Group estimates that only 15 percent of the transmission system is built to withstand Category 4 (or 5) hurricanes. Consequently, many transmission lines, including critical north-south lines traversing mountainous terrain, suffered catastrophic failure. Mudslides and unstable terrain also caused many structures and towers to topple. Electric substation equipment damage was extensive as high winds, mudslides and water intrusion into sensitive equipment and buildings containing control panels and switches. Up to 75 percent of distribution lines were damaged by high winds and flooding.

The Working Group recommends several short-term recovery objectives and longer-term design and rebuild objectives to be considered when building back the T&D system. These include rebuilding the Puerto Rico electric power system to current codes and industry best practices, hardening for greater storm resiliency, and designing for the future. To harden the transmission and distribution (T&D) infrastructure, physical and structural improvements to lines, poles, towers, substations, and supporting facilities will be needed to make them less vulnerable to the damaging effects of hurricane winds and flooding.

Specifically, he Working Group recommends that PREPA's system should be designed and constructed to withstand an upper Category 4 event (155 mph winds) and heavy flood waters. To harden and enhance the resiliency of PREPA's system, the following measures are proposed for the T&D system:

1. Reinforce existing direct-embedded poles with enhanced support such as perimeter injected concrete grout or other soil stabilization
2. Upgrade damaged poles and structures to a higher wind loading standard
3. Strengthen poles with guy wires
4. Install underground power lines in select areas prone to high wind damage

5. Modernize the T&D system via smart grid investments to make the system less susceptible to extended outages
6. Install automated distribution feeder fault sectionalizing switches to enable fault isolation and reduce outage impact
7. Deploy modern control systems to enable distributed energy resources (DER) integration and encourage their development
8. Adopt effective asset management strategies, such as the targeted inventory of critical spares
9. Institute consistent vegetation management practices, including changing tree trimming standards
10. Apply enhanced design standards for equipment and facilities damaged in the recent storms

These recommendations include relocating existing high voltage transmission lines from difficult to access and unstable mountainous terrain to new rights-of-way along existing highways, installing flood barriers or raising equipment in substations, and locating distribution lines away from transmission lines. They also include upgrading communication and control systems to limit the number of customers affected by storms and to improve system operator's ability to restore service once interruptions occur; upgrades systems and procedures also are needed to manage and integrate the distributed resources and microgrids that the Working Group recommends to enhance resiliency and reliability of electricity supply to critical facilities and infrastructure.⁴

Generating Stations

Many electric generating plants encountered significant damage, particularly along coastlines, where the storm surge and high winds resulted in the partial or complete loss of output from these stations. Inspections conducted by experienced personnel from NYPA and ConEdison indicated damage to cooling towers and unprotected or exposed turbines and boilers, and fuel handling facilities. Delivery of electricity from plants that remained on line was complicated by the loss of electric switchyards and transmission lines, including those that deliver output from generating plants located along the southern coast to major load centers in the north. One major plant, Palo Seco, experienced significant damage to such an extent that the Working Group recommends a complete upgrade or replacement of most units. Similar to T&D facilities, the full extent of damage to these stations and necessary repairs should be

⁴ Enhanced communications and controls also are required for load reduction measures that the Working Group recommends to reduce electricity production from conventional generating stations during periods of high demand.

determined by a detailed engineering assessment and testing to supplement and confirm the findings obtained during initial inspections.

Many of the generating units that were damaged are older and less efficient than modern generation. These units also mostly burn oil and do not meet current Mercury and Air Toxic standards (MATS). Notably, pre-storm generating capacity, including independently-owned generation sources,⁵ was almost 6,000 MW, or approximately 100 percent above the recent system peak of just above 3,000 MW. The system peak has dropped by over 15 percent from the previous peak of 3,600 MW and further decreases may occur due to post-storm migration to the mainland.

Based on the initial damage assessment and above observations, the Working Group's evaluation of Puerto Rico's generating fleet led to the following priorities and recommendations:

1. Expedite near-term restoration of power to the island
2. Identify opportunities to increase the use of DER
3. Develop new targets for renewable resources (Renewable Portfolio Standard or RPS)
4. Shift oil-fired fossil generation to mostly dual-fuel units, with primary fuel as natural gas
5. Harden the remaining generating facilities that will remain
6. Consider a reduction of the generation reserve margin to 50%

The primary modifications recommended by the Working Group was the conversion and upgrade of existing generators at Palo Seco and Aguirre to highly efficient, dual-fuel units that meet MATS requirements, with natural gas as the primary fuel source. It includes the planned Aguirre Offshore Gas Port along with marine infrastructure and pipeline to shore for gas delivery to shore would enable the conversion of the Aguirre generation plant to natural gas. These plants also would be capable of provide the operating flexibility needed to accommodate the large amount of renewable generation the Working Group anticipates will be installed in Puerto Rico over the next decade and beyond. Additional study is needed to determine the reduction in reserve margin that can be achieved while maintaining reliability of supply throughout the island.

⁵ 961 MW is provided by two co-generators (EcoElectrica and AES-PR) through 20-year power purchase operating agreements (PPOAs). EcoElectrica, L.P. in the Municipality of Peñuelas (507 MW of gas-fired capacity) and AES-PR in the Municipality of Guayama (454 MW of coal-fired capacity) are the two largest sources of generation on the island

The issues noted above will require the 2015 Integrated Resource Plan (IRP) approved by state regulators to be modified to ensure all relevant factors are considered, including the potential impact of increased DER, increased renewable targets, shift of fossil generation to natural gas, and reduction of system reserve margin. The updated IRP could include a recommendation to retire generation plants where upgrades or repairs are proposed and therefore, not require the full level of estimated expenditures for rebuild or hardening outlined in my testimony.

Rebuild Cost Summary

The following table provides a breakdown of the Working Group's \$17.6 billion cost estimate for the recommended power system rebuild investments. We expect these costs may vary as more detailed engineering and testing is performed, and after Each line item estimate includes a 30% scope confidence escalator. Final cost estimates require multiple engineering studies and an updated IRP the IRP is updated. Accordingly, each line item estimate includes a 30 percent scope confidence escalator.

Rebuild Recommendations	Total (Millions)
Overhead Distribution (includes 38 kV)	\$5,268
Underground Distribution	\$35
Transmission - Overhead	\$4,299
Transmission - Underground	\$601
Substations – 38 kV	\$856
Substations – 115 kV & 230 kV	\$812
System Operations	\$482
Distributed Energy Resources	\$1,455
Generation	\$3,115
Fuel Infrastructure	\$683
Total Estimated Cost	\$17,606

Summary

As noted, transforming and modernizing the Puerto Rico electric grid will not be easy. An ongoing commitment by affected stakeholders, including state and federal agencies is essential to ensure a successful outcome. Further, a rebuild project of this magnitude requires the consideration of several technical and non-technical factors necessary for the success of the project including, but not limited to those listed below.

- **Management of Cash Flow** – Work that is proposed as a reimbursement from other funding sources, including federal funding, requires upfront expenditures.

- **Stafford Act Compliance** - Generally, federal funding requires the use of US-sourced material, a strict procurement process, a strong quality assurance capability, strict accounting, and an on-going audit process.
- **Supply Chain** – Competitive bidding on both equipment purchases and construction contracts is needed.
- **Labor Force** – Recommendations in this report will require development of the on-island workforce to operate the system with new technologies and methods.
- **Stewardship** – It is critical that strong asset management principles and practices are implemented with the reinstallation and replacement of power system equipment.
- **Organizational Change Management** - Our report proposes a significant amount of grid modernization and the use of new technologies, systems, and operating methods. PREPA and related stakeholder agencies will need to consider the impacts of these changes and institutionalize new business processes, systems and organizational roles and responsibilities.
- **Stakeholder Engagement** – Many of the Working Group recommendations will require extensive stakeholder engagement.
- **Project Management** - Effective project management will be required to deliver on the rebuild recommendations, optimize the use of federal funding, provide transparency and accountability, and comply with federal tracking, control and reporting requirements.

This concludes my testimony.

Mr. HARPER. Thank you very much.

Members will now have an opportunity to ask questions of you. I'll recognize myself to begin.

And, Mr. Torres, if I may start with you.

You certainly have an extensive career and experience in emergency management, long time. And your comments about this being the most severe certainly goes noticed. But you've certainly led recovery efforts following many severe natural disasters such as Sandy and others.

What has made this such a long and difficult recovery? And I know geography and terrain presented challenges, but were there other factors that contributed or are contributing to the challenge?

Mr. TORRES. I think just the sheer fact that it's an island, I think is one factor.

The other factor is getting people, the restoration workers, to the island, the logistics that are needed to bring the materials and the equipment.

Also, materials were definitely an issue that I've never dealt with, and I think the challenge for the whole Unified Command Group and working with the Army Corps of Engineers and FEMA to try to secure those materials, having had Harvey, Irma, and then the forest fires in California really put a stress on the ability to have those materials available.

So we we worked with our partners to try to secure it and get it there as quickly as possible, and they used every means possible, using barges to deliver the very heavy equipment materials, as well as airfreighting materials as quickly as possible.

Mr. HARPER. Right. So many factors that you're discussing, but was there anything in particular about PREPA, for example, their management practices, system design, or maintenance response capabilities that stood out to you as different than what you would have encountered elsewhere in the United States?

Mr. TORRES. As I mentioned in my statement, I don't think any one company can handle an event of this nature. And when Manny and I went down—I'll say we injected ourselves very quickly into understanding PREPA's challenges and what their capabilities were, and we quickly said: We have to put these incident management teams in place. And these IMTs I think really served to support PREPA, but it doesn't leave PREPA out of it. They are still responsible. And they were part of delivering the plan.

It's their plan. We helped them develop the plan. Again, and I'll talk, and in my 30 years in the business, I've never seen such an extensive damage to the transmission system. And having to build a transmission system, I can say I've done one now. But it was a challenge, and a very big learning experience for myself, and I'm sure for everybody involved in that whole process.

Mr. HARPER. Thank you.

Mr. Shlatz, you also have extensive experience with electric power systems. If you did a similar assessment of the grid in, say, Florida, would you expect to find similar opportunities for improvement or hardening?

Mr. SHLATZ. Well, my understanding in Florida, many of the utilities, for example, Florida Power & Light, have already upgraded their system to withstand hurricane force-type winds, and I think

that may have been proven in the last hurricane. So I think there's quite a distinction between the design and construction standards that exist today in Puerto Rico versus Florida and other States as well.

Mr. HARPER. Obviously some of the issues, such as the mountainous terrain, some of these issues would be different, but when it comes to things like poles, substations, integration of distributed resources, is there a dramatic difference in the resiliency of systems outside of Puerto Rico?

Mr. SHLATZ. I think the mere fact that the facilities were deteriorated, my understanding is they hadn't been maintained perhaps up to industry standards, and the overall condition of the equipment was deteriorated. They were older. And so those factors, taken together, when you compare them to more the modern facilities that you find in the U.S., which perhaps may have been built over the past, say, 20 years, that very fact is going to underscore some of those differences in terms of the reliability of those assets and their ability to withstand storms. So I think there are distinct differences between what you see typically in the U.S., and there exceptions as you go across the country, but States which are most susceptible to hurricanes and storms either have recently or intend to upgrade their systems. So I think those account for the differences.

Mr. HARPER. Thank you very much, Mr. Shlatz.

The chair would now recognize ranking member of the committee, Ms. DeGette, for 5 minutes.

Ms. DEGETTE. Thank you, Mr. Chairman.

And, Mr. Torres, I want to also thank you for all of the work that you've done. It's been really Herculean what you've done down there.

In your written testimony, you say that efforts to restore power in Puerto Rico would have been more efficient if there had been better damage and equipment assessments, repositioning of crews, access to equipment and materials, and investments in grid hardening.

And you just told the chairman here, part of the problem was materials, which you said in your written testimony, and also the fact that it's an island, which goes to the repositioning and the other issues.

Is that right?

Mr. TORRES. Yes, I agree.

Ms. DEGETTE. So I know the response effort is underway still. But, as I said in my opening statement, hurricane season is now less than 2 months ago.

Do you think any of the lessons that have been learned can be implemented in time to be ready for the next hurricane season so if we do have some kind of a devastating hurricane, we can be repositioned, we can have better assessments, et cetera?

Mr. TORRES. So I would say in terms of materials, we are working with PREPA. I know FEMA is looking to replenish the stock that they've used during the storm, as well as securing stock for the hurricane.

Ms. DEGETTE. Right. I'm glad they're looking into it. Do you think they'll be ready?

Mr. TORRES. I believe they will.

Ms. DEGETTE. OK, great.

Mr. TORRES. In terms of materials, yes.

Ms. DEGETTE. OK, good.

Now, we heard from the Army Corps of Engineers that they're going to completely draw down by May 18th with the hope of 100 percent restoration.

Do you think that we need—but, yet, there's still 50,000 people who don't have power in some of the most difficult areas. Do you think we still need the Army Corps there? Do you think May 18th is a reasonable deadline?

Mr. TORRES. I think that you get to a point in the storm where you have to right-size the workforce. And I think PREPA is positioning themselves to have the resources on the island to take over.

Ms. DEGETTE. So you think they will likely be able to do that?

Mr. TORRES. Yes, I believe so.

Ms. DEGETTE. OK. Now, are you helping PREPA to be able to take on that increased responsibility?

Mr. TORRES. Yes, we are doing a transition with PREPA; as the workforce moves out, the IMTs, we're transitioning with them all the work packages so they can finish off the work.

Ms. DEGETTE. OK.

Mr. TORRES. So a lot of the engineering—

Ms. DEGETTE. So that work is underway?

Mr. TORRES. Yes.

Ms. DEGETTE. So I wanted to also ask: You have a lot of years of experience working in the energy industry. And so I'm sure you understand how a utility's leadership and management is so important to its ability to mount and implement an effective response effort. And you talked a little bit about this before.

We all know about PREPA's management challenges. Do you think those management challenges have been addressed sufficiently to allow PREPA to be able to manage the remaining response and recovery work once the Corps leaves?

Mr. TORRES. I've only known Walt Higgins for a short while since he's been on board and working with the PREPA team. I think that they have to meet that challenge. I think that—

Ms. DEGETTE. Do you think they can?

Mr. TORRES. I think they're going to be challenged. I think they're going to be able to do it, but they're going to be challenged, and they're going to work through it.

Ms. DEGETTE. Are there risks to utilities or a risk to ratepayers if we don't have a strong regulatory structure in place to govern the utility?

Mr. TORRES. I think regulations and having a regulatory body serves a purpose in terms of ensuring safety—

Ms. DEGETTE. OK.

Mr. TORRES [continuing]. Consistency in the standards, so I think it's very important to have a—

Ms. DEGETTE. OK. Mr. Shlatz, I wanted to commend you on your "Build Back Better" report.

Mr. SHLATZ. Thank you.

Ms. DEGETTE. And I wanted to ask you what the biggest implementation challenges to building a modernized electric grid are in Puerto Rico?

Mr. SHLATZ. There's a set of challenges, but perhaps the overriding challenge is making all this happen. There's a lot of work to be done between the transmission and distribution, generating facilities, so it's a very big effort.

Ms. DEGETTE. Yes.

Mr. SHLATZ. And it's on an island system. So strong leadership, strong management, having the materials, crews available on a continued basis. We see this happening over a 7- to 10-year period so there has to be a sustained and committed effort to get this done. A lot of coordination, a lot of material procurement, a lot of engineering. So a lot has to happen. At the same time, trying to maintain a reliable electric system is going to indeed be a challenge.

Ms. DEGETTE. And do you think that Puerto Rico is committed to meeting that challenge?

Mr. SHLATZ. I'm not sure I'm in a position to opine on that.

Ms. DEGETTE. OK.

Mr. SHLATZ. That type of organization still needs to be structured and assembled. So it's probably premature to comment on that yet, but your point is well taken because that needs to be in place.

Ms. DEGETTE. Right.

Mr. SHLATZ. A very strong organization to be able to manage such an effort.

Ms. DEGETTE. Thank you.

Mr. Chairman, this seems like a good place for us to continue our regulatory oversight. And I would just propose that we do that, and I yield back.

Mr. HARPER. The gentlewoman yields back.

The chair will now recognize the vice chairman of the committee from Virginia, Mr. Griffith, for 5 minutes.

Mr. GRIFFITH. Thank you very much, Mr. Chairman.

And thank you, Mr. Chairman and Ranking Member DeGette, for rescheduling this hearing. When it had to be canceled earlier, I was concerned because this is an important subject that we need to keep, as Ms. DeGette just said, we need to keep our oversight going so that we can make sure things continue to work as well as they have the last few months.

And I appreciate you, gentlemen, taking your time. We're closing in on a quarter of 6. You all probably have been here most of the day. We got a little delayed on a couple of things this morning, but appreciate you all taking your time to be with us this evening.

Mr. Shlatz, I'm going to ask you, based on the "Build Back Better" report recommending consideration of microgrids as a component of the rebuild effort in Puerto Rico—and in your oral testimony here today, you see that as important. As you may have heard me in the previous panel, I think microgrids are something that we ought to be looking at as a Nation for other areas that may have needs or concerns. So, based on your experience in the electric sector, what do you see as the strengths and the weaknesses of microgrids?

Mr. SHLATZ. Well, clearly the strength is the resiliency it provides. Both the electric power system and to the individual loads or communities or facilities which are equipped with microgrids.

Probably the biggest challenge or concern is one of cost. Microgrids are not inexpensive. It's a very expensive way to be able to maintain backup reliability and resiliency to the grid.

Over time, these costs, while we do expect them to go down, but right now costs of microgrid is high. And on a business case alone, it is very difficult to structure a business case on economics that would justify a microgrid in many situations.

Mr. GRIFFITH. So how do we, particularly in areas that could easily be isolated in a time of a disaster, such as an island, but also some mountainous regions or some areas we heard testimony about Florida where part of it might be fine and the other part being hit by a hurricane, how do we justify building in that cost? Because I think it's something that we probably need to do, and you mentioned in your oral testimony making sure that we had hospitals, police stations, some other facilities that were hooked in and had that capability. So what are your recommendations on how we can bring that cost down or justify to the public the spending of—

Mr. SHLATZ. Well—

Mr. GRIFFITH [continuing]. Tax dollars?

Mr. SHLATZ. From a justification standpoint, you just named the critical facilities, so those facilities where sustained power is essential, certainly that. The value of the reliability, of the need for reliability is far enhanced in that case. So, in that situation, there's a much stronger case or justification for a microgrid.

Over the longer term, the industry envisions microgrids providing support to the grid. So, to the extent that, with the proper communication and control systems, the microgrids could be properly managed, can provide reliability to the system and, to some extent, may be able to defer the need for centralized facilities—so, to the extent that those microgrids can play a role with regard to providing ongoing and firm support to the system, that further justifies the economics of a microgrid.

Mr. GRIFFITH. So kind of like the situation that I mentioned previously, where those of us who went down to Puerto Rico earlier on a fact-finding mission earlier this year—or late last year. We went to a town that at one time had had hydropower, but because it was easier to wheel it in from somewhere else, that's what they did. But if you had the hydropower as part of your mesh or grid, then, in times of emergency, they could have it with the supply going to the hospital or the school or the police station, and the rest of the time, it would just be a part of making the overall grid more resilient. Is that what I'm hearing you say?

Mr. SHLATZ. To an extent. I suspect the hydroplants, ones which are owned and operated by PREPA, are already part of the integrated grid. So, to some extent, very often those facilities can be isolated if they're capable of being able to supply those locally without tripping offline. They, in effect, represent a microgrid, but they also represent part of the integrated system. So, incrementally, I wouldn't view that as a microgrid. They operate in a microgrid fashion but—

Mr. GRIFFITH. Yes. But what happened in this case was they had just abandoned the hydro. And it struck me. I was like: Great, if you had had the hydro, you would have had something. Now, you are having to rely on it coming in from miles away and over the top of a mountain.

And that was what I was thinking, that if you had some of these smaller systems that were there, yes, they might be a part of the overall system in good times, but in bad times, they could be a bulwark against disaster.

Mr. SHLATZ. Yes. And, again, going back to my prior statement, I'm not entirely sure why the hydroplant was not available, maybe—

Mr. GRIFFITH. I think it was just out of use for a decade or so.

Mr. SHLATZ. Right.

Mr. GRIFFITH. But I was doing the research.

Mr. SHLATZ. But it needs to be connected to the loads. It needs to be able to follow the loads.

Mr. GRIFFITH. Right.

Mr. SHLATZ. In the proper manner. And there may have been an absence of adequate lines to be able to deliver that power. There may be control system problems, even operator problems.

Mr. GRIFFITH. OK.

Mr. SHLATZ. So I'm not personally aware of why that unit was or was not available, but I would view the hydro unit as being part of the integrated grid whereas microgrids typically involve smaller generation.

Mr. GRIFFITH. All right.

Mr. SHLATZ. Typically, 1 megawatt or less, combination of, say, diesel, perhaps wind, solar power, more recently, battery systems, as part of a contained grid within an area, being able to operate on a standalone basis or in parallel with the power system.

Mr. GRIFFITH. And I see that my time is up, but it's been very educational.

And thank you, gentlemen, for your help. And I was hoping to give you a chance, Mr. Torres, to weigh in on this, but another day.

Mr. HARPER. The gentleman yields back.

I just have one quick followup, Mr. Torres. Of course, one of the main problems here is this is an island. And how do you compare Puerto Rico to, say, Hawaii? How would I compare those?

Mr. TORRES. Well, they have definitely different challenges. I mean, Puerto Rico is going through—PREPA is going through a bankruptcy. It's a different situation. So the challenges that they have to deal with, it is not your typical storm response. They're dealing with a lot of issues. And luckily for them, they have the help of the Federal Government to help fund a lot of this restoration work and hopefully the recovery, reconstruction, resiliency work.

Mr. HARPER. OK. We may have one other member who would like to ask questions.

Do you have followup?

Mr. GRIFFITH. I was just going to say, maybe Mr. Torres would want to—and he may not, but give him the opportunity to maybe talk about microgrids a little bit if he wanted to.

Mr. TORRES. So, in terms of microgrids, I think they're very useful. We have used them here at the island. We had up to 10 of them; now we have 4. They do serve a purpose. But you have to still build infrastructure to get to the customers. So, be it having a microgrid or having the generation at a power plant, you still have to have an infrastructure in place, and you have to build it resiliently to be able to withstand those hurricane-force winds, floods. So I think microgrids are great because you try to centralize. Power quality is also good. But you got to manage that as a macro system.

Mr. GRIFFITH. Thank you very much.

I yield back.

Mr. HARPER. I'll recognize Ranking Member DeGette for a followup question.

Ms. DEGETTE. Let me say, we may have some additional questions—oh. We may have some additional questions that we'd like to submit to you in writing. And if you could get us those responses, that would be great.

Mr. TORRES. Absolutely.

Mr. HARPER. Great. Thank you.

The chair will now recognize the gentleman from Georgia, Mr. Carter, for 5 minutes for questions.

Mr. CARTER. Thank you, Mr. Chairman.

And thank both of you for being here today and for your work on this very important subject.

Mr. Torres, if I could ask you, based on your experience, do you feel that PREPA is prepared or understands what it needs to do to prepare in advance of future storms? Have we learned something from this? Tell me that it's going to be better next time.

Mr. TORRES. So I think we've learned, and PREPA has learned. I think we still have to sit back and do our after-action review, and we're going to do it jointly as individuals, the companies; PREPA is going to have do their own, and the Federal partners are going to do their own. And we have to get back together again and look at that.

I think any experience that you go through is a learning experience, and you have to learn from it. I think that they are going to be challenged. And I know, as part of the Unified Command, we've talked with PREPA as a partner and the need for them to bring additional resources to help manage events, to manage not just the restoration but more the future with the reconstruction and recovery and the resiliency. They are going to need resources. They're going to bring additional contractors on board to do this reconstruction work. So they're going to need a management team that's going to focus on safety, on logistics, on the materials, on the engineering. So they probably don't have that bandwidth right now, and they're going to have to work on that. So in talking—

Mr. CARTER. Have they made any improvements for the next time?

Mr. TORRES. I will say yes, that the systems that we've been put back—the large portion of their transmission and distribution system has been impacted. What we put back, we've tried to meet to their specifications.

Mr. CARTER. To their specifications.

Mr. TORRES. Yes.

Mr. CARTER. How do those specifications compare to our specifications?

Mr. TORRES. Well, that's something that Bruce Walker spoke to in the previous panel, and that's something that they have to work on. But in terms of hardening perspective, we look at their spec, and we built it to—if it was a wood pole, they prefer putting it through their specs to put steel poles or concrete poles. And that was what we tried to do when the material was available. If the material was not available, in order to expedite restoration, we went back with wood. The same thing with the wire and the insulators, the whole restoration. We tried to put it back. The same thing with the transmission system, we put back the ladder structures based on their designs, but they have new anchors and new bases, so I think that they should be able to withstand another storm. But not to say that it will not be impacted. I would be foolish to say something like that.

But I think it's built a little bit better. I think what Mr. Shlatz is looking for as part of that—the plan is make it even better.

Mr. CARTER. So let me ask you, Mr. Shlatz. Based on your work with the “Build Back Better” report, what are the obvious or the most important priorities for improving the resiliency, if you will, of the electrical infrastructure in Puerto Rico?

Mr. SHLATZ. Well, both the transmission and distribution system were heavily impacted. But the resilience of the island is dependent first upon the bulk system, which is the power generating plants and the transmission lines that deliver it ultimately to the distribution lines and to the customers.

To the extent that the transmission system, although being rebuilt well, may still be quite susceptible to hurricane damage in the future. So I would say a primary item right now is focusing on that transmission grid, ensuring that it's up to current standards. And we do recommend rebuilding it to withstand a Category 4 hurricane. So that, in my view, would be one of the higher priorities.

Mr. CARTER. So, if it were your system, that's what you would do?

Mr. SHLATZ. That's what I would do.

Mr. CARTER. OK. Anything else?

Mr. SHLATZ. Well, along with that, we are looking at damage that was done across the entire system, so identifying critical load centers. We had talked about a backup system, microgrids to critical facilities, at the same time ensuring that the lines serving those critical facilities, such as water treatment facilities, hospitals, police stations, that the power lines serving those particular loads, are certainly quite reliable, built well, and most likely to withstand damage in a future storm. So I would prioritize based on criticality of load as well as in addition to ensuring that the bulk system is intact and robust.

Mr. CARTER. OK. One last question. When will the island be 100 percent again?

Mr. SHLATZ. I'm not in a position to answer that. I'm not familiar with the day-to-day activities.

Mr. CARTER. Mr. Torres, do you have any idea?

Mr. TORRES. This being the most difficult work—the terrain is really kind of treacherous. The very narrow roads and the equipment that's needed to put the lines back up and the poles in, it needs helicopter work; it's very hard. And I equate it to——

Mr. CARTER. Is that an "I don't know"?

Mr. TORRES. Well, it's going to take time, and I can't really tell you.

Mr. CARTER. OK. Fair enough.

Fair enough.

OK. My time's up.

Thank you very much, both of you.

And I yield back.

Mr. HARPER. The gentleman yields back.

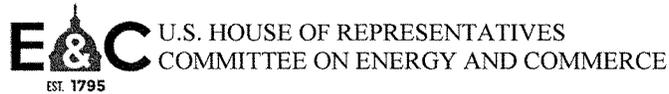
I want to thank both of you for being patient today, for being here. And, remember, too, that both staffs, this is critical for them to help us, and this process of your being here accomplishes a lot. And we commend both of you for the great work and the effort to help us as we go forward.

I anticipate that you will get a number of written questions. And so members are advised that they have 10 business days to submit questions for the record. And if that happens, I would ask you to respond as quickly as possible.

With that, the subcommittee is adjourned.

[Whereupon, at 5:56 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]



April 9, 2018

TO: Members, Subcommittee on Oversight and Investigations

FROM: Committee Majority Staff

RE: Hearing entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure"

The Subcommittee on Oversight and Investigations will hold a hearing on Wednesday, April 11, 2018, at 2:00 p.m. in 2322 Rayburn House Office Building. The hearing is entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure"

I. WITNESSES

- Bruce J. Walker, Assistant Secretary, Office of Electricity Delivery and Energy Reliability, Department of Energy;
- Jeffrey Byard, Associate Administrator, Office of Response and Recovery, Federal Emergency Management Agency;
- Charles R. Alexander, Jr., Director, Contingency Operations and Homeland Security Headquarters, Army Corps of Engineers;
- Carlos D. Torres, Power Restoration Coordinator, Edison Electric Institute; and
- Gene Shlatz, Director, Navigant Consulting.

II. BACKGROUND

a. Hurricanes Impacting Puerto Rico

2017 was one of the most active hurricane seasons on record.¹ This is reportedly the first time in recorded hurricane history that three Category Four hurricanes hit the United States and its territories in the same year.² Puerto Rico was impacted by both Hurricane Irma and Hurricane Maria, the latter causing significant damage to the island. On September 6, 2017,

¹ U.S. Dep't of Commerce, National Oceanic and Atmospheric Administration, *Above-normal Atlantic hurricane season is most likely this year* (May 25, 2017), available at <http://www.noaa.gov/media-release/above-normal-atlantic-hurricane-season-is-most-likely-year>.

² Doyle Rice, *Not your imagination: This hurricane season has been much worse than usual*, USA TODAY (Oct. 5, 2017), available at <https://www.usatoday.com/story/weather/2017/10/05/not-your-imagination-hurricane-season-has-been-much-worse-than-usual/736649001/>.

Majority Memorandum for April 11, 2018, Subcommittee on Oversight and Investigations Hearing
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Hurricane Irma moved across the Virgin Islands and the northern coast of Puerto Rico as a Category 5 storm.³ Over 1 million power customers and critical infrastructure lost power.⁴ After the storm, the Puerto Rico Power Electric Power Authority (PREPA) successfully restored power for about 70 percent of affected residents.⁵

Two weeks later, on September 20, 2017, Hurricane Maria brought heavy winds and flooding that resulted in catastrophic damage to infrastructure and loss of electrical power to nearly all of the 1.57 million customers in Puerto Rico and 55,000 customers in the U.S. Virgin Islands.⁶ The storm's winds reached over 150 miles per hour and dropped 25 inches of rain on Puerto Rico.⁷ The storm surge and rain runoff from the mountains led to sustained flooding and the island's terrain created funnels for the hurricane force winds, contributing to the extensive damage to Puerto Rico's electric infrastructure.⁸ The damage from both hurricanes resulted in the longest loss of power in the history of the United States.⁹ As of April 4, 2018, 62,000 residents are still without power on the island of Puerto Rico.¹⁰

b. Federal Response for Energy and Infrastructure

i. Overview

The preparation for, response to, and short-term recovery from these storms is dictated by the National Response Framework (NRF), a guide detailing the roles, responsibilities, and coordinating structures for the Nation from federal, state, local, and non-governmental entities. Under the NRF, states set priorities, lead, manage, and drive the overall recovery process and play a central role in coordinating recovery activities, including providing financial and technical support.¹¹ Federal assistance to the states is coordinated through the Federal Emergency Management Agency (FEMA). Working through FEMA, other federal agencies fulfill specific roles and responsibilities through Emergency Support Functions (ESF) and Recovery Support Functions (RSF) under the NRF and National Disaster Recovery Plan, respectively.

³ NY Power Authority, Puerto Rico Electric Power Authority, et. al, *Build Back Better: Reimagining the Strengthening the Power Grid of Puerto Rico*, Dec. 2017, available at https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/PRERWG_Report_PR_Grid_Resiliency_Report.pdf.

⁴ *Id.*

⁵ *Id.*

⁶ U.S. Dep't. of Energy, *Hurricanes Maria, Irma, and Harvey Summary Report*, Sept. 26, 2017, available at <https://www.energy.gov/sites/prod/files/2018/04/f50/Hurricanes%20Maria%20%20Irma%20Event%20Summary%20April%204%2C%202018.pdf><https://www.energy.gov/sites/prod/files/2017/09/f37/Hurricanes%20Maria%2C%20Irma%20and%20Harvey%20Event%20Summary%20September%2026%2C%202017.pdf>.

⁷ See Report, *supra* note 3.

⁸ *Id.*

⁹ *Id.*

¹⁰ U.S. Dep't. of Energy, *Hurricanes Maria & Irma Summary Report*, April 4, 2018, available at <https://www.energy.gov/sites/prod/files/2018/04/f50/Hurricanes%20Maria%20%20Irma%20Event%20Summary%20April%204%2C%202018.pdf><https://www.energy.gov/sites/prod/files/2018/04/f50/Hurricanes%20Maria%20%20Irma%20Event%20Summary%20April%204%2C%202018.pdf>.

¹¹ U.S. Dept. of Homeland Security, Federal Emergency Management Agency, *Nat'l Disaster Recovery Framework*, Sept. 2011, available at https://www.fema.gov/media-library-data/20130726-1820-25045-5325/508_ndrf.pdf.

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If the resources required to respond to a natural disaster or incident are beyond the capabilities of the state and the affected local government, the governor may request federal assistance, including assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act).¹² Under the Stafford Act, if a governor requests federal assistance and it is clear that the event exceeds the abilities of the state and affected local governments, the President may make an emergency or major disaster declaration.¹³ Following the Presidential declaration, the Stafford Act allows the President to provide financial and other assistance to state and local governments, certain non-profit organizations, and individuals to support response and recovery efforts.

President Trump issued disaster or emergency declarations for Puerto Rico and the U.S. Virgin Islands in response to both Hurricane Irma and Hurricane Maria.¹⁴

ii. Agency Roles

When a state requests federal assistance following a disaster, FEMA is responsible for coordinating federal support and public assistance under the NRF. In the energy and infrastructure sectors, FEMA is supported by the Department of Energy and U.S. Army Corps of Engineers.

Department of Energy. The Department of Energy (DOE) is the designated Sector-Specific Agency for the Energy Sector under the National Infrastructure Protection Plan, and serves as the lead federal coordinating agency for Emergency Support Function #12—Energy under the National Response Framework.¹⁵ In addition, DOE is authorized under the Federal Power Act to address electricity shortages and secure the grid, as well as authorized under the Energy Policy and Conservation Act to address fuel supply interruptions with drawdowns from the Strategic Petroleum Reserve (SPR).

During severe weather events, or in response to energy supply disruptions, DOE is responsible for providing clear and consistent communication to deliver situational awareness of energy sector impacts. During emergencies, regulatory assistance and waivers are often used to expedite restoration when the situation warrants. DOE provides a central location for common waivers and special permits for energy response.¹⁶

¹² U.S. Dep't of Homeland Security, Federal Emergency Management Agency (FEMA), *The Disaster Declaration Process* (last updated Apr. 6, 2017), available at <https://www.fema.gov/disaster-declaration-process>.

¹³ *Id.*

¹⁴ U.S. Dep't of Homeland Security, Federal Emergency Management Agency, Press Release, *President Donald J. Trump Signs Emergency Declaration for Puerto Rico*, Sept. 18, 2017, available at <https://www.fema.gov/news-release/2017/09/18/president-donald-j-trump-signs-emergency-declaration-puerto-rico>; see also The White House, Statement & Releases, *President Donald J. Trump Approves Puerto Rico Disaster Declaration*, Sept. 10, 2017, available at <https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-approves-puerto-rico-disaster-declaration/>.

¹⁵ See U.S. Dep't of Homeland Security, Federal Emergency Management Agency, *Emergency Support Function Annexes*, ESF 12 available at <https://www.fema.gov/media-library/assets/documents/25512>.

¹⁶ U.S. Dep't of Energy, *Energy Waiver Library*, available at <https://www.energy.gov/oe/services/energy-assurance/response-and-restoration/energy-waiver-library>.

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U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers (USACE) is the designated Sector Specific Agency for public works and serves as the lead coordinating agency under Emergency Support Function #3—public works and engineering under the National Response Framework. Generally, its role in hurricane response includes debris management, commodities distribution, temporary housing, temporary roofing, emergency power, infrastructure assessment, and support to urban search and rescue.¹⁷

iii. Role of Industry in the Electric Sector

The electric power sector relies on a collaborative, industry-led process called mutual assistance to expedite restoration efforts following an emergency. Mutual assistance establishes a formal process through which companies can request support from voluntary networks of companies and contractors within and across each segment of the industry. The company requesting aid is responsible for providing materials, lodging, and other expenses and compensating responding companies, at cost.

This process has improved over time and is now integral to many companies' contingency plans. For example, Hurricane Irma left more than 7.8 million customers in the southeast continental US without power. Through mutual assistance, more than 60,000 workers from 250 companies across the U.S. and Canada helped restore power to 95 percent of customers within one week.¹⁸

c. Restoration of Puerto Rico's Electric Infrastructure

The restoration of Puerto Rico's electric power infrastructure has been challenged by a confluence of institutional, geographical, logistical, economic, and other factors. Following Irma and the subsequent devastation from Maria, the territory's electric power utility, PREPA did not request mutual assistance. Instead, after Maria, PREPA turned to private contractors to assist with grid restoration.¹⁹ Subsequent to this decision, the Governor of Puerto Rico requested assistance from the federal government and, on September 29, 2017, FEMA issued a mission assignment to USACE to assist Puerto Rico with power restoration efforts.²⁰

Grid restoration is not a typical mission assignment for USACE. USACE, however, had contracting vehicles in place to hire contractors and the procurement and logistics infrastructure to obtain supplies in support of the restoration effort.²¹ On October 31, 2017, PREPA formally requested mutual assistance from the electric power industry.²² Due to a lack of formal mutual

¹⁷ U.S. Army Corps of Engineers, *2017 Hurricane Season*, available at <http://www.usace.army.mil/Missions/Emergency-Operations/Hurricane-Season/>.

¹⁸ Written Testimony of Scott Aaronson, Edison Electric Institute before H.Comm. on Oversight and Govt. Reform, "Bureaucratic Challenges to Hurricane Recovery in Puerto Rico," (March 21, 2018).

¹⁹ See Scott DiSavino & Roberta Rampton, *Puerto Rico Calls on U.S. Utilities to Help Restore Power*, REUTERS, Oct. 31, 2017, available at <https://www.reuters.com/article/us-usa-puertorico-power-new-york/puerto-rico-calls-on-u-s-utilities-to-help-restore-power-idUSKBN1D02EJ>.

²⁰ *FEMA: Army Corps of Engineers to Rebuild Puerto Rico's Infrastructure*, CNN WIRE, Sept. 29, 2017, available at <http://fox43.com/2017/09/29/fema-army-corps-of-engineers-to-rebuild-puerto-ricos-infrastructure/>.

²¹ See DiSavino & Rampton, *supra* note 19.

²² *Id.*

assistance agreements and the lack of a formal incident command structure, among other factors, industry crews did not arrive on the island until January 2018.²³ The request did trigger, however, the appointment of a Power Restoration Coordinator, Carlos Torres, and the establishment of a formal incident response structure to facilitate coordination and work flow across the multiple restoration teams.²⁴ Restoration work is now coordinated through a unified grid-restoration command which includes FEMA, USACE, PREPA, and the island's Power Restoration Coordinator.²⁵

One of the most significant impediments to the restoration of Puerto Rico's electric infrastructure is geography. There have been significant delays due to challenges in obtaining and shipping materials necessary to the island. These issues have been exacerbated by shortfalls on the mainland due to prior hurricane response activities, as well as PREPA's uncertain inventory of existing stockpiles within the Commonwealth. Much of the material and equipment—including, for example, bucket trucks—must be shipped, adding to delays. The island's terrain and location of existing electric infrastructure exacerbate the challenge.

Puerto Rico's electrical grid contains "2,478 miles of transmission lines, 31,485 miles of distribution lines across the service territory, and 334 substations."²⁶ PREPA is responsible for providing about 66 percent of electricity to the island and purchases the remainder from third parties.²⁷ The electrical power system provides electricity to an area that is about 110 miles east to west and 35 miles north to south.²⁸ Puerto Rico has a central mountain range that reaches about 4,390 feet at its peaks.²⁹ Because most of PREPA's transmission and distribution (T&D) is above ground, it is vulnerable to high winds and landslides associated with severe weather events.³⁰

Power generated by PREPA is concentrated on the northern and southern coast lines.³¹ Aguirre and Costa Sur are the largest and most important power generating facilities, both located on the southern coast of the island.³² This is problematic because most of the demands for power is around San Juan, on the northern side of the island.³³

The separation of generation and load resulted in transmission lines that run over the island's central mountains.³⁴ Many of the lines were built decades ago and do not follow roadways. Instead, transmission towers and lines traverse steep terrain, subject to erosion, covered with heavy vegetation. As a result, towers and lines lack sufficient rights-of-way, which

²³ See David Ferris, *Puerto Rico's Grid Recovery, by the Numbers*, E&E NEWS, Feb. 20, 2018, available at <https://www.eenews.net/stories/1060074219>.

²⁴ *Id.*

²⁵ *Id.*

²⁶ See Report, *supra* note 3.

²⁷ *Id.*

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² *Id.*

³³ *Id.*

³⁴ *Id.*

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cannot be expanded due to local protections for flora and fauna.³⁵ This challenging terrain has complicated restoration efforts, forcing crews to perform difficult work in dense forest, often via helicopters.³⁶

d. Current Status

The impact of both hurricanes caused such substantial damage to Puerto Rico's electrical infrastructure that "a significant portion of the generation, transmission, and distribution system must be rebuilt, including high voltage transmission lines that often survive lower category hurricanes."³⁷ As of early April, the USACE had obtained more than 50,000 poles and more than 5000 miles of conductor wire, with more in the pipeline. In addition, FEMA has obligated approximately \$3.5 billion to electric power restoration in Puerto Rico, including more than \$2.5 billion to USACE and \$990 million to PREPA.

At the peak of recovery efforts, 6,200 workers were in Puerto Rico "repairing transmission and distribution lines across the island, about half of them working for the corps."³⁸ In February 2018, USACE announced that it was initiating a "responsible drawdown" of its workers on the island.³⁹ As of early April, there are fewer than 1000 USACE contractors on the island and between 1000-1500 total workers.

Due to the fragility of the current infrastructure, nearly 1,000 generators provided by FEMA are still being used to power most hospitals and numerous police and fire stations.⁴⁰ As of early April 2018, PREPA reported that "89.2 [percent] of normal peak load and 95.8 [percent] of customers (1,411,086) have been restored. All 78 municipalities are at least partially energized. Approximately 62,000 customers remain without power."⁴¹ Most of the areas still without power—known as Puerto Rico's last mile—are located in "difficult and isolated terrain, from the island's southeast corner through the central mountains and out the northwest coast,"⁴² along with communities on the islands of Vieques and Culebra.

e. Future of the Grid

In December 2017, a report entitled *Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico* was published.⁴³ The report, a joint report drafted by numerous organizations from both the public and private sector, outlines a plan to improve Puerto Rico's

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ Frances Robles, *Contractors Are Leaving Puerto Rico, Where Many Still Lack Power*, NY TIMES, Feb. 26, 2018, available at <https://www.nytimes.com/2018/02/26/us/puerto-rico-power-contractor.html>.

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ Hurricane Update, *supra* note 10.

⁴² Arelis R. Hernández, *In Puerto Rico's 'Last Mile,' Power is Still Elusive as Next Hurricane Season Looms*, WASH. POST, Apr. 4, 2018, available at https://www.washingtonpost.com/national/in-puerto-ricos-last-mile-power-is-still-elusive-as-next-hurricane-season-looms/2018/04/04/00dc0cb4-1e69-11e8-b2d9-08e748f892c0_story.html?utm_term=.2bf006082f95

⁴³ See Report, *supra* note 3.

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power grid to withstand winds from a Category 4 hurricane.⁴⁴ In total, the plan estimates that the total cost to modernize the grid will be over 17 billion dollars.⁴⁵ According to the report, rebuilding objectives should include “rebuilding the Puerto Rico electric power system to current codes and industry best practices, hardening for greater storm resiliency, and designing for the future. To harden [T&D] infrastructure, physical and structural improvements to lines, poles, towers, substations, and supporting facilities will be needed to make them less vulnerable to the damaging effects of hurricane winds and flooding.”⁴⁶

Recommendations from the report include:

- Reinforce existing direct-embedded poles with enhanced support, such as perimeter injected concrete grout or other soil stabilization;
- Upgrade damaged poles and structures to a higher wind loading standard;
- Strengthen poles with guy wires;
- Install underground power lines in select areas prone to high wind damage;
- Modernize the T&D system via smart grid investments to make the system less susceptible to extended outages;
- Install automated distribution feeder fault sectionalizing switches to enable fault isolation and reduce outage impact;
- Deploy modern control systems to enable distributed energy resources (DER) integration and encourage their development;
- Adopt effective asset management strategies, such as the targeted inventory of critical spares;
- Institute consistent vegetation management practices; and
- Apply enhanced design standards for equipment and facilities damaged in the recent storms.⁴⁷

III. ISSUES

The following issues may be examined at the hearing:

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

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- What have the federal agencies learned thus far in the recovery process?
- How can Puerto Rico's electrical infrastructure be improved to prevent future catastrophic power outages?
- What are DOE's plans moving forward as the agency takes on more responsibility for the electrical infrastructure?
- What updates to the electrical infrastructure should be completed before the start of the 2018 Hurricane Season?
- How much will it cost to build a long-term electrical infrastructure capable of withstanding future Category Four hurricanes?

IV. STAFF CONTACTS

If you have any questions regarding the hearing, please contact John Ohly or Lamar Echols at (202) 225-2927.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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May 10, 2018

Mr. Jeffrey Byard
Associate Administrator
Office of Response and Recovery
Federal Emergency Management Agency
500 C Street, S.W.
Washington, DC 20472

Dear Mr. Byard:

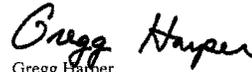
Thank you for appearing before the Subcommittee on Oversight and Investigations on April 11, 2018, to testify at the hearing entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Thursday, May 24, 2018. Your responses should be mailed to Ali Fulling, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Ali.Fulling@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Gregg Harper
Chairman
Subcommittee on Oversight and Investigations

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations

Attachment

Question#:	1
Topic:	Puerto Rico's Grid
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: How fragile is Puerto Rico's grid right now, as we head into another hurricane season and following the island-wide blackout which occurred the week of April 15th?

Response: The Puerto Rico Power Authority's (PREPA) infrastructure was fragile prior to the past hurricane season due to the age of the existing infrastructure and poor maintenance of the power grid, caused in part by liquidity issues. Producing and delivering power to customers takes generation, transmission, sub-transmission (in Puerto Rico), and distribution. PREPA has several generating units out of service for repairs or other operating factors and four generating units out of service for economic reasons, so generation is not stable. Emergency repairs on the transmission and sub-transmission infrastructure are not yet completed, and transmission forms the backbone of how power moves around the island. Finally, there is still work to do in neighborhoods to complete the distribution system. Emergency work is being completed as quickly as possible to bring power up completely across the island; however, this is not the final stage to rebuild the power grid. Therefore, the system will continue to be fragile until permanent work can be completed.

However, as we move to permanent work, the Commonwealth of Puerto Rico, PREPA, DOE, FEMA, RAND, and others are working together to design a grid that is standardized, resilient, modern, and scalable. Restoration activities conducted by PREPA and the Army Corps of Engineers have already improved many components of the Puerto Rican grid. The recovery of Puerto Rico's power grid through mitigation and permanent work will continue to result in a more stable grid system.

Thanks to action taken by Congress, FEMA has new authorities in the Bipartisan Budget Act of 2018 to provide Public Assistance funding in Puerto Rico (and the U.S. Virgin Islands) for critical services to replace or restore systems to industry standards without restrictions based on their pre-disaster condition. The law further allows FEMA to provide assistance for critical services to replace or restore components of a facility or system that was not damaged by a disaster when it is necessary to fully effectuate the replacement or restoration of disaster-damaged components to restore the function of the facility or system to industry standards.

Question#:	1
Topic:	Puerto Rico's Grid
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question#:	2
Topic:	Comparison
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: Please describe how the devastation to the island caused by Hurricanes Irma and Maria compares to the impact of hurricanes that made landfall in years past?

Response: We understand the natural inclination to compare responses to large-scale disasters. There are similarities among disasters of any kind both in terms of the effects – power outages, displaced families, damaged and destroyed property, piles of debris – and whole community response. But that is where the similarities end. An old emergency management adage – every disaster is local – sums it up best.

The path of Irma primarily affected the northern portion of the Island, while the route of Maria nearly cut the Island in half from the southeast corner to the northwest corner. Hurricane Maria was the strongest hurricane to impact Puerto Rico since 1928 and had sustained winds of up to 155 miles per hour and up to 40 inches or more of rain in some regions.

Hurricane Maria caused an unprecedented level of devastation to an already degraded power grid. Components of the transmission system toppled over in many places, often in areas with challenging topography that complicated restoration, and the distribution system, whose infrastructure was often already overtaxed by communications lines and other equipment, was mangled in locations across the Commonwealth. Several substations were flooded as well. These circumstances led to total system failure and a resulting blackout starting on September 20, 2017 that has been reported to be the longest in U.S. history.

Question#:	3
Topic:	Lessons Learned
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: What lessons did FEMA learn in responding to back-to-back hurricanes, and is the Agency better prepared to respond to a possible similarly timed series of storms this hurricane season?

Response: FEMA has learned, and will continue to learn, from the historic 2017 hurricane season. FEMA has taken steps to ensure that these lessons transform the way FEMA and the emergency management community responds to and recovers from future disasters. Some of the key lessons learned from this past year include:

- To improve FEMA's ability to scale a response for concurrent, complex incidents, FEMA plans to collaborate with federal partners and the White House to revise the National Planning Frameworks and Federal Interagency Operational Plans to emphasize the stabilization of critical lifelines and coordination across critical infrastructure sectors.
- FEMA has also updated hurricane plans, annexes, and procedures for the continental United States and OCONUS states/territories (American Samoa, Commonwealth of the Northern Mariana Islands, Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands).
- FEMA is also training and exercising with federal, state, and tribal partners to ensure readiness across the emergency management community.
- FEMA sponsored the National Level Exercise (NLE) 2018, which included a scenario of a Category 4 hurricane impact on the mid-Atlantic coast. Although the scenario was selected before the 2017 hurricane season, the exercise allowed FEMA, and the whole community, to test and validate plans and initial lessons learned from the 2017 hurricane season. More than 200 organizations participated, including governments at all levels, private businesses, nonprofit organizations, and critical infrastructure owners and operators. The events focused on several important themes from the 2017 hurricane season including pre-landfall protective actions, coordination with the private sector to manage a large-scale power outage and cascading impacts to other critical infrastructure sectors, the evacuation and sheltering of vulnerable populations, operational continuity and emergency communications, and planning for the delivery of recovery programs in a complex environment.
- To improve the overall readiness of the FEMA's incident workforce in the event of needing to staff concurrent, complex incidents, FEMA is focusing on several initiatives. These initiatives include conducting a Coordinated Workforce Review of our force

Question#:	3
Topic:	Lessons Learned
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
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structure for incident management, incident support, and mission essential functions in order to effectively deploy the incident workforce and incorporate lessons learned from the 2017 disaster season. FEMA is also professionalizing doctrine and policy that guides the Personnel Mobilization process and procedures to quickly integrate deployed staff into field operations. FEMA continues to work towards its target force structure by improving and expanding our field leadership capabilities through targeted recruiting and a formal training and development program, designed to ensure certified personnel effectively lead response and recovery operations.

- In situations where disaster response requires more than FEMA's organic capabilities, FEMA will need to augment its workforce. FEMA is updating and revising the Concept of Operations for the Surge Capacity Force and conducting additional mobilization exercises to ensure the readiness of SCF volunteers when needed. In addition to SCF support, FEMA is also bolstering the readiness of state and local partners by conducting a coordinated FEMA Qualification System (FQS)/National Qualification System (NQS) training pilot program in Puerto Rico to support the readiness of our state and local partners.
- To improve sustained whole community logistics operations in preparation for the 2018 hurricane season, FEMA has updated high-priority, national-level contracts, including the National Evacuation Contract, Caribbean Transportation Contract, and National Ambulance Contract. Specific to the Caribbean, FEMA has increased planning factors for the Caribbean and disaster supplies, including meals, water, tarps, sheeting, cots, blankets, infant and toddler kits, durable medical kits, consumable medical kits and generators on the islands in preparation for the 2018 hurricane season. In addition to the generators located at the Caribbean Distribution Center, FEMA is planning to maintain an increased number of generators in place in Puerto Rico as compared to historical numbers. FEMA is adding 300 new emergency generators to the inventory. A new associated contract simplifies maintenance and support for these newer generators. The Caribbean Distribution Center is being repaired and expanded in Puerto Rico to accommodate the additional commodities the agency will stockpile. Until this is complete, leased storage space will be used.
- To expand transportation capabilities, 75 percent of FEMA's current 53-foot trailers are being converted to 40-foot trailers over five years, allowing for better access to disaster sites and transportation to island locations. FEMA Logistics is also developing a new transportation contract for the Caribbean for end-to-end support from CONUS to the islands.

Question#:	3
Topic:	Lessons Learned
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Committee:	ENERGY & COMMERCE (HOUSE)

- While FEMA continues to hire staff for the logistics cadre, FEMA logistics is also conducting operational training to increase certified staff numbers for the reception and distribution of commodities. Additionally, FEMA is reviewing its resource request process in an effort to implement process improvements and streamline resource requests. FEMA is also increasing its capacity for logistics training and exercises with SLTT partners.
- To improve FEMA's ability to respond during long term infrastructure outages, FEMA disaster communications is refining tactical and long-haul communications, from land mobile radios to satellite communications.
- Specific to the Caribbean, FEMA Region II is taking additional steps to bolster existing communications capabilities, ensuring it can continue to provide prompt, efficient and effective communications support to all levels of government during future disasters. FEMA intends to develop a more comprehensive understanding of local, regional, and national supply chains, as well as stronger relationships with critical private sector partners to support rapid restoration in response to catastrophic incidents. Additionally, Region II will increase the capabilities for survivable, sustainable and redundant communications in advance of the 2018 hurricane season. Region II, in conjunction with the Disaster Emergency Communications Division of FEMA Headquarters and partners from a host of other territorial and federal agencies, is continuing to develop State Emergency Communications Plans and a Regional Emergency Communications Plan. The Regional Emergency Communications Plan will examine the current communications landscape and consider methodologies to be implemented for increased satellite, land mobile radio, terrestrial and other mediums of communications should a disaster strike.
- To capitalize on innovations that FEMA developed during the 2017 hurricane season to improve mass care to initial housing operations, the agency will be modernizing housing inspections to improve the survivor experience and streamline the process. The goal is to lessen the inspection burden for the disaster survivor and better leverage similar efforts across the federal government. FEMA also strives to better share data across entities to reduce or eliminate the need for multiple inspections. This involves utilizing a more innovative inspection prioritization method, including assessing damage based on an applicant interview, and using geospatial data. FEMA has also reconvened intra-agency working groups dedicated to improving housing operations. Finally, FEMA will seek to improve the delivery and effectiveness of housing options, including exploring grant-making authority. FEMA will also work with its federal partners to clarify agency roles and responsibilities.

Question#:	3
Topic:	Lessons Learned
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Many of the lessons learned also informed FEMA's 2018-2022 Strategic Plan which outlines goals and objectives to Build a Culture of Preparedness, Ready the Nation for Catastrophic Disasters, and Reduce the Complexity of FEMA.

Question#:	4
Topic:	Power to the Caguas Region
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: What are the challenges to fully restoring power to the Caguas region?

Response: The Caguas region was heavily damaged and is extremely mountainous. Since there was little maintenance on the system, roads are having to be cut to access some locations. Also, specialized equipment is needed to fit into narrow roads, helicopter work is required on the distribution system, and drones have been used to get into hard to access areas. In some cases, crews have to get to their work zone by helicopter and their equipment is being flown into the mountains as well. The helicopter work is impacted by weather, so that adds to the complexity. Materials, life support for the crews, and access to hard hit areas were also major factors. Crews have continued to work in the area and as of June 11, 2018, the PREPA Caguas Region is at 97.88 percent restored.

Question#:	5
Topic:	Preparations
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: How is FEMA preparing for preparing for upcoming storms? For example, is the Agency leading trainings and exercises, or will emergency generators be left on the island in the event that Puerto Rico experiences similar power outages?

Response: In preparation for the upcoming 2018 Hurricane season, FEMA and the Commonwealth are participating in a number of exercises. The Healthcare Leadership for Mass Casualty Incidents (HCL) Course is a three-day course from May 29 to June 1, 2018, that will address disaster preparedness at the facility and system level.

The Integrated Emergency Management Course (IEMC) from June 11 to 14, 2018, is an exercise-based training activity for Emergency Operations Center personnel to practice simulated, but realistic, crisis situations, within a structured learning environment. The jurisdiction will select the hazards and core capabilities to simulate in the classroom and exercise components of the course. The design will reflect the jurisdiction's specific hazards and organizational structure included in its emergency plans.

Lastly, there will be a full scale exercise from June 18 to 22 that will test activation, integration and transition procedures. Participants include:

- **Incident Management Assistant Team (IMAT) Readiness Exercise** - Annual readiness evaluation of National and Regional IMAT capability for one National and one Regional IMAT
- **Regional and National Response Coordination Center Exercise** - Caribbean Hurricane scenario based exercise for Region II RCC and NRCC Staff
- **Puerto Rico NQS IMT Training and Exercise** - Initial National Qualification System Training and exercise for Puerto Rico Incident Management Team (IMT) development
- **PREMA Commodity Distribution Exercise** - Table top planning and execution of commodity distribution strategy for selected municipalities and select designated distribution points.

The Capacity Building Sector is also working on completing a Hurricane Season 2018 Contingency Plan with the region, DHS, the Commonwealth and other internal and external stakeholders. The group is working on a number of issues that include response transition, IOF and JFO location, PREMA coordination and LNO's, Commodity Storage and PREMA Distribution plan and Critical Infrastructure Assessment.

Question#:	5
Topic:	Preparations
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

There are generators on the island in preparation of the upcoming Hurricane season. As of May 14, 99 percent or 2,182 out of 2,193 total sites for the temporary power mission have been completed. There are 791 generators currently installed at critical facilities around the island.

Question#:	6
Topic:	Extending USACE's Mission
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: In light of the all-island power outage which occurred the week of April 15th, will FEMA extend USACE's mission assignment until the grid is more stable?

Response: On May 17, FEMA approved the extension of the U.S. Army Corps of Engineers (USACE) mission assignment for emergency power restoration. This extension will allow for the lease, generation and maintenance of all three mega generators until the Puerto Rico Electric Power Authority (PREPA) completes its purchase of these generators.

Additionally, this assistance includes continuing the support for more than 700 generators that are in use throughout Puerto Rico and it includes the extension of USACE's logistics and materials management capability until PREPA can effectively manage the volume of emergency restoration materials.

At the direction provided by the PREPA Chief Executive Officer and the Energy Unified Command Group, as of May 18, USACE will no longer provide line restoration work for PREPA. PREPA will oversee their contractors and the remaining work in grid restoration.

Question#:	7
Topic:	Work Done
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: How would you describe the work done by FEMA-contracted entities on Puerto Rico's electric grid?

Response: FEMA has not directly contracted any entities to date to work on the electric grid.

Question#:	8
Topic:	Whitefish Contract Reimbursement
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: There have been contradictory press reports on whether FEMA will be reimbursing the Whitefish contract to restore power to the Island. Will the Agency reimburse it?

Response: FEMA has not received any invoices from PREPA for reimbursement related to Whitefish.

Question#:	9
Topic:	Contract Funds
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: There are a number of contracts awarded by FEMA with obligated funds that have not been completed, or are seriously delayed in performance. These include, but are not limited to: Tribute Contracting, Filcor, Inc., and Master Group. Does the Agency plan to de-obligate or disburse the remaining funds?

Response: FEMA has multiple active contract awards of various types: fixed price, firm fixed-price, time and materials, etc. The timing of the payout of funds is dependent on the work to be done, the funding method, and the contract type. For those contracts for which all obligated funding is not expended, FEMA intends to de-obligate such funds as appropriate.

Question#:	10
Topic:	Stafford Act
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: Based on the recovery process so far and the proximity of hurricane season, is it your belief that the Stafford Act should be amended to increase the cost share to 100 percent of long-term permanent recovery projects in Puerto Rico?

Response: FEMA recognizes that the scale of devastation in Puerto Rico will necessitate a significant financial investment and require long-term support for recovery to be successful. FEMA has previously supported the Governor's requests for increased cost shares for all categories of Public Assistance up to 90 percent and temporary cost share adjustments for debris removal and emergency protective measures up to 100 percent. Responding to and recovering from the impacts of disasters are shared responsibilities. The provision of 100 percent federal assistance for long-term recovery projects removes the intrinsic stewardship incentives of the shared governance structure. This arrangement has, in the past, contributed to higher costs and delayed recovery.

FEMA believes it is important that Puerto Rico continue to also invest in its permanent recovery and does not support a federal share increase to 100 percent. Puerto Rico has multiple options for contributing its cost share portion. Congress has appropriated significant Community Development Block Grant - Disaster Recovery (CDBG-DR) funding to the Department of Housing and Urban Development (HUD), who has allocated approximately \$20B to Puerto Rico. Historically, HUD has allowed CDBG-DR recipients to apply those funds towards cost share requirements. Puerto Rico could propose purposing a portion of its CDBG-DR to satisfy some or all of the cost share. Additionally, FEMA has authorized Puerto Rico to utilize the Hazard Mitigation Grant Program Global Match which allows it to aggregate and leverage multiple funding sources to meet a combined cost share amount, rather than requiring a cost share on each individual project. Finally, Congress appropriated up to \$150M in each of the second and third disaster supplementals (Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2017, Pub. Law, Pub. L. No. 115-72 and Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018, Pub. L. No. 115-123) for the Disaster Assistance Direct Loan Program (DADLP) to be available for loans to advance the non-Federal share. At this time, Puerto Rico has not requested a loan through the DADLP.

Question#:	11
Topic:	Minimize the Obstacles
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: How could policymakers redesign and rebuild Puerto Rico's energy grid in a way that would minimize the obstacles FEMA faced post-Maria in providing efficient and effective emergency management services?

Response: FEMA is working collaboratively with the Government of Puerto Rico, PREPA, the U.S. Department of Energy, and other federal and industry stakeholders to develop, design and implement strategies that support a resilient energy system and enduring economy. These partners will continue to work together to develop strategies based on the lessons already learned through the Hurricane Maria response effort: the grid would benefit from using a widely-used set of utility standards (i.e., the USDA Rural Utilities Service standards that have recently been adopted by PREPA), standardized materials, newer technology, generation in the north closer to the major urban areas, and improved right-of-ways, among other improvements. Equally as important, any redesign must build in a robust operations and maintenance program and vegetation management program – lack of these two programs alone contributed significantly to the restoration challenges – and should be supplemented by enhanced emergency planning.

Question#:	12
Topic:	Engaging Community Leaders
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: Has your Agency worked with community leaders to engage them in the rebuilding process? If so, please indicate which ones.

Response: FEMA coordinated with voluntary organizations that responded to Hurricane Maria from both the Continental United States and the island itself. Organizations such as the Salvation Army, American Red Cross, Samaritans Purse and others¹ provided the primary means to distribute commodities to the impacted communities throughout the island.

Through FEMA's Voluntary Agency Liaisons (VALs) the agency provides voluntary organizations trainings on the FEMA Individual Assistance Sequence of Delivery², information including case work and case management, GIS maps, contacts to subject matter experts, regular updates on other FEMA program mission areas like U.S. Army Corp of Engineers Blue Roof program and other assistance to help the volunteer groups maximize their impact.

Many survivors have additional needs beyond what can be provided by FEMA programs. FEMA works closely with the government of Puerto Rico, other federal agencies (e.g., the U.S. Small Business Administration Disaster Loan Program) and faith-based and voluntary organization partners to help match survivors with other sources of assistance. Working with voluntary agencies and the government of Puerto Rico, survivors have many housing options available and we are working diligently with those survivors to help ensure they receive all the assistance they can.

FEMA has and continues to coordinate extensively with over 100 voluntary organizations in disaster operations. These voluntary organizations have participated in various FEMA missions including mass care operations, public property debris removal, emotional and spiritual care, and immediate needs assistance for survivors, shelter operations, assistance to people with access and functional needs, and assistance to children.

FEMA and voluntary agencies are partnering on the Voluntary Agencies Leading and Organizing Repair (VALOR) Program initiative to assist voluntary agencies in providing minor repairs to help survivors return to homes that are clean, secure, and ready for

¹ National VOAD and Other Voluntary Organizations Play Critical Role in Housing Cleanup:
<https://www.fema.gov/news-release/2017/11/12/4339/national-voad-and-other-voluntary-organizations-play-critical-role-housing>

² Individual Assistance Sequence of Delivery:
<https://www.fema.gov/pdf/about/regions/regioni/sequence2008.pdf>

Question#:	12
Topic:	Engaging Community Leaders
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

further rebuilding. VALOR provides a structure for FEMA to provide supplies, materials, and personal protective equipment to participating voluntary organizations. It also provides building materials and equipment to approved voluntary organizations providing minor repairs to return survivors to homes that are safe, habitable, functional and ready for further repairs. Under this program FEMA secured over \$839,000 worth of building materials to be used by voluntary organizations conducting temporary home repairs.

Question#:	13
Topic:	FEMA Officials in Puerto Rico
Hearing:	Update on the Restoration of Puerto Rico's Electric Infrastructure
Primary:	The Honorable Frank Pallone Jr.
Committee:	ENERGY & COMMERCE (HOUSE)

Question: How many FEMA officials were in Puerto Rico prior to Hurricane Maria making landfall?

Response: FEMA's National Response Coordination Center (NRCC) was activated to a Level I (the highest level of activation, with all Emergency Support Functions activated) prior to Hurricane Irma's impacts on the U.S. Virgin Islands (USVI) and Puerto Rico. Federal personnel were also pre-positioned in Puerto Rico to coordinate with territorial and municipal officials. This included FEMA staff from the Caribbean Area Division office located in San Juan, regional personnel from FEMA's Region II (which has responsibility for both Puerto Rico and the USVI), as well as Incident Management Assistance Teams (IMATs) that were deployed to the territory.

More than 300 staff were available and ready to assist the island when on September 19, 2017 —only two weeks after Hurricane Irma hit— the eye of Hurricane Maria passed just south of the USVI on its way to making landfall in Puerto Rico on September 20, 2017. One day after Maria made landfall in Puerto Rico, there were already more than 2,000 FEMA and other federal partners' staff on the ground in Puerto Rico supporting response and recovery operations.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
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Majority (202) 225-2927
Minority (202) 225-3641
May 10, 2018

Mr. Charles R. Alexander, Jr.
Director
Contingency Operations and Homeland Security Headquarters
U.S. Army Corps of Engineers
441 G Street, N.W.
Washington, DC 20314

Dear Mr. Alexander:

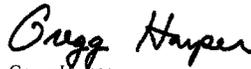
Thank you for appearing before the Subcommittee on Oversight and Investigations on April 11, 2018, to testify at the hearing entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Thursday, May 24, 2018. Your responses should be mailed to Ali Fulling, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Ali.Fulling@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Gregg Harper
Chairman
Subcommittee on Oversight and Investigations

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations

Attachment

Attachment – Additional Questions for the Record

Subcommittee on Oversight and Investigations – Committee on Energy and Commerce
Hearing entitled “Update on Restoration of Puerto Rico’s Electric Infrastructure”

April 11, 2018

The Honorable Frank Pallone, Jr.

1. QUESTION: After May 18, how many USACE contractors will be working in Puerto Rico?

ANSWER: Under the leadership of the Federal Emergency Management Agency (FEMA), USACE is working with other Federal agencies as part of the overall effort to restore power, and stabilize critical infrastructure in Puerto Rico.

On September 30, 2017, FEMA assigned USACE the mission of assisting the Puerto Rico Electric Power Authority (PREPA) restore power to the island. USACE works with FEMA, PREPA, and Puerto Rico’s restoration coordinator on this mission. This is a joint effort, and includes providing for a successful transition as the need for USACE involvement ends. On March 29, 2018, FEMA extended the USACE mission assignment through May 18, 2018. The USACE power restoration contractor will continue its work in parallel with PREPA and its contractors until then, after which PREPA would complete the restoration effort.

2. QUESTION: As part of the emergency power grid repairs mission assignment, the USACE has installed several large-scale generators, including mobile power generators, at Palo Seco and Yabocoa to provide additional power generation while the transmission system is still being restored. Is that correct? What arrangements, if any, have been made to transfer the ownership, use, or maintenance of these generators to PREPA so that these generators can continue to be used once the USACE mission assignment concludes?

ANSWER: Yes, that is correct. The generators also provide stability and responsiveness to the grid. They provide stability through voltage, power factor, and megawatt (MW) control. As for responsiveness, the generators are able to come back online or adjust their MW output much faster than the larger units at power plants. For example, the generators at Palo Seco were the first to come back online and provide power to the grid during April’s island-wide blackout.

3. QUESTION: The most recent numbers indicate that the grid is more than 96% restored, but that approximately 56,000 individuals remain without power. Is this the case?

ANSWER: As of the date of today’s hearing, PREPA reports that 96.9% percent or approximately 1.427 million of the 1.47 million customers in Puerto Rico who were able to receive electric power before the storm have now had their service restored, while 46,000 customers remain without power. Crews are working to restore power to these customers.

4. QUESTION: What lessons has USACE learned so far from working in Puerto Rico's difficult geographic conditions, and how are these lessons informing efforts to restore power for those who remain without it? How might these lessons be applicable in the instance that the USACE is tasked with hurricane response in similar geographic conditions?

ANSWER: USACE will participate in and contribute to discussions among the Federal agencies on lessons learned in Puerto Rico following Hurricane Maria. The distance and geographic separation of the island from the mainland, and its mountainous terrain, complicated the effort to provide assistance following the storms. The extent of the damage sustained across the island, and particularly to its transportation (ports, airfields, roads, and bridges), electric, and communications systems, compounded the logistical challenge.

For example, due to the difficulty in transporting material (e.g., poles) to mountainous locations, the recovery effort used alternate methods (e.g., helicopters) to get the needed materials and personnel to some of the work areas. In an environment as devastated as Puerto Rico, a methodical, site-by-site process was necessary to ensure safe grid restoration efforts.

5. QUESTION: What is the current target date for having power fully restored to the Caguas region? Does the USACE believe it will be able to fully restore power before it draws down its presence in Puerto Rico? If no, why not?

ANSWER: The current estimated date for having power fully restored in the Caguas region is July 20, 2018. PowerSecure, a USACE contractor, is working on eight circuits in the Caguas region, and expects to complete its assigned work on two of these eight circuits by May 18. After that, PREPA will take over and complete the work of restoring power to the customers served by the other six of these eight circuits in this region.

The concept of "working on a circuit" refers to work on a system of transmission and distribution power lines that includes providing for redundancy to allow transmission along an alternate pathway when a line is down or compromised for some reason.

6. QUESTION: What additional restoration measures is USACE taking following the island-wide blackout the week of April 15?

ANSWER: USACE supported PREPA as it worked to restore power from an island-wide power outage that occurred on April 18. In coordination with PREPA, USACE's focus was to bring its three generators, located at the Palo Seco and Yabucoa power plants, back on line. USACE also maintained continuous operation of four micro grids, which were not affected by this outage, as well as over 800 emergency power generators at multiple critical facilities.

7. QUESTION: In light of ongoing blackouts, is USACE in conversations with FEMA to extend the mission assignment until the grid is more stable?

ANSWER: The USACE power restoration mission is now scheduled to end on May 18.

8. QUESTION: How is USACE preparing for preparing for upcoming storms? For example, is the Agency leading trainings and exercises, or will emergency generators be left on the island in the event that Puerto Rico experiences similar power outages?

ANSWER: Storm preparation across the United States is a local municipality and state responsibility. Specifically in Puerto Rico, the Puerto Rico Emergency Management Agency (PREMA) oversees all emergency preparedness and response activities for the Territory.

PREMA, in coordination with the Puerto Rico Electrical Power Authority (PREPA) and FEMA, is identifying critical public facilities requiring back-up power generation support. Under FEMA direction, USACE is prepared to pre-position FEMA generators at selected critical facilities in preparation for the 2018 hurricane season. In support of PREMA, FEMA and the other federal partners also are supporting a PREMA sponsored and hosted multi-echelon exercise, scheduled for 18-21 June 2018. This exercise will focus on familiarizing responders with the revised PREMA emergency response synchronization checklist, and will help PREMA, FEMA, and the other federal partners prepare for the 2018 hurricane season.

Following a Presidentially declared disaster, FEMA directs the overall Federal response under the Stafford Act. USACE works with other Federal agencies as directed by FEMA, as part of the Federal effort.

The current power restoration mission in Puerto Rico also includes preparation for the full handoff of responsibility for the restored electric grid to PREPA. For example, FEMA is planning to leave around 600 small generators on the island that can provide power quickly to critical facilities on an emergency basis in the event of a future storm.

USACE will also participate in and contribute to discussions among the Federal agencies on lessons learned in Puerto Rico following Hurricane Maria. This would include consideration of the geography of the island, and the challenges in getting people, equipment, and supplies to its coastal and interior regions in the aftermath of a disaster. These discussions would inform future local and Federal planning and preparedness efforts, and will cover issues such as training, exercises, and the stockpiling of equipment and supplies.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
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COMMITTEE ON ENERGY AND COMMERCE

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WASHINGTON, DC 20515-6115

Majority (202) 225-2827
Minority (202) 225-3641

May 10, 2018

The Honorable Bruce Walker
Assistant Secretary
Office of Electricity Delivery and Energy Reliability
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Walker:

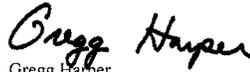
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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Gregg Harper
Chairman
Subcommittee on Oversight and Investigations

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations

Attachment

QUESTIONS FROM RANKING MEMBER PALLONE

- Q1. What additional capabilities exist in DOE's network of national laboratories that can be used to further assist the grid reconstruction effort in Puerto Rico, beyond the Department's current efforts? Does the Department intend to make these capabilities available?
- A1. DOE is supporting a multi-laboratory effort on near-term grid modeling. Results from this effort will support the rebuilding of a more resilient electric power grid system in Puerto Rico. This effort is developing a dynamic model of the Puerto Rico power system to capture interdependencies and analysis of contingencies useful for real-time and long-term planning. The results of this modeling will also support and inform Department of Housing and Urban Development (HUD) and Federal Emergency Management Administration (FEMA) suggested actions that can be taken now and during the current hurricane season, as well as longer-term infrastructure investments that can have lasting effect to make the grid more resilient.

Furthermore, there are many technologies that have been developed in various national laboratories that will be integrated into the Puerto Rico Electric Power Authority (PREPA) system as it is rebuilt over the next several years. DOE is committed to working with PREPA and others to provide technical expertise and coordinate in identifying key technologies that can be incorporated into the electric grid.

DOE released an *Energy Resilience Solutions for the Puerto Rico Grid* report, which includes 30 technical recommendations—including some for immediate action—to rebuild and improve Puerto Rico's energy system.^a The report considers recommendations from other reports as well as insights gained from our and others' participation in restoration and recovery efforts to date.^b The recommendations in the report will inform larger efforts by FEMA to coordinate Federal support and contributions to Puerto Rico's economic and disaster recovery plans, as directed by Congress (Section 21210 of the Bipartisan Budget Act of 2018, Pub. L. No. 115-123).

^a <https://www.energy.gov/oe/articles/office-electricity-releases-energy-resilience-solutions-puerto-rico-grid-report>
^b <https://www.energy.gov/oe/articles/office-electricity-releases-energy-resilience-solutions-puerto-rico-grid-report>

- Q2. What would DOE's role be if another hurricane were to come through and cause further damage to Puerto Rico's grid?
- A2. Under the National Response Framework (NRF), DOE is the coordinating agency for Emergency Support Function #12 – Energy (ESF-12). Under the National Disaster Recovery Framework (NDRF), DOE is a primary agency for the Infrastructure Systems Recovery Support Function (RSF), while the U.S. Army Corps of Engineers is the coordinating agency. The Infrastructure Systems RSF works to efficiently facilitate the restoration of infrastructure systems and services.

As the coordinating agency for ESF-12, DOE works to facilitate the reestablishment of damaged energy systems and components, in coordination with the state, local, territorial, and tribal governments, FEMA, other Federal agencies, and industry.

When a hurricane is expected to impact the U.S. or a U.S. territory, DOE deploys ESF-12 responders, in coordination with FEMA, to the National Response Coordination Center (NRCC), Regional Response Coordination Centers (RRCC), State/Territorial Emergency Operations Centers, and, as part of Incident Management Assistance Teams (IMAT), in the affected or potentially affected area. ESF-12 responders support a wide variety of efforts, to include damage assessments of energy infrastructure; collection and evaluation of information on the status of energy systems, including progress on electric system restorations and the availability of fuel; validation of materials requests for restoration efforts; and coordination among local utilities, as well as FEMA and other Federal and industry partners.

If needed, the Department can also deploy available subject matter experts from the Power Marketing Administrations (PMAs) to provide additional technical assistance with restoration planning, estimates, validation, and quality assurance/quality control. During a response, DOE also activates the Emergency Response Organization at DOE Headquarters to coordinate ESF-12 activities and the Department's response efforts, including working with industry and facilitating mutual assistance. As response activities

shift to recovery, DOE may engage subject matter experts from the national laboratories or other program offices to provide recommendations for long-term recovery.

- Q3. What lessons have been learned about how best to respond to disasters that affect remote areas with difficult terrain, and how are these lessons learned about working in challenging terrain being incorporated into Puerto Rico's future disaster plans?
- A3. As part of the Department's After-Action Review process, DOE is working to better utilize its capabilities and expertise, to include how these capabilities support each phase from pre-incident preparedness, response, damage assessment, and restoration to long-term recovery. In the future, quick contracting mechanisms could be established that would enable DOE to activate quickly under additional authorities other than the Stafford Act (such as pre-scripted mission assignments for NDRF support and memoranda of understanding for PMA and DOE national laboratory support).

DOE's *Energy Resilience Solutions for the Puerto Rico Grid* report contains recommendations for improved resilience for incorporation into Puerto Rico's rebuilding and recovery plans, and for improving the energy infrastructure. The Governor of Puerto Rico's *Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico* report also devotes substantial content to the restoration and resilience of the energy sector.

In addition, DOE is supporting a multi-laboratory effort on near-term grid modeling. Results from this effort will support the rebuilding of a more resilient electric power grid system in Puerto Rico. This effort will develop a dynamic model of the Puerto Rico power system to capture interdependencies and analysis of contingencies useful for real time and long-term planning. The results of this modeling will also support and inform HUD and FEMA suggested actions that can be taken now and during the current hurricane season, as well as longer-term infrastructure investments that can have lasting effect to make the grid more resilient.

- Q4a. What capacity building is occurring in order to ensure that the island is ready for the next hurricane season?

- A4a. FEMA remains deployed in Puerto Rico, with significant resources and equipment made available during the response to Hurricanes Irma and Maria also remaining deployed in Puerto Rico.
- Q4b. Is there an updated emergency response plan for the island informed by the challenges of responding to Hurricanes Irma and Maria?
- A4b. The *Energy Resilience Solutions for the Puerto Rico Grid* report, while not a formal emergency response plan, addresses opportunities for improving energy sector operations, including suggestions on how to better prepare for and respond to disasters in Puerto Rico.
- Q5a. Are there limitations in the federal support that can be provided? For example, does current law limit federal authority to rebuild an electrical grid following a disaster?
- A5a. The Stafford Act provides the principal Federal mechanism to reimburse state and local governments for the cost to repair or rebuild damaged public infrastructure to restore pre-disaster function to applicable codes and standards. The Stafford Act also authorizes FEMA, for repair and replacement projects, to provide funds for hazard mitigation that will reduce future risk to the facility. The Stafford Act does not permit FEMA to provide funding for pre-disaster condition or lack of maintenance and limits FEMA Public Assistance funding to restoring only facilities and components that were actually damaged by the declared disaster.

On February 9, 2018, President Trump signed the Bipartisan Budget Act of 2018, which includes provisions allowing the FEMA Administrator additional flexibility to provide assistance in Puerto Rico and the U.S. Virgin Islands for certain types of facilities and systems, including power infrastructure, as defined through section 428 of the Stafford Act, for the duration of the recovery in Puerto Rico and the U.S. Virgin Islands. With this new provision, FEMA may provide Public Assistance funding to replace or restore the function of the electrical grid to industry standards without regard to its pre-disaster condition. The amended law further allows FEMA to provide assistance to replace or restore components of the electrical grid that were not damaged by the disaster when necessary to fully effectuate the function of the facility to operate at industry standards.

This unique authority is limited to addressing the 2017 hurricane impacts in Puerto Rico and the U.S. Virgin Islands.

- Q5b. What specific changes to the Stafford Act would improve the ability of grids to be restored following future disasters?
- A5b. The Bipartisan Budget Act of 2018 provided the flexibilities needed to improve the ability to be restored in Puerto Rico following the 2017 hurricanes. As for broader grid restoration following a disaster on the mainland or other territories, DOE defers to FEMA regarding potential changes to the Stafford Act. DOE is working to better utilize its capabilities and expertise, to include how these capabilities support each phase from pre-incident preparedness, response, damage assessment, and restoration to long-term recovery. In the future, quick contracting mechanisms could be established that would enable DOE to activate quickly under additional authorities other than the Stafford Act (such as pre-scripted mission assignments for NDRF support and memoranda of understanding for PMA and DOE national laboratory support).

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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May 10, 2018

Mr. Carlos D. Torres
Power Restoration Coordinator
Edison Electric Institute
701 Pennsylvania Avenue, N.W.
Washington, D.C. 20004

Dear Mr. Torres:

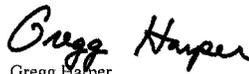
Thank you for appearing before the Subcommittee on Oversight and Investigations on April 11, 2018, to testify at the hearing entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Thursday, May 24, 2018. Your responses should be mailed to Ali Fulling, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Ali.Fulling@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Gregg Harper
Chairman
Subcommittee on Oversight and Investigations

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations

Attachment

**Attachment-Additional Questions for the Record
The Honorable Frank Pallone, Jr.**

1. How can PREPA and individual power plants prevent another situation like the explosion at the Monacillo plant and the most recent island-wide blackout? In the event of one of these blackouts, what can be done to make sure they are as short lived as possible? Are there plans in place for these sorts of failures?

In my opinion, the actions that PREPA could take include maintenance, exercises, plans, and redundancy. More important, there is no substitute for investment in the energy grid. Since Superstorm Sandy in 2012, investor-owned electric companies on the mainland have invested more than \$230 billion in transmission and distribution systems. In Puerto Rico, it has been widely reported that few, if any, investments have been made in the island's energy grid for several years.

In addition, vegetation management had not been done for years in Puerto Rico. Reestablishing such a program now could be beneficial. Routine drills and exercises for all threats also allow electric companies to apply lessons learned and to enhance response and recovery capabilities.

Finally, stockpiling materials and having redundancy in place on the system reduce single points of failure. As I noted in my testimony, there were limited equipment reserves (e.g., poles, wire, transformers, insulators, etc.) in place in Puerto Rico prior to Maria and certainly not enough to support an emergency power restoration effort of this magnitude. Companies on the mainland, particularly those in hurricane-prone areas, stockpile as much material as possible so that mutual assistance crews have what they need to support the recovery.

2. Given that Puerto Rico's electric power infrastructure was known to be in poor condition before the 2017 hurricane season, should the grid be rebuilt using a different model than pre-storm condition? For example, do you think it makes sense to incorporate resiliency and hardening as Puerto Rico's grid is rebuilt?

My work in Puerto Rico has been focused exclusively on the short-term emergency power restoration, not on the future of the system. However, every electric company should focus on resiliency. As noted above, there are many things that can be done to make energy systems stronger and smarter. Resiliency comes from solid engineering (for example, incorporating redundancy into the transmission, sub-transmission, and distribution systems), a strong maintenance program, vegetation management, and better preparations and contingency plans. Technological advancements—such as smart meters—should be considered, but not at the expense of ignoring basics like spare equipment, routine maintenance, and vegetation management.

**3. Please explain the risks to utilities caused by the absence of a strong regulator.
4. Please explain the risks to ratepayers caused by the absence of a strong regulator.**

My expertise is in storm preparedness and restoration, not regulatory theory. However, I think a healthy relationship among regulators, energy companies, and customers drives balance and

accountability. Electric companies must make prudent investments for the benefit of customers, and be allowed to charge just and reasonable rates to recover those costs. Oversight from regulators is important for companies and customers alike.

5. What types of investments would be needed to incorporate technologies to make the grid stronger and more resilient?

As I stated in my response to question #2, my work in Puerto Rico has been focused exclusively on the short-term emergency power restoration, not on the future. That said, every electric company should focus on resilience, and there are many things that can be done to make energy systems stronger and smarter. Resilience comes from solid engineering (for example, incorporating redundancy into the transmission system), a strong maintenance program, vegetation management, and better preparations and contingency plans. Technological advancements—such as smart meters—should be considered, but not at the expense of ignoring basics like spare equipment, routine maintenance, and vegetation management.

6. Are there limitations in the federal support that can be provided? For example, does current law limit federal authority to incorporate a transition to renewable energy generation?

I am unaware of any federal limitations. I am not an expert in this area and am not qualified to answer this question definitively.

7. How does PREPA plan to accomplish upgrades and modernization if energy sales may drop even further as the island's population declines?

My work in Puerto Rico has been focused exclusively on the short-term emergency power restoration, not on the future of the system. This is a question that should be answered by PREPA.

8. What governance issues or reforms would help PREPA more quickly and successfully rebuild and modernize the grid? Should such alternative management regimes be considered?

This is not my area of expertise. This is a question that should be answered by policymakers in Puerto Rico.

9. What efforts are currently being taken to modernize Puerto Rico's electrical grid and to ensure that it will be resilient to future storms and less susceptible to blackouts? And how are electricity costs for consumers and businesses being considered as part of these efforts?

I recommend that PREPA and the Transformation Advisory Council (TAC) answer these questions. Again, my work in Puerto Rico has been focused exclusively on short-term emergency power restoration, not on the future of the system.

10. To what extent have efforts taken thus far to modernize Puerto Rico's electrical grid been informed by the Build Back Better report?

I am not sure how they have been informed by that report. This is a question that should be answered by PREPA.

11. In your testimony, you acknowledged that PREPA will be challenged once federal support is further reduced. What is being done to ensure PREPA is fully prepared to take over the restoration work currently being done by the Army Corps of Engineers and their contractors by May 18, when the Corps and contractors are scheduled to complete their "responsible drawdown"? Is there additional work that can be done to ensure would help ensure a successful transition?

As I noted in my written testimony, I have discussed this transition with PREPA's newly appointed CEO, Walter Higgins, and the rest of the Unified Command. We all agree that the responsibility for the long-term management of the island's energy grid ultimately must be borne by PREPA. My team on the island and I have worked on the transition from the Incident Management Teams to the PREPA leadership to complete the mission of restoring power to the remaining customers and to prepare the company for its next phase of recovery and mitigation.

12. Does Puerto Rico have an emergency response plan? If not, is such a plan being developed?

13. What is the Puerto Rican government doing to examine lessons learned from what went wrong in the response to Maria? How are these lessons being applied so that Puerto Rican officials and emergency responders can improve their performance if and when the next disaster strikes?

I would defer these questions to officials in Puerto Rico. We have impressed upon our colleagues in Puerto Rico the importance of having plans in place and drilling frequently. Walter Higgins, the new CEO of PREPA, testified before the Senate Energy Committee, indicating that PREPA is working on an internal and an island-wide drill before hurricane season begins.

14. How will the departure of the Army Corps affect recovery efforts on the island?

USACE's mission assignment to provide grid restoration work ended May 18, 2018, and USACE's power restoration contractor worked in parallel with PREPA and its contractors to support and transition PREPA as the host company takes over final restoration efforts.

FEMA issued [an extension](#) May 17, 2018, of the following USACE's mission assignments related to emergency power restoration:

- The lease, generation, and maintenance of all three mega generators until PREPA completes its purchase of these generators.
- Continued support for more than 700 generators that are in use throughout Puerto Rico.

- USACE’s logistics and materials management capability to complete the transfer to PREPA and PREPA’s assumption of the management of the emergency restoration materials

USACE also is overseeing the environmental remediation at 150 sites across the island in order to restore the sites disturbed during the emergency power restoration mission.

The Army Corps of Engineers was a key member of the Unified Command and provided helpful logistics support, but emergency power restoration is a specialty of industry and associated contractors.

15. Has Puerto Rico requested that FEMA extend the USACE mission assignment until power restoration efforts are complete?

According to a [FEMA press release](#), the direction provided by PREPA’s CEO, Walter Higgins, and the Energy Unified Command Group, as of May 18, is that USACE will no longer provide power line restoration work for PREPA. PREPA will oversee its contractors and the remaining work in grid restoration.

16. From what you have witnessed on the island, do you have any concerns about PREPA’s role in grid modernization?

I believe PREPA has learned important lessons from this experience. As I said at the hearing, PREPA will be challenged to manage not just the ongoing restoration, but the future with the needed reconstruction and resilience work. The company will need to keep focus on safety, logistics, and materials, and it will need to balance the needs of the basic “blocking and tackling” of running the grid while considering the future of the system.

Based on my experiences on the island, I also strongly recommend that PREPA re-engineer and rebuild its energy grid to similar standards that are used on the mainland. As I noted earlier, resilience comes from solid engineering (for example, incorporating redundancy into the transmission, sub-transmission, and distribution systems), a strong maintenance program, vegetation management, and better preparations and contingency plans. Significant investments are needed to harden PREPA’s system, and the system needs to be maintained at all times, not just after an event.

In my opinion, PREPA also would strongly benefit from securing a contractor oversight service to help manage its contractor workforce and track the work being done.

17. What efforts are being taken to ensure that Puerto Rico is diversifying its electricity generation portfolio as it recovers?

I defer these questions to officials in Puerto Rico, particularly PREPA and the TAC.

18. How, if at all, are repairs to renewable power generation facilities being prioritized?

I defer to PREPA. I don't believe that PREPA owns any of the renewable power generation facilities on the island, so I do not know if it is involved in prioritization.

19. How many microgrids have been set up on the island? Where are they currently being used?

My understanding is that there were nine (9) microgrids set up on the island. They are currently being used in three sites: Arecibo (Choco Hondo substation); Culebra; and Vieques. The remaining six (6) microgrids have been decommissioned, but were located in Lares, Maunabo, Naguabo, Patillas, Villalba, and Yabucoa.

20. Are any of the recently installed microgrids currently being powered by renewable sources of power generation? Could some or all of these microgrids be transitioned to be powered from renewable sources?

There are no microgrids that were installed by the Army Corps of Engineers that operate with renewable sources of power generation. Microgrids are not my area of expertise, so I cannot answer whether renewable power generation facilities can be utilized at any of these sites.

21. What steps are being taken to transfer the operations and maintenance of these microgrids to more permanent arrangements?

There have been discussions at the Unified Command level (PREPA, FEMA, USACE and myself as the Power Restoration Coordinator) that PREPA will take over the operations and maintenance of the microgrids that will remain in Puerto Rico. As for the three microgrid sites they are as follows:

- a) Arecibo (Choco Hondo) – The Choco Hondo Substation was destroyed beyond repair from Hurricane Maria and will need to be replaced, so this will be a long-term installation for this microgrid. PREPA will need to provide the plan/schedule for the replacement of this substation. Nothing has been provided by PREPA to indicate whether it or a third party will be secured via an operations/maintenance contract for this site.
- b) Culebra – Will be in place until a plan/schedule is established and executed around the Vieques Temporary Power Solution (see item d).
- c) Vieques – Will require the Vieques Temporary Power Solution to be planned, scheduled, and executed, and this is being handled by PREPA at this time via a request-for-proposal (RFP) to obtain various power solution options to power both islands of Vieques and Culebra. The RFP includes the operation and maintenance and fuel for this installation. Note that Culebra will be fed by the Vieques Temporary Power Solution and fed from the existing 38kV undersea cable between these two islands that was tested and found to be in good conditions.

PREPA does not have the capacity to manage the operations and maintenance of the microgrids, and it has been urged by the rest of the Unified Command members to do so. To the best of my knowledge, PREPA has yet to put out an RFP for this required service.

22. How will the inclusion of microgrids help to improve the resiliency of Puerto Rico's grid in future storms?

Any questions regarding long-term plans for inclusion of microgrids in Puerto Rico's grid is for PREPA and/or the TAC to answer. That said, and as I stated in one of my responses during the hearing on April 11 when asked by Representative Griffith, I believe that microgrids are a part of the solution and could help the resiliency of Puerto Rico's grid in future storms. However, I also noted that the microgrid would need to be designed and installed to withstand the impacts of a storm (hardened/resilient or at least able to be temporarily removed and reinstalled after the storm). Furthermore, the infrastructure to get to the customers still would need to be built, and infrastructure that is fed by the microgrid would also need to be hardened/resilient.

23. Are battery storage facilities incorporated into any of the microgrids that have been set up by the Army Corps of Engineers?

To my knowledge, there is no battery storage built to any of the microgrids installed by the Army Corps of Engineers, but this question may be better answered by PREPA or the Army Corps of Engineers.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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May 10, 2018

Mr. Eugene Shlatz
Director, Energy
Navigant Consulting, Inc.
77 South Bedford Street
Burlington, MA 01803

Dear Mr. Shlatz:

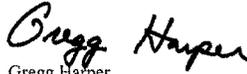
Thank you for appearing before the Subcommittee on Oversight and Investigations on April 11, 2018, to testify at the hearing entitled "Update on the Restoration of Puerto Rico's Electric Infrastructure."

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Gregg Harper
Chairman
Subcommittee on Oversight and Investigations

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations

Attachment

NAVIGANT

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September 10, 2018

The Honorable Gregg Harper
Chairman, Subcommittee on Oversight and Investigations
United States House of Representatives
2124 Rayburn House Office Building
Washington, DC 20515-6115

To the Honorable Chairman Harper,

Please find attached responses to questions raised in your May 10, 2018 letter pertaining to my April 11, 2018 testimony before the Subcommittee on Oversight and Investigation hearing on the "Update on the Restoration of Puerto Rico's Electric Infrastructure."

My responses are based on findings and recommendations contained in the December 11, 2017 report titled "Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico" prepared on behalf of the Governors of the State of New York and Commonwealth of Puerto Rico. They also are informed by new or additional findings that have become available following the issuance of the report.

Please do not hesitate to contact me if you or any other Subcommittee members would like me to clarify or expand upon any of the responses provided in the attached document.

Sincerely,



Eugene L. Shlatz
Director
Enclosure

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Oversight and Investigations



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Eugene L. Shlatz

**Responses to Additional Questions from the April 11, 2018 hearing on the
“Update on the Restoration of Puerto Rico’s Electric Infrastructure.”**

From the Honorable Gregg Harper

1. Do you know of any private companies willing to spend billions to modernize the grid in a situation where they are completely uncertain of payment, population stability and rate stability?

Response: No.

2. Does Puerto Rico currently have a strong, independent regulator to set rates fairly and keep them stabilized in this uncertain environment?

Response: Because I am not familiar with the Puerto Rican Energy Commission's position on the current environment regarding rates and grid stability, I am unable to offer an informed response to this question.

From the Honorable Diana DeGette

1. Could you please describe who wrote the Build Back Better report and how they intended it to be used?

Response: The report was prepared and submitted by an extensive working group comprised of the following entities: New York Power Authority, Puerto Rico Electric Power Authority, Puerto Rico Energy Commission, Consolidated Edison Company of New York, Inc., Edison International, Electric Power Research Institute, Long Island Power Authority, Smart Electric Power Alliance, US Department of Energy, Brookhaven National Laboratory, National Renewable Energy Laboratory, Pacific Northwest National Laboratory, Grid Modernization Lab Consortium, and PSEG Long Island, an agent for and on behalf of the Long Island Lighting Company d/b/a LIPA, and Navigant Consulting, Inc.

The report is intended to provide the Governors of New York and Puerto Rico, and the Administrator of the United States Federal Emergency Management Agency with information and guidance as outlined in the following excerpts from the Build Back Better report.

... this report provides an assessment of the electric power system storm damage caused by hurricanes Maria and Irma, describes a new system design basis, and proposes redesign and rebuild recommendations for strengthening the power grid of Puerto Rico.

Our [i.e. the Working Group and Steering Committee] overriding goal is to support the Puerto Rico Governor’s Office, PREPA, interested stakeholder agencies, and the Federal Emergency Management Agency in defining first level funding requirements and electric power system rebuild recommendations.

The Working Group offers a roadmap outlining short-term, mid-term and longer-term actions to implement resiliency and hardening measures that are designed to increase the capability of Puerto Rico's electric power grid to withstand future storms. The recommendations include the modernization of the Puerto Rico electric grid, leveraging proven power system technologies to better contain outages, reduce recovery times, lower operation costs, and enable more sustainable energy resources that will reduce reliance on imported fuel. Additionally, we are recommending the use of increased renewable energy resources, such as wind and solar and incorporating new distributed energy resource technologies, such as energy storage and microgrids to enable energy to become abundant, affordable, and sustainable to improve the way of life for the citizens of Puerto Rico.

2. The Build Back Better report states that the grid should be built to withstand an upper Category 4 event, and proposes 10 measures to achieve this goal. What do you believe are the most important of these recommendations?

Response: While all 10 recommendations are merited, the first 3 recommendations, which focus on strengthening and hardening of the power delivery system – i.e. transmission and distribution lines and substations - are most critical. Specifically, there is an urgent need to upgrade the high voltage transmission infrastructure. The transmission system is the “backbone” of the electric grid, delivering power from generating stations to substations located throughout the island. The transmission grid must be intact following a storm or emergency event before service can be restored to customers served by local distribution lines. Because of the criticality of the transmission grid, its current susceptibility to damage from storms, and the long lead time needed to plan, design, permit and construct new facilities, it is reasonable to place a higher priority on upgrading the high voltage transmission grid.

3. In your estimation, what are the greatest discrepancies between the current state of the grid and where it needs to be to withstand a Category 4 hurricane?

Response: As noted in my response to Question 2, the greatest discrepancy is the inability of the existing transmission system, including sections that were repaired following Hurricane Maria, to withstand a Category 4 storm. Unlike lower voltage distribution lines, electric utilities typically design and construct transmission lines in hurricane-prone locations to withstand a Category 4 event. It is noteworthy that relatively few high voltage transmission lines in the mainland U.S. were damaged during Hurricanes Irma and Maria. This is because many of these lines were built to withstand a Category 4 storm. Because Puerto Rico is located in an area prone to hurricane-related damage, high voltage transmission lines on the island also should be capable of withstanding a Category 4 hurricane. Further, the substations that transmit electric power delivered by the transmission grid to local distribution lines should be rebuilt or reinforced to ensure they can withstand wind-related damage or flooding during hurricanes. Several of the existing substations on the island suffered significant damage due to flooding, mudslides or wind.

4. The Build Back Better report suggests it may cost as much as \$17.6 billion to rebuild the system at this level? This includes, among other things, \$5.3 billion to rebuild overhead distribution lines, \$4.3 billion for overhead transmission, and \$3.1 billion for rebuilding generation to harden them for greater storm resiliency in the future. How did the Build Back Better Working Group arrive at these estimates?

Response: These estimates were derived based on the assumption that existing electric facilities would be designed and constructed to withstand upper Category 4 force winds and, where applicable, would be relocated to areas less prone to flooding and mudslides. They were prepared over a relatively short time frame, approximately 6 weeks, and therefore, should be viewed as planning level estimates as opposed to detailed engineering designs. Accordingly, the \$17.6 billion includes a 25 percent risk adder to account for items that typically are unknown when preparing planning level estimates. It also includes a 13 percent risk adder to account for the higher cost of materials and construction on the island.

The Working Group prepared these estimates based on the cost of comparable facilities constructed in the mainland U.S., adjusted to account for conditions on the island (e.g. relocating transmission lines to more accessible locations) and the cost adjustments cited above. For some facilities, such as substation reinforcements, the Working Group's estimates were based on upgrades or measures that were successfully implemented following prior storms such as Hurricane Sandy in New York.

The \$5.3 billion for distribution assumes about 75 percent, or approximately 1200 lines are rebuilt to a higher design standard; and most of the existing 334 substations are either reinforced or repaired due to damage caused by the storm. The \$4.3 billion for transmission assumes about 350 miles of overhead high voltage transmission lines are replaced and rebuilt to a higher design standard, approximately 1000 existing poles are reinforced, and 45 miles of new underground transmission is built. The \$3.1 billion for generation assumes that older, less efficient existing plants such as Palo Seco are retired, and a new, highly efficient combined cycle generating plant, along with natural gas infrastructure and delivery facilities, is constructed.

5. Is it possible that issues may arise to cause these estimates to increase?

Response: Yes. Reasons that costs may increase include the following:

- a) The cost of materials or labor may increase
- b) Ongoing or future studies may indicate additional transmission, distribution or generation facilities may be needed, beyond those outlined in the Build Back Better report
- c) The cost to obtain permits or rights-of-way to relocate or construct facilities may be greater than the planning-level estimates contained in the report
- d) Delays caused by weather, permitting or other factors not under the control or those responsible for designing and construction the facilities
- e) Damage to facilities was greater than what was provided or available to the Working Group at the time it prepared the report.

6. Would the recommendations in the Build Back Better report to modernize the grid lower electricity costs for individuals or businesses on the island? If so, how?

Response: The Working Group did not address the impact of its recommendations on electricity costs in the Build Back Better report. Therefore, I'm unable to provide an informed response to this question.

7. How would incorporating battery storage into the Puerto Rico grid improve its resiliency?

Response: The primary way battery storage improves resiliency is when it is integrated with or used to manage output from renewable energy sources such as wind or solar. The Build Back Better report assumes, per current Puerto Rico renewable energy targets, that a substantial amount of solar and wind generation will be installed over the next decade and beyond. Because solar and wind operate intermittently, batteries (and other types of energy storage) provide back-up power when these sources are not operating or operate at lower than rated levels, thereby making these sources more firm and able to serve electric load during power interruptions.

Battery storage, when controlled by automated systems or by control center operators, also can quickly adjust electric output, up or down, to respond to rapidly changing electric demand caused either by intermittent renewable energy output or when abnormal events occur on the grid. The ability to respond rapidly to unanticipated conditions is another way resiliency is improved by battery storage. Also, the report anticipates battery storage will be used to support new microgrids, particularly those that rely, in part or in whole, on renewable energy resources. The use of microgrids is included in the report as one method to increase resiliency on the island.

8. What role does battery storage play in minimizing the cost of importing fossil fuels to an island like Puerto Rico?

Response: Battery storage plays an important role in minimizing cost as, in addition to the resiliency benefits cited in my response to Question 7, it also enables renewable generation to displace fossil fuel generating capacity. Because renewable energy operates intermittently, battery storage (and other forms of energy storage) is essential to maintain sufficient electric generating capacity during hours when renewable energy output is reduced or unavailable. Absent battery storage, fossil fuel generation would be needed to provide back-up power when renewable energy output is reduced or unavailable. Cost savings are achieved due to (1) lower amounts of fossil fuel generating capacity that is needed to reliably meet the electric demand of the island, and (2) the displacement of energy via renewable resources that otherwise would be supplied by fossil-fueled generation.

9. How could battery storage be incorporated into future efforts to increase renewable energy generation the island?

Response: Please refer to my response to Questions 7 and 8. Specifically, battery storage will enable greater amounts of renewable energy to be installed on the island. Battery storage will be needed if a large amount solar photovoltaic generation is installed, particularly during hours when solar output is high and electric demand is low. During hours when electric demand is low and solar output is high, solar output may need to be curtailed, thereby reducing its value. Battery storage is able to store this excess energy and release it during hours when demand is high; for example, during evening hours when electric demand is high due to air conditioning.