

MODERNIZING ENERGY AND ELECTRICITY DELIV-
ERY SYSTEMS: CHALLENGES AND OPPORTUNI-
TIES TO PROMOTE INFRASTRUCTURE IMPROVE-
MENT AND EXPANSION

HEARING
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SUBCOMMITTEE ON ENERGY
OF THE
COMMITTEE ON ENERGY AND
COMMERCE
HOUSE OF REPRESENTATIVES
ONE HUNDRED FIFTEENTH CONGRESS
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SUBMITTED MATERIAL

Environmental Assessment, Dakota Access Pipeline Project: Crossings of
 Flowing Easements and Federal Lands, Army Corps of Engineers, Omaha
 District, July 2016,¹ submitted by Mr. Cramer
 Memorandum Opinion of United States District Judge James E. Boasberg,
 September 9, 2016, for Civil Action No. 16 091534 (JEB), Standing Rock
 Sioux Tribe, et al., v. U.S. Army Corps of Engineers, et al.,² submitted
 by Mr. Cramer

¹The information has been retained in committee files and also is available at <http://docs.house.gov/meetings/IF/IF03/20170215/105567/HHRG-115-IF03-20170215-SD007.pdf>.

²The information has been retained in committee files and also is available at <http://docs.house.gov/meetings/IF/IF03/20170215/105567/HHRG-115-IF03-20170215-SD008.pdf>.

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³The information has been retained in committee files and also is available at <http://docs.house.gov/meetings/IF/IF03/20170215/105567/HHRG-115-IF03-20170215-SD036.pdf>.

MODERNIZING ENERGY AND ELECTRICITY DELIVERY SYSTEMS: CHALLENGES AND OP- PORTUNITIES TO PROMOTE INFRASTRUC- TURE IMPROVEMENT AND EXPANSION

WEDNESDAY, FEBRUARY 15, 2017

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

The subcommittee met, pursuant to call, at 10:03 a.m., in room 2123, Rayburn House Office Building, Hon. Fred Upton (chairman of the subcommittee) presiding.

Members present: Representatives Upton, Olson, Barton, Shimkus, Murphy, Latta, McKinley, Kinzinger, Griffith, Johnson, Long, Bucshon, Flores, Mullin, Hudson, Cramer, Walberg, Walden (ex officio), Rush, McNerney, Peters, Green, Doyle, Castor, Sarbanes, Welch, Tonko, Loeb sack, Schrader, Kennedy, Butterfield, Ruiz, and Pallone (ex officio).

Staff present: Will Batson, Legislative Clerk, Energy and Power; Ray Baum, Staff Director; Mike Bloomquist, Deputy Staff Director; Karen Christian, General Counsel; Wyatt Ellertson, Research Associate; Blair Ellis, Press Secretary/Digital Coordinator; Adam Fromm, Director of Outreach and Coalitions; Giulia Giannangeli, Legislative Clerk, Digital Commerce and Consumer Protection/Environment; Tom Hassenboehler, Chief Counsel, Energy/Environment; Zach Hunter, Communications Director; Ann Johnston, Senior Policy Advisor, Energy/Environment; Peter Kielty, Deputy General Counsel; Brandon Mooney, Senior Policy Advisor, Energy; Annelise Rickert, Counsel, Energy; Chris Sarley, Policy Coordinator, Environment; Dan Schneider, Press Secretary; Hamlin Wade, Special Advisor for External Affairs; Jeff Carroll, Minority Staff Director; Jean Fruci, Minority Policy Advisor, Energy and Environment; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; John Marshall, Minority Policy Coordinator; Jessica Martinez, Minority Outreach and Member Services Coordinator; Alexander Ratner, Minority Policy Analyst; Tim Robinson, Minority Chief Counsel; Andrew Souvall, Minority Director of Communications, Member Services, and Outreach; Tuley Wright, Minority Energy and Environment Policy Advisor; and C.J. Young, Minority Press Secretary.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. UPTON. All right. Good morning, everybody. Today's hearing entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion" marks the beginning of the subcommittee's push this Congress to promote the modernization of our energy infrastructure.

The hearing will examine the state of America's evolving infrastructure and barriers to innovation, modernization, job creation, and economic growth. America's energy infrastructure is vast, complex, and highly interconnected. When we say "energy infrastructure," we are talking about the expansive network of pipelines, storage facilities, power plants, electric lines, and distribution systems that crisscross the country millions of miles. These systems and the people that operate them move energy from the source to the consumer so that when we flip the switch, the lights in fact will go on.

We are blessed to have the world's most highly developed energy infrastructure, but our systems are aging and we are confronting new challenges with the changing energy landscape.

The huge increase in oil and gas production that we have seen in the last decade has been a boon to the economy, yes it has, but it has also revealed bottlenecks in capacity constraints in that pipeline system. These inefficiencies are harming consumers by discouraging new production and creating unnecessary price spikes in some parts of the country.

So our power generation mix is changing, too, as relatively low-priced natural gas and environmental regulations have accelerated retirements of coal-fired power plants, which represent a significant amount of our baseload power.

We have also seen the growing penetration of renewables, like wind and solar, and distributed energy, such as energy storage. And while Federal incentives have contributed to this trend, States have been very active in developing subsidies and mandates to incentivize renewables. Integrating these resources into the changing grid presents both challenges as well as opportunities.

So our first panel of witnesses will focus on the need to modernize our electric grid and develop solutions to strengthen security, improve efficiency, and reduce costs. We will hear from industry experts and businesses on the leading edge of developing new technologies and data analytics to improve the performance of our Nation's electricity system. American consumers depend on reliable and competitively priced electricity for their everyday lives. And although new digital technologies have the potential to transform our Nation's electric power grid, challenges remain to ensure that the grid is operated in a way that is reliable, resilient, and secure.

The second panel will focus on the need to modernize our transportation storage and distribution infrastructure, including pipelines. There is a new urgency to improve the siting and permitting process for pipelines. The domestic oil and gas boom and increased utilization of natural gas for power generation are driving new demand for pipeline infrastructure. So, we want to ensure that all relevant stakeholders, including Tribal Governments have a seat at

the table and an opportunity to participate in a meaningful way. That is the purpose of today's hearing.

We welcome our witnesses and their ideas to reform the current process to implement lessons learned from past experiences. I yield the balance of my time to the vice chairman of the subcommittee, Mr. Olson.

[The statement of Mr. Upton follows:]

PREPARED STATEMENT OF HON. FRED UPTON

Good morning. Today's hearing, entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion" marks the beginning of the subcommittee's push this Congress to promote the modernization of our energy infrastructure. The hearing will examine the state of America's evolving infrastructure and barriers to innovation, modernization, job creation, and economic growth.

America's energy infrastructure is vast, complex and highly interconnected. When we say "energy infrastructure" we're talking about the expansive network of pipelines, storage facilities, power plants, electric lines and distribution systems that crisscross the country. These systems, and the people that operate them, move energy from the source to the consumer, so that when we flip the switch, the lights turn on.

We're blessed to have the world's most highly developed energy infrastructure, but our systems are aging and we're confronting new challenges with the changing energy landscape.

The huge increase in oil and gas production that we've seen in the last decade has been a boon to the economy, but it has also revealed bottlenecks and capacity constraints in our pipeline system. These inefficiencies are harming consumers by discouraging new production and creating unnecessary price spikes in some parts of the country.

Our power generation mix is changing too—as relatively low priced natural gas and environmental regulations have accelerated retirements of coal fired power plants, which represent a significant amount of our baseload power. We've also seen the growing penetration of renewables like wind and solar and distributed energy, such as energy storage. While Federal incentives have contributed to this trend, States have been active in developing subsidies and mandates to incentivize renewables. Integrating these resources into the changing grid presents both challenges and opportunities.

Our first panel of witnesses will focus on the need to modernize our electric grid and develop solutions to strengthen security, improve efficiency, and reduce costs. We'll hear from industry experts and businesses on the leading edge of developing new technologies and data analytics to improve the performance of our Nation's electricity system. American consumers depend on reliable and competitively priced electricity for their everyday lives. Although new digital technologies have the potential to transform our Nation's electric power grid, challenges remain to ensure the grid is operated in a way that is reliable, resilient and secure.

The second panel will focus on the need to modernize our transportation, storage and distribution infrastructure, including pipelines. There is a new urgency to improve the siting and permitting process for pipelines. The domestic oil and gas boom and increased utilization of natural gas for power generation are driving new demand for pipeline infrastructure.

Like other major infrastructure projects, siting a pipeline involves multiple jurisdictions. Close communication and collaboration between Federal, State, local, and Tribal governments is critical.

Unlike interstate natural gas pipelines, there is no comprehensive Federal siting and permitting process for interstate oil pipelines. State and local laws govern the approval of the route, other than the portions crossing Federal lands.

While Federal agencies follow rigorous procedures to evaluate potential impacts to communities and the environment, more can be done to bring greater transparency, accountability, and predictability to the permitting process.

Dynamic and integrated energy and electricity delivery systems allow reliable and competitively priced energy for American consumers. A modernized infrastructure is absolutely critical to our Nation's economic growth.

This subcommittee will continue to conduct oversight over Federal laws that govern the siting and construction of energy infrastructure. We're going to be taking

a close look at the Federal Power Act, the Natural Gas Act, and other laws that affect energy supply, delivery and use.

We want to ensure that all relevant stakeholders, including Tribal governments, have a seat at the table and an opportunity to participate in a meaningful way. We welcome ideas from our witnesses to reform the current process or implement lessons learned from past experiences.

Mr. OLSON. Thank you, Mr. Chairman.

Energy infrastructure is at the heart of the American economy. My own State of Texas has a vast network of pipelines moving products across the State to markets both home and abroad. We balance safety, community, and the environment. We do it in a very big way.

One mile from house in Sugar Land, Texas at Veterans Park on the Brazos River there is a dog park, a hill where kids fly kites, an off-road bike trail, a covered family pavilion. I often see kids fishing at the lake in our park. There is a natural gas pipeline 35 yards from where those people are fishing. We have proven that nature can be preserved, while balancing growth.

Texas is also a leader on advancing electronic markets. And since most of our State is on its own power market, we have a self-reliant and far-reaching electric grid. We are building that grid out, as we integrate wind power from the west to other emerging technologies. This committee has an opportunity to look forward on energy infrastructure. We need to not only make sure that this country can continue to build these networks but that we also make sure our energy is always advancing in terms of safety, reliability, and efficiency. We have to find proper balance, the sweet spot. We must find it. If we can find it in a park in Sugar Land, Texas, we can find it anywhere in America.

I thank the chairman and yield back.

Mr. UPTON. Thank you.

The Chair will now recognize the ranking member of the subcommittee, Mr. Rush from the good State of Illinois, for 5 minutes for an opening statement.

OPENING STATEMENT OF HON. BOBBY L. RUSH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. RUSH. I want to thank you, Mr. Chairman, for holding this very important hearing today on the challenges and the opportunities associated with improving our Nation's energy infrastructure.

Mr. Chairman, this is a timely hearing and it is my hope that we can follow up on the bipartisan agreement that was initiated last session as part of the comprehensive energy bill that ultimately passed the House but never did make it to the Conference Committee.

As part of those discussions, Mr. Chairman, there are two provisions in particular that I hope we can bring to fruition this time around, specifically, the Pipeline Safety Replacement Program that would provide assistance to lower income communities that I have been promoting quite vigorously.

Additionally, Mr. Chairman, I hope that we can come together and agree to invest in modernizing the Nation's aging electrical grid infrastructure that Ranking Member Pallone has been advocating vociferously and very vigorously.

Mr. Chairman, it is important that as we embark on this path of upgrading our Nation's energy infrastructure that we do so in a way that is responsible, environmentally conscious, and takes into account the rights and the interests of the impacting communities that are going to be immediately and deeply affected.

Even as we speak, Mr. Chairman, we are seeing the impact of shoddily built infrastructure in the national tragedy that is playing out in the State of California, where almost 200,000 residents have been evacuated due to leaks in the emergency spillway in Oroville Dam. Certainly, Mr. Chairman, this episode, in its entirety, could have been avoided if builders, if regulators had taken heed to the warnings of environmental groups who had forewarned almost a decade ago of the risk of catastrophic flooding, but these individuals, these groups, these warnings were not heeded but ignored.

Mr. Chairman, it is important to remember that while some may consider commonsense, safety, and environmental regulations to be overly burdensome or tedious, these protections may one day mean the difference in saving one's property, livelihood, or even life.

Mr. Chairman, I would like to refer to regulations as nothing but safety measures. That is what they are, safety measures.

Another aspect that is important to today's hearing will hopefully provide instructions in attempting to strike the right balance between modernizing and upgrading the Nation's energy infrastructure like we so desperately need, while also taking into account the rights of land owners, Native Americans, and other communities that might be adversely impacted by these types of projects.

Mr. Chairman, nowhere in this struggle is the struggle more pronounced than in the battle over the Dakota Access Pipeline, and I am sure that we will hear more about this from our second panel of witnesses.

Mr. Chairman, as policymakers, we all understand the needs for additional infrastructure to ensure the critical views and critical resources are transported to the places where they are needed in order to meet our Nation's energy demands. However, as representatives of the people, Mr. Chairman, we must also ensure that the rights, the interests of Native Americans, property owners, and less affluent communities are also protected, and protected very vigorously.

Mr. Chairman, Congress should help provide thoughtful and responsible guidance for instituting a fair and balanced process for moving forward with large-scale energy projects that respect the rights of all communities and does not place expedience or maximum profit among the rights of land owners or the communities that these projects traverse.

Mr. Chairman, I welcome today's witnesses and I look forward to a very rigorous debate on these very important and difficult issues. I yield back.

Mr. UPTON. I appreciate the gentleman's statement. I do look forward to working with you to get the job done with Mr. Pallone and both Republicans and Democrats as we move forward.

It is time now for me to recognize the chairman of the full committee, the gentleman from Oregon, Mr. Walden, for 5 minutes.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. Thank you very much, Mr. Chairman. And as I said a couple of weeks ago to our first Energy Subcommittee chairman, we are all humbled by our responsibility of this committee and appreciate the power that we have to make policy changes that will have an enormous and positive impact on American consumers for decades to come.

Today, we examine the challenges and opportunities to expand, improve, and modernize our energy infrastructure across the Nation. We will hear from builders, and laborers, and contractors, and energy producers, and concerned citizens. We will hear from Tribes and utilities at the forefront of these issues. Our infrastructure is undergoing rapid changes on both the electrical and the energy-producing side but there is one thing I think that unites both, and that is these changes can mean real jobs.

On the first panel, we will hear from witnesses who will present a wide-ranging view of the technology developments in the electricity system. The U.S. electrical grid is one of the engineering marvels of modern history, but it is aging and it is under stress. The vast network that arose to deliver seamless uninterruptable power into our homes, schools and hospitals in a centralized and standardized fashion is being tested and challenged by the intersection of digital technology and innovation.

As technology continues to change the way we go about our daily lives, we also have to rethink how we generate, deliver and consume electricity. This could provide opportunities for consumers both large and small to save money and be more competitive.

The meeting I held in my district a couple of weeks ago in Prineville, Oregon, they were talking to an outfit that wanted to locate there and bring hundreds of jobs, do a major build-out. Then they found out the electrical grid is not sufficient to support that. And when I pursued that with Bonneville Power Administration and others, they are telling me it could be 2 to 3 years before they could get the capacity this community needs. This community during the downturn had the highest unemployment rate consistently in the State of Oregon. How the heck did we get to this point?

When you finally think you have a chance to grow jobs, put people to work building things, you discover somehow the electrical grid is not up to snuff and that it could take a couple of years to get it there. That is not where we want to be.

That is why we are here today, by the way. That is part of it, is we have got to do a better job of forecasting. We have to clear the roadblocks out of the way that aren't necessary, while still protecting the environment, while still providing appropriate ability for people to weigh in. You should always have the right to appeal your Government decisions, but it can't be an endless appeal that leads to situations that stop jobs and stop progress on making sure we have a safe and secure grid or that the pipelines continue to get the product where it is needed.

On the second panel, we will hear from all sides that area affected by the country's record-setting liquid fuels production growth. This growth has brought about tremendous opportunities

to make our Nation more energy independent, all the while creating thousands jobs.

At the same time, concerned citizens have come forward with their worries about the potential environmental impacts from new projects. The Dakota Access Pipeline is currently at the forefront of those headlines, and we welcome before the committee our witnesses from both the Standing Rock Sioux Tribe and the Dakota Access Project developer, Energy Transfer Partners.

We know that this issue means a great deal to both parties involved, and we are here to listen. The committee welcomes all sides of the debate, and we look forward to the testimony.

But the Dakota Access Pipeline is not the only project that is currently being challenged across the country. The impacts and delays brought on by increasing amounts of uncertainty do nothing to open up a productive conversation about the true risks and benefits of these types of projects.

We want to learn from the ongoing challenges presented to us today in order to bring more accountability, transparency, and predictability to the environmental permitting processes. The sooner our project developers and communities can talk about the risks and benefits within the community, the better. It is only by talking to each other, and not past each other, that we will be able to move beyond rhetoric and do what is right for our communities.

As this committee implements its own energy policy agenda, the testimony we take today will inform us on how to best approach the future so that we can embrace innovation and new technology for consumers.

We can be good stewards of our environment, and we will, while we also pursue policies to grow our economy. They are not mutually exclusive goals.

We stand ready to listen. We are excited to work, and we thank you all for being here.

[The statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

I said 2 weeks ago during our first Energy Subcommittee hearing that one of the humbling responsibilities for members of this committee is to fully appreciate the power we have to make policy changes that can have enormous and positive impact on American consumers for decades to come. And I reiterate that sentiment today as we begin our efforts to examine the challenges and opportunities to expand, improve, and modernize our energy infrastructure across the country. We will hear from builders, laborers, contractors, energy producers, concerned citizens, Tribes, and utilities at the forefront of these issues. Our infrastructure is undergoing rapid changes on both the electrical and energy producing side but there is one thing uniting them both. These changes mean jobs.

On the first panel, we will hear from witnesses who will present a wide-ranging review of the technological developments in the electricity system. The U.S. electrical grid is one the engineering marvels of modern history. But it is aging and under stress. The vast network that arose to deliver seamless uninterruptable power into our homes, schools and hospitals in a centralized and standardized fashion is being tested and challenged by the intersection of digital technology and innovation. As technology continues to change the way we go about our daily lives, we also have to rethink how we generate, deliver and consume electricity. This could provide opportunities for consumers, both large and small to save money and be more competitive.

However, these opportunities do not come without their own set of challenges. We must strike a delicate balance of maintaining the reliability and security of the grid and ensuring ample power generation, regardless of the fuel source. We must ensure

that the grid works in ways that optimize and build upon integrating new technologies with existing grid infrastructure, and siting new infrastructure when needed. I look forward to hearing the testimony of some of the leading entrepreneurs and research minds in this space to help create the electricity system of the future. I especially welcome our witnesses from the labor and contractor community, who stand to benefit with thousands of new jobs putting people to work doing what they do best.

On the second panel, we will hear from all sides that are affected by the country's record-setting liquid fuels production growth. This growth has brought about tremendous opportunities to make our Nation more energy independent all while creating thousands of jobs. At the same time, concerned citizens have come forward with their worries about the potential environmental impacts from new projects. The Dakota Access Pipeline is currently at the forefront of those headlines, and we welcome before the committee our witnesses from both the Standing Rock Sioux Tribe and the Dakota Access Project developer, Energy Transfer Partners. We know this issue means a great deal to both parties involved, and we are here to listen. The committee welcomes all sides of the debate and looks forward to your testimony.

But the Dakota Access Pipeline isn't the only project that is currently being challenged across the country. The impacts and delays brought on by increasing amounts of uncertainty do nothing to open up a productive conversation about the true risks and benefits of these types of projects. We want to learn from the ongoing challenges presented to us today in order to bring more accountability, transparency, and predictability to the environmental permitting process. The sooner project developers and communities can talk about the risks and benefits within the community, the better. It's only by talking to each other that we will be able to move beyond rhetoric and do what's right for our communities.

As the committee implements its own energy policy agenda, the testimony we take today will inform how we approach the future and how we best use innovation and technology to protect American consumers. We can be good stewards of our environment while also pursuing policies to grow our economy; they are not mutually exclusive goals. We stand ready to listen and are excited to get to work helping create new jobs to reinvigorating our energy and electricity delivery systems, ultimately bringing consumers affordable American energy that is safe, secure, and efficient.

Mr. WALDEN. And I yield the balance of my time to the vice chair of the committee, Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman. We are looking forward to today's hearing.

Whatever your energy needs are, America has it. I had the Ambassador for India in my office yesterday, and he wanted to talk about American energy going to India. If we have the energy, we have to be able to transport it. And in order to transport it, we have to be able to build transmission lines, pipelines, railroads, highways. That is what this hearing is about, is how do we build our infrastructure to transport our energy in a way that is economically sound and environmentally safe. And I am sure at the end of this hearing, we will have a better understanding of how to do that.

With that, I appreciate the hearing and yield back.

Mr. UPTON. The gentleman yields back.

The Chair recognizes the ranking member of the full committee, the gentleman from New Jersey, Mr. Pallone, for 5 minutes for an opening statement.

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

Mr. PALLONE. Thank you, Chairman.

Democrats strongly support modernizing our energy infrastructure, much of which is either outdated, on the verge of disrepair, or inadequate to today's needs. In the last Congress, we agreed with the Republicans on this committee on the need to provide funding to bring our electricity grids into the 21st century and to facilitate the repair of old leaky gas pipelines that waste resources and pose significant safety and environmental threats. In fact, we had an agreement with the GOP committee leadership to provide a total of \$3 billion for a Grid Modernization Grant Program and a Pipeline Repair Program modeled off the recommendations of the first installment of the Department of Energy's Quadrennial Energy Review.

Unfortunately, the full House Republican leadership, probably in response to the far right wing of the Republican caucus, opposed that plan and that led to the collapse of our bipartisan efforts here in this committee. Nevertheless, I am willing to try again. Infrastructure modernization is too important to our economy, to the public, and to workers to become a partisan issue. And if we do it right, we can enhance the environmental performance of the energy sector and protect vital natural resources. We need new and revitalized infrastructure to deliver energy, industrial feedstocks, and information safely, reliably, and efficiently. And it is going to take a substantial investment to realize this goal. This can't just become the package of deregulatory measures, tax giveaways to corporations, and fake investments through private-public partnerships. We need new hardware, new software, and new thinking, work that can and should be done in America by American workers for the benefit of all the American people. Our Nation is filled with great minds and great technologies that can modernize our energy infrastructure to meet 21st century needs. We can make our infrastructure smarter, more flexible, and more resilient and we can significantly improve its safety and environmental performance.

Now, most of us can agree that our country's energy infrastructure needs to be upgraded. Yet, the most important question today is not whether we invest in our infrastructure but what types of infrastructure we prioritize. And I still believe that we should be focusing on Federal funding to repair our aging gas pipeline distribution system and looking at ways to upgrade our electricity transmission and distribution networks to enhance reliability and efficiency, and to ensure sufficient power generation.

Now, I am a big supporter of expanding renewable energy generation here in the United States but I understand that a massive transmission to cleaner energy sources won't take place overnight. As long as we continue to use fossil fuels, pipelines can be the safest, most environmentally benign and economically efficient ways to move these fuels. But pipelines are only a benefit if they are constructed, maintained and overseen properly and they must be sited correctly with due respect for the rights of Tribes, local Governments, and individual property owners, as well as the environment. They must be constructed to high standards that ensure safety and protection of the communities and resources along their pathways and Federal permitting agencies have a critical responsibility to ensure that these pipelines don't jeopardize the land, water, habitat and cultural resources that surround them.

So many of the problems we see with big pipeline projects like Dakota Access revolve not around the project itself, but the process for routing and constructing the line. We won't solve these problems with streamlining. Instead, it will take discussion, understanding, respect, and flexibility and that takes time but it is time worth spending.

With regard to the siting of natural gas pipelines, we need to not only modernize our infrastructure but also the law that Governs its construction. The Natural Gas Act allows for the taking of private land in the name of the public convenience and necessity. That power was an important one when we were building pipelines to bring critical fuel to power plants and heat to homes. But now it is time to examine whether that power should be available merely to bring higher profit margins to some operators.

So, Mr. Chairman, these are important issues. This is a critical time to examine and plan for our future needs. Our past investments served us well for over a century. Now, however, we face new conditions and new challenges, including climate change. To retain our economic strength and robust job base, we need to get this right. Simply reinforcing old patterns of energy production, distribution, and use won't take us where we need to go.

And I want to work together to build the infrastructure that will deliver broad-based public benefits will into the future I hope we will not squander this opportunity to move forward. The time is now. The need is great and we have the resources to get this done. We only need the will to do it.

I yield back.

[The statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

Mr. Chairman, Democrats strongly support modernizing our energy infrastructure, much of which is either outdated, on the verge of disrepair, or inadequate to today's needs.

In the last Congress, we agreed on the need to provide funding to bring our electricity grids into the 21st Century and to facilitate the repair of old, leaky gas pipelines that waste resources and pose significant safety and environmental threats. In fact, we had an agreement to provide a total of \$3 billion for a grid modernization grant program and a pipeline repair program modeled off the recommendations of the first installment of the Department of Energy's Quadrennial Energy Review. Unfortunately, the House Republican Leadership, probably in response to the far right wing of the Republican caucus, opposed the plan. That led to the collapse of our bipartisan efforts.

Nevertheless, I am willing to try again. Infrastructure modernization is too important to our economy, to the public and to workers to become a partisan issue. And, if we do it right we can enhance the environmental performance of the energy sector and protect vital natural resources.

We need new and revitalized infrastructure to deliver energy, industrial feedstocks, and information safely, reliably, and efficiently. And it's going to take a substantial investment to realize this goal. This can't just become a package of deregulatory measures, tax giveaways to corporations and fake investments through "private-public partnerships." We need new hardware, new software and new thinking -work that can and should be done in America by American workers for the benefit of all the American people. Our Nation is filled with great minds and great technologies that can modernize our energy infrastructure to meet 21st Century needs. We can make our infrastructure smarter, more flexible, and more resilient. And, we can significantly improve its safety and environmental performance.

Most of us can agree that our country's energy infrastructure needs to be upgraded. Yet, the most important question today is not whether we invest in our infrastructure, but what types of infrastructure we prioritize. I firmly believe that we

should be focusing on setting aside Federal funding to repair our aging gas pipeline distribution system and looking at ways to upgrade our electricity transmission and distribution networks to enhance reliability and efficiency and to ensure sufficient power generation, particularly from renewable energy sources.

I am a big supporter of expanding renewable energy generation here in the U.S., but I understand that a massive transition to cleaner energy sources won't take place overnight. As long as we continue to use fossil fuels, pipelines can be the safest, most environmentally benign and economically efficient way to move these fuels. But pipelines are only a benefit if they are constructed, maintained and overseen properly. And they must be sited correctly, with due respect for the rights of Tribes, local Governments and individual property owners, as well as the environment. They must be constructed to high standards that ensure safety and protection of the communities and resources along their pathways. Federal permitting agencies have a critical responsibility to ensure that these pipelines don't jeopardize the land, water, habitat and cultural resources that surround them. So many of the problems we see with big pipeline projects like Dakota Access revolve not around the project itself, but the process for routing and constructing the line. We won't solve these problems with "streamlining." Instead, it will take discussion, understanding, respect and flexibility. That takes time, but it is time worth spending.

With regard to the siting of natural gas pipelines, we need to not only modernize our infrastructure, but also the law that governs its construction. The Natural Gas Act allows for the taking of private land in the name of public convenience and necessity. That power was an important one when we were building pipelines to bring critical fuel to power plants and heat to homes. But now it is time to examine whether that power should be available merely to bring higher profit margins to some operators.

These are important issues and this is a critical time to examine and plan for our future needs. Our past investments served us well for over a century. Now, however, we face new conditions and new challenges including climate change. To retain our economic strength and robust job base, we need to get this right. Simply reinforcing old patterns of energy production, distribution and use won't take us where we need to go.

We want to work together to build the infrastructure that will deliver broad-based, public benefits well into the future. I hope we will not squander this opportunity to move forward. The time is now, the need is great, and we have the resources to get this done. We only need the will to do it.

Mr. UPTON. The gentleman yields back. The time for opening statements is concluded.

We are very pleased to have our first panel with us this morning. We are joined by Mr. Michael Howard, President and CEO of Electric Power Research Institute; Mr. Ganesh Bell, Chief Digital Officer and General Manager for Software and Analytics for G.E.; Lonnie Stephenson, International President of the International Brotherhood of Electrical Workers; and Steve Hauser, CEO of GridWise Alliance.

I appreciate very much you submitting your testimony well in advance. I was able to read it last night. Your statement is made part of the record, and we will give you 5 minutes to summarize your comments and move on from there to questions.

Dr. Howard, you are recognized. Thank you and welcome.

STATEMENTS OF MICHAEL W. HOWARD, PH.D., PRESIDENT AND CHIEF EXECUTIVE OFFICER, ELECTRIC POWER RESEARCH INSTITUTE; GANESH BELL, CHIEF DIGITAL OFFICER, GE POWER; LONNIE R. STEPHENSON, PRESIDENT, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS; AND STEVEN G. HAUSER, CHIEF EXECUTIVE OFFICER, GRIDWISE ALLIANCE

STATEMENT OF MICHAEL W. HOWARD

Dr. HOWARD. Thank you. Good morning and thank you very much, Chairman Upton, Ranking Member Rush, and members of the subcommittee.

I am Mike Howard, President and CEO of the Electric Power Research Institute. This is our 45th year as an independent nonprofit company whose mission is to advance safe, reliable, affordable, and clean energy for society through global collaboration, thought leadership, and science and technology innovation.

Our annual research funding is over \$400 million a year, principally from the electric utility companies in more than 30 different countries. Our research focuses on the generation of electricity, the delivery of electricity, and the use of electricity, including energy efficiency.

Over the past couple of years, we have examined the forces that are changing the world's energy systems. We have gained insights through discussions with our advisors, leaders in the industry, regulators, academicians, science and environmental organizations financing Government. We introduced our initial finding earlier this week at NARUC conference in a report titled, "The Integrated Energy Network: Connecting Customers with Reliable, Affordable, and Cleaner Energy." This report is provided to you as my written testimony and serves as the basis for my comments.

The Integrated Energy Network envisions a future in which customers have flexibility to use, reduce, and manage energy as they choose, while improving access to reliable, safe, affordable, and cleaner energy. I want to share with you five insights from the work and implications for infrastructure investment.

First, electric, gas, transport, and water systems are increasingly interdependent, but their planning, operations, and regulation are largely separate. Closer integration could improve liability, gain efficiency, and maximize value of energy customers, as well provide greater independence and security. We emphasize that infrastructure investments will be more effective if broad energy and natural resource implications are considered, rather than focusing narrowly in a single energy sector.

Second, advances in information and communication technology, sensors, data analytics modeling are key enablers for The Integrated Energy Network. These digital innovations enable greater customer engagement with their energy choices and control, while maintaining a focus on critical issues such as affordability, reliability, security, and data privacy.

Third, an essential near-term step is the full implementation of what we call The Integrated Grid, an integrated electrical system which fully realizes the value of central and distributed energy re-

sources. The Integrated Grid is the backbone of The Integrated Energy Network.

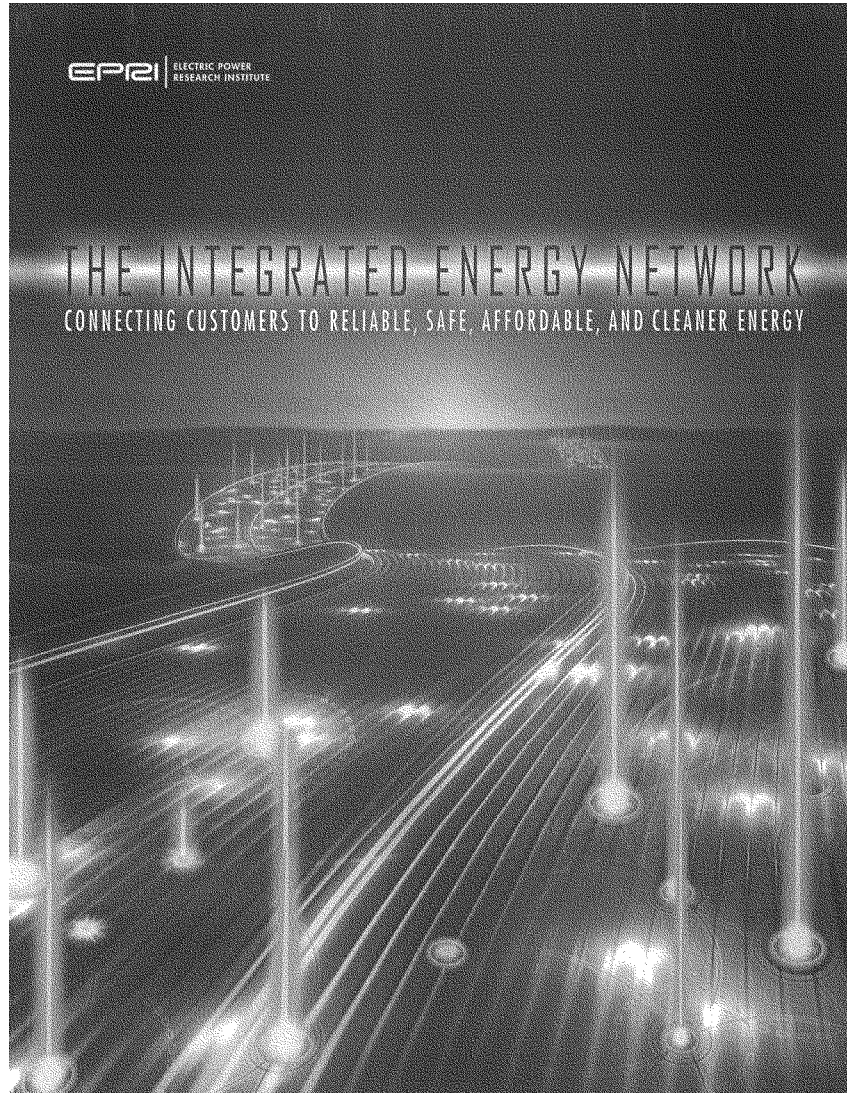
Much progress has been made, but we need to redouble efforts to create technical and communication standards, deploy modern electric grid technologies, and providing supporting infrastructure and oversight to accelerate the adoption of emerging electrification technologies. These advanced electrification technologies, to name just a few, include electric vehicles, advanced heat pumps, and water heaters. These more efficient electrification technologies have the potential, the opportunity to improve productivity and efficiency while reducing emissions by using electricity where it is more efficient compared to other energy options.

Fourth, investment in the electric grid is needed to maintain reliability. The emergence of shale gas and rapid deployment of large-scale solar and wind have fundamentally changed the electric generating fleet, stressing an aging grid infrastructure. Rapid deployment of solar and wind generation increases significantly the value of expanding regional and long distance electric grid systems to enable more effective utilization as these have every important generation assets.

And finally, acknowledging advancements are essential to controlling costs and creating new possibilities in delivering and generating electricity, including next generation nuclear plants, advanced thermal fossil plants with carbon capture in storage. The generation fleet will need to be more operationally flexible to support a much greater end-to-end dynamic electrical system that puts the customer first.

More detail on the required actions and challenges to provide are provided in my written testimony. I very much appreciate the opportunity to be here this morning and I look forward to your questions. Thank you.

[The prepared statement of Dr. Howard follows:]



FOREWORD

Over the past few years, EPRI has examined the forces changing the world's energy systems. We have gained insights through discussion with our Board of Directors, Research Advisory Committee, public-utility Advisory Council, and with leaders from energy businesses, regulatory commissions, academic institutions, scientific and environmental organizations, finance, and government.¹

These conversations have revealed that systems for managing energy and natural resources are increasingly interconnected. Yet these systems remain largely separate and fragmented with respect to strategy, management, and operations. Technological change is amplifying the cost of failing to integrate these systems while also creating new opportunities and rising customer expectations with respect to reliable, affordable, and cleaner energy. Many customers also seek greater control of their energy options.

To realize the opportunities arising from such change requires fundamentally different thinking. Here we outline steps—the Integrated Energy Network (IEN) pathway—to articulate how the actions of diverse interests could yield more integrated, efficient, and productive management of energy and natural resources.

As a result of this assessment, EPRI will make changes we believe are needed to fulfill our mission, "Advancing safe, reliable, affordable, and environmentally responsible electricity for society through global collaboration, thought leadership, and science and technology innovation." We will:

- **Refocus our research.** We will look more broadly at the changing interconnections between electricity, gas, water, transport, other energy carriers, and natural resources such as water and clean air. We will investigate also new customer expectations and opportunities in the broader context of these interconnected industries.
- **Broaden our membership** to encourage diverse entities to participate in our collaborative research.
- **Expand our communication and outreach** to increase engagement with participants across the energy sector and to more constructively engage with diverse stakeholders.
- **Expand internationally** to bring to our R&D collaborative the broadest possible perspectives, knowledge, ideas, and approaches.

We offer this document to spark new thinking and discussion about how integration can affect the production and use of energy. As we publish a series of supporting technical documents and launch new R&D efforts we seek your input. Our website at <http://ien.epri.com> offers more information and various ways for you to help us develop this pathway. We look forward to your engagement.


 Michael W. Howard, Ph.D., P.E.
 President and CEO
 Electric Power Research Institute

¹ EPRI's Board of Directors and Research Advisory Committee are comprised primarily of leaders from EPRI's global membership. EPRI's Advisory Council consists of leaders from regulatory, academic, environmental, financial, and scientific organizations. While all provided thought and guidance, the views represented in this document, unless otherwise stated, are EPRI's and do not necessarily represent the views of the members (individually or collectively) of those bodies, or of EPRI's funders and members.

THE FUTURE OF ENERGY: A PERSPECTIVE AND PATHWAY

Over the past 12 years the world's population grew by 1 billion, passing 7.3 billion in mid-2015. Credible projections envision further growth to about 11 billion by 2100.² Most people live in cities today, for the first time in history, and almost all of the anticipated population growth is projected to be urban. The global economy is expected to expand three to four times faster than population, substantially increasing the demand for energy services.

This growth affects an array of local and global environmental challenges. Competition for scarce water resources is already evident in much of the world. Concern about air and water quality is rising—especially in emerging economies—even as tremendous progress is made in managing pollution. The World Health Organization (WHO) recently concluded that 92% of the world's population lives in places where air pollutant levels exceed WHO limits.³ Globally, nations are joining in efforts to limit emissions of greenhouse gases, most of which come from the energy sector. As environmental pressures grow, and as societies become wealthier and more aware of the issues at stake, they expect that their energy systems will deliver more services at a reasonable cost and with a much lighter environmental footprint.

Along with these rising demands and expectations, the technological capabilities for energy supply and environmental protection are changing quickly. In the past, the systems that provided customers with energy services such as lighting, communication, mobility, and clean water developed largely independently. Looking to the future, new technologies and business models are making feasible a much deeper integration of these services. These changes offer the opportunity for societies and firms to rethink how they organize and provide energy and natural resource services.

Much of the technological transformation is rooted in rapid, pervasive digitalization. By 2016, more than 50% of U.S. residential electricity customers were equipped with smart meters.⁴ The European Union expects more than 70% of customers to have smart meters by 2020,⁵ and deployment is proceeding rapidly in Latin America and Asia. Power plants and transmission and distribution assets are being retrofitted with sensors to operate more efficiently and in ways that allow much more precise environmental control. Markets—still nascent in much of the world—are creating price signals that reward better and more integrated operations. Ongoing deployment of smart devices prompts some to project that within a decade or so essentially every grid-connected device will have its own internet address—from light bulbs to the many components of electric vehicles and nuclear power plants. Natural gas and water systems also are digitizing, although at a pace generally slower than the electric sector. Intelligent sensors, automation, and real-time data offer more information, choices, and control to customers and provide new ways to optimize energy systems. They also raise customer expectations—prominent among them the demand for much more reliable supplies of electric power needed to power digital systems.

² World Population Prospects – 2015 Revision. United Nations.

³ World Health Organization. News release on September 27, 2016.

⁴ Institute for Electric Innovation. *Electric Company Smart Meter Deployments: Foundation for a Smart Grid*, October 2016, available at: <http://www.edisfoundation.net/ew/publications/Documents/Final%20Electric%20Company%20Smart%20Meter%20Deployments%20Foundation%20for%20A%20Smart%20Energy%20Grid.pdf>.

⁵ European Commission. 2016. "Smart Metering Deployment in the European Union." <http://ses.jrc.ec.europa.eu/smart-metering-deployment-european-union>.

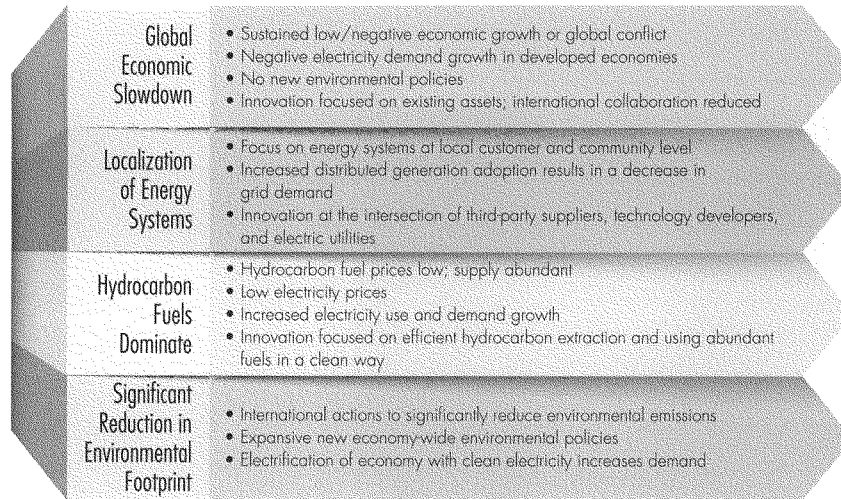


Figure 1. Bounding Scenarios.

With these trends in mind, in 2015 and 2016 EPRI convened a range of stakeholders to explore their expectations for the energy industry and how the future may unfold. Our discussions were informed by many diverse sources of information including an array of studies recently published by government, academic, and private organizations.^{6,7,8}

To structure discussion, EPRI developed four bounding scenarios—each driven by alternative views of such forces as demand for energy services, the price of hydrocarbons, energy and environmental policies, human behavior, and innovation (Figure 1).⁹

From these, EPRI developed *Global Points of View* to summarize the insights that hold in most, if not all scenarios, excerpted below. These scenarios and points of view help to map plausible futures for the world's energy systems. Energy companies and stakeholders can use these to explore causes and consequences of transformations in how society produces, trades, and uses energy.

⁶ Several studies focus on the specific aspects of the energy future. For example, Risky Business, *From Risk to Return: Investing in a Clean Energy Economy*, November 2016. Obama Administration, *United States Mid-Century Strategy for Deep Decarbonization*, November 2016. MIT, *Utility of the Future*, December 2016. US Department of Energy, *Transforming the Nation's Electricity System: The Second Installment of the Quadrennial Energy Review*, January 2017.

⁷ Some studies explore the links between energy and natural resources. For example, BP, *Water in the energy industry: An introduction*. <http://www.bp.com/content/dam/bp/pdf/sustainability/group-reports/BP-ESC-water-handbook.pdf>, 2013.

⁸ There are fledgling efforts to understand energy system integration from a technical perspective. For example, EPRI participates in the International Institute for Energy Systems Integration, <http://iiesi.org/>, which aims to explore many of the technical issues associated with energy systems integration.

⁹ For a fuller description on the scenarios EPRI developed and a full listing and details associated with the Global Points of View, see *A Perspective on the Future of Energy: Scenarios, Trends, and Global Points of View*. EPRI 3002009918, February 2017.

*Excerpts from EPRI "Global Points of View"
to the 2030s and Beyond*

- The global economy expands fueled by significant growth in energy use, coupled with significant reduction in energy's environmental footprint, in response primarily to regional environmental issues, but increasingly in response to global issues such as climate change.
- Efficiency emerges as a social, economic, technological, and operational trend across the energy sector. In emerging economies increased demand for energy services leads to increased energy use. In developed economies, efficiency gains outweigh energy service growth, leading to flat or declining energy use.
- Electricity demand grows more rapidly than overall primary energy demand, continuing a century-long trend. Technological advances and strengthened environmental policies could greatly accelerate electrification.
- The transportation sector reaches much higher efficiency, incorporates intelligence and communication technologies, and moves to low-carbon fuels, including electricity.
- Greater value and expectations are placed on power quality and reliability.
- Central-station generation, including nuclear, gas, coal, and renewable, and the electric grid continue to serve an anchor role in providing reliable, affordable electricity. These technologies evolve to enable productive use of a more diverse energy portfolio in developed economies. For emerging economies in which new transmission is constrained or costly, they support deployment of local grids and distributed resources.
- Renewable energy deploys rapidly and globally through electricity and via direct application of biofuels and other energy carriers in non-electric portions of the energy system. Distributed power applications require modernization of distribution and transmission systems enabled by integrated communications and control.
- Integration of system planning and customer information enables greater efficiency and control, and creates new opportunities and challenges for security and resiliency.
- Connections between electricity, other energy sources, and water take on greater importance. Emerging technologies such as electric vehicles and an array of hydrogen applications create new connections.
- Innovation accelerates, with new technologies and business models increasingly coming from sources outside the traditional energy industry.

THE INTEGRATED ENERGY NETWORK

Emerging from EPRI's analysis is the essential insight that society and the industry should welcome and accelerate the tighter integration of energy systems. Services traditionally provided by diverse and disconnected systems—such as heating, lighting, transport, and industrial automation—should be provided through a more integrated system of systems. Moreover, energy services need to be better integrated with the resources they utilize. EPRI calls the desired end-state of this process the Integrated Energy Network (IEN) and the near-term steps towards this destination, the IEN pathway. The IEN frames a future in which customers have flexibility to use, produce, and manage energy efficiently, in ways they prefer, with access ensured to all for reliable, safe, affordable, cleaner energy.

The Integrated Energy Network won't happen automatically

Making the IEN a reality requires new thinking on many fronts, breaking from current trends and practices. For example, it will require energy companies, policy makers, and the R&D enterprise to:

- Manage energy and natural resources as an integrated system. Separate regulation, planning, and operation of electricity, natural gas, and water systems have made these systems less reliable and efficient, and they make it harder to realize the productivity and environmental gains of deeper integration.
- Guide an efficient transition to much more digital, dynamic, and networked energy systems, which will require significant technology advances and infrastructure investments coupled with secure and private communication, control, and operational standards.
- Accelerate the development of cleaner energy technologies—supply, demand, delivery, and storage technologies—that can operate more flexibly, ensuring the reliability of energy services while emissions are reduced significantly.

- Unleash and promote opportunities for efficient electrification, the essential path to a more efficient, cost-effective, and cleaner energy system.

- Create new business models that build on the strengths of today's energy infrastructure while taking advantage of new technological possibilities.

- Increase energy system resiliency and security while protecting privacy.

The IEN pathway envisions not just physical interconnections among these energy systems and resources. It is rooted in pervasive, secure interconnections of data, information and market signals that can enable much more sophisticated monitoring and control of energy networks, and expanded customer choice. Indeed, increased choice and information interconnections are at the root of many current industrial transformations.¹⁰ Developments in those industries perhaps foreshadow new patterns in the propagation of ideas and market signals through energy industries. A prominent example is the importance of battery technology for transportation, grid operation and services, and water movement. Technology advances in one application can give rise to profound changes across the energy and natural resource systems.

The IEN pathway also illuminates the critical role of electrification as a means of integration and achieving greater value. Where fossil fuels are combusted directly today—such as within onboard engines in cars and trucks—electricity will increasingly become the carrier of useful energy. Electricity's role has been steadily growing since its commercial introduction in the 1880s. Accelerated electrification may well emerge as the keystone to enhancing efficiency, improving productivity, and providing cleaner energy.

The IEN extends EPRI's earlier thinking regarding electric sector challenges. In 2014, EPRI introduced its Integrated Grid concept, aimed at maximizing the value of central and distributed electric resources.¹¹ EPRI views the Integrated Grid as an essential enabler of the Integrated Energy

¹⁰ McKinsey Global Institute, "A Future that Works: Automation, Employment, and Productivity", January 2017.

¹¹ See <http://integratedgrid.com> for a series of reports and opportunities to get engaged in this vital, ongoing effort.

Network. The IEN expands the Integrated Grid concept in many dimensions. For example, IEN includes a comprehensive, integrated consideration of the environmental consequences of all choices while the Integrated Grid addresses environmental issues only indirectly. The IEN also expands the range of options considered for addressing key challenges such as balancing load with variable renewable and distributed energy resources. While the Integrated Grid considers dynamic options in power production, delivery, and use to balance this variable generation, the IEN considers a much wider array of traditionally “arm’s length” options such as natural gas storage, thermal storage, creation of new flexible demands such as electric transport, or integration with potential future energy carrier systems such as hydrogen.

The IEN, taken to its fullest extent, suggests the need for a fundamental rethinking of an energy system that has evolved gradually for most of the past century. This transformation could rival the late nineteenth and early twentieth century when the basic elements of the modern electricity industry emerged. As new electric options were introduced, it took several decades for industry and households to adopt them, and in the process, many vital social and industrial functions were created and transformed. Homes gained lighting and refrigeration. Industry used these decades to redesign factories to make new products or make existing products in new ways, resulting in much greater economic efficiency. This paper proposes that the IEN can help prompt similarly fundamental change and create new, unforeseen opportunities as diverse energy industries and services become more interwoven.

Integrating production, delivery, use, and control of resources

In considering the complex, multi-dimensional global energy sector, the IEN examines its systems from three perspectives:

■ **Using Affordable, Cleaner Energy – through efficiency and electrification.** From this perspective, consumer desires for reliable, affordable, cleaner energy combine with expanded choice and control. The pace of electrification accelerates as electricity use provides

a cleaner energy alternative, while remaining affordable and reliable. Improved energy efficiency results from both environmental stewardship and advances in consumer technologies.

■ **Producing Cleaner Energy – through more efficient and environmentally sustainable, and flexible generation.** Energy service providers reduce costs and environmental footprint while operating more flexibly, leading to wider use of electricity as an energy carrier. Renewable energy plays a growing role, and hydrogen potentially emerges to meet some energy needs.

■ **Integrating Energy Resources – through new control technologies, communications, standards, and markets.** Improved control of electric systems, coupled with communication and security protocols and online systems, support interoperability of connected systems. Integration of distributed generation and the grid improve system productivity and flexibility. This enables broader, coordinated management and control of energy and other resources that improves reliability and efficiency. Electricity emerges as the central, essential means to improved energy efficiency and environmental sustainability.

Each of these perspectives is introduced below. EPRI will release additional technical papers in 2017 to further develop these perspectives (see <http://ien.epri.com>).

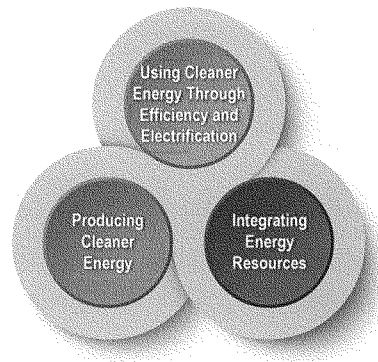
USING AFFORDABLE, CLEANER ENERGY – THROUGH EFFICIENCY AND ELECTRIFICATION

A central driver of the Integrated Energy Network is the demand for affordable and cleaner energy. Expanding urban populations with rising income levels expect this. An array of technological advances make obtaining cleaner energy more affordable today than ever before, while expanding customers' choices and control.

Efficiency gains are essential to cleaner energy. From a customer's perspective, some efficiency gains require investments (e.g., insulation, new lighting) while others come essentially at no additional cost, such as power-saving innovations in portable electronics spreading to other products.¹²

Electrification enables a more productive, efficient, and cleaner energy system

Electrification—customers' shift from direct combustion of fossil fuels to electricity—has emerged as a valuable strategy for not only boosting efficiency, but also for reducing emissions at minimum cost. While acknowledging those circumstances in which it remains more efficient or less expensive to burn fossil fuels directly, there is a growing array of energy uses for which electricity is the best option—especially where pollution must be cut nearly to zero, such as in densely populated cities. For example, with today's technologies, sending electrons to vehicles can be more than twice as energy efficient while reducing local emissions to zero. Electrifying vehicles in this case can also reduce the cost of fuel by 70% while lowering emissions of CO₂ by 75%.¹³ Another important example is space heat. By moving heat rather than creating heat via gas combustion in a furnace, an electric heat pump requires significantly less primary energy. Heat pumps have lower emissions in many locales today, and as the electricity fueling a heat pump becomes cleaner over time, emissions fall relative to the heat produced. The United Kingdom and other European countries have adopted policies to implement clean heating that rely in large part on electric technologies, either directly through heat pumps or indirectly through clean production of hydrogen.



Today, electricity provides a cleaner fuel option for an array of applications across the economy. As the electric system becomes even cleaner, electrification becomes an even more attractive path for reducing the economy's environmental footprint, while keeping energy services affordable. Electrification's economic and environmental benefits are evident from studies examining energy services comprehensively. Based upon hundreds of published scenarios produced by dozens of models around the world,¹⁴ the United Nations' Intergovernmental Panel on Climate Change (IPCC) has concluded that decarbonizing electricity coupled with accelerated electrification is a "key component" for cost-effective, deep cuts in global emissions. The European Commission's detailed examination of climate policy for Europe, *Energy Roadmap 2050*, projects a near doubling of electricity's share of "final energy" from 20% today to 36-39% in 2050.¹⁵ Edmonds, et al., in one of the few papers to examine electrification in detail globally and regionally, concluded the tighter the carbon constraint, the greater the role of electricity—even with very conservative

¹² See for example, *The Third Wave of Energy Efficiency*, EPRI 3002009354, November 2016.

¹³ Key assumptions underlying these calculations include: Gasoline at \$3/gallon retail; electricity at \$100/MWh; 30 mpg and 0.08 tons CO₂/mile for the gasoline vehicle; 300 Wh/mile and 0.3 tons CO₂/MWh (consistent with modern gas-fired turbines) for the electric vehicle.

¹⁴ IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

¹⁵ Electricity's share of final energy is one metric used to provide an aggregate, quantitative measure of electricity's role in the energy system. Electricity's role has grown over the last century largely driven by increased use of electricity-dominated end uses, e.g., lighting, air conditioning, home

ELECTRICITY'S SHARE OF TOTAL ENERGY CONSUMPTION, BY SECTOR 1949-2015 (SOURCE: EIA AER 2016)

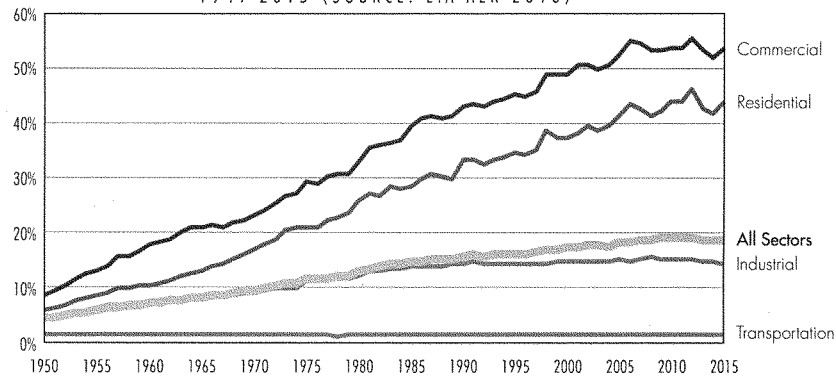


Figure 2. Electricity's share of energy use and its role have grown steadily, rising from 3% of final energy in 1950 to 18% in 2015. This growth has been led by the residential and commercial sectors where electricity has supplied increasing and changing demands for light, cooling, entertainment, and information/communication. Electricity's growth also has been significant in the industrial sector, until a recent drop driven by lower natural gas prices. For U.S. transportation, electrification—primarily rail and light-duty vehicles—has been negligible. To date, this growth has been led by increased demand for end-uses where electricity dominates. Those trends are expected to continue and be supplemented by technology- and policy-driven electrification.

assumptions regarding improvements in power generation technology.¹⁷ Other EPRI research consistently supports this conclusion.¹⁸ There are many ways to cut emissions, but these studies underscore that, both for specific and very broad application, electrification is crucial to making emission controls cost-effective and affordable.

Recent EPRI analyses illustrate how electrification may accelerate in the United States and reduce transport emissions, even without prescriptive environmental policies.¹⁹ Figure 2 provides context for these analyses. While the commercial and residential sectors have steadily electrified since 1950, and industry has electrified somewhat, U.S. electricity use for transportation has remained negligible. The U.S. Energy Information Administration, in the reference case in its

2017 Annual Energy Outlook, sees this trend continuing with electricity growing from 0.1% of delivered transport fuel in 2015 to only 1.5% in 2050.²⁰ In contrast, EPRI analyses suggest that automobiles and other light-duty vehicles may be poised for rapid electrification as prices drop, capabilities increase, and manufacturers expand offerings. For example, the plausible achievement of purchase price parity between electric and gasoline vehicles by 2025²¹ could increase electricity's share of transport and overall final energy markedly over the next fifteen years—yielding new electric loads and local challenges for distribution and transmission infrastructure coupled with significant new opportunities for managing load and the electric system flexibly.

¹⁷ appliances, communication, entertainment. Electrification—defined here as switching from fossil fuel end-uses to electric ones driven by technology advances or efficiency/environmental goals—appears poised to accelerate this growth.

¹⁸ European Commission, "Energy Roadmap 2050", European Commission, 2011.

¹⁹ Edmonds J. A., T. Wilson, M. A. Wise, and J. P. Weyant (2006). Electrification of the Economy and CO₂ Emissions Mitigation. *Environmental Economics and Policy Studies* 7, 175–203.

²⁰ Rose S., R. Richels, G. Blanford, and T. Rutherford (2016). "The Paris Agreement and Next Steps in Limiting Global Warming."

²¹ IEN Electrification white paper forthcoming, June 2017.

²² Energy Information Administration's Annual Energy Outlook 2017.

²³ Projections of potential cost parity between electric vehicles and internal combustion in the next decade are emerging from a variety of sources. EPRI's internal analysis, which updated US DOE automobile cost simulations with more aggressive assumptions about battery improvements, suggested purchase price parity for EVs without subsidies in the 2020s. The Wall Street Journal stated, "Mercedesmaker Daimler thinks the production cost of engine and battery technology might reach parity in 2025. But the tipping point for consumers, who also factor in subsidies and running costs, will

Vehicle electrification can lead to much more than cost saving, efficiency gains, and CO₂ emissions benefits. Jointly with the Natural Resources Defense Council, EPRI concluded that "...widespread use of electric vehicles—including lawn and garden equipment and heavy industrial equipment such as forklifts—could radically improve air quality, particularly in densely populated urban areas..." (see Figure 3).²² In recent years, substantial attention has been directed to electrification as a means of cutting global CO₂ and other greenhouse gas emissions. But findings that electrification can lower local and regional pollutants underscores how both policymakers and consumers can look to electrification to address an array of pollution reduction goals.

Creating technologies that enable more efficient provision of energy services does not by itself make energy systems cleaner. Public policies can offer additional incentives that alter customers' decisions and those made by the energy sector businesses that serve them.

Expanded customer choice, increased efficiency, and the advantages of electrification will not be achieved without effort. They require investment in innovation and testing new ideas, along with complementary policies and the creation of markets, such as those that empower customers to choose cleaner, affordable energy systems. These key actions are summarized in the box on the following page.

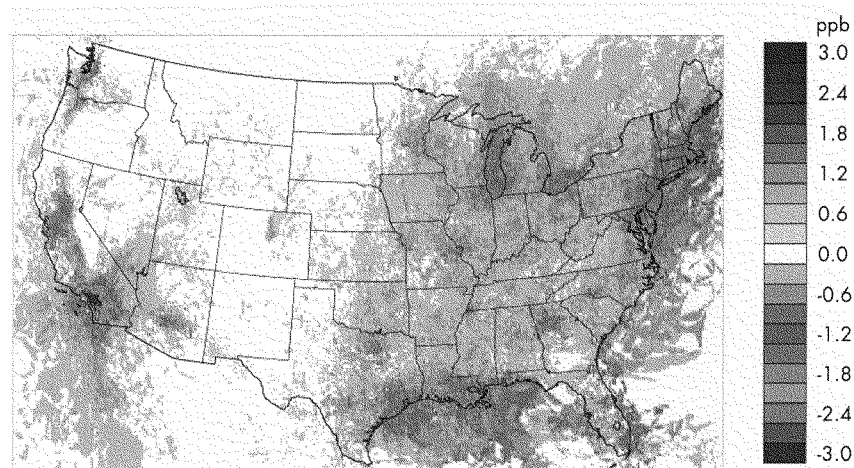


Figure 3. Reductions in ozone due to electrification (results for 2030; based on fourth highest daily max eight-hour ozone concentration).

be earlier" in the article, *Investors Get Ready for the Coming Electric Car Revolution*, December 13, 2016. In its February 25, 2016 report, *Global EV Sales Outlook to 2040*, Bloomberg New Energy Finance projected "By 2022, the unsubsidized total cost of ownership of BEVs will fall below that of an internal combustion engine assuming oil is between \$50 and \$70 per barrel."

²² Reference... <http://epri.co/3002006881>.

*KEY ACTIONS: Using Affordable, Cleaner Energy –
Through Efficiency and Electrification*

Policy, regulation, and technology advances are required to promote energy efficiency and to enable or encourage electrification:

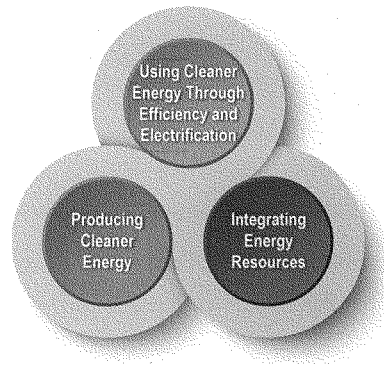
- **Explore technical options and policies for achieving cost-effective efficiency gains.** Traditional energy efficiency efforts should expand to look beyond equipment improvements to examine broader gains from fuel switching (gas furnace to heat pump) and process improvement (e.g., airlines reduce energy use per passenger using price structures to fill seats). Efficiency metrics that assume two-thirds losses in all electricity generation are becoming inappropriate in many regions. Regulators can review efficiency policies to assess and improve their effectiveness.
- **Evaluate energy and environmental policies and regulations that allow or encourage electrification.** Understand how each sector's policies drive disincentives or work at cross-purposes for efficient, effective compliance throughout the energy sector. Examples include rules that penalize electric utilities for increasing emissions as a result of powering large fleets of electric vehicles, despite a net reduction in emissions when considering the gasoline use that is displaced. Research must provide for accurate accounting of electrification's net results and identify approaches to overcome financial, ownership, and informational impediments. Policymakers and regulators can seek new cross-sector approaches to achieve their goals and create incentives necessary to spur infrastructure investment (e.g., electric vehicle charging structure).
- **Develop and demonstrate advanced, highly efficient, clean-energy end-use technologies.** EPRI deems it necessary to identify promising electric technologies and develop those that drive and serve new customer preferences and that provide increased value as economics and policies evolve. Continued investment in these technologies can reduce emissions per unit of energy services, reduce water consumption and other environmental impacts, and offer customers an array of benefits including lower cost, productivity gains, improved product quality, and a cleaner, safer work environment. Also important are advances in fuel cells and other technologies for consuming cleanly produced hydrogen as well as technology, communication protocols, and distribution standards for effectively integrating these end-use resources in the system. Sustained funding for research and technology demonstrations are critical to keeping promising products in the pipeline.

PRODUCING CLEANER ENERGY – THROUGH MORE EFFICIENT, ENVIRONMENTALLY SUSTAINABLE, AND FLEXIBLE GENERATION

Electricity produced from cleaner resources such as renewable energy, nuclear power, and fossil-fueled generation with carbon capture offers the potential to reduce energy systems' emissions substantially. With technology advances in both utility-scale and distributed generation, the cost of cleaner energy declines substantially. Current opportunities and issues for each power source include:

■ Solar and wind offer variable power production and plummeting equipment prices, with further decreases likely. To address day-to-day variation in supply, grid operators use forecasting to schedule reserves from flexible resources (primarily thermal generation today) with an increasing role for demand response and energy storage. Expanded transmission can also connect large regional centers of diverse supply with load centered in other regions. Seasonal variation in production may be much more expensive to address and require well-functioning capacity markets and backup generation as well as innovation and deployment of long-term storage.

■ Nuclear power's track record emphasizes reliable, baseload power production with essentially zero emissions. However, it can take many years to build in the United States and Western Europe, making financing a challenge and payback uncertain. Significant nuclear power development is proceeding in nations such as South Korea and China, where plants are constructed faster and at lower cost; construction experience is enabling companies in these countries to emerge as equipment vendors and operators for other countries. Existing nuclear plants also face challenges. An economic challenge arises in electricity markets with systemically low and negative energy prices—a condition that often accompanies surging or sustained oversupply of renewable generation at zero marginal cost. This market challenge has been exacerbated in the United States by persistent low natural gas prices (\$2.3/MMBtu).²⁹ Public acceptance offers ongoing challenges—evident with the planned closing of all German nuclear plants and the suspended operation of nearly all Japanese plants post-Fukushima. Ad-



vanced plant designs and ongoing R&D in support of operating plants offer enhanced approaches to address these issues.

■ Carbon capture, transport and utilization and storage (CCUS) are generally considered essential to making deep cuts in global CO₂ emissions. The idea of CCUS has been around for a long time, but sustained investment to develop and demonstrate these technologies has lagged. Beneficial use of captured CO₂—such as for enhanced oil recovery or some industrial processes—offers attractive niche applications to introduce and establish these technologies. Combined with biomass, CCUS may be viable for removing atmospheric CO₂—in effect, creating power plants that offer useful energy services (electricity) with negative net emissions. This combination plays a key role in theory, appearing as a critically important technology in almost all modeling studies of low-carbon futures, but has yet to attract significant investment. The challenges with CCUS are partly technical and mainly, it seems, linked to the lack of viable business models and regulatory frameworks necessary to attract investment.

²⁹ The states of New York and Indiana in late 2016 implemented policies to help keep their nuclear plants running; several other states and possibly the federal government are considering similar policies.

These three technology clusters will be important in most regions. Other important technologies will depend on geography and markets. For example, in the United States and other countries with abundant, low-cost natural gas, this fuel likely will account for a growing share of relatively lower-carbon power for decades to come. The switch from coal to natural gas-fired power generation has reduced emissions over the past decade. Prospectively, low natural gas prices could continue the trend. Natural gas also may fuel a significantly larger portion of the mid- to heavy-duty vehicle fleet, based on economics and environmental benefits. The future for natural gas, however, depends on continued advances in production combined with environmental policy choices, such as whether society seeks emission cuts so deep that conventional gas technology can't deliver. Renewable natural gas produced from landfills, dairy operations, and other sources could help further decarbonize this fuel, making it instrumental in a transition to much lower emissions. Cost-effective CCUS combined with natural gas also could be important—especially if coupled in a manner to efficiently provide the variable output needed to help integrate renewables with the power grid.

Energy diversity has value

For the foreseeable future, the drive to create cleaner energy carriers will focus on electricity. However, any comprehensive consideration of energy system transformation must consider unknowns regarding which energy carriers will best serve varied energy needs. Hydrogen, like electricity, can be a carrier (or transmitter) of cleaner energy. A central question for its future as a clean energy carrier is where it will complement versus substitute for electricity. Today, almost all hydrogen use is in industrial applications with limited use for heavy transport (e.g., buses). The predominant processes for creating hydrogen today also produce significant CO₂ emissions. Clean hydrogen production costs are at present economically prohibitive, and no clear path has emerged for cost-effective delivery at large scale or developing safety standards for public use. Still, the Integrated Energy Network pathway will consider using hydrogen to store surplus renewable or nuclear electricity and as an energy carrier for certain industrial and transport applications. For residential or commercial use, cleanly produced hydrogen might be blended with natural gas to lower the natural gas supply's carbon content—making it possible for societies to reduce emissions while using the existing natural gas network.

Because many unknowns remain—even with the most prom-

ising choices for cleaner production of electricity—substantial research by EPRI and others has examined the value of a diversified, full portfolio of technology options. The IPCC emphasized this by noting that efforts to decarbonize energy could be many times more expensive if attempted without the full portfolio—notably (in order) CCUS, renewables, and nuclear. Indeed, the overarching imperative for integrating energy systems may well require a concerted drive to a diverse portfolio. Integration creates more opportunities to arbitrage and diversify risk across a larger and more capable energy system.

Key challenges for producing cleaner energy include making advances in individual technologies, improving systems' flexibility to manage variable production effectively, and creation of policies and regulation to support full-scale technology demonstrations. An essential foundation for this is demonstrating through research and development the value of a full portfolio of technologies.

KEY ACTIONS: *Producing Cleaner Energy*

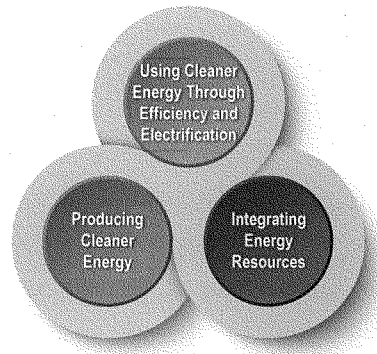
In working across the energy sector, a clear priority is to refine and deepen a common understanding of the opportunities and challenges inherent in each energy resource and system:

- ***Develop a better understanding of renewable energy integration challenges, and inform policy, regulatory, and business models.*** Policy, business model, and technical approaches must progress in concert to realize the full benefits of variable renewable production. An integrated portfolio of technologies should be explored for dealing efficiently with daily and seasonal variability. This includes improved use of forecasting, expanded long-distance transmission, diverse storage options, and demand response. Market, regulatory, and communication and controls advances are required to enable and sustain the system's efficient, reliable operation as variable resources are added. Environmental research is needed to anticipate and address emerging environmental issues associated with these technologies.
- ***Create advanced renewable technologies.*** Next-generation renewable technologies that can respond to grid and market conditions more rapidly and reliably are essential to reduce costs further and increase capabilities to operate more efficiently as part of the overall system.
- ***Demonstrate advanced low-emission fossil technologies and the policies, regulations, and business models needed to support them.*** Research is essential on advanced power cycles and on carbon capture, storage, and utilization. Support for demonstrations is needed for capture technologies at scale; basic research is needed to examine use of CO₂ captured, and regulations are needed to deal with underground storage.
- ***Support development of new nuclear designs and the policies, market reforms and business models needed to support existing and new nuclear.*** Advanced reactor designs and government policies are needed that support development of new plants and continued operation of existing plants.
- ***Explore bioenergy technology options, particularly bioenergy with CCUS.*** Bioenergy with CCUS is assumed to be deployed widely in most scenarios that achieve the long-term goals of deep carbon reduction, (e.g., the goals of the Paris Climate Agreement). Research must address many questions regarding the production and control technologies and sustainable, large-scale, low- or no-net-emission fuel supplies, including attention to feedstocks and life-cycle emissions accounting.
- ***Explore the role of hydrogen as a clean carrier of energy and the economic and policy impediments to its development.*** Research must focus on producing hydrogen cleanly, on business models for developing a hydrogen infrastructure, and on safety.
- ***Explore flexible operation opportunities for all generation technologies.*** R&D should be undertaken addressing aspects or features of the technologies above that support variable power generation through fast ramping, advanced inverters, long-term storage, or other technology. An increasingly flexible central station fleet is a key enabler of the Integrated Energy Network.

INTEGRATING ENERGY RESOURCES – THROUGH NEW CONTROL TECHNOLOGIES AND MARKETS

The systems and infrastructure for supplying electricity, gas, and water are increasingly interconnected and interdependent. However, the flows of information and market signals to control systems are minimally integrated across these sectors as are the impacts of these systems on the natural environment. Such fragmentation increases costs, limits customer choice, and exacerbates vulnerability relative to a more fully integrated system.

Improvements in electric systems controls, coupled with advances in protocols, cyber security, application program interfaces, and telecommunications will make it possible to integrate distributed generation seamlessly into the grid and improve system productivity and flexibility. Also, decisions regarding energy and other natural resources can be considered in real time, enabling gains in affordability, reliability, efficiency, and expanded customer choices. Digital technologies provide new opportunities for choice, control, and optimization in sectors, and ultimately, coordinated operation among sectors. The electric sector is well ahead of the others in implementing these technologies and is positioned as an essential enabler and backbone of the



Integrated Energy Network. Figure 4 highlights some of the key components and connections in the Integrated Energy Network with electricity as the keystone.

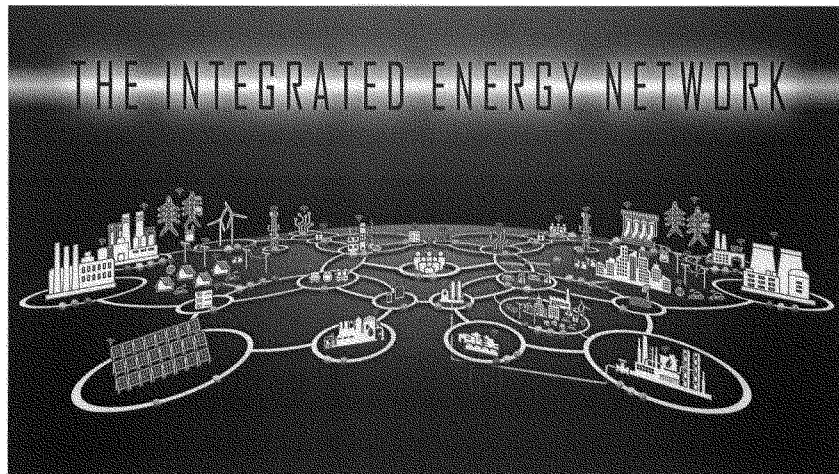


Figure 4. The electric, gas, and water systems are interconnected and interdependent. Electricity, gas, water, data, and thermal (heat and cold) flow through a highly-connected, centerless system. The Integrated Grid in the electric sector provides a physical and logical platform for beginning to integrate these existing systems as well as potential future energy systems, such as electric transport and hydrogen.

Building the Integrated Grid is a key first step

Near-term, a critical step in the Integrated Energy Network's pathway is the effective integration of the bulk electric grid with the many new distributed energy resources, a challenge EPRI refers to as the Integrated Grid.²⁴ The resulting shift to more variable supply and demand characteristics—along with improving energy storage technologies and markets for demand response—will force a shift from the traditional methods for forecasting load and dispatching generation that were developed and honed over decades of operating large, centralized grids. Currently, most electric power systems still operate through “forecast and supply” methods that ramp up and down the controllable resources to deal with demand that is treated as variable and passively unresponsive. Integration increasingly requires a new “forecast and balance” approach through which both load and generation are forecast while supply and demand technologies are used to balance the system, often through market signals. Integrated planning for generation, transmission, and distribution systems (loosely linked until recently) can equip utilities and customers to make better use of all resources.

Achieving this requires expanding and upgrading the electric grid. Most transmission assets were designed to move power from conventional generation (sited for access to water and fuel) to distribution systems within utility service territories. The rapid deployment of renewable energy and the closing of existing generation assets changes power flows dramatically and puts pressure on an aging transmission infrastructure. Near term, this requires inspection, assessment and monitoring, and upgrades to maintain reliability. Further, it necessitates regional transmission expansion to connect generation from different locations. Because renewable resources (e.g., wind, solar) centered in different locations provides operational diversity, the value of transmission systems increases as they are able to link these resources with centers of load over much larger areas, while using more sophisticated, comprehensive control systems.

Integrating electricity, natural gas, transportation, and water systems offers new opportunities

Making the electricity system more capable is just the start. In regions where the electric sector's reliance on natural gas is growing, further integrating electricity and natural gas networks can offer substantial value. While electricity generation is increasingly dependent on natural gas, the natural

gas supply system itself often relies in part on electricity to power compressor stations and control the transport of natural gas. Similar intersections exist with product demand where customers depend on natural gas and electricity in tandem to provide energy services. When natural gas supply is constrained—for example, during periods of extreme cold with high heating demand for natural gas—it may be impossible to provide heat and electric services that are reliable simultaneously. Better integration of planning as well as dispatch and markets can give customers and operators more flexibility when faced with difficult choices.

Even greater potential for integration lies with services that, traditionally, were not the province of the electric power industry. In the coming decade, integrating vehicles into an electricity-focused network can create new needs for investment and infrastructure control. The deployment of significantly more electric vehicle charging stations can require upgrades to the electric distribution and regional transmission systems. Also needed will be new technology standards and business models that balance the need for predictability with fundamental uncertainties resulting from rapidly changing technology, markets, and consumer tastes. From a system perspective, these new loads can help optimize a system operating with substantial variable generation. For example, charging electric vehicles in the afternoon in regions with high solar penetration could enable a more efficient deployment of additional solar. With electric vehicle batteries sufficient in number to supply meaningful power to the grid, this value increases further. To effectively incorporate electric vehicles and electricity storage into the grid requires that it be integrated with information and communications technologies to enhance monitoring, measurement, and control and that systems are created that are interoperable, more dynamic, automated, and reliable.

Looking further into the future, opportunities abound with the integration of energy services and natural resources. Electricity and water supply systems are inextricably tied. Water is essential to thermal generation of power, the dominant source of supply today; electric power is widely used to produce, move, and purify water. As water supplies come under more pressure, the electric and energy industries must use it sustainably. On the demand side, energy-water interactions take on increasing importance as storage of water heat and other water uses have the potential to offer some flexibility to electric system operations.

²⁴ For resources on EPRI's Integrated Grid initiative, see <http://integratedgrid.com>.

Resilience and security are essential

A central challenge with automation and integration is to deploy resilient, integrated systems that are not prone to cascading failure. Bigger networks are not inherently more secure unless they can better identify and contain failure, and perform "self-healing." Physical and cyber threats to the energy system are real and increasing, and the public has become attuned to how pervasive digitalization can affect privacy. Each energy and water network is susceptible to disruption, and through physical network interconnections, a problem or its consequences in one can affect all. It is critical that information integration strengthens capabilities to localize, control, and overcome such threats, making integrated systems the more reliable alternative.

Other challenges to integration span technology, policy, regulatory, and standards domains. Key actions are listed in the box on the following page.

KEY ACTIONS: *Integrating Energy Resources*

A first step is to create a robust, secure Integrated (electric) Grid to efficiently integrate central and distributed electric resources:

- **Develop interconnection rules and communications technology and standards.** Rules and tools are needed to support realtime data transfer and to address privacy. This requires technology development and standards development along with regulatory and policy support.
- **Assess and deploy advanced distribution and reliability technologies,** including smart inverters, distribution management systems, sensors, distributed energy storage, and demand response – and the communication and information technology infrastructure to tie them together. Regulatory support is needed for testing and demonstrating promising technologies.
- **Create strategies for integrating distributed energy resources with grid planning and operation** for efficient and effective system planning and operations. Efficient investment and operation of the electric grid require broad, specific coordination across customer, distribution, transmission, and generation planning functions. This requires new tools and processes for companies as well as regulatory support.
- **Inform policy and regulation development to enable flexible yet reliable operation of the electric system for effective DER integration** reflecting the costs and benefits of the various components and systems. Much remains to be done for providing detailed assessments and for determining costs and benefits of electric system components. Fundamental challenges include: value depends on location and on what else is connected, with the result that value will change over time.
- **Strengthen and expand the transmission system to maintain reliability and enable more flexible operation.** Inspection, assessment, monitoring, and investment are needed to ensure transmission system reliability, given rapid changes in electric generation technologies and locations. Transmission system expansion will enable integration of variable generation and loads and will be essential to support electrification. New “lower-impact” substation and line designs are among the technologies needed to increase public acceptance, reduce costs, and maintain reliability.

As the Integrated Grid develops, it becomes instrumental in developing and applying comparable smart technologies for natural gas, water, and other systems. While these systems’ needs differ, they have much in common with respect to sensors/meters/switches, communication, data analysis, and cyber security architectures. They can be made interoperable through development of an architecture, operational principles, and procedures that include data format and communications systems.

- **Identify ways to integrate systems as they are automated for production, delivery, and use of electricity, natural gas, and water.** Common elements among devices, architectures, and software may support and drive common interests, approaches, and solutions.
- **Assess key interfaces between gas and electric systems and markets; explore market integration.** Include comprehensive consideration of environmental challenges and opportunities, integrated modeling of operations and planning, and market integration to achieve efficiency.
- **Assess key interfaces between energy and water** to enable efficient water use, support more flexible operation of the electric system, and improve environmental performance.
- **Develop diverse capabilities for managing, assessing, and analyzing “big data”** to meet the future energy system’s dynamic, real-time requirements.

KEY ACTIONS THAT CROSS BOUNDARIES

With respect to using cleaner energy, producing cleaner energy, and integrating energy resources, the Integrated Energy Network pathway must be considered from technological, economic, and social perspectives. Important social considerations such as security and privacy will be integral to progress along the pathway and in demonstrating the

value of broader integration to diverse social groups and interests. Environmental issues must be anticipated and addressed, and worker safety ensured as the energy system changes. With these perspectives in mind, the actions below cross traditional boundaries to support broader recognition of the opportunities and challenges presented by IEN.

KEY ACTIONS That Cross Traditional Boundaries

Actions relevant to all three IEN elements:

- **Develop a framework for evaluating the costs and benefits of integration.** An essential step to guide investments in coordinating and integrating energy and natural resource systems is a comprehensive framework for assessing costs and benefits. The Integrated Grid benefit-cost framework provides a starting point, but much more thought is needed.
- **Inform policy/regulatory decisions and customer choices with clearly communicated scientific and technological findings and perspectives.** Understand the consequences of consumer actions and choices, based on a comprehensive analysis of impacts and benefits with respect to cost, reliability, and other factors such as air/water emissions, waste, and land use.
- **Anticipate and address emerging environmental and worker safety issues.** The IEN pathway creates substantial change in how energy is produced, transported, and used. It is essential to anticipate and address effectively emerging environmental and worker safety issues (e.g., environmental impacts of renewables).
- **Implement funding mechanisms and processes to support development and demonstration of new technology.** Allocate resources nationally and regionally sufficient to support development and demonstration of technologies at commercial scale. Development at less-than-commercial scale leaves too many unknowns with respect to cleaner energy production, delivery, and use. Pursue broader public-private collaboration to secure adequate funding.
- **Expand and coordinate international and cross-sector research.** International and cross-sector coordination of research, development, and demonstration of technologies is key to efficient, timely progress in development and deployment.
- **Focus on security, reliability, resiliency, and privacy.** Public acceptance depends on effective, concerted attention to cyber security and privacy controls in moving to a more integrated, digitally controlled energy system.
- **Expand public education and communication.** For over a century, the inner workings and complexities of the electric system have been largely hidden from the public, whose concern primarily focuses on whether the lights come on at the flip of the switch. As customers become more active in managing energy use, education is needed help them understand the system and their options.

INTEGRATED ENERGY NETWORK — THE PATH FORWARD

The Integrated Energy Network pathway outlines EPRI's view of first steps to an efficient, reliable, affordable, and cleaner energy future. Such a future is plausible but not assured. As highlighted in this introduction, the IEN pathway requires advances in science, technology, markets, policy, regulation, business models, and customer awareness.

At its essence, the IEN calls for a change in how we think about energy:

- It argues for a much more integrated approach to providing energy services and managing natural resources—a fundamental shift from the planning, operation, and regulation of these systems today.
- It leverages digital technologies that enable levels of integration that would have seemed implausible even a few years ago.
- It requires that technology, policy, regulation, and business models must advance in concert if the Integrated Energy Network is to be realized.

Next steps

In the preceding sections, EPRI described key actions in the IEN pathway. Going forward, EPRI will initiate and inform discussions that address all aspects of the IEN, including technology, policies, regulations, standards, economics, and market frameworks.

The IEN website, <http://IEN.EPRI.com>, will provide an ongoing slate of EPRI research programs, research and discussion papers, workshops, collaborations, and other opportunities to get involved. EPRI plans to release more detailed characterizations of each IEN pillar and invites comment and input as they are developed:

- *Producing Cleaner Energy*, spring 2017 release
- *Using Affordable, Cleaner Energy*, June 2017 release
- *Integrating Energy Resources*, August 2017 release as part of a complete IEN paper

Supplementing these will be technical white papers that examine: generation technology costs; perspectives on electrification opportunities, challenges, and actions needed; the dimensions of energy-water interactions; cyber security in an Integrated Energy Network; an Integrated Energy Network Planning white paper that examines the new challenges of utility planning; and perspectives on a framework for estimating costs and benefits on the IEN.

As 2017 progresses, EPRI will announce new collaborations and R&D to consider near-term and long-term steps along the Integrated Energy Network pathway.

The Electric Power Research Institute, Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, affordability, health, safety and the environment. EPRI also provides technology, policy and economic analyses to drive long-range research and development planning, and supports research in emerging technologies. EPRI members represent 90% of the electric utility revenue in the United States with international participation in 35 countries. EPRI's principal offices and laboratories are located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass.

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Mr. UPTON. Thank you very much.
Mr. Bell, welcome.

STATEMENT OF GANESH BELL

Mr. BELL. Thank you, Chairman Upton, Ranking Member Rush, and members of the committee.

I am Ganesh Bell, Chief Digital Officer for GE Power. I have spent my entire career in software, and today I work at the intersection of the industrial world, especially energy and software. I am one of 28,000 employees in a newly formed business unit in GE called GE Digital that is helping our 125-year-old company. Our customers become digital business, and the industries that we serve, especially energy, become a digital industry.

This is a time of incredible innovation in business. Every industry, every aspect of our society is being reimaged through software. Low-cost sensors, ubiquitous connectivity, cloud computing, data science are presenting incredible opportunities to innovate a new industrial internet. The possibilities for the electricity industry is especially exciting. The 100-year-old model of electricity grid that our founder Edison helped proliferate is being tested, pushed, and challenged every day, as Dr. Howard testified in his fantastic Integrated Energy Network paper.

Consumers are also becoming producers of electricity. The industry is in transformation. The future of the electricity infrastructure is not just the flow of electrons, but electrons and data in multiple directions across our electricity highway. While these are some of the challenges, these are also big business model opportunities for every power producer and every utility. There are already one billion devices connected across electricity today. There will be seven billion devices by 2020. Power plants, wind farms, grids, substations, energy management systems already produce terabytes and petabytes of data a day. Less than two percent of that data actually is analyzed. The unused or underutilized dark data pulls massive value and potential for the entire industry.

Last year, we would say 2016 we believe was a tipping point of this digital transformation of the electricity industry. We help our customers and the power they release get more out of their existing assets and optimize their operations using digital technologies. Our customers can now monitor and diagnose every single asset across generations. It doesn't matter if it is gas, or nuclear, or renewables. They can monitor every asset across transmission distribution, even consumption of energy. So they can now forecast the yield from renewable energy, integrate them better into the grid. They can ramp up or ramp down fossil power plants, based on supply and demand. They can improve fuel efficiency, reduce grid losses, eliminate unplanned downtime, improve accuracy of the predictive maintenance, and even improve the safety of the workers across the entire system using digital technologies.

And these ceilings are really, really meaningful. Leaders like Exelon, NRG, PSEG, and NYPA, New York Power Authority, are well on their way in their digital journey, and these savings add up to massive value for the industry. The World Economic Forum estimates that in the next 10 years, just by deploying digital technology, there is \$1.3 trillion of value to be created. And the societal

benefits are even higher, more than \$2 trillion over the next 10 years and especially three million new jobs at the intersection of software and electricity.

And there are other societal benefits as well, reduced emissions and also improving the reliability and affordability of electricity and access to every citizen on the planet.

Lastly, digital will help us capture the skills of an aging workforce. More than 25 percent of the electricity workers are going to retire in the next 5 years. We can capture their expertise and knowledge for the next generation in software and also encourage a new generation of digitally savvy workforce to join the industry to solve some of the biggest problems that we have ahead.

This is just the beginning. Just like Amazon, Apple, eBay, and Uber's software platforms change their industries, electricity and power producers now have the opportunity to transform all of generation, all of transmission, all of consumption into a new connected network that we call The Electricity Value Network, Dr. Howard calls The Integrated Energy Network, where it is really about the network and not a linear model anymore.

The grid was the foundation of the 20th century economy. The internet is the foundation of our digital economy. This Electricity Network will be the foundational infrastructure for the democratization of modern cities, intelligent transportation, and healthier and connected communities. America has an opportunity to lead. The country that invented the grid and the internet, two of the biggest innovations and important networks which are now coming together, America has an opportunity to lead this future. We need to remove the obstacles. We need to modernize our existing infrastructure. We need to modernize operation technologies all the way from sensor to cloud, cybersecurity. We also need to prepare a whole new generation of digital workforce that are going to come in and transform this entire industry.

I thank you for holding this important hearing and welcome your comments.

[The prepared statement of Mr. Bell follows:]

STATEMENT OF GANESH BELL

CHIEF DIGITAL OFFICER

GE POWER & GE DIGITAL

BEFORE THE COMMITTEE ON ENERGY AND COMMERCE

“MODERNIZING ENERGY AND ELECTRICITY DELIVERY SYSTEMS. CHALLENGES
AND OPPORTUNITIES TO PROMOTE INFRASTRUCTURE EXPANSION AND
IMPROVEMENT”

FEBRUARY 15th, 2017

INTRODUCTION

Chairman Upton, Ranking Member Rush, and Members of the Subcommittee on Energy, thank you for the opportunity to testify before you today on this important topic. My name is Ganesh Bell. I am the Chief Digital Officer of GE Power, the largest of General Electric's businesses providing technology for electricity generation, transmission, distribution and consumption management. I have spent my entire career in the software industry, and work today at the intersection of the industrial world and the digital world, bringing new software-driven solutions to traditional industrial problems.

GE POWER

As many of you will know, GE has long been a leader in the electricity industry. We have a global team of more than 330,000 employees, operate in 175 countries around the world, and our technology generates one third of the world's electricity. Our four electricity businesses, GE Power, GE Renewables, GE Energy Connections and Current together offer a portfolio of industrial hardware, software and services for renewable, nuclear and fossil power generation, electricity transmission & distribution, and commercial and industrial energy management. In sum, these businesses account for 45% of GE's industrial segment revenues, or about \$51 billion. As I mentioned, I am also part of a new digital organization at GE - GE Digital - which employs more than 20,000 people focused on solving business problems in diverse industries with software.

DIGITAL TRANSFORMATION OF ELECTRICITY

It is an exciting time to be working in this industry. For a century, the electricity industry - largely unchanged - has powered the development of our economy, transformed society and our industries. Now, electricity itself is being transformed. Traditional energy infrastructure is becoming smarter just as the industrial base of the country is transforming into the digital industrial base.

The industry's mix of fuel is rapidly evolving with the addition of more diverse and distributed generation sources. Different countries and even different U.S. states will embrace different mixes of fuels, enhancing, but also challenging the stability and capacity of the grid.

More devices are becoming connected. Already 600 million smart meters are connected. There will be more than 20 billion devices connected by 2025. Billions of them will be in the electricity value chain generating valuable data.

This wave of connectivity and innovation is being enabled by a set of technologies coming together to form what we call the Industrial Internet. The combination of cloud computing, data science, low cost sensors and the Internet of Things applied to industry is allowing the merger of physical infrastructure and digital systems.

Modern power plants already generate terabytes of data per day. Wind turbines capture data every 10 seconds. There are already a billion connected electricity devices and assets, more than half of which are smart meters. The data being generated by these assets could be incredibly

valuable to improving our understanding, and thereby the operating efficiency of the whole system, but less than 2% of that data is being analyzed and used today.

We believe this transformation of our electricity infrastructure will generate significant societal benefits, from job creation to capturing the expertise of an ageing workforce, reducing emissions and lowering the cost of electricity to consumers.

GE recognized this challenge and opportunity in our own business five years ago. As part of an effort to find new productivity and growth we began to invest in digitalization projects that would enable us to better understand the performance of the machines we make, and the processes by which they are made and maintained. We believed digitalization would drive cost out of our business and accelerate innovation for the benefit of our customers and our shareholders.

When we say digital and digitalization, we are referring to collecting data from sensors attached to traditional electricity infrastructure and machines such as steam turbines, aircraft engines and locomotives. We then use analytic software to compare data with physics-based models of those machines – called Digital Twins - so that we might better understand their current, and predict their future, performance.

Digitalization also refers to making manual work processes such as the inspection of machines and the scheduling of maintenance and repairs more efficient through software.

In the past year, digitalization initiatives of both types generated \$700M in savings for GE, which we reported as productivity in our most recent quarterly earnings call.

Upon seeing benefits of this scale, we realized digital technologies could generate tremendous value if applied companywide, industrywide, and even to industries and infrastructure in which GE does not traditionally operate.

As Chief Digital Officer for GE Power, my mission has been to evolve those digitalization projects into cloud-based commercial software products; to devise GE's strategy for bringing those products to market in the electricity industry, and to work closely with our power producer and utility customers to implement them.

I should underscore that GE has unique expertise in the electricity industry. More than one third of the world's electricity is generated using machines made by GE. Our expertise in building and servicing machine infrastructure has given us unique insights in developing software to improve their reliability, productivity and profitability, and ultimately the performance and profitability of entire power plants and utilities.

DIGITALIZATION IN ACTION

Digital technologies have helped our customers bring more agility and responsiveness to the capability of their generating infrastructure. This is particularly important as the fuel mix evolves to include more renewables, more distributed energy resources, and greater electrification of

transportation and building energy management systems. In the face of growing variability in supply and demand, software helps utilities plan for, and respond more rapidly, to change, and at lower cost, adding to the reliability and resilience of the grid.

For example, GE's software enables power producers to more accurately and quickly forecast energy derived from renewables. It also enables traditional fuel sources to ramp up more quickly and more efficiently when responding to fluctuations in supply and demand. Traditional generation types were not designed to ramp-up rapidly and often, and therefore tend to do so inefficiently and with higher emissions. These digital technologies improve starting reliability, heat rate and fuel consumption so that fossil power can run more profitably even when it is no longer running as a base load generator.

Second, our digital technologies have dramatically reduced unplanned downtime in traditional generation environments, thereby also contributing to overall grid reliability and stability. I ride a motorcycle as a hobby, but you don't need to have your own to know that regular inspection and maintenance, including the replacement of worn parts, will improve the performance of a bike. The same is true for electricity generating machines, only it is much harder to inspect and conduct maintenance on a machine that is operational 24 hours a day, 7 days a week. By collecting and analyzing sensor data – and comparing that data with Digital Twins – it becomes possible to identify anomalies that may indicate a future breakdown or sub-par performance, without taking the machine offline. Plant operators and control systems can then use this data to fine tune performance to reduce fuel consumption, emissions, ramp rate and more. Today's digital technology can eliminate as much as 80% of all unplanned downtime, increasing total plant availability by 10%.

I want to stress that addressing unplanned downtime alone presents a tremendous opportunity to enhance the efficiency of electricity in the US. According to NERC, the US fleet operates at less than 50% of potential capacity. Generating units are unavailable on average for 15% of the time due to outages and maintenance. 6% of the time they are unable to meet demand at all. The EIA highlights that a further 6% of electricity is lost in transmission and distribution due to both technical factors and outages. Digital can play a huge role in optimizing this infrastructure.

On a related note, and third, our digital technologies are helping the nuclear industry deliver on its Nuclear Promise to reduce operations and maintenance costs 30% by 2018. Digital helps support this goal by predicting with a high degree of accuracy when SCRAMs (Safety Control Rod Axe Man) - the nuclear industry's name for unplanned downtime - will occur. Our software can predict SCRAMs with as high as 90% accuracy, enabling operators to conduct proactive maintenance at a significantly lower cost and with less interruption.

Benefits such as these can generate savings of \$50M over the lifetime of an existing plant, or as much as \$200M in a new plant when the latest hardware and software are combined.

Applied industry-wide, the World Economic Forum has estimated that digital transformation of electricity infrastructure could generate \$1.3T in value worldwide in the next 10 years, with an additional \$2T in societal value. The economic impact is particularly important to improving

productivity in an industry experiencing very low demand growth in the US, as it is in most developed markets.

The economic value from existing infrastructure will be derived from factors such as reduced fuel consumption, increased generation capacity, faster time-to-generation, total plant availability and industrial worker productivity. Almost one third of that economic value (\$387B) could be derived by reducing unplanned downtime in the electricity industry. We believe we can eliminate as much as 80% of all unplanned downtime with this type of software.

The societal benefits will include significant job creation in areas such as data science, energy storage integration, smart asset planning and asset performance management. As many as three million jobs could be created worldwide. Digitalization will also help capture expertise from an ageing workforce. As this Committee is likely aware, 25 percent of electricity industry employees will be ready to retire in the next five years. Lastly, we anticipate societal benefits from reducing emissions and from financial benefits passed on to customers.

Early adopter customers are beginning to experience these benefits on individual machines and plants but the real value of electricity digitalization to the United States will be derived from the digitalization of the entire electricity infrastructure value chain. That shift will bring innovation at a speed at scale that we have only witnessed so far in the consumer Internet. Let me expand on that comparison for a moment as I describe what we call the creation of the Electricity Value Network.

THE ELECTRICITY VALUE NETWORK

I think the members of the Committee will recognize that several technology companies have created very efficient software platforms for connecting demand and supply. Amazon, Apple, eBay and Uber have all built platforms that removed the friction associated with finding a product or service, and in connecting sellers to an online marketplace. There are myriad other examples from other industries, but they all have one thing in common: the efficient mapping of demand and supply, and the digitalization of processes required to bring the two together. It is our belief that the digitalization of the electricity industry and the creation of an Electricity Value Network will be similarly valuable.

By applying digital to individual connected assets - a boiler in a coal plant, a wind turbine, or a grid substation – we can reduce downtime, elevate productivity and output, and – in the case of traditional fuels – reduce emissions.

By connecting entire fleets of assets, we will be able to dramatically enhance our ability to forecast supply, to dynamically increase or decrease supply in response to fluctuations in demand or resource variability, and to optimize overall production for a host of factors – from profitability to emissions and fuel consumption.

By connecting the workers and the processes by which the electricity industry is operated and maintained, we can catch potential outages earlier, address them faster, improve the safety of operations, and dramatically reduce the cost of operations.

By connecting every customer, generator, grid operator, battery, building, HVAC system, light fixture, and transportation mode – every possible node of the electricity value network’s infrastructure – entirely new business models will emerge that can underpin the development of smarter cities and stronger and healthier economies.

The electrification of building energy management and of transportation systems to reduce emissions and energy consumption are two excellent examples. In the State of New York, transportation accounts for 34% of the State’s emissions and \$26.7 billion in fuel costs. New York’s buildings consume roughly 60% of its total energy. An Electricity Value Network could play a significant role in reducing emissions and energy consumption through electrification.

IMPEDIMENTS TO DIGITALIZATION OF THE ELECTRICITY INDUSTRY

The electricity industry has an exciting opportunity to modernize its infrastructure and to create new value by doing so, but we do not underestimate the obstacles to digitalization. The transformation overall will require enlightened leadership particularly with regards to technology adoption, but there are two challenges that stand out: the need for new skills, and cybersecurity.

First, the industry’s workforce is facing challenges. As has been extensively documented by the Energy Department, the industry has an ageing workforce, and it is struggling to recruit engineering and technical talent in sufficient numbers to offset retirements and meet future needs. These challenges are likely to be exacerbated by digital transformation, which requires new technical and leadership skills. The days when expertise passed from generation to generation could sustain the industry’s development are likely over. The next generation of workers will not only be industrial workers – they will need be digital industrial workers.

Acknowledging the opportunities for next generation jobs in a digital infrastructure economy, at GE Digital’s New Orleans Digital Hub we have partnered with the University of New Orleans to train and mentor the next generation workforce. The successful Software Engineering Apprenticeship Program (SWEAP) brings students each year for a two-year Digital internship with the promise of a fulltime position as a software engineer, developer or analyst upon graduation. This is one example as to how GE will develop talent and create jobs along its digital industrial transformation.

Second, the reliability of the electricity supply is naturally of the utmost importance to our power producer and utility customers, and they are concerned that the evolution of the electricity value chain into a connected network infrastructure – an Electricity Value Network – and the use of data analytics software delivered via the cloud could make it more vulnerable to cyberattacks. It is our strongly held conviction that security in the cloud, of the type GE provides, is more reliable, more consistently applied, and more rapidly updated than today’s approaches.

Naturally, the choice of provider matters, but the best cloud providers make investments in security software, capabilities, processes and personnel that are tested and leveraged at scale across multiple customers. Reduced variation in a cloud environment also means that strict security software and standards can be implemented and enforced across all customers rapidly, with the latest security patches and fixes instantly and continuously.

While this wave of technology is still in its nascent phase in terms of deployment, I would stress that neither of the challenges I have outlined have significantly impeded adoption to date. In fact, 2016 was something of a tipping in the industry, with more than 30 of the world's leading power producers and utilities adopting GE's cloud-based software for the first time.

CONCLUSION

In conclusion, the digital transformation of the electricity industry and its infrastructure represents a very significant opportunity to modernize and elevate the competitiveness of our energy sector. It will also add new skilled jobs at a faster rate than automation will eliminate them, and, very importantly, it will enable our power producers and utilities to deliver electricity to citizens at a reduced cost.

GE customers such as New York Power Authority, PSEG, NRG and Exelon are already realizing these opportunities to improve the reliability, resiliency and security of our nation's critical infrastructure. If we can accelerate the deployment of these technologies to the entire industry, the United States has an opportunity to ensure that the country that invented the grid once again has the world's best electricity infrastructure.

Given the myriad benefits of applying digital technology to electric power production and distribution – benefits that accrue to consumers, to utilities, and to the environment – the federal government should explore ways to encourage the responsible adoption of these digital technologies as a core part of our national electricity infrastructure strategy.

We would welcome the opportunity to collaborate with this Committee in furthering that objective, and in ensuring provisions are made to invest in the development of the new skills that will be required to modernize our public electricity infrastructure.

Thank you for holding this important hearing, and for the opportunity to present this testimony. I look forward to your questions, and working with you over the longer term to help accomplish new levels of reliability, efficiency and innovation in the electricity sector.

-ends-

Mr. UPTON. Thank you very much.

Mr. Stephenson, welcome back. Nice to see you.

STATEMENT OF LONNIE R. STEPHENSON

Mr. STEPHENSON. Chairman Upton, Ranking Chairman Rush, and the members of the committee, thank you for inviting me here today.

Often when people think of infrastructure, they think of roads, bridges, or airports, but perhaps even more important is our electrical infrastructure. The energy industry has changed in so many ways, but too much of our existing infrastructure is still stuck in the 20th century. The configuration of our current grid, which largely functions on a localized, Statewide basis just isn't appropriate to meet our current energy needs. We need a truly national grid and new transmission lines that can safely and reliably transfer power, including renewables like wind and solar, from energy-rich regions to those parts of the country where it is most needed. And that means we need new transmission projects that will cross multiple jurisdictions and State lines. Projects like the Plains and Eastern Clean Line. This is a \$2.3 billion line that would deliver low-cost energy throughout the southeast. This is not only a huge boost for energy consumers, who can count on a cheaper and more reliable power supply, but for working families throughout the region. This project alone is estimated to create and support more than 2,500 construction and manufacturing jobs, and this only is one of the many planned transmission projects across the country that could mean hundreds of thousands of new jobs.

But, despite Clean Line's importance and clear economic benefit, it has bumped up against regulatory snags that continue to hold up the final approval. Just like the interstate highway system, the modern transmission lines of the 21st century can't stop at the State line. But it only takes only local commission or regulatory board to delay a project like Clean Line indefinitely. With all respect to all local authorities, we need a new approach to siting and permitting that trims the unnecessary red tape, streamlines the rules created by numerous regulatory authorities, and lets us start breaking ground on these projects sooner rather than later.

We in the International Brotherhood of Electrical Workers are the best trained, most professional workforce in the electrical industry. Electrical infrastructure is our business. It is our outside construction members who build the high voltage lines and our utility members who maintain them. It was our members who built the first electrical grid and have kept it running safely and reliably for more than 100 years. And under our Code of Excellence Program, we are fully committed to working with our employers to provide on-the-job excellence every day. Our members are ready to get to work modernizing and expanding our grid and our apprenticeship and training programs, which are second to none, will guarantee a steady stream of skilled electrical workers necessary for the projects that are so important to this Nation's future.

We ask for your leadership on making this a reality and remain a ready partner with both our employers and our elected officials from both sides of the aisle to get this job done.

Thank you for the opportunity to testify before you here today.

[The prepared statement of Mr. Stephenson follows:]

**Written Testimony of President Lonnie R. Stephenson,
International Brotherhood of Electrical Workers
Before the Energy and Commerce Committee
U.S. House of Representatives**

The International Brotherhood of Electrical Workers (IBEW) represents approximately 750,000 active members and retirees who work in a wide variety of skilled occupations including: utilities, construction, telecommunications, broadcasting, manufacturing, railroads, and government. On behalf of the IBEW membership, I appreciate the opportunity to submit this written testimony for your Committee's consideration.

Often when people think of infrastructure, they think of roads, bridges, or airports. But perhaps even more important is our electrical infrastructure. The energy industry has changed in so many ways, but too much of our existing infrastructure is still stuck in the 20th century. The configuration of our current grid, which largely functions on a localized or statewide basis, just isn't appropriate to meet our current energy needs. We need a truly national grid and new transmission lines that can safely and reliably transfer power -- including renewables like wind and solar -- from energy rich regions to those parts of the country most in need.

In 2014, IBEW Utility Department Director, James Hunter, testified before the Senate Energy and Natural Resource Committee regarding the reliability and security of the United States electric grid.¹ While his testimony primarily focused on the impact of the Environmental Protection Agency's (EPA) regulations on generation, his assessment of demand increasing remains true. The U.S. Energy Information Administration recently issued its Annual Energy Outlook for 2017.² Energy consumption is set to increase 5-11% between 2016 and 2040.³ This projection underscores the need for new transmission projects that will cross multiple jurisdictions and state lines. In order to assure these important projects are completed in a timely manner, unnecessary red tape must be eliminated from the siting and permitting process.

It is absolutely critical that electrical infrastructure projects are completed by highly skilled, thoroughly trained, licensed workers. IBEW members in both the construction and utility industries complete extensive training programs. Our members in the construction branch complete up to 10,000 hours of on the job and classroom training in privately funded, nationwide apprenticeship programs. These programs are sponsored by the electrical training ALLIANCE, a joint effort

¹James L. Hunter, Testimony: *Keeping the lights on- are we doing enough to ensure the reliability and security of the U.S. Electric Grid*, April 10, 2014.

² U.S. Energy Information Administration, Annual Energy Outlook 2017 with projections to 2050 (Jan. 2017), [http://www.eia.gov/outlooks/aeo/pdf/0383\(2017\).pdf](http://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf).

³ *Id.* at 4.

between the National Electrical Contractors Association (NECA) and the IBEW and are designated as Registered Apprenticeships through the United States Department of Labor.⁴ The electrical training ALLIANCE program is the largest apprenticeship of its kind. An astounding 350,000 apprentices have completed the program, becoming journeyman since its inception years ago. The knowledge and skills obtained through this world-class training gives IBEW members the ability to perform at the highest level for our NECA contractor partners and consumers on each and every project. The electrical training ALLIANCE website contains more information on the program. In addition, I encourage each of you to visit one of the training centers. There are around 300, located across the entire U.S., and their doors are always open to you. It is important to note that the continuation of this successful training partnership is dependent upon opportunities for continuous employment, like infrastructure investments, both private and publically funded. As discussed in my oral testimony⁵, the IBEW's Code of Excellence (COE) program is an example of the IBEW's full commitment to working with our employer partners to provide on-the-job excellence every working day. The COE is a solid commitment from our leadership, members, and contractors to customers that we will consistently provide the best value product. IBEW members will

⁴ electrical training ALLIANCE, *About Us*, <http://electricaltrainingalliance.org/AboutUs> (Feb. 2017).

⁵ Lonnie R. Stephenson, Testimony: *Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion*, Feb. 15, 2017.

continually perform their work safely and efficiently, with a strong sense of pride and ownership. The COE program has been highly effective, and as a result has been implemented across all IBEW represented industries. I have attached a PowerPoint with more information that I believe highlights some of the benefits of this successful program.⁶

Thank you for this opportunity to testify on this important topic. I look forward to working with each of you on infrastructure investments that result in job creation and a more safe, more reliable electrical grid.

⁶ International Brotherhood of Electrical Workers, Your Power Professionals in Electrical Construction, 2017 presentation.

Mr. UPTON. Thank you.
Mr. Hauser.

STATEMENT OF STEVEN G. HAUSER

Mr. HAUSER. Good morning, Chairman Upton, Ranking Member Rush, full committee Chairman Walden, Ranking Member Pallone, and distinguished members of this subcommittee. I am Steve Hauser, CEO of the GridWise Alliance. I appreciate the opportunity to testify at today's hearing on such an important topic and with such distinguished colleagues on this panel.

In 2001, the Senate Energy and Natural Resources Committee asked me to testify before them on the opportunity to use emerging information and communications technologies to improve the efficiency and operation of the electricity grid. Then, 2 years later, during one of the most significant blackouts in U.S. history, I founded the GridWise Alliance to educate public policymakers and advance the modernization of the electricity sector. At the same time, the newly formed Office of Electricity in the U.S. Department of Energy launched an R&D program to focus experts around the country on these same issues. And I might add that EPRI has worked in this area for just as long.

GridWise Alliance members include both public and private utilities from many of your States, technology companies such as GE, transmission builders and operators from around the country, national labs, academic institutions and others.

From the very beginning, our goal was to represent the broad interests of all stakeholders who have a role in building and operating the electricity grid, and we have advocated for policies that are clearly in the Nation's interest, rather than those of individual companies.

We applaud the leadership that this subcommittee and full committee have demonstrated over the past decade and more with the "Smart Grid" Title XIII of the 2007 Energy

Independence and Security Act being a major policy change that has served to motivate many significant changes throughout the industry in the years since.

Today's hearing continues to demonstrate your desire to place a high priority on these issues and explore new policies that will continue to lead our Nation toward an effective, safe, and reliable electricity grid for the next several decades.

The electric system is probably the most critical infrastructure and has been a major driver of our economic success for over a century. From the very beginning, Congress has recognized the need for effective national policies to drive the expansion and sophistication of the grid. Our digital economy, our national security, and all aspects of this sector and all other critical infrastructure sectors, and our daily lives depend on a reliable, safe, affordable, resilient, and secure electricity systems.

For many decades, we promised our citizens access to electricity anywhere, anytime and, I might say, as much electricity as they want to use. We have realized the need to change this paradigm, being more efficient and smarter about the ways in we use electricity, resulting in a much more complex electric grid, actively

managing loads, installing generation closer to loads, and integrating new sources of power.

Over the past several years, the electricity industry has experienced fundamental changes on a scale not witnessed since the creation of the electricity system more than 100 years ago. Our Nation's grid must continue to be modernized and evolve to respond to these changes. The future grid needs, and will need, to manage not only for daily operations that our digital economy requires, but also for increasing security, resiliency, reliability, consumer choice, affordability, flexibility, and more.

Fortunately, new technologies and capabilities have come along to help us address these changes. The challenge we face is that our infrastructure has not kept pace with these rapid changing needs and demands and technology opportunities. In addition, the business models and policies also need to be revamped to ensure the grid and grid operators remain viable.

One key point I want to leave with you today is that, because the electric system is critical infrastructure, and because this infrastructure is in desperate need of being modernized, GridWise believes that any infrastructure package that you can consider must include the electricity system and, as part of this, must address grid modernization or "Smart Grid."

Congress has an opportunity to demonstrate leadership with this regard. Grid modernization is an area that has garnered bipartisan support in the past and should continue to do so. Modernizing the grid will help create highly skilled jobs and stimulate economic growth. It also will help reduce costs, and increase reliability, resilience, and security in the near and long term.

Nearly every State and most utilities are now considering the best way to modernize their electricity infrastructure. With some States and utilities leading the way, we recognize that each has its own priorities and constraints that result in unique policy approaches that fit its specific situation. What works in California and New York does not necessarily work well in Oregon and Michigan.

Regardless of the specifics, however, the technologies and capabilities apply almost universally.

And I respectfully refer you to the rest of my written testimony, which includes details and specific examples of changes that are happening across the industry, and we look forward, representing my companies and the broader stakeholders, to working with you to make these changes happen. I look forward to your questions. Thank you.

[The prepared statement of Mr. Hauser follows:]

**TESTIMONY OF STEVEN G. HAUSER
CEO
GRIDWISE ALLIANCE
BEFORE THE
SUBCOMMITTEE ON ENERGY
OF THE
HOUSE ENERGY AND COMMERCE COMMITTEE
HEARING ON
“MODERNIZING ENERGY AND ELECTRICITY DELIVERY SYSTEMS:
CHALLENGES AND OPPORTUNITIES TO PROMOTE INFRASTRUCTURE
IMPROVEMENT AND EXPANSION”
February 15, 2017**

Introduction

Good morning Chairman Upton, Ranking Member Rush, full Committee Chairman Walden and Ranking Member Pallone, and distinguished Members of this Subcommittee. I am Steven Hauser, CEO of the GridWise Alliance (GWA). I appreciate the opportunity to testify at today’s hearing on such an important topic and with such distinguished colleagues.

In 2001, the Senate Energy and Natural Resources Committee asked me to testify before them on the opportunity to use the emerging information and communications technologies to improve the efficiency and operation of the electricity grid. Two years later, during one of the most significant blackouts in U.S. history, I founded the GridWise Alliance to educate public policy makers and advance the modernization of the electricity sector. At the same time, the newly-formed Office of Electricity at the U.S. Department of Energy (DOE) launched a Research and Development (R&D) program to focus experts around the country on these same issues.

Gridwise Alliance members include investor-owned and municipal electric utilities, as well as rural electric cooperatives; information and communications equipment and service providers; Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs); national laboratories; academic institutions; and, more. From the very beginning, our goal was to represent the broad interests of all the stakeholders who have a role in building and operating the electricity grid. We have advocated for policies that are clearly in the Nation’s interest rather than those of individual companies.

We applaud the leadership that this Subcommittee and the Full Committee have demonstrated over the past decade and more with the “Smart Grid” Title (i.e., “Title XIII”) of the 2007 Energy Independence and Security Act (EISA) being a major policy change that has served to motivate

many significant changes throughout the industry in the years since. Today's hearing continues to demonstrate your desire to place a high priority on these issues and explore new policies that will continue to lead our Nation toward an effective, safe and reliable electricity grid for the next several decades.

The electric system *is* probably the most critical infrastructure and has been a major driver of our economic success for over a century. From the very beginning, Congress has recognized the need for effective national policies to drive the expansion and sophistication of the grid. While decades ago, electricity provided basic safety, security, and comfort to our citizens, today it is at the foundation of every aspect of our Nation's society. Our digital economy, our national security, and all aspects of this sector and all other critical infrastructure sectors, and our daily lives depend on a reliable, safe, affordable, resilient, and secure electric system.

For many decades, we promised our citizens access to electricity anywhere, anytime. We have realized the need to change this paradigm, being more efficient and smarter about the ways in we use electricity, resulting in a much more complex electric grid, actively managing loads, installing generation much closer to loads, and integrating new sources of power. Over the past several years, the electricity industry has experienced fundamental changes on a scale not witnessed since the creation of the electric system more than 100 years ago. Our Nation's grid must continue to be modernized and evolve to respond to these changes. The future grid needs, and will need, to manage not only for daily operations that our digital economy requires, but also for increasing security, resiliency, reliability, consumer choice, affordability, flexibility, and more. Fortunately, new technologies and capabilities have come along to help us address these changes. The *challenge* we face is that our infrastructure has not kept pace with these rapidly-changing needs and demands. In addition, the business models and policies also need to be revamped to ensure the grid and grid operators remain viable.

One key point I want to leave with you today is that, because the electric system is critical infrastructure, and because this infrastructure is in desperate need of being modernized, GridWise believes that any infrastructure package *must* include the electric system and, as part of this, **must address grid modernization or "smart grid."** The modernized grid or "smart grid" refers to the need for integrating a myriad of distributed resources requiring the two-way flow of

power, an increase in sensors, resulting in a significant increase in information, and communications to facilitate management and optimization of the grid.

Congress has an opportunity to demonstrate leadership in this regard. Grid modernization is an area that has garnered bipartisan support in the past and should continue to do so. Modernizing the grid will help create highly-skilled jobs and stimulate economic growth. It also will help reduce costs, and increase reliability, resilience, and security in the near and long term.

In fact, aging electric infrastructure is responsible for nearly 25 percent of the power outages in the U.S., according to one report.¹ The Electric Power Research Institute (EPRI) estimates that momentary power outages and “power quality events cost businesses as much as \$15-\$20 billion annually.”² And, these are just a portion of the costs across our entire economy.

Grid Modernization Technologies and Capabilities Help Create Jobs, Enhance Economic Growth and Competitiveness, and are Cost Effective

The adoption of new technologies and further innovation in these fields also will lead to the creation of highly-skilled jobs and will enhance our Nation’s economic growth and competitiveness. EPRI has estimated **the total benefit from the smart grid to be between \$1.3-2 trillion from 2010-2030** and benefit-to-cost ratios are found to range from 2.8 to 6.0.³

Nearly every state and most utilities are now considering the best way to modernize their electricity infrastructure, with some states and utilities leading the way. We recognize that each has its own priorities and constraints that result in unique policy approaches that fit its specific situation. What works in California and New York does not necessarily work well in Oregon or Michigan. Regardless of the specifics, however, the technologies and capabilities apply almost universally.

- **Michigan:** In your state of Michigan, Mr. Chairman, DTE Energy has been working on a project called “Building a Predictive Grid for the Motor City,” which is using sensors and

¹ Tollgrade Communications, Inc., “Predictive Grid Quarterly Report: Building a Predictive Grid for the Motor City,” Volume 1, February 2015, p. 1. (Hereinafter referred to as “Predictive Grid Quarterly Report.”)

² Predictive Grid Quarterly Report, p. 4.

³ EPRI, *Estimating the Costs and Benefits of Smart Grid: A Preliminary Estimate of the Investment Requirements and the Resultant Benefits of a Fully Functioning Smart Grid, 2011 Technical Report*, Final Report, March 2011 (March 2011 Final Report), pp. 1-4, available at: <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001022519&Mode=download>.

analytics software to help detect and prevent outages.⁴ Thus, updating our infrastructure with these types of technologies and capabilities provides one way to address the problems at hand, and could help create jobs and help reduce the tremendous costs to businesses and society as a whole, which, in turn, will help boost our economy.

- **Illinois:** “Through October of 2014, ComEd [in Illinois] said grid modernization ha[d] helped avoid more than 1 million outages and reduced the frequency of outages by 19 percent.”⁵
- **Oregon:** Portland General Electric has been a leader in implementing smart grid technologies, such as smart meters and advanced distributed peak management systems.
- **Texas:** Since 2011, CenterPoint Energy in Texas, through its intelligent grid, has avoided nearly 200 million customer outage minutes, by rerouting power around faults. A study by the Electric Power Research Institute (EPRI) has suggested that when deployed across Houston over the next several years, CenterPoint Energy’s intelligent grid could ultimately save consumers \$1.6 billion in prevented losses according to the DOE’s Interruption Cost Estimate (ICE) calculator.⁶
- **California:** In 2013, PG&E invested in smart grid technologies that helped reduce the average duration of a service interruption for its customers to an all-time low, with a 40 percent improvement. Its customers also experienced the fewest service interruptions in company history.⁷ That is, PG&E’s advanced automation technology avoided more than 40 million customer outage minutes between 2012 and 2014 and saved over \$40 million in one year alone.⁸ From July 2013 to June 2014, it also experienced \$21.2 million in direct customer savings and nearly \$80 million in total cost savings; \$11 million in avoided costs; and \$4.5 million in customer energy usage savings, or benefits.⁹

⁴ Predictive Grid Quarterly Report, p. 2.

⁵ Wernau, Julie, “ComEd’s smart grid plan may get more time,” Chicago Tribune, December 2, 2014, available at: <http://www.chicagotribune.com/business/ct-smart-grid-extension-1203-biz-20141202-story.html>.

⁶ EPRI/CenterPoint Energy Houston Electric, *Cost/Benefit Analysis of CenterPoint Energy’s Intelligent Grid Project*, October 2014, included in a 2015 Distribution Cost Recovery Factor (DCRF) Filing (Docket 44572) to the Public Utility Commission of Texas (PUCT).

⁷ PG&E, *PG&E Smart Grid Annual Report – 2014*, October 1, 2014, p. 2.

⁸ PG&E, *PG&E Smart Grid Annual Report – 2014*, October 1, 2014, p. 3, p. 8, respectively.

⁹ PG&E, *PG&E Smart Grid Annual Report – 2014*, October 1, 2014, p. 8. Projects that contribute to PG&E’s Smart Grid project benefits include: PG&E’s SmartMeter™ project; PG&E’s SmartMeter™ outage information improvement; PG&E’s SmartRate™ program; PG&E’s Home Energy Reports project Energy Alerts, and My Energy Site; PG&E’s automated demand response program; PG&E’s Fault Location and Service Restoration (FLISR) project; and, PG&E’s Modular Protection and Automation Control (MPAC) project.

Some brief illustrations of the quantity and types of highly-skilled jobs produced by grid modernization are as follows:

- A Report by the U.S. Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE) contains the following feedback from Snohomish PUD in Washington State: "We've more than doubled the number of engineers that are attached to the control room, but we're not a huge organization. We originally had three SCADA engineers in the entire department. Now we call it the OT department, and it includes code writers and engineers. We have a real-time engineer in the control room. The OT group reports to our engineering department. . . . And we've told the IBEW . . . that would be a job expectation. So what we see in the very long run is that we'll have field people who eventually become possibly engineers or operators in the future."¹⁰
- In the same DOE-OE Report, a Duke Energy Project Director states: "[o]ur Grid Management organization has nearly doubled since we started the project. We have added engineers, technicians, and a couple of schedulers to help keep track of it all. Two of the engineers have the title of DMS Optimization Engineer. Their job is to help us bring additional value to the system because they now have increased visibility of the grid. Their job is to learn new things about the system and figure out how to make it work better."¹¹ Duke Energy further stated that they "added folks with two-year degrees, four-year degrees, and a PhD.[(s)], . . ." so these truly are highly-skilled jobs.¹²

Grid Modernization Technologies and Capabilities Enhance System Resilience, Reliability, and Security

Let me now turn to the need to enhance the **resilience, reliability, and security** of the grid for a moment. Many "smart grid" technologies already exist and are making a difference in significantly enhancing electric system reliability and resilience. Grid modernization, or "smart grid" technologies help prevent outages and enable the grid to better withstand outages when they do occur, due to a human-caused or natural disaster, as elaborated on in a report entitled *Improving Electric Grid Reliability and Resilience: Lessons Learned from Superstorm Sandy*

¹⁰ (U.S. Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE), *Insights into ADMS*, February 2015, p. 24, available at: https://www.smartgrid.gov/files/ADMS-Guide_2-11.2015.pdf. (Hereinafter referred to as: *Insights into ADMS*.)

¹¹ *Insights into ADMS*, p. 12.

¹² *Insights into ADMS*, p. 34.

and Other Extreme Events the GridWise Alliance published to help share lessons learned following such events.¹³

To elaborate, for instance, these types of technologies allow control room operators to gain better and faster visibility of faults on the grid, which can facilitate faster outage restorations. These dramatic technological developments also provide utility crews with greater situational awareness in often dangerous situations, which enables them to do their jobs more safely and efficiently. One utility executive, for example, stated that “. . . [Advance Distribution Management System] (ADMS) is very, very key to . . . [providing] us optics and transparency in real-time information. We used to drive around with flashlights at 2:00 a.m. looking for a tree on the circuit, and now we go to our control center and find out exactly where the fault is and expedite deployment of a truck to fix the problem.”^{14,15}

In addition, homes and businesses can continue operating electricity and heat or air conditioning, depending on the locale, thus ensuring continued safety, health, and economic productivity. Consequently, investing in and deploying these technologies, and improving our grid infrastructure on the front end, will substantially reduce the economic impacts from outages and power quality disturbances down the road, thereby resulting in dramatic cost savings to society as a whole.

Cybersecurity threats, extreme weather events, and other hazards present challenges and strong incentives for prompt action to proactively facilitate the transition to our twenty-first century electric system. The above technologies and capabilities will improve daily operations as well as emergency situations. They also will help balance load and optimize the management and operation of the grid.

¹³ GridWise Alliance, *Improving Electric Grid Reliability and Resilience: Lessons Learned from Superstorm Sandy and Other Extreme Events*, June 2013, available at: www.gridwise.org.

¹⁴ “An advanced distribution management system (ADMS) is the software platform that supports the full suite of distribution management and optimization. An ADMS includes functions that automate outage restoration and optimize the performance of the distribution grid. ADMS functions being developed for electric utilities include fault location, isolation and restoration; volt/voltampere reactive optimization; conservation through voltage reduction; peak demand management; and support for microgrids and electric vehicles.” — Gartner IT Glossary. *Insights into ADMS*, p. 5.

¹⁵ Statement by Tracy Bridge, Executive Vice President and President of the Electric Division, CenterPoint Energy, *Insights into ADMS*, p. 4.

Relatedly, during extreme events, “smart technologies” also enable the isolation and continued service to limited portions of the grid, as needed, to prevent larger outages or provide for localized grid recovery from such events. **Princeton University in New Jersey** serves as a prime example of a microgrid that helped maintain power during Superstorm Sandy. In addition, “[a]fter Sandy in 2012, state regulators approved Consolidated Edison Inc.’s request for \$1 billion in grid upgrades to protect the New York City utility system against flooding and intense storms. The improvements have averted more than 65,000 customer blackouts since Sandy struck, Con Edison has said.”¹⁶

Just Monday (February 13, 2017), there was a report of the Nation’s tallest dam in California experiencing damage, resulting in nearly 200,000 residents being evacuated.¹⁷ Some of the initial “cascading” effects were as follows: “[s]tores closed. Shelters opened. Local gas stations were swarmed with cars as residents tried to leave town. Evacuees waited in traffic trying to get out of low-lying areas” for hours.¹⁸ The same type of situation can, and has, resulted from widespread power outages, whether from natural- or human-caused incidents, as I have noted herein. Some examples of the types of relief and solutions that “smart” technologies could facilitate in this and other events include: transportation management, knowledge of availability of fuel at gas stations, and information regarding the estimated duration of the evacuation, so emergency responders and residents alike could plan for food and shelter accommodations.

More technologies and capabilities, such as microgrids, as well as energy storage and minigrids, also are becoming increasingly available to ensure we not only maintain, but improve, resilience, reliability, and security. I am not suggesting that technology alone will solve all outage-related problems; they will not. Nor will we prevent all outages.

Hardening is needed, too. “About 1.2 million FP&L customers blacked out by [Hurricane] Matthew had power restored within two days after the storm, the company said. NextEra has

¹⁶ Polson, Jim, “10 Days of Blackouts Cut to 2 After U.S. Utility Spends Billions,” BloombergMarkets, October 17, 2016 (updated October 18, 2016).

¹⁷ Madison Park and Elliott C. McLaughlin, “Evacuations ordered over concerns at California dam system,” CNN.com, February 13, 2017, available at: <http://www.cnn.com/2017/02/12/us/california-oroville-dam-failure/index.html>.

¹⁸ Madison Park and Elliott C. McLaughlin, “Evacuations ordered over concerns at California dam system,” CNN.com, February 13, 2017, available at: <http://www.cnn.com/2017/02/12/us/california-oroville-dam-failure/index.html>.

spent more than \$2 billion hardening Florida's power grid over the past decade."¹⁹ "They invested their own \$2 billion in everything from simple stuff like concrete poles rather than wooden poles to mak[e] the grid smarter and harder with information technology," according to U.S. Energy Secretary Ernest Moniz. "Hurricane Matthew could have left 'a lot of' customers without power for 10 to 15 days."²⁰

Solutions to Ensure and Accelerate the Transformation to the Twenty-First Century Electricity System

I offer the following initial recommendations whereby Congress can help achieve results to help catalyze grid modernization to meet the substantial infrastructure needs I have only touched on here in my testimony.

At a high level, the types of areas that infrastructure legislation could address in the grid modernization space include, but are not limited to: public-private partnerships to leverage scarce resources and help mitigate the risks of private sector investments; research, development, and deployment; workforce training; and, technical assistance to state and local governments, who need a range of help to "get up to speed" on the dramatic transformation facing this industry. These types of efforts could focus on the following areas (again, these are only examples and are not meant to be limiting in any way).

- 1) **Transmission:** Such as, promoting the deployment of advanced technologies for new and existing transmission, including transmission technologies that *use existing* transmission lines or rights-of-way, and thereby enhance system efficiency, eliminate the need to build new lines, and relieve congestion;
- 2) **Resilience:** Including a comprehensive approach to planning proactively as well as to rebuilding "smarter" after a natural disaster, not just with the "same old" technology and/or infrastructure, and "hardening" physical infrastructure; and,
- 3) **"Smart Cities" Initiatives:** That bolster the "smart" infrastructure of cities to improve reliability, resilience, security, and efficiency in the electric sector, as well as across critical infrastructure sectors, such as water, transportation, and telecommunications

¹⁹ Polson, Jim, "10 Days of Blackouts Cut to 2 After U.S. Utility Spends Billions," BloombergMarkets, October 17, 2016 (updated October 18, 2016).

²⁰ Polson, Jim, "10 Days of Blackouts Cut to 2 After U.S. Utility Spends Billions," BloombergMarkets, October 17, 2016 (updated October 18, 2016).

through improved domestic and global coordination, better (and different) workforce training, sharing of best practices, and more.

To elaborate, we need to:

- Foster ongoing public-private collaboration, which is essential to facilitating this transformation; for example, utilities, technology companies, and other stakeholders already are partnering with DOE-OE and/or with National Laboratories to help determine and simulate potential threats to the electric system, and demonstrate technologies and capabilities that improve situational awareness, and reduce major outages;
- Relatedly, test, measure, and verify the benefits and costs of emerging technologies as well as the associated business models, regulatory models, rate design structures, and more through demonstrations and pilot programs;
- Maximize transparency and educate and empower consumers so they can better manage their electricity consumption, especially as they become both producers and consumers of electricity, or “prosumers”;
- Establish a shared vision of where we want to go in terms of achieving a twenty-first century grid infrastructure and the steps we will take to achieve this vision (like “putting a man on the moon.”);
- Facilitate work underway at DOE and the National Laboratories on a grid architecture, so we have a platform that enables all of the distributed resources and other changes to the grid, while maintaining system reliability and security;
- Conduct scenario modeling and analysis to test concepts and their validity before deploying projects at scale; and, create performance metrics to measure and evaluate whether various grid modernization goals actually are being achieved; and,
- Develop guidance for states and leverage best practices in a way that offers tools for states to undergo the transition to a twenty-first century electricity system.

During this transition, it will be important to take into consideration regional, state, and local geographic and other key differences.

Conclusion

I will conclude as I began by stating that: because the electric system is critical infrastructure, and because this infrastructure is in dire need of upgrade and modernization, any infrastructure package *must* include not only energy and the electric system, but also must address **grid modernization or “smart grid.”** Virtually every day we learn of reports of failing infrastructure that is costing American taxpayers huge sums, as noted in the prior section. We are seeing the increasing need not just to repair, but to upgrade and harden, failing infrastructure, to withstand extreme weather events and ever-changing human-caused threats.

We have an historic opportunity to accelerate the modernization and transformation of our Nation’s electric grid. Action is needed now because these issues are complex and the situation is pressing – becoming more dire by the day, as the aforementioned examples illustrate – and the technological and policy changes required will take years to implement. On the other hand, this transformation can help optimize the grid, spark economic growth and competitiveness, create jobs, and dramatically reduce the physical, economic, and human impacts of natural- and human-caused threats.

We need to look beyond smart meters and communications, and achieve the critical infrastructure needed to make the grid more efficient, reliable, secure, and resilient. We must create the policy and economic structures that leverage scarce resources and incentivize utilities to make smart grid investments.

There is a broad consensus that there is a national imperative to modernize our nation’s electric system. Congress must play a leadership role in taking up and passing vital grid modernization infrastructure legislation. We stand ready as a resource to you and your colleagues as you proceed.

Mr. Chairman, thank you for this opportunity to testify today. I look forward to answering questions from you and your colleagues.

Mr. UPTON. Thank you. Thank you all.

We will now recognize ourselves up here for 5 minutes each for questions.

Dr. Howard, you mentioned that 25 percent of the workforce is going to be needed to be replaced within the next 5 years. Mr. Stephenson, I have seen your wonderful folks. I have seen the outcome of your apprenticeships. Are you going to be ready for that challenge?

Mr. STEPHENSON. Yes, not only do we, within our construction branch, have about around 300 training centers across the United States alone, where we train our inside and outside construction branches, but also we work very closely with our utilities themselves, and we have started the National Utility Industry Training Fund, where we have got four locations, recognizing the number of our members that are going to be retiring out of the utility branch alone, that we need to have an avenue to help utilities bring in more people, hire more people and get them trained as well. So, we have been working with our employers very closely in that regard.

Mr. UPTON. So, Dr. Howard, in your report, you indicated that smart meters in the U.S. among residential sectors is pretty close to 50 percent in the U.S. I think they are a little bit better in Europe is what you noted.

What is the trend line that we are on? What are some of the energy savings that we are able to see because of the advent or the roll out of smart meters in a good number of communities across the country?

Dr. HOWARD. So the trend line that we are on is full deployment of smart meters. They are a very, very important tool to not only—

Mr. UPTON. They are all digital, right?

Dr. HOWARD. Absolutely, that is right. And it is important because, from a customer's perspective, they can integrate and understand their use of electricity and other forms of energy as well, but from the utility's perspective, it gives them a much clearer picture of where issues are—for example, if there is an outage, and they can then restore it much faster because they have near perfect information and visualization of the electrical system.

So, it is an extremely important technology and one that we have been doing work with for a long time and it is going to be full deployment here very soon.

Mr. UPTON. And as we see more and more homes going with solar displays on the roof or even wind turbines, are they able to measure the energy that is put back into the system as well?

Dr. HOWARD. Absolutely. It is a two-way flow system now that is much more dynamic and the smart meters are able to look at it both ways. You have got to have that, absolutely.

Mr. UPTON. So, Mr. Bell, I want to hear a little bit. You asked that we do all we can to remove obstacles to, in essence, get out of the way. Particularly on the digital side, questions that I have, what have you done—what can we do more to prevent a cyberattack? I mean that is the fear that we all have, something that was in Ted Koppel's book, "Lights Out," which I am sure that you have all looked at.

What are additional things that we can do to help the industry help folks like you to make sure that that is a never-ever occurrence?

Mr. BELL. Great question. From a cybersecurity it is important to understand that while across every business people take information or IP security very, very importantly. They should also take it through measures, operational technology. So in industries and especially in electricity, we need to think about everything from sensors to cloud. That means we need to think about modernizing age-old controlled systems. We need to think about security firewalls for all.

There is a misconception that connected systems are actually vulnerable. It is actually quite the opposite. All of our phones today are way more secure than any of our PCs are, because a phone was designed for a connected era. We believe a connected asset is a safer asset. So, we have to make sure that power producers, utilities start connecting every single asset, make sure that they are monitored. That means when it is connected, they have the latest and the greatest updates of patches running. So, we have to make sure that there are incentives for power at least to modernize all their software systems. And also, we need security standards that industries can come together, and not just around information technology, but also around physical technology.

Mr. UPTON. So, as you mentioned in your testimony that you worked with a number of different power utilities around the country, do you have a special chapter on cyber threats and different firewalls that they need to continue to update and install?

Mr. BELL. Absolutely. Yes, so we offer a cyber assessment service for all of our customers. We also make industrial-specific cybersecurity fire walls.

And we are also working with partners because cyber is not just a single-vendor problem. It is an industry problem. We have the Industrial Internet Consortium. We are working with lots of partners. We are furthering technologies and standards across the industry, especially in the context of adopting Internet of Things or industrial internet.

Mr. UPTON. Are there any specifics that we can do legislatively to help you on your job to make sure that it is as foolproof as it can be?

Mr. BELL. Yes, along with working with institutions like EPRI, driving Industrial Internet Consortium Standards and the adoption of IoT technology.

So, specifically around Internet of Things or industrial internet in the context of energy, providing standards would be very helpful.

Mr. UPTON. Thank you. My time has expired.

I recognize the gentleman from Illinois, Mr. Rush, for 5 minutes for questions.

Mr. RUSH. I want to thank you, Mr. Chairman.

My question is in relation to Mr. Bell. Mr. Bell, my office received a letter from the National Urban League which, in part, noted the importance of job training and workforce development programs as an essential component of any comprehensive infrastructure proposal. Specifically, the letter discussed the necessity of including technical training, career apprenticeships, internships,

and job placement opportunities for African Americans and other minority communities as a way to ensure that all Americans are able to fully benefit in the tremendous opportunities that abound before us.

As many of you are aware, myself and Representative Hudson co-sponsored a bill that would make training for women, minorities, veterans, and displaced energy workers a key priority.

Mr. Bell, in your written statement, you talk about significant job creation in areas such as data science, energy storage integration, smart asset planning, and asset performance management. And you note that as many as three million jobs could be created worldwide. You also cite significant challenges that industry faces and will continue to face due to the current aging workforce and the insufficient numbers of skilled workers ready to step in to replace these retiring workers.

Would you discuss some of these innovative partnerships that your company, GE, has initiated and how some of these programs may provide a way forward for industry and for those communities that desperately need jobs and opportunities?

Mr. BELL. Fantastic question, Ranking Member Rush.

When you think about jobs, if you think about even myself, I said all my career I worked in software. Only in the last 3 years I am working at the intersection of energy and software.

So first thing in GE, we are making everyone aware that the industrial world—the world of electricity, health care, transportation—we need software developers and technology people. That is something we were driving at a company level, at an industry level. We are partnering with our customers.

For example, where in the past we only had a thermal engineer around power plants, now, in the future, we think that thermal engineers are also data scientists. So, we have to train a whole new generation.

We are also doing things to balance the equation for women. We have programs around women in leadership, women in science, technology, and math, and we are driving programs to make sure that across the company we are actually committed to getting 20,000 more women by 2020 in the field of engineering, science and technology in GE, and it is a worldwide commitment for us.

But the interesting thing about these jobs that we are talking about, which is at the intersection of software and energy, is not just jobs in Silicon Valley or in New York, because software means you can actually do it anywhere. And we also need them to be in the local communities, whether it is in Minneapolis, or Eugene, Oregon, or Batesville, Indiana. You need electricity systems, consumptions systems in grid. So we believe the future of this intersection of jobs can be put anywhere across the country. And in fact, America can—just like Silicon Valley leads the digital economy, America can lead this new infrastructure of electricity and digital from here in America across the globe.

Mr. RUSH. Mr. Stephenson, many of us understand the value of nuclear power and nuclear power plants are sourcing a reliable, safe, carbon-free energy. There has been no action at the Federal level to fully value these plants. And in that absence, many States, including my home State of Illinois, are taking steps to preserve

these plants as part of their energy infrastructure. These actions have caused a lot of controversy and, in some cases, they are being challenged at the local level.

We know that there are thousands of jobs at stake nationally. So, my question is what role do you think that the Congress can take to support these State-level policies, and should we be involved in any of them anyway?

Mr. STEPHENSON. Thank you, Congressman Rush.

As far as the nuclear, I was very engaged with what was going on in Illinois the end of last year when Exelon was looking at possibly closing some of their plants there in Illinois. In fact the two units, Quad Cities, that is where I am originally from. So I was very close to that and very passionate to that.

But I could tell you the nuclear industry, the whole energy, when we talk about energy, and we are moving to the green economy. We are moving to more wind, more solar but we still have to have reliable baseload. And nuclear is a very reliable baseload energy that has really zero emissions. If our goal is to try to cut down on carbon emissions, nuclear is clean when it comes to carbon.

So I think there is a big role to play for nuclear. I think one of the problems they have is because of the price right now, say, of natural gas and some of the other power supplies, that it is difficult for them to build and run reliably and economically because of the pressures economically that are put on them. And I think the action that was taken in Illinois—and I think there was also some action taken in New York, as well—to recognize and preserve that they are already providing a good, clean energy source is something that needs to be considered for the nuclear industry and make sure that we are keeping a good, solid baseload, a reliable baseload that provides clean power.

Mr. RUSH. I yield back, Mr. Chairman.

Mr. UPTON. The gentleman yields his time back.

The Chair recognizes Mr. Walden for 5 minutes.

Mr. WALDEN. Thank you, Mr. Chairman.

Thank you all for being here. I appreciate your testimony. It is most helpful to inform our decisionmaking going forward.

Mr. Stephenson, I have toured Local 48 and the work they do there in Portland and throughout Oregon and been very impressed with the training that goes on, the education that goes on and the work.

Mr. Bell, in your testimony, you cited some statistics about the efficiency of our generation fleet. And according to NERC, the U.S. fleet operates at less than 50 percent of total potential capacity. Generating units are unavailable on average 15 percent of the time due to outages and maintenance, 6 percent of the time they are unable to meet demand at all.

Is this purely a technological issues or are there regulatory barriers at the Federal level and State level preventing greater utilization and market efficiency in digitalization?

Mr. BELL. Great question, Congressman. We believe it is an untapped potential today. Like I talked about, a single gas-fired power plant, for example, could generate up to two terabytes of data a day. That is more data than all of us collectively in this room could even put on Facebook or Twitter over a year.

So there is more data. It is actually unused data. And we have been able to drive efficiencies as much as reduce unplanned downtime by 17 percent, increase uptime, therefore, by 10 percent or, in the case of nuclear, predict outages with accuracy of 90 percent.

And these are just the start, as the algorithms are getting trained on technology. For example, we already have algorithms that are trained on a 100,000,000 hours of operating data. So as they get trained on more operating data, we can get specific with recommendations not just about a particular class of a machine, but about a machine in that particular operating condition. So we can get more specific about eliminating that 15 percent, which is a very meaningful number that we can make a dent into.

Mr. WALDEN. You know part of what we always have to keep in mind is both the efficiency but also the consumer.

Mr. BELL. Yes.

Mr. WALDEN. And so in my district we have thousands of megawatts of wind energy, enormous—not enormous, but we have a lot of solar energy, a lot of hydro power. We are a very renewable energy base.

We also, obviously, have other generating source, gas and I think we get electricity from coal from outside of the region, but it comes in via the power lines.

As we work on renewable energy, one of the concerns that has come my way is it is not 24/7 baseload.

Mr. BELL. Yes.

Mr. WALDEN. And so often, that means you have to have a stand-by baseload plant you have to build, and the consumers are ending up paying for both. How do we bridge that best? How do we get the best efficiency out of that? And what does this mean to consumers? Because price to consumers is an issue we need to be thinking about.

Mr. BELL. Absolutely. So, just like the example you shared, in renewables, for example, we are already using software to improve the predictability of energy yield from renewable resources. And that is absolutely key so you can plan the other fuel sources to compensate for the fluctuations.

And also, software is already helping baseload power plants be more flexible. We can ramp them up quickly and ramp them down quickly.

So regardless of what the mix of energy is, to really optimize all of the sources of fuel, you need software because at the end of the day it is an optimization problem and our customers are starting to use them individually now, and some of them are actually building operation centers, where they monitor every asset, whether it is NYPA, for example, building an operations center that monitors everything from Niagara Falls to all sources of generation and grid. So now we can get to a state where we can truly integrate renewables even better because by New York reg standards, they have got to get 50 percent renewables by 2030. The only way that happens is instrumentation of every single node, every single asset, and optimizing algorithms through software.

Mr. WALDEN. So, Mr. Stephenson, talk to me a bit about what your members have encountered in terms of jobs that are out there,

the permitting processes, delays, from your experience necessary/unnecessary. What should we be focused on there?

Mr. STEPHENSON. Well as I mentioned briefly in my remarks, because of some of the permitting—I will give you an example. Clean Line Energy has, I think, three or four projects where they are taking wind energy from out in the west, where there is a big demand or an opportunity for wind, and moving it east into the Chicago metro area and down into Indiana and down south through the Southeast. One of the problems they are having in getting that opportunity is getting all the proper—you know each State they go through they have got a whole new challenge of regulations they have got to have to get through those States.

And so I have been working personally with Clean Line Energy probably for about 8 years, the first time I met with them when they were talking about what their projects were.

So, some way to start getting that standardized for them to build and get their sitings for where they are going to put these towers. And in a lot of ways we have already got functioning towers all over the country. They have been there. So it is not like we necessarily have to always take a whole new path. I mean, they are able to kind of parallel some paths where there are already towers there and blended in with the communities. But that is the biggest obstacle. There are several projects that are waiting right now that if we could get through that process would be up and ready to go. And a lot of these projects, by the way, are privately funded. These are the companies that have the resources ready to go. They just need to get the proper permitting to start.

Mr. UPTON. Thank you, Mr. Chairman.

The Chair would recognize the ranking member of the full committee, Mr. Pallone, for 5 minutes.

Mr. PALLONE. Thank you, Mr. Chairman.

Building new energy infrastructure is important but protecting and strengthening our existing infrastructure is as important, if not more so. And I think we need to do more to ensure that we are hardening essential infrastructure and making the grid more resilient and that means not just transmission but providing more flexibility and resilience within the distribution networks.

And I mentioned in my opening that I was very proud of the fact that at the beginning of the last session we did have agreement with the Republicans on the committee to have a \$3 billion grant program for grid modernization and pipeline repairs.

But I wanted to ask Mr. Stephenson, you spoke about the well-developed training program that IBEW runs for your members. And I wanted to ask has the program been expanding to train members to move into new areas, such as energy storage, nuclear technologies, and microgrids. And in your opinion, would a grid modernization grant program like I have discussed, providing grants to States actually help create jobs for your members?

Mr. STEPHENSON. Yes, it would because, you know, we are constantly training in the new technologies. As soon as we see new activities come in, our training program is always on top of it, starting to get our folks trained and ready for the changes as they come. But yes, it absolutely would provide that.

Mr. PALLONE. OK and then you mentioned that many members work in the nuclear utilities also and coal utilities. And you said that with respect to nuclear, in particular, that these haven't necessarily fared well in recent years.

Would some or all of the workers in coal or nuclear, would they be able to move into other jobs associated with the grid modernization of the electricity sector? If we have that kind of a grant program, would that be helpful to them?

Mr. STEPHENSON. Well, it would help, but one of the issues we face is that when you are going from, let's say, coal generation because coal has been changing rapidly over the years, where you might have 200 employees at a coal-generating plant and that is being replaced by a natural gas plant. You know you might go from 200 employees probably down to 40, and then, of course, the renewables as far as wind and solar would even be less. After the construction, after they are built, there are less permanent jobs in maintaining them.

So we will see, overall, probably a reduction in our utility branch because of some of those technological changes, but we also work very closely with our employers in the utility industry that, as they transition, our employees that are already there will have opportunities and have been offered opportunities to get training to allow them to stay employable in those new markets through those employers.

Mr. PALLONE. All right, thank you.

I wanted to ask Mr. Hauser, you know my district was the hardest hit by Superstorm Sandy back in 2012.

Mr. STEPHENSON. Yes.

Mr. PALLONE. It took an incredible toll on the electricity grid. More than 8.5 million households and businesses had outages. In some places, including my own house, the power took a couple of weeks to restore.

So as I said, a big part of our modernizing the electricity grid must include hardening our electricity infrastructure to protect the power lines, such as during a storm. Some of our utilities in New Jersey, such as PSE&G have made strides to protect the energy infrastructure but there is a lot more than can be done to prevent you know from a hurricane causing major power outages.

So in your testimony, you discussed hardening and resilience as important aspects of modernizing the grid. Kind of the same question I was asking Mr. Stephenson, would a grid modernization grant program providing targeted grants to States to support this effort, would that be helpful? What do you think about it?

Mr. HAUSER. Absolutely. I mean we talk a lot about the public-private partnerships that are needed to really build out this system to be more resilient. As I am sure you know, many of our utilities are private. There may be 70 or so utilities private, but there are almost 3,000 utilities across the country who are public utilities that absolutely need support to help do this.

While it is important to consider the rate payer's need to support this, I think the taxpayers need to also look at opportunities to support this. And in particular, a grand program would look at potentially some innovative ways, some things that GE has already

talked about, innovative ways to make it more cost-effective, certainly perform better.

Mr. PALLONE. All right, thank you very much. Thank you, Mr. Chairman.

Mr. UPTON. The Chair would now recognize the gentleman from Texas, Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman.

Back in 2005, we passed the Energy Policy Act and it put in place a procedure in congested areas if the Department of Energy designated a particular region as a congested or high-need region, set up an expedited procedure to site electrical transmission lines. A Federal court in Virginia, on a two-to-one vote struck that provision of the Act down. So we certainly don't have an efficient way to site interstate electrical transmission lines. And given the growing needs of our economy, we need to move electricity from where it is generated to where it is consumed. And it is also impossible to do in these States in the Midwest and the Northeast where the geography is constrained and the populations are fairly dense.

I would like to ask Dr. Howard and Mr. Hauser if your groups have any ideas that we could legislate to try to solve that problem.

Dr. HOWARD. So you bring up a very important point. And as we add additional variable generation resources onto the electrical system, we do want to move it where it is needed. And congestion is a problem because that is where you run into generation and load kind of meet each other at the congestion points.

So we have done a lot of work on looking at advanced conductors, whether it is DC or AC, to look at how we can advance the science and technology to help eliminate this problem. We are focused on the science and technology, but what I can say is that the need for additional work around trying to eliminate or alleviate congestion is critically important because it is not going away.

In terms of the regulation that is required or some potential policies, we don't have a specific recommendation. Our focus is on the science and technology, but what I can say is that when you look to the future, this is going to get to be a bigger and bigger problem unless it is solved because as we have more variable generation, it is going to be a bigger problem.

Some of the things that we are doing around sensors, and computation and analytics, and information and communication will help some, but it comes down to pipes and wires. We have got to have more wires to move this around.

Mr. BARTON. Mr. Hauser?

Mr. HAUSER. Building new transmission lines is certainly an important option that has to be considered going forward. There is a lot of work by companies that are looking at ways to use existing transmission line to upgrade them. That is kind of what Mike was talking about, make them more efficient, get more capacity through the existing systems.

You may be aware there is a project in New York now called the Brooklyn/Queens Demand Management Program that is a significant project that is looking at alternatives to building transmission to allow congestion relief in areas we call load pockets, where they do need more capacity.

So I don't think there is a magic silver bullet here to make this happen. I think we need to look at all options and certainly, in some instances, building new transmissions lines is the best option.

Mr. BARTON. Well, Mr. Chairman, I am very disappointed with those answers, to be frank. I would have thought that great minds would have come up with some alternatives besides just suck it up and try to get more molecules and electrons through the existing system. If you are going to have a nation that grows and an economy that grows, we are going to need more transmission lines. There is a limit how much technology can do.

And I hope we can continue to ponder that because if we are really going to do something in this area in this Congress, we are going, at least in my opinion, Mr. Chairman, we need to come up with a way that respects the rights of the States and respects the rights of the communities but still makes it possible when there is an obvious need to build new transmission lines. We simply have to do that. And with that, I yield back.

Mr. UPTON. The gentleman yields back.

The gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Well I thank the chairman for holding this hearing. It is really illuminating.

I am going to follow-up on Mr. Barton's last question. Mr. Hauser, you mentioned in your testimony that not only do we need new transmission, we need to focus on upgrading existing transmission facilities. Could you explain that, why we need to focus on—what is the benefit of focusing on rebuilding or upgrading?

Mr. HAUSER. Well, as an example, and I think Mike alluded to this, there are new conductors that allow you to put a lot more electrons through existing lines and existing right-of-ways so you can upgrade conductors, as an example, very cost-effectively and get a lot more power through the existing lines.

Mr. MCNERNEY. So the technology is there to—

Mr. HAUSER. Absolutely.

Mr. MCNERNEY [continuing]. Make it a cheaper way to go forward with our power needs.

Mr. HAUSER. Yes.

Mr. MCNERNEY. Do you believe the Smart Grid Matching Grants and Smart Grid Demonstration Project funding that was included in the American Recovery and Investment Act was a useful or good modernization in deploying new technologies?

Mr. HAUSER. Oh, absolutely. I think almost two-to-one the utilities that were beneficiaries of those grants are thrilled with the results. And in many cases the utilities that are members of mine talk about how the benefits they have seen from those grants far outweigh the benefits they even expected to get from those projects.

So yes, I would say that absolutely that is the case.

Mr. MCNERNEY. Well, excellent. You mentioned that the grid isn't keeping up with new technology. How would we go about improving that situation?

Mr. HAUSER. You know, it is always a challenge—as my colleagues have talked on the panel already, it is always a challenge to find ways to implement these new technologies that are somewhat revolutionary, if you will. And I think the grants that Con-

gressman Pallone talked about is certainly one way to show examples.

I think one of the things we are looking at is how to share lessons learned across the industry. So because there are so many utilities, one utility in Texas that is doing pioneering work in a particular area or Chattanooga, Tennessee, which does a lot of very impressive work, we want to take what they are learning and share it across the industry so that it is easier for the utilities and the regulators to accept some of the new technologies that are having such a big impact on the industry.

Mr. MCNERNEY. Mr. Howard, cybersecurity and resiliency remain an essential piece of any component throughout an electricity or energy production system. Is there a uniform definition of what cybersecurity and cyberresiliency means?

Dr. HOWARD. A uniform definition, I am not sure there is a uniform definition. I think there is a somewhat consistent awareness of the importance of it, but I am not sure there is a common definition.

Mr. MCNERNEY. Would it be useful to have a common understanding of what that means?

Dr. HOWARD. Certainly an increased awareness of what we can do and a discussion of some of the options that we could consider, all of that is very important. We are doing a lot of that at EPRI. So, yes.

Mr. MCNERNEY. Different subject. How could real-time pricing rates affect grid modernization efforts?

Dr. HOWARD. Well, one is that it could help consumers, and the devices themselves, to have a better understanding of congestion, for example. We talked about that previously. So anytime that you can provide more awareness and understanding of the issues, whether it is the consumer or the devices where they can make smarter decisions on their own, those are important factors that consumers can include in their energy choice.

Mr. MCNERNEY. Thank you. Mr. Bell, in about 30 seconds, what do you think the biggest obstacles to grid modernization are?

Mr. BELL. The biggest obstacle is actual visibility, lack of visibility today. Because we think of the whole system as a uniform system and there is already enough data. We are not talking about new instrumentation. We are talking about making sure we use all the existing data to get better insights and better visibility so we can start writing a program or a roadmap of how to modernize step-by-step.

Mr. MCNERNEY. Thank you.

Mr. Chairman, I yield back.

Mr. UPTON. The gentleman yields back.

The Chair recognizes the vice chair of the subcommittee, Mr. Olson, for 5 minutes.

Mr. OLSON. I thank the Chair.

Welcome, Dr. Howard, Mr. Bell, Mr. Stephenson, and Mr. Hauser. As you all know, in my home State of Texas, we have a huge amount of wind power coming onto our grid.

This question is for you, Mr. Hauser, and you, Dr. Howard. One year ago this month, nearly half the power in our grid came from wind turbines; 13.9 gigawatts of power from wind, double the ca-

capacity of any other State. Most of that wind is pretty far from our population centers so we worry a lot about things like line loss. At the same time, our plants that are closer to our cities are being closed or replaced, which can mean things like congestion to the system as the generation shifts.

Clearly, our grid is rapidly changing. In the Houston region, my alma mater Rice University at the Smalley-Curl Institute, it is advancing nanotechnology for a broad range of issues, mostly energy transmission.

Also, at Mr. Green's alma mater, the University of Houston, the Texas Center of Superconductivity Advancement is looking into power transmissions through superconductors. In fact, they are trying to rewire the whole main campus with superconductors.

Those are just two examples of how the grid could evolve. My question is, again, for you, Mr. Hauser, first, and then Dr. Howard. What are some of the technologies you see coming in terms of innovation for electric transmission and how can they shape the grid?

Mr. HAUSER. Yes, well, you have given a couple of great examples already from the great State of Texas. I might yield to Mr. Bell from GE because a lot of the work is being done to move to digital silicon-based transformers, switches at much higher speed, much higher power densities, two-way flow on the grid, controllers that allow two-way flow, sensors, and other devices that allow us to manage reactive power versus real power, which is also an issue that comes up with increasing amounts of wind and solar on the grid.

Mr. Bell, do you want to add anything to that?

Mr. BELL. I think Mr. Hauser covered a lot of—I think one of the simple ideas is while there is material science breakthroughs, new technologies, new electronics, we also believe that software closer to the edge needs to be changed and modernized.

Many substations, power plants are all still running controlled software that is, like, decades old. So, we are looking at algorithms that run what we call Edge, meaning closer to the machine so they can make intelligent decisions locally, just like Dr. Howard talked about, so they are aware.

When we talk about the network or the Electricity Value Network or the Integrated Energy Network, we mean that every node is aware of what is happening across the entire network, so they can make local decisions about how to optimize routing, how to take load, and how to react to demands outside of the network.

So, those are some of the innovations that are happening, actually, Mr. Tonko, right where you are, in Niskayuna, where we have our Global Research Center, this is where we talk about high-tech meets deep technology, where it is not just software, but driving that innovation all the way down to the silicon and creating new kinds of value up and down a full integrated stack of technology.

Mr. OLSON. Dr. Howard, you pulled the microphone, you are ready. Sir, you are up.

Dr. HOWARD. So we have talked a lot about digital communication centers and so on, and that is pretty important, but I want to mention three. One is, and you talked about superconductors, but it needs to be higher temperature superconducting materials. So that is one.

Second, low-loss conductors. There is a lot of work that is going on that will significantly reduce the loss on transmission cables and they are called low-loss transmission.

Three, power electronics. Our electronics, which will enable the digital grid is exactly what we need to move forward on, in terms of improving not only the congestion but the ability to increase the power on the existing right-of-ways and so on. It is akin to where we are headed, which is really a digital transformer.

Mr. OLSON. 4 seconds left. I yield back the balance of my time and save my questions.

Mr. UPTON. The gentleman yields back.

The Chair would recognize Mr. Peters for 5 minutes.

Mr. PETERS. Thank you, Mr. Chairman and thank the witnesses for some fascinating ideas.

You have highlighted a lot of the innovation that is happening in the economy into the private sector. I would like to explore a little bit what you think the Federal role is here. And maybe, Dr. Howard, I would ask you are we talking about—if we decided we are not going to do power loss conductors down the hallway. That is something that is going to happen appropriately in the private sector. If we were going to come up with actions that we can take, direct investment, grants, standard-setting, regulatory relief through Federal preemption, what are the kinds of things that you think would be helpful for us to do to support the kind of grid that is in the national interest?

Dr. HOWARD. Probably the most important is the continued focus on basic research because all of these things we have talked about, whether it is high-temperature semiconductors, or advanced cables, or power electronics, or sensors, and so on starts, many of them start in the national labs with looking at fundamental material science. And I think that is one of the most important things that we can do to advance. Once the material is designed and we uncover the basics of the atom and its ability to work together to advance some of these technologies, then private industry can take it from there and apply it and make this the best grid possible. But it takes the fundamental science and research to help us get there.

Mr. PETERS. Do you have an opinion on the adequacy of the current levels of funding in that field?

Dr. HOWARD. Low.

Mr. PETERS. Low. Too low?

Dr. HOWARD. Yes.

Mr. PETERS. So I get that. I think I would be supportive of that. How do you think, though, that we assure the outcomes? Obviously, the Nation has an interest in a grid that functions and that is resistant to attack, that is resilient, that is efficient, that conserves energy. How do you think we could, as a Federal Government, most productively assure that outcome through all the innovations that you are talking about today?

Dr. HOWARD. Well, one way is to encourage and support the application of these technologies. They don't just wake up one morning and say let's go and apply it. We have to start off with multiple demonstrations and learn from that to make it better. And the basic research it is conducting in the national labs, then you take that and move it into private industry and you support the need

for multiple demonstrations and multiple science to then learn from that so that you can apply it and make sure it does the job that we thought it will do when we started the research. So, support the application and demonstration.

Mr. PETERS. So some information sharing as well as the research.

Dr. HOWARD. Absolutely.

Mr. PETERS. And do any of the other panelists want to talk about what the Federal role? Any thoughts you have, Mr. Hauser?

Mr. HAUSER. I will add a couple of things. First of all, we should have mentioned storage in the context of technology, too. That is a real game changer for this industry going forward. But I think technical assistance, building better models, better analytic models, we are really moving from a data poor to a data rich environment. So a lot of our models from a regulatory standpoint, from an operations standpoint have been based on not having much data about what is happening out in the system.

With the changes that are happening with AMI, with automated distribution systems, we are collecting so much data now and our models really haven't kept abreast of that and building better analysis, better models, is certainly something that could be done at the Federal level or at least the support for that.

And the last thing I would say is technical assistance to regulators and to local utilities. Again, there are more than 3,000 utilities across this country. It is a very complicated stakeholder environment. And providing the education and the training, and the technical assistance is going to be really important.

Mr. PETERS. So one of your points is that not all utilities are huge and have all the resources that they need to do this.

Mr. HAUSER. Absolutely.

Mr. PETERS. So am I to understand, too, that there aren't sufficient private incentives to take advantage of the kinds of technologies that Mr. Bell is talking about? Is that something that the Federal Government has to get involved in?

Mr. HAUSER. Yes, I think so. I mean there is always this dance between State and Federal roles with regard to this and we need to be respectful of both. But certainly, providing better incentives for new technologies, again, the utility—and Mike can probably talk about this better than I can, but historically, utilities install technologies that last 30, 40, 50 years, and that is part of the issue that we have got, is that we have got technologies in the systems now that were installed in the 1970s or even the 1960s. And so coming up with ways to allow them to put technologies that may not have 30- or 40-year lifetimes, they may have 5- or 10-year lifetimes because technology is evolving so fast, is going to be really critical to this.

Mr. PETERS. Thank you very much. My time has expired, Mr. Chairman.

Mr. UPTON. Time has expired. The Chair will recognize the gentleman from Illinois, Mr. Shimkus, for 5 minutes.

Mr. SHIMKUS. Thank you, Mr. Chairman. And welcome. This is a great hearing and I read the testimony also and I have been listening to the question and answer and your 5-minute statements.

So I have gone off the rails a little bit here to ask some questions that I don't think people have asked yet. But actually Scott Peters asked great questions, I think Joe Barton asked some questions of really what is the Federal role. Where can we be helpful? Where can we be harmful, right? And we can do both.

And plus the electricity generation and transmission world has changed just through competitive markets versus regulated communities. We haven't really started talking about that. Do you try to put the genie back into the bottle? Can you get incentivized?

So let me kind of ramble here for a few minutes. The other thing, I mean, I see the laborers in the crowd. I know you are with IBEW and this focus on jobs. My, I called him, Uncle Bob, he climbed power poles. I grew up with his kids. My dad was a telephone lineman, climbed poles and he fed seven kids and mine was a stay-at-home mom. So, that is the story of a lot of us in my era. So I have great appreciation for the work that is done.

But we don't talk, what we haven't talked about are these jobs here. These jobs. The IBEW guys at a power plant, the United Mine Workers at the coal mine, the pipefitters, the boilermakers, and the change that we are dealing with now is because we have lost these. They are under attack for a lot of reasons. So there are some issues about what can Government do. Government can get off the back of the fossil fuel sector and allow us to—major generation.

So in all of our debates, no one talked about major generation, baseload generation and the importance to the grid and the resiliency and the cost. So that is my first question, if you would go to Dr. Howard, across the first panel, I would appreciate it.

Dr. HOWARD. Thanks. So, we have for years been looking at the generation mix and what that means to security of the country. All of the research that we have done points toward the need for a full portfolio generation options, which includes the need for all forms of thermal generation, including nuclear and coal.

Mr. SHIMKUS. And they are all at-risk.

Dr. HOWARD. Well, we need them all.

Mr. SHIMKUS. They are at-risk. No one who is observing these markets will say that major nuclear, major coal is not threatened and at-risk.

Dr. HOWARD. Well, let me just—

Mr. SHIMKUS. Let me go quickly, because I have got another question. So, Mr. Bell.

Mr. BELL. Sure, Mr. Shimkus, the role of baseload. The role of baseload, we actually, our biggest customers today use our software across baseload power plants.

If you take Exelon, who is one of our biggest customers, they are implementing our software across all forms of generation because being gas, nuclear and it is all about improving efficiency, reliability—

Mr. SHIMKUS. OK, let me go to Mr. Stephenson. I get it. Exelon is a good friend of mine.

Mr. BELL. Yes.

Mr. SHIMKUS. Mr. Stephenson.

Mr. STEPHENSON. Yes, baseload is very important, as I mentioned earlier and especially all forms. I believe there is clean coal

technology that still needs to be looked at and considered about some of the jobs that you just pointed out.

Being a former Illinoisan, I am very aware of what is going on in downstate Illinois and the number of jobs that are at-risk there. And so I think there are still opportunities. And we, maybe, as a Federal Government could help fund some of the that technology, some of that research, so that we can go into carbon capture questions and others.

Mr. SHIMKUS. And the Federal Government really has put a lot of money into that type of research already.

Mr. Hauser, baseload quickly. I have got one more question for you after.

Mr. HAUSER. Yes, well, sir, clearly Illinois is the leader in this space. Exelon is one of my members.

You know I think what I would add to this is that the technologies we have been talking about that apply to the grid changes are also being applied to power plants. I mean power plants are becoming much more efficient. Sensors are being used to help us understand how to make them much more efficient, how to make the O and M much more effective and less costly.

Mr. SHIMKUS. And I liked one of the testimonies that talked about the downtime of the grid saved a million households didn't go out of power.

But Mr. Hauser, you also made a statement and I want to end with this. Aren't rate payers the same as taxpayers?

Mr. HAUSER. I often joke that it comes out of either your right pocket or your left pocket. So, yes, the citizens—

Mr. SHIMKUS. So I mean there is a private sector so we just have got to be careful about how we apportion the cost and assume that one is not the other when they are actually the same people.

Mr. HAUSER. Sure.

Mr. SHIMKUS. I yield back.

Mr. OLSON [presiding]. The gentleman yields back.

The Chair calls upon the gentleman from Texas, Mr. Green, for 5 minutes.

Mr. GREEN. Thank you, Mr. Chairman and I thank our witnesses for being here.

I represent a very urban district in Houston with refineries, chemical plants. GE actually shut down one of our plants—not shut it down but because of the international market but we make turbines for whatever few you have.

Our problem in Texas is not—because we build our own pipelines. We have our own grid. And so if we have wind power in Lubbock, Texas, they actually can get it to the Dallas-Fort Worth market, Houston market, San Antonio because it doesn't cross State lines. And we have our own grid, the ERCOT, that we can work ourselves.

But I know we have trouble with getting pipelines and getting electricity transmission permitted across State lines. But like I said, we don't have that problem but I am real aware of it because I would like to sell more natural gas to Mexico from Texas and we need to get those permits quickly done so we can sell that.

President Stephenson, welcome. I work with your Houston locals both. In fact, I was down at our nuclear power plant in south

Texas. It has been IBEW since it was built and the first time I had been back here.

We have a small amount of nuclear in Texas. We wanted to go expand it but because of the market and because one of our partners with Fukushima, Tokyo Power went bankrupt and they were one of our partners and we couldn't expand. And we have a lot of mix, whether it is wind power, nuclear power, of course natural gas, and in Texas, as my friend from Pennsylvania say you burn dirt, we burn lignite, which is probably one of the dirtiest we could do but we bring in a lot of coal from the Midwest for our coal-fired plants.

But the mix is changing, simply because of the cheap prices of natural gas. And we are seeing it literally at home.

But I want to talk about the workforce because I have a district that they work at those plants. And IBEW, you have partnerships with your local contractors, I assume, because you have a great apprenticeship program, but also with our community colleges. A couple of years ago, our previous Secretary of Labor, Tom Perez, was at San Jacinto Community College in my area and Congressman Babin's area and they were training for jobs that were available right then because they partnered with the large employers in the community and said show us what you need and we will let you write the curriculum because our goal is to get these students get those jobs and fill them. And we still had challenges on that in the energy industry but it is working.

Does IBEW partner, have a goal partnering with your apprenticeship program with the community colleges?

You might say yes, so that the record will take it up.

Mr. STEPHENSON. Yes.

Mr. GREEN. And does IBEW have expansion plans? I have been to your apprenticeship programs. They are actually in our district near Hobby Airport in Houston.

Mr. STEPHENSON. Yes, we are consciously looking at the projected workforce needs and adjusting our apprenticeships, trying to take in more apprentices to provide for the additional need to the skilled labor so we can provide them for our employers so that they can continue to bid that work.

Mr. GREEN. Mr. Bell, does GE partner with local community colleges and support workforce training? I don't know in my area because although we had that turbine plant but we have GE oil and gas buildings all over Houston, Texas.

So do you all partner with local community college for that workforce training?

Mr. BELL. Absolutely we do. And we are also doing, for example, in New Orleans, we have an apprenticeship program where it is software engineering apprentice program that we are working in New Orleans. We partner with the universities in many different areas.

And also talking about the workforce question you talked about, when we think about digital infrastructure and network, it is not just the assets. We think about how the workers are becoming more productive and their work environments are getting safer. So we think about every worker in a power plant becoming a digital worker so they have all the information they need, whether

through wearables or safety devices so they can help do their jobs better.

Mr. GREEN. Mr. Hauser, do the relevant Federal agencies currently possess the required authority to expedite the Smart Grid siting and also the approval? And we are talking about interstate, not intrastate.

Mr. HAUSER. So, there has clearly been a lot of discussion and debate around that issue. I think FERC is looking at that now in terms of what other authority might be needed to appropriately address that.

So much of the Smart Grid work is being done at the local level, so it is really more State PUC focused and focus with the Governor and the State legislatures.

Mr. GREEN. Thank you, Mr. Chairman. I yield back.

Mr. OLSON. The gentleman's time expired.

The Chair calls the gentleman from Pennsylvania, Dr. Murphy, for 5 minutes.

Mr. MURPHY. Thank you, Mr. Chairman. It is great to have you all here and I find your testimony fascinating as we recognize the problems with our grid and what we need to be doing for modernization.

A special welcome, Mr. Stephenson. It is good to have the IBEW, my friends here, as well as my Lonnie in the back as well.

But Mr. Hauser, I want to ask you some issues with regard to the grid. In my district, I have the National Energy Technology Lab, so it is funded by the Department of Energy doing research.

Mr. HAUSER. Yes.

Mr. MURPHY. And I think it is very important to continue funding to have that partnership. They also put a lot of grants out to the private sector, too.

With regard to this, what kind of areas in research and development can NETL have to invest in some approved—you talked about resilience, reliability, and security in the system. Could you elaborate on where the public sector can be assisting this?

Mr. HAUSER. Yes, absolutely, and we have worked with the National Energy Technology Lab for more than 10 years in different spaces. I am aware right now that they are doing some work in power electronics. Controls is becoming a very, very hot topic. Again, GE is doing a lot of work in that area, but NETL has some work going on in that area, looking at advanced control theory structures. How do you use the data that is being collected to a much more effective job of controlling what has become a much more complex grid and will continue to become much more complex.

Mr. MURPHY. So this has continued to be pretty sophisticated as you go through this. Like when I go to the IBEW training facility, this is on a very high level. This is not my knowledge of electricity, which is just above dangerous. I know the black wires connect with black, white/white, and the copper, leave them alone, and then call somebody to connect the power and check my mess.

But as it goes through here, and the kind of controls that are developed by companies out there, GE and other ones, it is pretty sophisticated. But this is where we have this kind of alliance and working together of public and private sector. Can you give some

examples of areas where we need to continue to push this or move this forward in these public-private partnerships to facilitate this? I mean you mentioned something with GE. Can you elaborate on that a little bit more or if GE can elaborate.

Yes, Mr. Hauser.

Mr. HAUSER. So, yes, public-private partnerships, of course, have been important in a lot of different areas. The labs, of course, work with companies like GE. They work with utilities. A lot of the time it is proof testing, demoing these advanced systems so that they can be deployed more broadly and more reliably.

Mr. MURPHY. You mean with the Smart Grid, for example?

Mr. HAUSER. Yes, absolutely.

Mr. MURPHY. Define that. Expand a little bit on that, how that works and the kind of work we can do to help.

Mr. HAUSER. So the Department of Energy might put out a request for proposals where the company's team, EPRI is involved in those, many of my member companies are involved. Utility will often get involved to do some of the demo of a technology, maybe it is a new storage technology, and integrating into the grid. A lot of times the questions become how do you take it from a lab environment to a full-scale environment.

Mr. MURPHY. In the context of what you are saying, one of the advantages I understand is Smart Grid. If you do it right, you are not wasting a lot of power. You are actually making it work more effectively, more efficiently along the way.

Mr. Bell, can you comment on that Smart Grid and how we can be facilitating that? Power waste is environmental waste, too. We don't want that. We want to create just enough and use it wisely. How do we do that?

Mr. BELL. I mentioned a World Economic Forum Study. They actually talk about across the world, and a big part of that applies in America as well. More than 75 percent of breakdowns in generation, for example, can be prevented using software analytics. And more than eight percent of electricity that gets generated never reaches the consumer.

Mr. MURPHY. Seventy percent.

Mr. BELL. No, eight percent of electricity that gets generated never reaches the consumer.

Mr. MURPHY. Got it.

Mr. BELL. There are 75 percent of breakdowns that happen that can be already predicted and prevented. So we actually think that number could be even higher with software.

So when you think about eliminating breakdowns and preventing failures, as well as reducing transmission loss, you can actually yield more from existing investments that are out there.

And to the question of proof of concept, where the Government funds—environmental research is very, very important, as we talked about, but also funding new solutions, especially members that are part of the IoT Working Group, thinking about this as an option of cloud, an option of modern technologies, and setting up labs and proof points where—

Mr. MURPHY. Mr. Stephenson, my final few seconds here. And what does this yield in terms of jobs if we move forward to this

kind of Smart Grid? And just your workers alone, what are we talking about here, do you have some sense?

Mr. STEPHENSON. I am sorry, could you repeat that?

Mr. MURPHY. Yes, I am just wondering in terms of jobs, moving forward on these issues to improve the grid, what does this mean in terms of jobs, just in your group alone, your unit alone?

Mr. STEPHENSON. Well, there is the potential for a big demand as we continue to train the next generation of workers for these changes.

Mr. MURPHY. Several thousand?

Mr. STEPHENSON. And due to the baby boomers that are leaving and the new people coming in, there is a big demand.

Mr. MURPHY. Awesome. Thank you, Mr. Chairman.

Mr. OLSON. The gentleman's time has expired.

The Chair calls upon the gentleman from Pennsylvania, Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman, and thank you for convening this hearing today.

Let me start with Mr. Hauser. In your testimony, you mentioned the importance of Smart City Initiatives. As you know, Pittsburgh was a finalist in this new initiative that the Department of Transportation had last fall. And our city later received some funding for a component of its application and I think that this is a program that should be expanded and we hope the new administration will do that.

Can you just expand a little bit on what you think are some of the most important features of potential Smart City programs and how we should try to encourage such programs here at the committee?

Mr. HAUSER. Yes, absolutely. And I think it was Dr. Brown that mentioned as we understand and increase the sophistication of the electricity system, it begins to interact more, and more, and more with the other infrastructures, whether it is electric vehicles, autonomous vehicles, whether it is water systems either to cool the power plants or it is pumping required for agricultural use and other things, these infrastructures are increasingly becoming complex and interactive. And so it is really important, from a Smart City standpoint, that we look at the entire infrastructure, not just one infrastructure at a time. The interactions are becoming extremely important.

Mr. DOYLE. Yes, I am glad you mentioned autonomous vehicles. With Uber and now Ford making their announcement, Pittsburgh is now claiming itself to be the autonomous vehicle capital of the world. So, we look forward to more research in that.

Let me go into nuclear, too. The QER 1.2 notes that nuclear power currently provides 60 percent of the U.S.'s zero-carbon electricity but existing nuclear merchant plants are having difficulty competing in the market these days.

I have been a long-time supporter of the country's largest source of carbon-free power and I am alarmed by the premature plant retirements that we are seeing across the country.

Mr. Stephenson, and let me say it is a pleasure to work with IBEW Local 5 in Pittsburgh under the leadership of Mike Dunleavy. Those guys do a great job. But each nuclear power plant

employs between 400 to 700 people and the average plant also generates an average of almost \$16 million in State and local tax revenue annually and Federal tax payments of approximately \$67 million each year.

And this source of energy is vital for our local economies and critically important in our fight against climate change. Can you please comment on what the closure of some nuclear plants is meant for your workers and their communities?

Mr. STEPHENSON. Yes, we have had, for example, the ones—we avoided this at this point, but the Exelon you know had announced earlier they were looking at closing three facilities. And if they had done that, it would have been approximately \$3.6 billion out of the local economy and direct and indirect loss of jobs of around 13,300 that we had researched just for that alone.

In other areas, Zion, Illinois, for example, was a plant that was closed several years ago but if you read the research, they are still suffering. That community has still never recovered because it was built—you know when those were built a lot of the nukes, they weren't in the metropolitan areas. They were more in the rural area. So those rural communities have grown and thrived because of the economy of the nuclear industry. And when they start going down, you decimate all those people that live in those small communities.

Mr. DOYLE. Yes, Mr. Hauser, one of the other recommendations in the QER was to expand funding assistance to enhance analytical capabilities for State PUCs and improve access to training and expertise for smaller utilities. I think this is particularly important, given the rise in distributed generation resources.

Mr. HAUSER. Yes.

Mr. DOYLE. Do you agree with that? And if so, could you please expand on the challenges you see in this space?

Mr. HAUSER. Yes, I do agree with that. And as I have mentioned earlier, there are almost 3,000 public utilities out there that are, many of them, struggling with these issues. As the systems become more complicated, as the data becomes more rich, we need better models and simpler models, I will say, for many of these utilities to use and they need training and technical assistance, certainly, to help understand and effectively use the models that are being developed.

Mr. DOYLE. Yes, you know I have seen estimates of we will need to invest anywhere from \$500 billion to over a trillion dollars in our grid by 2040 or we are going to suffer decreased reliability.

I guess the question is to anyone on the panel. What is the best way for our committee to call for significant investment in the backbone of our country's energy infrastructure?

Mr. OLSON. Quickly, please.

Mr. DOYLE. More funding.

Mr. BELL. We believe that, as I said, just like grid was the foundation of the economy in the last century and the internet is the foundation of our digital economy, we have got to create a belief that the intersection of both creates this new electricity network, which is the foundation of the next set of economies. We just have to have that belief and invest with that belief.

Mr. DOYLE. Thank you, Mr. Chairman. I would just note that while we are in sequester, that is the discretionary part of the budget what makes us tough to increase funding for basic research in this country and we all have got to find a way to get out of that sequester.

Thank you.

Mr. OLSON. The gentleman's time has expired.

The Chair calls on the gentleman from Ohio, Mr. Latta, for 5 minutes.

Mr. LATTI. Thank you very much, Mr. Chairman and thanks very much for the panel. It has been a very, very good discussion this morning.

Mr. Bell, if I could ask the first question to you. In your testimony you talked about advances in technology and innovation in the electricity sector that point towards an increasing smarter grid. This could follow bidirectional flows of electricity, clear price signals, and a greater balance of supply and demand.

And a smarter grid system enables operators to identify reliability issues, address consumer concerns, and promote efficiency delivery of electricity to consumers.

If you could talk just a little about the smarter grid but let me take you back. I can't believe it, I just checked it has almost been 14 years ago that we had the major blackout and it hit Ohio, went into Pennsylvania, New York, Ontario. I couldn't believe it, at that time, I was actually in all those places about that same time. But how could a smarter grid, if you could take us back almost 14 years, how can we hopefully either stop that from occurring or how we could get things up faster from that massive electrical blackout that we had at that time?

Mr. BELL. So, first is understanding the reason why. I believe you are also the co-chair of the IoT Working Group. And when you think about things that are already connected and the ideas that we have had about Smart Grid and interconnected systems and SCADA systems, and being able to monitor devices are not new.

But when you look at an interconnected set of systems, you get a system of systems, as Dr. Howard would call it, to be able to optimize the whole system. And what we see is a new network of data across all of the existing infrastructure that we have, so we can actually get better at monitoring, better at predictive maintenance, better at preventative maintenance, and prevent all these outages because we do have the combination of not just the software-driven analytics, but also physics-based analytics.

So being able to create virtual, what we call digital twins, today we can actually create that. In the past, this was a challenge. Now I can have 100,000,000 hours of operating data being questioned in a matter of seconds at the speed of thought because of cloud technologies. So, adopting those technologies and making sure that we use all the data will give us insights into how to optimize the entire network.

Mr. LATTI. Thank you.

Mr. Hauser, can you share some of the benefits of the grid modernization technologies that have enabled or provided in my home State of Ohio?

Mr. HAUSER. Yes. So, AEP, in particular, has been a pioneer in this space. They have done a lot of work in storage. They have also done some work around involving customers and reducing outages across the system. As I am sure you know, ice storms come through Ohio periodically and take down lines pretty routinely. And having the utility able to identify the outages and redirect flows in order to minimize the impact on consumers has been really important. AEP has been an excellent example of doing that.

Mr. LATTA. Thank you.

I would like to, in my last minute and half, maybe go to ask all of the full panel real quickly give a quick answer. From your vantage point, what are the most significant challenges that the U.S. electricity system or the industry is facing today? Mr. Howard.

Dr. HOWARD. So the most significant is the incorporation of the whole digital group. It is the technology modernization that is required to take us to the fully functional digital grid. And it is that infrastructure modernization that is going to get us there.

Mr. LATTA. OK, Mr. Bell, in about 10 seconds.

Mr. BELL. I said digital, and I think it is also utilizing the existing assets more effectively. I think we don't have the visibility and insight across all the networks. We can do that today with modern technologies like cloud and IoT.

Mr. LATTA. Mr. Stephenson?

Mr. STEPHENSON. I think building the transmission line necessary to tie the whole system back together again from all the green energy. To get everything tied, we have got to have the transmission to get it there.

Mr. LATTA. Thank you. Mr. Hauser?

Mr. HAUSER. I think business models are going to be a huge challenge for this industry, especially the private utilities. Load growth is pretty flat in most places. In some places, it is actually going down and the business models have typically been built around growing load growth, where you have to build more power plant and earn a rate of return on the investment of large capital. So, I think there is going to have to be a real significant look at how do we make these business models work in a future grid scenario.

Mr. LATTA. Well, thank you very much. And Mr. Chairman, my time has expired and I yield back.

Mr. OLSON. The gentleman's time has expired.

The Chair calls upon the lady from Florida, Mr. Castor—Ms. Castor, I'm sorry—for 5 minutes.

Ms. CASTOR. I know I am the only female on the dais but—

Mr. OLSON. The biggest Houston Cougar fan, I believe, from Florida, as well.

Ms. CASTOR. Well, thank you, Mr. Chairman.

I want to say that I share the enthusiasm of this expert panel on the great potential that modernization of America's electric grid holds. We really are at a turning point on the transformation of how we supply energy to consumers and businesses, whether it is how we are generating it, energy efficiency, Smart Grids, and technology, we really need to unlock the potential here and I see us kind of being held back.

Mr. Bell, you rightly identified that traditional energy infrastructure is becoming smarter and the mix of fuel is rapidly evolving

with addition of more diverse and distributed generation sources. At the same time, we have a wave of connectivity and innovation.

And Mr. Stephenson, you are absolutely right. We can unlock higher wage jobs, higher skilled jobs, if we all work together to bring American ingenuity to bear here.

I have been to the IBEW training center in Tampa with Randall King and that great team there and they are ready to go. But it is oftentimes being blocked by our inability at the State level to do the kind of innovative thing that we need to do.

Consumers are more sophisticated right now. They are ready. They are clamoring for more tools to control their power usage.

Businesses are really in the lead beyond Government because they see what it means to their bottom line and productivity and profits. But I look across the country and progress is very uneven.

The electric utility regulation largely happens at the State level and you have some States that are being very innovative and then others—Mr. Hauser, you hit it on the answer to the last question. There are State regulatory schemes and business models that are stuck in 30 years ago and all of the incentives are on building big new plants, while all of the new tools that we have are about efficiency, demand management. Yes, we have got to keep that base-load. Yes, we have got to modernize the infrastructure across the country but what can we do here in Washington to really incentivize and bring those States that are laggards and have these old business models, what can we do here in Federal policy to help create these highly skilled jobs and move towards a more innovative electric system?

Mr. HAUSER. So, it is a great question. As you probably know, the State regulators are meeting in the other part of town, as we speak. These issues are things that they are discussing and debating. I am very impressed with how the discussion at the State level has evolved over the last few years.

I believe a lot of that has come from Federal leadership, and while you can't necessarily dictate what they do, you can certainly set ambitious expectations and goals for them to look for ways to live up to and I think that is one of the things that the feds at ear level really look at.

Ms. CASTOR. So how do we set expectations in Federal policy? We can say this is good, this is bad but unless there is something really set forth in Federal policy, how do we encourage those laggard States to do better?

Mr. HAUSER. Yes, I don't have a great answer for that. I think at GridWise Alliance we do something we call the grid modernization index, which we look at all 50 States and DC and rank them on a score of zero to a hundred on how well they are doing.

Ms. CASTOR. Dr. Howard, there must be something better than just rankings and encouraging. Do these business models have to change to help incentivize energy efficiency and use of technology? What are the discussions that are being had?

Dr. HOWARD. Well, we are focused on helping to advance the science and technology so policymakers can make these more informed decisions. But we are seeing, as we have talked about here today, a variety of technology options that regulators and policy-

makers can use to help to make more informed decisions, but that is our focus.

Ms. CASTOR. I think we can do a lot better and I encourage you all to be creative and be innovative and give us the best expert advice because we have, like I said, there is huge potential here for an economic revolution as part of the modernization of our electric grid and we want to do better.

Thank you. I yield back the balance of my time.

Mr. OLSON. The gentlelady, Ms. Castor, yields back.

The Chair calls upon the gentleman from West Virginia, Mr. McKinley.

Mr. MCKINLEY. Thank you, Mr. Chairman.

Mr. Stephenson, about maybe an hour ago you made a remark that resonated with me and I want follow up on what John Shimkus was talking about about reliability. Do you think that the markets should place more value on reliability attributes of our power plants, especially as it relates to baseload capacities?

Mr. STEPHENSON. Absolutely, we have got to have reliable baseload, and that could be a combination of nuclear, I think coal should still be in a mix and can be, and of course natural gas. We have got to have that baseload reliability.

Mr. MCKINLEY. Thank you. I guess the work is still ahead of us how we are going to convert. We have just gone through 8 years, we have seen a loss of baseload capacity across this country and we are going to have to rebuild now after 8 years of a war on coal.

So, Mr. Howard, your comment was interesting as well in your written statements about the need for carbon capture and clean coal technology and as it relates to demonstration plants. What is the incentive? What do we need to do to build more large-scale demonstration plants?

Dr. HOWARD. Well, there is still a lot of need for some basic research on understanding the more optimal approach to capturing carbon. We made some steps. We have got a project now going on in Texas. It is going to demonstrate one technology, but it is going to take a full suite of different technologies to really enable a carbon capture storage to be economically efficient. And so supporting the demonstrations and advanced science and technology needed to come up with the right chemistry that will efficiently capture carbon.

Mr. MCKINLEY. And also release some of the burdens that our regulatory agencies have put on for enhanced oil recovery from using carbon capture as well, I assume.

Dr. HOWARD. Right.

Mr. MCKINLEY. No, Mr. Bell, the last question more to you. It is more for General Electric's position and that is, this wireless power transfer. It is probably aspirational. We see around the world Russia, and Germany, and Japan are moving into some pretty significant investments in that. What do you see coming with that? We know we already are using wireless with our cell phones, our internet access with wireless. We are seeing induction motors in our industrial plants. We are seeing others are wireless.

Where do you see GE moving in that arena in wireless power transfer?

Mr. BELL. I will answer the first part of your question, which is around the different source of fuel. Then, I will get to the other part.

See, we actually introduced the idea of how can existing power plants, whether it is gas or coal, be digital, with the idea of a digital power plant. We can actually reduce emissions in existing power plants using our software. So whether it is coal, or gas, or nuclear, whatever the source of fuel, we can rejuvenate existing sources and keep them functioning more efficiently and effectively.

With regards to wireless, there is a lot of fundamental research that is happening, not a whole lot of commercial-ready solutions at industrial scale. What we would do is we would get back to you with some of our research colleagues on what we see as the future of how that should be brought to market in a commercial way.

Mr. MCKINLEY. I don't think we are talking—maybe eventually it is long-term transmission that would reduce some of the outages we have but that is not what I am talking about. I am talking more short-term within our—to be able to, through induction coils, recharge our electric cars, same thing that we are already doing with our cell phones. Some of the fundamental ways of moving technology so that America continues to be the global leader on innovation.

Mr. BELL. Yes.

Mr. MCKINLEY. So, I have run out of time, unfortunately, but if you could get back to me on that, I would like to know more from your perspective.

Mr. BELL. I would be happy to do that. We will follow-up on that.

Mr. MCKINLEY. Thank you. I yield back.

Mr. OLSON. The gentleman yields back.

The Chair thanks Dr. Howard for talking about the Petra Nova Project and the Parish Power Plant there in my district in Texas. That is the only viable carbon capture enhanced oil recovery operation in the entire world. Texas brag.

The Chair now calls upon the gentleman from Vermont, Mr. Welch, for 5 minutes.

Mr. WELCH. Thank you very much. Great hearing. Great witnesses. I appreciate you being here.

I will start with you, Mr. Bell. I liked your testimony. I have met with some folks from GE and you are doing a lot of good work on decentralizing, decarbonizing, and digitizing. But as I understand it, you are so confident in your business model that when you make some contractual arrangements with some of your customers, that you agree to be paid from the savings that you achieve on their behalf. Is that correct?

Mr. BELL. Yes, in addition to being a hardware provider, as well as services provider around the hardware, with our digital business, we started offering our software in a subscription model, just like every other software provider in the world.

Mr. WELCH. So, you have very large customers that provide electricity into the grid. Are there benefits for individual consumers with the approach that you are taking with your technology and your coding?

Mr. BELL. Yes, absolutely. So what we look at, we want to help our customer's customers. So today, most of our customers, who are

power and utilities, they see their customer as a meter. They have no insight into beyond the meter. So we are partnering with solutions.

For example, we have a separate business that we call Current, that is driving energy efficiency for commercial industrial customers of electricity, and we want to partner with power utilities to make sure that those systems are integrated back into them.

Mr. WELCH. OK, thank you very much and I appreciate the work you are doing.

Mr. STEPHENSON, I wanted to talk to you a little bit. You know we have a lot of jobs in this country but we don't have a lot of good paying jobs. And I think the issue is paychecks is actually more than jobs. A lot of your folks have good jobs and they help keep the lights on and I just want to acknowledge that and thank you.

Do you see there to be a big opportunity if we plunge into modernizing the grid to provide more folks with the kind of good jobs that your union provides?

Mr. STEPHENSON. Yes, absolutely, because we are going to need both our employers, our utility employers, and our construction employers are going to need to wield their workforce as this moves on. So yes, absolutely.

Mr. WELCH. And I would be interested, I don't want you to take the time now, but your specific recommendations about job training. I know your union does a lot but that has got to be organically integrated into our educational system so that people who want to work can work and get jobs where they get a living wage. So I would really welcome, and I think the whole committee would welcome your concrete suggestions on that.

One point I wanted to bring up with you, you talk about the permitting process. And you have got some legitimate points there. How does it work? It has got to be fair but ideally, it is timely so that there is a fair resolution in a timely way and that includes access to people who have got altering different points of view.

But the last Congress we passed, and this was a bipartisan effort, the FAST Act, which, in part, created a Federal Permitting Improvement Steering Council to expedite permitting and environmental review for large infrastructure projects, namely, those over \$200 million. I don't know if you are familiar with that but would you regard as at least a down payment on trying to get this thing in better order?

Mr. STEPHENSON. I am not specifically aware of that. I do know this.

Mr. WELCH. That is the idea that you are talking about.

Mr. STEPHENSON. Right.

Mr. WELCH. To try to get an answer, get from here to there, sooner rather than later—

Mr. STEPHENSON. Absolutely.

Mr. WELCH [continuing]. But not cut corners on considering the valid environmental labor and safety concerns.

Mr. STEPHENSON. Absolutely.

Mr. WELCH. Is that right?

I want to ask Mr. Hauser, with any new grid technology has to be fast enough to incorporate locally generated electricity, which is the heart of oftentimes what renewables are. In Vermont, we have

a focus on renewables and we have had a focus on efficiency. And actually by doing that, we have been able to save about \$400 million in grid repair and grid expansion. So there is a lot of money to be made in using less electricity or using it more efficiently.

How do we get the grid to work that way and how do we align it with the incentives that have to be changed for utilities that have generally been based on a reimbursement model, where the more they invest, the more they make?

Mr. HAUSER. That is a good question, and those are very impressive numbers, of course, in Vermont.

I think I am impressed. VELCO is one of my members. I have been impressed with the work that they are doing, for instance, on predicting weather and being much more accurate in how to predict the weather impacts and effects on the grid, and that includes wind, solar, as well as storm recovery and so on. And so I think that is an example of some of the work that is going on to help make this much more effective.

Mr. WELCH. OK, thank you. I see my time is up.

Mr. Chairman, I hope we can get some very concrete suggestions from these witnesses about one, two, three, what we can do to facilitate the advocacy they are presenting here today.

Mr. OLSON. We will do our best to make that happen. The gentleman's time has expired.

The Chair calls upon the gentleman from Virginia, Mr. Griffith, for 5 minutes.

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

Dr. Howard, let me jump right in. We were talking about reliability of baseload, Congressman Shimkus, Congressman McKinley. And in your testimony, you talked about carbon capture, sequestration projects, et cetera. And one of the things you said is we have to have more research as a part of that discussion.

Some of my friends, even in the Obama administration Department of Energy, were advocating for parity in research dollars between clean-burning fossil fuel research and the renewables. Would you agree with that strategy?

Dr. HOWARD. I am not sure about parity. I would emphasize the importance of focusing on a broader energy mix, which certainly coal and nuclear, and other sources, including certainly renewables, is part of the mix. And we need to advance all of those technologies, including ensuring that the baseload generation, of which nuclear is a big part, continues to operate safely and reliably, and coal is part of it, as well.

Mr. GRIFFITH. And I appreciate that very much, coming from a coal-producing region that has lost thousands of jobs in the last several years.

As a part of that, I have been very interested in chemical looping and so that is one of the reasons I would like to push research because it can be used both with coal and natural gas. And what it does for carbon capture and sequestration is if it works, if the demonstrations work out, we don't have as much expense on capture because what you get is CO₂. So, I am very hopeful for that.

I noticed you also touched on that we probably need to do some more research with carbon capture with bioenergy. And I am assuming that is algae. Are there other substances we can use? And

I am one of those people that doesn't make fun of algae. We are not ready yet but it is a way that you can use the CO₂ and use some plant materials. But is there something besides the algae?

Dr. HOWARD. And other biomasses.

Mr. WELCH. And other biomasses, where they use the CO₂ and convert it into additional energy.

Dr. HOWARD. Right, and for some parts of the world, that is critically important to have those other options available. So, absolutely.

Mr. WELCH. I do appreciate that.

Mr. Bell, I am going to switch to you, and I am have to be a little parochial. I have a GE facility. Now it is not apparently in the same line that you are in but you did mention Current a minute ago. And my plant in Salem, Virginia, which we are very proud of, is GE Energy Connections, which is a part of the Connections and Current section. So I do want to say that.

And you also indicated that with your division, you all could create jobs anywhere. I have high unemployment on two ends of my district. It is about a 6-hour-long district, but on the south side and around Martinsville we have some high unemployment and then in the coal fields. So if you are looking for jobs, we have got all kinds of wonderful buildings and sites that we would love to show you.

But that being said, I do want to talk about something a little different before I get into just a general question and that is the United States has always used high voltage alternating current for the majority of its transmission lines, as opposed to high voltage direct current. The world is looking at direct current. The economists ran an article describing the growing use of long distance high voltage direct current power lines in China. It also references a project in India on which GE is working.

OK, should we be looking at this? I think there is one project in the United States now. Should we be looking more at direct current?

Mr. BELL. I will add to the first part of your question, which is around coal and fossil fuel.

Mr. GRIFFITH. Sure.

Mr. BELL. With regards to research and investment, I do agree with Dr. Howard that we believe all sorts of fuel need to be optimized. In fact, last year we acquired a company of 25 data scientists who work in the coal industry, because clean energy means you have got to make everything clean. And we like the vision of decentralized energy, decarbonization and digitalization all working together.

So, we will definitely look into that as we create more jobs, jobs in your region.

With regards to DC, obviously we are working technologies like that. I am not the expert on DC versus AC, but if there are specific questions, we would love to follow up with you and share with you what we are doing and when we think those technologies will be used for commercial purposes.

Mr. GRIFFITH. I do appreciate that.

Mr. BELL. We do see it adopted in microgrids quite a bit right now.

Mr. GRIFFITH. And I have got about 35 seconds so I am going to give you an opportunity to talk about something that maybe we haven't talked about that GE is working on that you think, particularly from your division where you are an expert, where you think that we can be helpful.

Mr. BELL. I think we have discussed most of the technologies today. Thank you.

Mr. GRIFFITH. Well I do think that the digital aspects in making existing coal-fired power plants cleaner is a great way to go. I hope it is fairly affordable but we need people to not be afraid to use coal because everybody I have talked with, not only in this country but around the world, believes that coal will be a significant part of the mix well into the future. Would you agree with that?

Mr. BELL. Yes, we see that across the globe and increasingly more plants built around in Asia, for example. So if it is going to be part of the mainstay, we want to make sure it is optimized and it is clean. So, we want to provide the technology so our customers can make the best determination of what is the right fuel mix.

Mr. GRIFFITH. And I agree with that. I yield back.

Mr. WALDEN. Would the gentleman yield just a second?

Mr. GRIFFITH. I have negative 23 seconds, but you are welcome to them.

Mr. WALDEN. I just wanted to—on the DC issue of transmission, in about, I don't know, probably the late 1960s, early 1970s, the Bonneville Power put in an intertie to California from The Dalles, Oregon down there. It is all DC. So we could hook up with Bonneville Power and all. It is, I think, very efficient.

Mr. GRIFFITH. Thank you. I yield back, Mr. Chairman.

Mr. OLSON. The gentleman yields back.

And the Chair calls upon the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair, and welcome to our panelists. Great discussion. Important discussion.

I work closely with the industry, with the union, with the IBEW and am proud of the fact that we have been able to move forward with progress. A lot longer road to go but the commitment is there and I appreciate it.

Mr. Bell, earlier today you made mention of the intersection of the software industry and the electric industry and you also made mention of efficiency being required in the generation aspects, the delivery aspects, and consumption aspects.

So in the delivery area alone, is there some order of data analysis, as we do these analyses of the data compiled, is there a biggest area that you believe of promise as to how we can improve and make more efficient the delivery portion, the transmission and distribution ends of things?

Mr. BELL. Yes, so for us we have a simple vision that is across the entire electricity network. We want to start building. Just like Google organizes the world's information, we want to organize all of the analytics, all of the data science, all of the algorithms across the entire network.

We definitely started a lot in the generation space. We have a library of analytics and data science algorithms across all of distribution and transmission as well. When we look at end use, ev-

everything from congestion to world war, all of those ideas are still some of the biggest areas for our continued research.

I think right now the biggest challenge is most of these systems or opaque. Our customers do not have the right level of visibility and utilization of all of the data. So, as we look into more utilization of data, I think we will get better insights into what those outcomes could be that we can go generate.

Mr. TONKO. The best synergy, the best structuring of utilizing that and providing that service to professionals, what is the format? How do we best structure that?

Mr. BELL. So our customers are adopting our IoT platform that we call Predix and they are deploying solutions they call asset performance management. So it doesn't matter if it is a substation or a grid or a transmission or a distribution. All of those systems can be monitored so we can get better insights into.

So the best way is analytics, insights, and applications around being able to run those systems.

Mr. TONKO. OK. And you mentioned the GE R&D lab.

Mr. BELL. Yes.

Mr. TONKO. Very proud of the institution and the workers. The professionals are magnificent.

What are the effective ways to integrate renewables into the grid. Is digitization something that can best help that, support that integration?

Mr. BELL. Yes, today it is software at all levels. For renewables, for example, just about few years ago we were capturing data that was about every few minutes at a wind farm. Now we can capture data at every sub-second and all that data stays locally within that plant, and we can make local decisions around how to optimize improvement in wind performance. So we are able to, just by software, for example in the last few years, we can improve wind turbine and wind farm performance by up to five or ten percent. That is five or ten percent more power from the same wind. But when you also combine that with forecasting and predictability, we now have better algorithms to integrate them into the grid. And when you combine that with the ability to ramp up or ramp down other sources of fuel, it gives operators confidence to be able to incorporate all sources of fuel into the mix and also confidently bid into the market.

So we think it is a combination across all of that and also the grid, as well, to be able to take on those new sources of fuel.

Mr. TONKO. Thank you. And Dr. Howard and Mr. Hauser, have you been sensing this also, that the smarter grid is making the integration of renewables a whole lot easier and more effective?

Dr. HOWARD. Absolutely, and I would add one other technology that is important, and that is the inverter. That is the device that fits between the renewable and the grid. And we have made tremendous progress in improving the technologies around the smarter inverter. So that is a big enabler.

Mr. HAUSER. I was in the control center at Texcel just a few weeks ago and watched them manage a very large fraction of wind power on their system. And one comment that they made is that they actually can send signals to the wind turbine now, which they

didn't in the past. So they can actually control the wind turbines up and down to meet the load.

Mr. TONKO. Now your groups have also been involved with DOE's research efforts and the Grid Modernization Initiative, I believe. And that has proved beneficial?

Dr. HOWARD. Absolutely. And the most important thing is, what it has done is allowed us to demonstrate the technology and show that it works or not. And if it doesn't, we can improve on it.

Mr. HAUSER. Tremendous capabilities across the lab system is, I am sure you are aware, including Brookhaven in New York and the GMI project at DOE has helped to integrate those, so that they talk a lot better amongst each other and they work together on joint projects very effectively.

Mr. TONKO. Thank you. Well, I see my time up, Mr. Chair, and I will yield back.

Mr. OLSON. The gentleman's time has expired.

The Chair calls upon the gentleman from Indiana, Mr. Bucshon, for 5 minutes.

Mr. BUCSHON. Thank you, Mr. Chairman. Thank you all for being here. I will be brief.

I support an all of the above energy strategy. And I was in Europe recently talking with some energy companies and the question that I am concerned about is what do you do about the reliability of the grid when you have a large percentage of renewables that are counted on for baseload. And what they are finding in Europe is they are going backwards and building coal-fired power plants and other things because they have to have those for reliability reasons. So it is not just about generating energy. It is about reliability of the grid.

Does anyone have any comments about where we see America going? Because every coal mine in the State of Indiana is in my district. My dad was a United Mine Worker for 34 years. Everybody I knew was in the coal industry. It was a great job. My main concern is reliability of the grid and if we go too far and we don't have that backup—look, I am all for renewables but we have to be realistic here. I would just be interested in your thoughts.

Dr. HOWARD. So what you are pointing out is the importance of not just having enough energy but having adequate capacity to fill in the voids. And that is one of the issues they ran into in Germany. And so we are getting to the point where we are energy-rich but capacity-poor, and that reinforces the need for baseload generation.

Mr. BUCSHON. I just want to reinforce what you just said. I mean we will just go down the line.

Mr. BELL. In Germany there was clearly a major problem. They had to curtail more than 1,500 gigawatts. And we see challenges for power plants that were built in the baseload era to be actually competitive in the ancillary services market. So, we are actually using software today.

In fact, there was a power plant in northern Italy that was shut down, and we were able to reopen that power plant with software, purely through software, because we are now able to make it competitive in the ancillary service market.

So every single power plant that is designed in a baseload era, we can actually make it flexible with software and technology so we can actually allow for the more integration of renewables and compensate for that with the void.

Mr. BUCSHON. So quickly, how do you then—say you have a power plant and you are running at 40 percent capacity. How do you have enough people there when something happens with renewables and you have to go to 80 percent capacity. I mean that is a challenge, right?

I mean, Mr. Stephenson, you might comment on the workforce issues as it relates to this type of thing.

Mr. STEPHENSON. Yes, it is, and like you said, to have that workforce there waiting. One thing about natural gas is they can fire up and shut down a gas unit a little quicker than, say, nuclear, for example. You pretty much have your workforce there around the clock, but it is very important that they are there.

So there are different forms of baseload. Of course, coal, again, I believe should be in the mix, to have the opportunity to bring it up when needed. And maybe having some smaller units that are, as time goes on, smaller units that could be fired up and quicker in a faster manner.

Mr. HAUSER. The industry has gotten so much better just in the last few years about being able to predict the wind and solar. And so they can anticipate it extremely well these days. So that is certainly helpful.

I want to do a short call out to Indianapolis Power and Light, who just won an award a couple of weeks ago from the industry for some of the work they are doing around storage. And storage is certainly going to be a key aspect of this as well.

Mr. BUCSHON. I mean, there is a real-world example in the United States. A number of years ago, we had that polar vortex. And I am talking to the energy folks, and I am not an energy expert but, in the northeast, for example, we were like really this close to brownouts because they had to buy power from, I would say, Midwestern coal-fired power plants, and those plants had to ramp up and really run.

And the other thing is, they didn't have the infrastructure in place for natural gas and other things. They were at capacity because of issues we have had with building out infrastructure in certain areas of our country. So that kind of ties this whole thing.

And I think it is important for people watching this hearing to know that the reliability issue and the stability issue, not just how the power is generated, is really critically important to the future of our country and our economics.

And does anybody have any final comments? I have 30 seconds.

Dr. HOWARD. I would just say that is the importance of storing the energy on-site. Nuclear, you can store it 18 to 24 months. Coal, you can put it in a coal pile. In times of need, you don't have to ship it in. You may not be able to.

Mr. BUCSHON. Thank you, Mr. Chairman. I yield back.

Mr. UPTON [presiding]. Mr. Sarbanes is recognized for 5 minutes.

Mr. SARBANES. Thank you, Mr. Chairman. I thank the panel.

We have an incoming Secretary of Energy. The Department of Energy, at one point, had talked about eliminating the Department

of Energy. He has changed his mind on that, I imagine partly because if that happened he wouldn't have a job, but also, I think, because he recognizes that we do have to make smart investments through a kind of partnering with private industry, with rate payers, and so forth.

So I would like to hear from each of you briefly your perspective, and you have obviously touched on this already, but the important role that the Department of Energy can play in leveraging the kinds of partnerships that can strengthen the grid across the country. If you want to site some examples of that kind of investment you have seen already, as you talk about what we can have going forward, that will be helpful as well.

I authored, in the last Congress on a bipartisan basis, a bill that would encourage and provide resources to the Department of Energy to give financial assistance to these kinds of public-private partnerships to make sure we are upgrading the grid and we are going to reintroduce that again and look forward to support for that kind of legislation.

So, I will just ask you to go down the line quickly.

Dr. HOWARD. OK, thanks. We partner a tremendous amount with the Department of Energy and their national labs. It is an incredible resource that we have in the U.S., unlike any other country. It is important that we continue to encourage the development of basic research that will help us address many of the issues that we are facing here today.

So, strong supporter, they are a great partner and we enjoy working with them.

Mr. SARBANES. Thank you. Any other thoughts?

Mr. BELL. So, in addition to research at the DOE level, engaging private-sector communities to go to drive innovation on top of that at the intersection of digital and hardware, and we would also say promotion of more industry-led performance standards. We don't need standard mandates. What we need is the industry will figure out where we need promotion of those standards and commitment for some policy to promote the support of these future technologies.

Mr. SARBANES. Great.

Mr. STEPHENSON. The IBEW, we work very closely with the Department of Energy and, particularly, with Secretary Moniz, and what he has done with our director, Jim Hunter, who is the director of our utility department. We have worked very closely over the last few years talking about the energy, where we are going in the country and some of the needs. And so we think that is crucial to continue to have the Department of Energy involved.

Mr. HAUSER. We certainly support the demonstration projects that you have talked about in your legislation. I have heard the modernization of the grid referred to as trying to modernize a 747 while it is in flight. So, it is not like we can shut down the grid, rebuild it, and then start it back up when it is all modernized. It has to happen in real time. So, demos become extremely important because we need to know for sure that these technologies will work in the way that we expect them to, when they are installed in the grid. So that becomes important.

Plus, a lot of the large-scale demos can be extremely expensive and Mike can certainly attest to that, that the industry need sup-

port, Federal support for sure to do a lot of these demos that can be pretty expensive.

Mr. SARBANES. Thank you.

Mr. Stephenson, I wanted to ask you a question. I had the privilege of working with a terrific partnership in Baltimore that is looking at installation of solar panels and basically trying to continue to aggressively in not just building that workforce but building that part of the energy portfolio. And I think you are probably very familiar with some of the statistics, the number of solar workers in the country increase by 25 percent over 260,000 and have been increasing by at last 20 percent every year for the past 4 years. One in 50 new U.S. jobs were in the solar industry, which is incredible. And the median wage for those installers is \$26 per hour.

So I wondered if you could just give us a few seconds on what kind of opportunities the solar energy part of the portfolio is offering to your members.

Mr. STEPHENSON. Well, you know, solar is continuing to grow in leaps and bounds, not only large solar fields, if you will, but also individuals, people putting it on their homes and otherwise and starting to use solar.

For the installation, we get a lot of work installing those processes. But again, afterwards, there are not a whole lot of jobs that follow the installation, once they are up and running.

Mr. SARBANES. Thank you. I yield back.

Mr. UPTON. Thank you. The gentleman's time has expired.

The Chair will recognize Mr. Long from Missouri.

Mr. LONG. Thank you, Mr. Chairman.

Mr. Hauser, can you take a moment to describe what a smart Grid is and how it differs from the electricity systems of the past?

Mr. HAUSER. Of course. I mean, this has evolved over many years. It is still evolving. I actually like to talk about it as a smarter grid and not just a Smart Grid. Smart Grid sounds like a thing. What it is, is an evolution of using technologies, communication technologies, sensors that have become very cheap and easy to install so that we can understand better how the grid is operating.

As you probably know, only just a few years ago, utilities didn't see anything below the substation. And now they do. And that is becoming increasingly important for them to see the operations, voltage levels, frequency levels, impacts on customers, outages, and so on.

Mr. LONG. Thinking about impact on customers, how does a Smart Grid or smarter grid, as you call it, expand the consumer choice?

Mr. HAUSER. So it provides consumers with a much better insight into how they use electricity and how their use of electricity impacts the grid. So, for instance, if it is 4:00 in the afternoon and the grid is being stressed and called on to provide electricity at a very high level and consumers are aware of that, they can reduce their usage in the afternoon to help stabilize the operation of the grid.

It certainly has become impactful in certain parts of the country when there are storms or when there are heat waves that really can stress the grid.

Mr. LONG. OK, thank you.

Mr. Stephenson, what can Congress do to improve workforce training and education for the electricity sector?

Mr. STEPHENSON. Well mostly, the training that we do specifically with our contractors is really self-funded. We fund ourselves. Through our collective bargaining agreement, we have funding that goes into our apprenticeship programs. And so all the training we do is pretty much self-funded. However, we do rely, as brought up earlier, on community colleges and others to help prepare new employees, new members to come into our programs. But we pretty much fund our own system within the IBEW structure.

Mr. LONG. OK, thank you.

Mr. Howard, in your testimony you discussed the Integrated Energy Network where energy systems and services are more connected with the resources that they utilize.

You state that separate regulation of these systems can make it harder to realize any gains from integration. Could you discuss how the current technology process hinders this integration?

Dr. HOWARD. The current technology that we are talking about here enables more optimal integration. So it doesn't hinder. It actually enables it.

The communication centers, computation, analytics, and so on that we have talked about here really are important enablers for allowing this energy system to be more—

Mr. LONG. We are talking about the regulatory process. How does the regulatory process?

Dr. HOWARD. OK, how does the regulatory? Well, I think it is an awareness that what happens in one energy sector, whether it is water, or petroleum, or others, does impact everything. And that is really at the heart of our discussion and our vision of the integrated energy network, that it all has to work together and you can't regulate it in one sector by the other. It has to be—

Mr. LONG. That is my next question. What approach should regulators take to improve integration?

Dr. HOWARD. That is exactly what I talked about this week at NARUC, which is an awareness that all of this fits together. We have to look at it much more holistically and step back and say if we are going to have a more resilient, affordable, safe, environmentally responsible energy future, then we have to look at it much more holistically and integrate it together.

Mr. LONG. Talking about renewable energy integration, what are some of the industry challenges that you face?

Dr. HOWARD. What are some of the challenges we face with integrating renewables? Well, the one is that it is variable. And the variable generation of renewables with a baseload and the flexibility that we need not only across the entire grid, but also the flexibility we need on both ends of the grid, both in generation and renewables. We are approaching an area here where we haven't ever had this. It is a two-way power flow, much more unpredictable, not as much forecastable, and not as much dispatchable. And when you put all of that together, that is why we absolutely have to have a more integrated energy network.

Mr. LONG. Well, how can we strengthen and expand the transmission system to support the integration?

Dr. HOWARD. Well, first is the recognition that we are going to need more transmission. We are going to need to upgrade the transmission system. We need to invest the money to modernize it, the infrastructure, the training, everything that we have been talking about here. You can't do this—in fact I have said several times that if you want to move forward with a digitized, a highly dynamic interactive grid, you are going to have to have more grid. And that starts with the transmission, upgrading, modernizing, the same with distribution.

Mr. LONG. OK, Mr. Chairman, I yield back. Thank you.

Mr. UPTON. The gentleman's time expired.

The Chair will recognize the gentleman from North Dakota, Mr. Cramer, for 5 minutes.

Mr. CRAMER. Thank you, Mr. Chairman. Thanks to all of our panelists. A special thank you to Mr. Stephenson.

My daddy was a proud member of the IBEW for I guess 60 years, up until his death. And probably one of my proudest artifacts are his hooks, and his belt, and his hard hat, and his pin. So, welcome.

You all have covered so many things that every time one of you speaks I think of a couple other things I want to ask you. So I am going to focus on two things.

I am going to stay with the DOE because there has been some really good discussion lately. And I thought Mr. Sarbanes touched on some issues related to the R&D, and some of you have spoken about how closely you work with DOE. And I have studied DOE fairly significantly in the last several months, and one of the things in the R&D that I have noticed is there are these applied research sort of silos, I call them, and that, while there are wonderful innovators at DOE that you all work with, no doubt, it seems to me we could even loosen that up a little more, maybe not have the research be so specific to—I would rather see an outcome that would be achieved with more innovation at that level, working with our private-sector friends.

Is that a relevant—it is not a criticism, necessarily, but we are going to be talking about DOE reorg eventually in this committee, and I would like to see some real innovation take place in the reorg itself that could unleash some of these incredible resources there.

So, Mr. Howard, if you want to begin, that would be great.

Dr. HOWARD. So there is a lot of innovation that is occurring at the national labs.

Mr. CRAMER. Right.

Dr. HOWARD. I have been to many of the national labs. I go there. I look at what they are doing, and it is incredible. And we need to reinforce the importance of that and then get it out and get it applied.

EPRI is focused on applied research. We want to take that basic research and figure out the best optimal solution to solving these problems. So we are kind of on the back end. But if you don't have the front end, you are not going to have a back end. That is why I am emphasizing points of basic research.

Mr. CRAMER. Anyone else? Mr. Bell.

Mr. BELL. Yes, we love the idea of outcomes. In fact, we think, yes, we should do fundamental science research and applied research, but to solve system-level problems, you need to look at the

whole outcome. In fact, we have a business model that we call outcome as a service, just like our customers can buy software. And what happens is when you think about an outcome, whether it is fuel efficiency or integration of renewables or now we want to incorporate more mobility, intelligent transportation or electrified transportation, you intend to solve the whole problem versus pieces of the problem. So I do think there are big initiatives that when we think about the future of digital electricity infrastructure, we have big use cases to go solve. So we should look at some of those use cases as big outcomes that we want to go solve and fund research at that level, as well. We like that.

Mr. HAUSER. I am certainly concerned that our current administration will look at DOE and look at it as an opportunity to reduce the funding for the good R&D that they do. As I am sure that you know, the funding at DOE has gone up and down over the years. That is not a good thing. It is difficult to manage against budgets that increase and decrease a lot. I think stability is very important for an R&D mission, and it is also the focus sometimes tends to go more towards basic. And I think, as you have said, applied research, working with industry, is extremely important, especially in this sector and especially now, these days.

Mr. CRAMER. Well, I appreciate that. Mr. Hauser, what I would say is that I think without decreasing or increasing that R&D budget, by knocking out some walls, making the research more outcome-based, rather than fuel-specific or politically based, we can get a lot more out of the current budget.

With that, I just want to end with a question about—we have heard a lot of talk about double circuiting, is what we used to call it, when I sited many transmission lines as a regulator and we would build these massive towers for the future. And I think that is all great, but sometimes I get a little concerned that we are willing to give up sort of geographic diversity, which is critical to that redundancy and reliability.

Do we need to be careful to not put all of our infrastructure in one corridor, that one storm can take out multiple resources?

Mr. HAUSER. Yes, and diversity is good.

Mr. CRAMER. I like simple answers. With that, I yield back.

Mr. HAUSER. Absolutely.

Mr. CRAMER. Thank you.

Mr. UPTON. The gentleman yields back. Seeing that there are no further members wishing to ask questions of the first panel, I want to thank you all for being with us for the last number of hours. I appreciate that. We all did. So you are now excused. That concludes our first panel.

We are going to take a few minutes to set up. I know originally we thought Panel II would start at 1:00. So, we are going to start 5 minutes early, because we are expecting votes on the floor perhaps around 1:15.

So my goal is to have the second panel actually give their testimony. Then, we will adjourn, recess for the votes, and then come back for questions. So, that is what our intention is.

So with that, the first panel is excused. Thank you.

Thank you very much.

[Recess.]

Mr. UPTON. We just had a series of votes on the floor, and we are all walking back. And we did our opening statements earlier, so we will not repeat those.

I want to welcome you back. Sorry we are starting a little later than we had anticipated. We are now moving into our second panel. And as the first panel, we appreciate you all submitting your testimony in advance. I read all the testimony last night, actually yesterday afternoon.

So we are joined by Terry O'Sullivan, General President of the Laborers' International Union of North America; Mr. Rex Ferry, owner and CEO of VEC, Inc. on behalf of the National Electric Contractors Association; Kim Kann, private citizen. Moving testimony. Thank you again. Chad Harrison, Councilman at-Large of the Standing Rock Sioux Tribe; and Joey Mahmoud, Project Director of the Dakota Access Line.

So, again, your testimony is part of the record. If you would, take no more than 5 minutes to summarize it. We will start with Mr. Harrison. And when we are completed, we will do questions on both sides of the aisle.

And I know the Democrats are on their way. They know that we are doing the testimony first. And again, they have read it as well, but they will be coming in as our Republicans who are not here yet.

So, Mr. Harrison, welcome. Thank you. Thanks for being here.

STATEMENTS OF CHAD HARRISON, COUNCILMAN AT-LARGE, STANDING ROCK SIOUX TRIBE; KIM KANN, LANCASTER COUNTY, PENNSYLVANIA, LAND OWNER; REX FERRY, PRESIDENT AND OWNER, VEC, INC. ON BEHALF OF THE NATIONAL ELECTRIC CONTRACTORS ASSOCIATION; TERRY O'SULLIVAN, GENERAL PRESIDENT, LABORERS' INTERNATIONAL UNION OF NORTH AMERICA; AND JOEY MAHMOUD, VICE PRESIDENT, ENERGY TRANSFER PARTNERS, AND PROJECT EXECUTIVE, DAKOTA ACCESS PIPELINE

STATEMENT OF CHAD HARRISON

Mr. HARRISON. Thank you, Mr. Chairman. Mr. Chairman, members of the committee, I am Chad Harrison, a Tribal Council member from the Standing Rock Sioux Tribe. It is an honor to be here today.

As the committee is well aware, Standing Rock Sioux Tribe has opposed the Dakota Access Pipeline because of our concerns about our waters and our sacred sites. We have said from the beginning that the impact of an oil spill would be devastating on our people, and we have a strong obligation to future generations to protect them from that harm.

This matter is currently in litigation. Just yesterday, our lawyers filed for motion for summary judgment to address our basic claims. Our position is straightforward. The Army has never, to this day, evaluated the impact an oil spill would have on our waters or our treaty rights. That evaluation needs to be done through an EIS, as promised to us before that promise was then taken away a couple of weeks ago.

Our litigation raises basic issues of fairness. The pipeline was originally routed across the Missouri River north of Bismarck, away from our reservation, but it was determined that the risk of an oil spill was too risky for the drinking water and wildlife interests near Bismarck. So, they rerouted the pipeline to cross the river just upstream from the reservation. How can a pipeline be too risky for the water supplies of Bismarck, but be perfectly fine for the water supplies of my people?

We have seen this kind of treatment throughout our history and we believe that we are entitled to a greater measure of fairness and justice. Along these lines, I have read the testimony from Dakota Access to this committee and it strikes me that there is a deep underlying irony there. Dakota Access argues that it is the victim here. But Dakota Access is a multibillion-dollar pipeline company in which the President of the U.S. has been an investor and its CEO is a campaign contributor to the President. When in history has such a company been the victim of an impoverished Indian Tribe? The answer is never.

And when they say their pipeline is safe, I ask then why was the original route changed if there is no risk of an oil spill at all? And why did you never allow an independent review of your secret documents on which you base your claims of safety? The point is, they are simply not telling you the full story.

These and other questions need to be resolved by the courts. And we are confident that the courts will vindicate the Tribe's position. But I am here today to discuss what I believe are some of the opportunities arising from our experience with this pipeline.

First, we do not oppose energy independence, economic development, or the protection of national security, but these goals must be advanced in a way that recognizes and protects Tribal culture resources, sacred places, and resources. For too long, decisions have been made and the Federal Government has acted in a way that places too much burden on Indian Tribes. We can all achieve prosperity together, but only if the costs of development and infrastructure are shared fairly. It is time to end the long-standing approach of forcing Tribes to bear the costs of prosperity for others.

Second, Tribes need to be full partners in the process of infrastructure decisions from the beginning. I truly believe that if there had been meaningful consultation with the Tribe at the very beginning regarding Dakota Access, we all could have avoided the lengthy dispute that has arisen. When Tribal interests are ignored in the beginning, it is much harder to resolve the matter than when those interests are properly addressed by the Federal decision-makers at the outset. Requiring proper Tribal consultation at the beginning leads to better results and less litigation about these matters.

Third, when we talk about meaningful consultation, we mean high-level Government-to-Government discussions that are comprehensive and collaborative that seek to obtain Tribal consent. All too often, Federal agencies treat Tribal consultation as a check-the-box exercise, rather than a solemn obligation. This mindset must change, as the absence of proper consultation can lead to very extensive problems later.

Fourth, the law regarding these matters needs to be amended. Where oil pipelines are concerned, decisions are made in a piecemeal way and there is no process for considering the impact of the pipeline overall.

As far as Tribal interests are concerned, the law needs to be strengthened so that when Tribal treaty rights and lands are involved, Tribal consent is required or, at the very least, that the Tribe has the ability to impose conditions to protect Tribal homelands.

Committee, our Tribe has a voice, and it demands to be heard on these issues. It demands to be heard on the front side of the issues, the front side of infrastructure development.

I want to restate that we are not against development of any sort. We are not against unions. We are not against jobs. We are for responsible and reasonable infrastructure development, and we wish to be included. We wish to be heard. We are Americans. We are the first Americans, and we wish to be treated as such.

Overall, we believe that more needs to be done to improve the processes of infrastructure approval for the benefit of native peoples and all Americans. We look forward to working with the committee on this important matter.

Thank you for your time.

[The prepared statement of Mr. Harrison follows:]

Testimony of Chad Harrison, Councilman At-Large
 Standing Rock Sioux Tribe
 Before the House Committee on Energy and Commerce
 Subcommittee on Energy Hearing on
 Modernizing Energy and Electricity Delivery Systems:
 Challenges and Opportunities to Promote Infrastructure and Expansion

February 15, 2017

I am Chad Harrison, Councilman At-Large for the Standing Rock Sioux Tribe (“Tribe”). The Tribe is a successor to the Great Sioux Nation, or *Oceti Sakowin*, and a signatory to several treaties, including the 1851 Fort Laramie Treaty, Sept. 17, 1851, 11 Stat. 749 and the Fort Laramie Treaty of 1868, 15 Stat. 635. In these Treaties, the United States recognized our territory and promised to protect us in our homeland. But the United States did not keep its word. Because of demands for gold, and later for agricultural lands, our lands were taken without our consent. By statutes enacted over time our Reservation was reduced to what it is today. *See* Act of Feb. 28, 1877, 19 Stat. 254; Act of Mar. 2, 1889, 25 Stat. 888.

The same happened when the Oahe Dam and reservoir were built. In 1942, Congress enacted the Flood Control Act, Pub. L. 78-534, 58 Stat. 887. This authorized the Army Corps of Engineers to construct five dams along the Missouri River, including the Oahe Dam and Reservoir. The Flood Control Act was implemented at Standing Rock in 1958. The United States took 56,000 acres of the Tribe’s reservation lands along the Missouri River for the Oahe project. Act of Sept. 2, 1958, Pub. L. No. 85-915, 72 Stat. 1762. The lands taken for the Oahe Project were the best remaining lands of the Reservation including timber lands and fertile farming lands. When these lands were flooded, hundreds of our families lost their homes. S. Rep. No. 102-267, at 188 (1992). The loss devastated the Tribal economy and culture.

Testimony of Chad Harrison,
Councilman At-Large
Standing Rock Sioux Tribe
February 15, 2017

Thus, the Standing Rock Sioux Tribe has a long history of dealing with the United States when it seeks to grow, prosper and develop this Nation's resources for the benefit of others. But expanding and improving our Nation's energy infrastructure need not always be about burdening tribes. Instead, I am here today to talk about the opportunities that we have to develop infrastructure right; to do it in a way that one community does not always bear the burden of providing prosperity for our Nation. We are, of course, continuing to address the Dakota Access Pipeline which puts the risk of oil spills on the Tribe – as we are the community that is directly downstream from where the pipeline will cross Lake Oahe. We remain hopeful that this can be corrected by the courts and that the laws of our country will be followed.

But this example of injustice can also be viewed as a story of an opportunity lost. For almost three years, the federal government and the company ignored the concerns of the Tribe. The failure to consider and address tribal concerns at the outset, and consider alternatives that would not put the risk of the pipeline on Indian people, has led to controversy, and costly and uncertain litigation. No one can argue that it would have been better for everyone involved if the stakeholders had taken advantage of the opportunity to truly consult, listen and address the tribal concerns at the outset.

Standing Rock has always and will continue to work to protect our waters and our sacred places for the benefit of our children not yet born. But to be clear, the Tribe does not oppose economic development, energy independence or protecting our national security. What we oppose is development that is undertaken without our consent and in such a way that it is our

Testimony of Chad Harrison,
Councilman At-Large
Standing Rock Sioux Tribe
February 15, 2017

community, our people, our cultural sites, and our natural resources that are put at the most risk, and when we are the ones who will pay the cost when something goes wrong. For too long, tribes have been forced to give so someone else can pursue development. The forced assumption on tribes and Indian people of this burden of prosperity and progress by others needs to stop. The laws and policies that are now in place present an opportunity for the cost of this prosperity to be shared fairly. If the federal government does not take advantage of the opportunity to follow the law and fully consider and protect the interests of the tribes, then the tribes and Indian people will continue to bear this burden.

The proposal to build the Dakota Access pipeline across the Tribes' taken treaty lands, and across the Missouri a half a mile upstream of our Reservation, illustrates the continued historic pattern of abuse. The Tribe conveyed its concerns about the routing this pipeline in such a sensitive location at the earliest opportunity, even before DAPL applied for the permits in December 2014. But decisions were made about the pipeline route without regard to the impact of the proposed pipeline on tribal rights. This became clear in December 2015, when the Army Corps of Engineers released a deeply flawed draft environmental assessment, drafted by DAPL.

This draft EA was remarkable for the fact that it said nothing at all about how close the pipeline would cross Lake Oahe just a half mile upstream from our Reservation. The draft EA said nothing at all about the pipeline's potential impacts on the water, which we drink and use for irrigation. The draft EA said nothing about the risk of oil spills on the fish and game and plants that our people, many of whom live below poverty, rely on to put food on the table and which

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are central to our religion and culture. In fact, the maps that were part of the draft EA completely omitted all information that would have shown the location of the Reservation relative to the pipeline's crossing. At the same time, however, the draft EA showed that DAPL had originally considered a different route, which would have crossed the Missouri ten miles north of Bismarck, North Dakota. Even though the north of Bismarck route would cross the Missouri River at a point where it is only 200-300 feet wide (instead of nearly a mile wide at the Lake Oahe crossing) DAPL abandoned the north of Bismarck route in part because of risks to downstream municipal water supplies.

We submitted numerous technical and legal comments on the draft EA to make sure that the Corps had the facts about our reliance on the waters of Lake Oahe, the sacred sites that would be affected by construction and operation of the pipeline, and the very substantial risks that an oil spill would create for us. We urged the Corps to prepare an EIS to assess route alternatives that did not cross the Missouri in a place that would put all the risks of an oil spill on Indian people who are still struggling to overcome generations of poverty and the related problems that occur with poverty. Other federal agencies agreed with the concerns we raised. The Interior Department and the Environmental Protection Agency criticized the draft EA and said that the Corps needed to do a more robust review with a focus on risks to water and to Tribal resources

Despite this, in July 2016, the Corps issued some permits to DAPL (but not an easement that they also needed), and released a final EA and a "finding of no significant impact" ("FONSI"). Although the final EA recognized that the Tribe existed, it still got the facts wrong.

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It incorrectly said that we relied mostly on wells for our water, even though we provided clear information about our extensive reliance on Lake Oahe for the drinking water in our homes, schools, community centers, IHS hospital and clinics, businesses (the casinos and hotel) and all tribal and federal public buildings. The final EA instead made conclusory statements dismissing the risks to the Reservation. But if there was no risk of an oil spill from this pipeline, why wasn't it safe enough to cross the Missouri River 10 miles upstream of Bismarck, instead of one-half a mile upstream of an Indian Reservation? The final EA never answers that question.

The Tribe immediately filed a lawsuit challenging these July decisions and accompanying EA/FONSI. And we continued to raise our concerns with the federal agencies. In September the Corps, Justice and Interior agreed that the issues we raised needed more evaluation, and on December 4, the Army announced that it would not issue the easement at Lake Oahe until the risks of the pipeline to our waters, and treaty hunting and fishing rights were fully evaluated, including a consideration of "alternative locations" for crossing the Missouri River that would avoid putting us at risk. The Army said that this review would occur via an EIS. The Army's decision was supported by a comprehensive legal analysis done by the Interior Department.

The decision made in December was really important for our people. It was the first time that the United States took advantage of the opportunity to determine if this pipeline might be done in a better way so that the Tribe, and our resources do not bear the burden of this pipeline. While proponents of the pipeline would argue that the December 4 decision caused delay, we

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would argue that the delay is the result of the company and the federal government failing to do this work when it should have been done. The Company assumed this risk when it chose to disregard the Tribe and our interests. Taking the time to do a job right is in our view good policy, that best serves National interests, not an unnecessary annoyance.

The Corps moved forward with the EIS process. It issued a notice on January 18, 2017 to invite comments on the scope of the EIS. The Tribe immediately assembled a team of technical and policy experts to participate in that EIS process, and formally requested cooperating agency status on the EIS pursuant to the regulations.

But within only days after the Inauguration, on January 24, 2017, President Trump signed a memorandum directing the Secretary of the Army to “review and approve, in an expedited manner, to the extent permitted by law and as warranted, and with such conditions as are necessary or appropriate” all permits and easements needed for this pipeline. On February 7, the Corps sent notice to Congress that it intended to grant the DAPL easement. And although the Corps’ normal policy is to wait 14 days after sending such notice to Congress, it waived that waiting period here. As a result, the easement was signed the very next day, on February 8. To the media, President Trump made clear that this had been his decision.

This latest action harkens back to a time when President’s exercised executive powers to take Tribal lands, remove Indian people from their homelands and terminate tribes. This action represents the lost opportunity to do this process right.

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We question why there is such determination to ignore the law and disregard the federal trust responsibility to tribes? Industry stakeholders and the President answer this question with the promise of jobs, and economic sustainability.

This pipeline is not bringing jobs to my people. The people doing this work will leave when their job is done, so there is no employment benefit for my community. There was an article published in the Dickinson Press that argued this pipeline does nothing for the economy of North Dakota and that shipping this crude oil by rail is much better for the economy of North Dakota. According to this article:

The pipeline itself is unnecessary because we have ample rail capacity to haul all of North Dakota's crude oil safely by rail with newer and safer rail cars. We are currently only shipping 3-4 oil trains a day out of North Dakota and we have the capacity to ship 100 trains a day with our state's 21 oil train loading facilities.

Over the past five years those loading facilities were built costing hundreds of millions of dollars and during the same time the BNSF railroad invested more than \$1 billion in North Dakota's track infrastructure to haul all this crude oil. So building the pipeline means hundreds of millions of dollars in stranded assets and lost opportunities for our state.

Building this pipeline adversely affects North Dakotans too. We have more than 200 railroad workers who are currently furloughed who would be put back to work if we shipped more oil by rail. While I support union construction workers who build pipelines, the truth is, most of these folks are from out of state, and this pipeline creates some jobs for a few months.

North Dakota railroad workers live here and shipping oil by rail will keep them employed for decades. Shipping oil by rail doesn't just benefit rail workers and our state's railroads, revenues from

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shipping oil helps pay for the maintenance of our entire rail system
and that benefits other shippers like farmers who depend on good
rail lines to get their crops to market. The Dakota Access
Pipeline...well it will ship oil

John Risch, Dickinson Press (November 11, 2016).

Second, Indian people believe in this Nation; we have served our country's armed forces in higher proportions than any group in America. We want our economy and our Nation to do well. In believing in this Nation, we believe that we are a Nation of laws, which must be followed in order for our economy to be sustainable. The failure to follow these laws threatens the economic viability of our community. Just this last year, the Navajo Nation experienced an environmental catastrophe with the Gold King Mine disaster; a consequence of federal agencies and companies not following the law. Thus, the promise of economic development is a false one for my community, if the laws intended to protect our land, water and people are not followed.

Finally, the United States' blatant disregard of the law is just one more trauma that my people will endure. I ask my friends at this table to explain to the youth, who ran from Standing Rock to the Washington, D.C. to plead with the President and the Army Corps to take action to protect our lands, how the Army Corps can take unilateral action and move forward with this pipeline and not comply with the process that the Agency had said it would follow. I am tired of trying to explain the government's action to my youth, who have lost faith and hope.

What our youth know is that there was an option for this pipeline to go north of Bismarck (and go under the River for a shorter distance), but that option was not taken because it posed too

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much of a threat to Bismarck's drinking water. Somehow the pipeline was deemed too risky for Bismarck but not risky at all for our Reservation's drinking water. Perhaps you don't know what happens when children lose hope, but my community knows and we pray every day that what we fear the most does not happen. But if it does, the responsibility will lie with those who chose to ignore our concerns. It will not lie with the leadership of the Standing Rock Sioux Tribe or with the tribal leadership across this nation who stood with us.

As a tribal leader, I cannot lose hope, that is why we are pursuing our options in litigation to do this process right, but this should not be necessary. We hope that the United States does not miss the opportunity to get this right the next time. Thus, when the federal agencies and the industry seek to move forward with infrastructure in the future, you must truly consult with tribes. Consulting does not mean telling us what you are going to do and how you are going to do it. It means listening and making the necessary changes to ensure these projects do not harm our people, our lands and our resources. We ask that the law be changed to clearly require our consent before this kind of project can move forward. The Treaty promised my Tribe a permanent homeland; what is the point of a homeland if it is contaminated or we do not have water to drink?

At the very least, Congress should change the law to require that when infrastructure like this pipeline is proposed that the tribes have the right to impose conditions on the project to protect the tribal interests and resources. Already, the Federal Power Act requires that when a private hydropower license is issued within a federal reservation, FERC must determine that it

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will not interfere or be inconsistent with the reservation and that the relevant federal agencies impose conditions to further protect the reservation including Treaty protected resources.

I end this testimony as I began it. The law provides the opportunity for infrastructure development to be done correctly so that tribal communities do not bear the burden of development. We are deeply disappointed that the federal government and the company did not take advantage of this opportunity with the Dakota Access Pipeline.

Thank you for the opportunity to testify.

Mr. UPTON. Thank you for your testimony.
Ms. Kann, welcome.

STATEMENT OF KIM KANN

Ms. KANN. First of all, thank you for inviting me here today. My name is Kim Kann. I want to commend the earlier speakers today for the really relevant and compelling testimony about how the industry is helping to keep our lights on, and our houses warm, and our businesses energized.

I am a 33-year STEM teacher, and I am canceling my lesson plans tomorrow to share with my students many of the things that I learned here this morning, because it was very exciting.

I'm here, however, to give a voice to the landowners who have had their dreams and financial security shattered by the unjust use of eminent domain for projects that are intended primarily to export U.S. energy.

I was blessed to raise my three sons on a small family farm in rural Lancaster County, PA, and grateful to be able to give them the perfect childhood haven; a stream for building dams, hidden campsites for sleeping outside, and a small pasture for a few horses that could teach them about patience and responsibility. Nothing was handed to us. Everything was the product of careful spending, self-reliance, hard work, and the dream was to pass that property on to my boys.

In the spring of 2014, my community was stunned to learn that William Partners intended to build a gigantic 42-inch 1580-pound per square inch Atlantic Sunrise natural pipeline through our community. So first, we studied exactly what that meant and we found that the proposal brought no benefit to us and potentially much harm and we opposed it; 1700 of 2300 registered voters returned petitions saying so.

And from the laundry list of harms we were facing, the issue of eminent domain was the most egregious. How could American landowners be forced to surrender their homes to a profit-making corporation that plans to export natural gas, while being forced to pay real estate forever on land that they would no longer own?

My story: My narrow 20-acre farm will now be cut in half. The far ten acres is only accessible by crossing a right-of-way that will be completely controlled by Williams. The bedrooms will be in the hazard zone, which guarantees catastrophic burns or death in the event of an explosion.

My story is echoed by my neighboring landowners, 36 who refused to sign easements in Lancaster County, people like John and Deb Swanson, who own a small farm. Much of their land will be taken and their home will lie well within the hazard zone. John is a proud Marine veteran who served America with honor. The country he defended is planning to allow a private corporation to take land that has been in his family for generations.

Or Laura and David Banta, who will have the pipeline pass feet from their bedrooms.

Or Linda Like, who has owned a small tract of farmland that she planned to sell for building lots to finance her approaching retirement. No one can build on it. So, retirement is no longer in her plans. She is trying to sell, but no one is interested.

We get that sometimes land needs to be taken for the benefit of the community. So, we looked for benefits. And from this project, locally, there were none. And beyond that, we found negatives that far outweighed positives. We hired a pipeline feasibility expert, Dennis Witmer, whose results can be found on the YouTube video, A Perspective on Natural Gas Markets, who found that there is no domestic demand for the gas that is to flow through this pipeline. In fact, we currently enjoy low natural gas prices because there is a glut. And keep in mind, much of the gas planned for Atlantic Sunrise is for export.

There is no local access, so our community and our neighbors cannot connect into the line. Claims of jobs are misleading, as most workers come from far out of State. And how do you justify supporting new jobs to create wealth for some at the expense of other hardworking citizens? We discovered our beloved preserved farms with world class soils, 106 supposedly protected for eternity with tax dollars and private donations, were targeted because of their open space and reduced land value.

We started following the news and saw catastrophic pipeline failures in San Bruno; Appomattox; Salem Township, Pennsylvania; Sissonville, West Virginia; and just this week in Baton Rouge, Louisiana, where two men were gravely injured and one is presumed dead, to name a few. This raises the risk of evacuation, contamination, catastrophic explosion, or death in our community from zero to something much higher.

The route through my township of Conestoga passes through four State-registered Native American cultural sites and 86 along the entire route. We learned that fracking is contaminating water and frack waste is difficult to dispose of and natural gas is not as clean as advertised, with methane being 80 times worse as a contributor to climate warming.

I would like to quote directly from the GOP Platform for 2016 defining the American Dream: "It means a decent place to live, a safe place to raise kids, a welcoming place to retire. It bespeaks the quiet pride of those work hard to shelter their family and, in the process, create caring neighborhoods."

The reality of a decent, safe, guaranteed place to live and retire is about to be ripped away from us, many of us. A 30,000-more miles of pipeline as slated in Pennsylvania by John Quigley in his State Impact Report of 2015, using the numbers from our pipeline in our county, 137,000 Pennsylvania landowners could face seizure of private property.

And as powerful corporations profit from the gas that flows to export, they will pay inflated executive salaries and dividends to shareholders.

The reality is our financial assets, will be seized and redistributed. That is corporate welfare at its worst.

This is what it has come to. In our small, very conservative town, in just 3 weeks, over 500 local residents have pledged to participate in non-violent civil disobedience to stop this project and their numbers are growing daily. Although framed as radicals, and far left crazies, they are really just counselors—

Mr. UPTON. Ma'am, if you could please just sum up, that would be great.

Ms. KANN. Sure.

They are just regular people that would like to have their voices heard.

And I am asking that all of you, Democrats and Republicans alike, work to find a solution to this issue, because they are going to make their voices heard, one way or the other. Thank you.

[The prepared statement of Ms. Kann follows:]

Thank you for inviting me here today. My name is Kim Kann. I was blessed to raise my 3 sons on a small family farm in rural Lancaster County, PA, and grateful to be able to give my sons the perfect childhood haven.....a stream for building dams, hidden campsites for sleeping outside, a small pasture for a few horses that could teach them about patience and responsibility. Nothing was handed to us. Everything was the product of careful spending, self-reliance and hard work. The dream was to pass the property on to my boys.

In spring of 2014 my community was stunned to learn that Williams Partners intended to force a gigantic 42", 1580 psi natural gas pipeline through our community. First we studied exactly what that meant. We found the proposal brought no benefit to us, and much harm. We opposed it. 1700 of 2300 registered voters returned petitions saying so. From the laundry list of harms we were facing, the issue of eminent domain was the most egregious. How could American landowners be forced to surrender their homes to a profit making corporation, while being forced to pay real estate tax on the land they no longer owned forever?

My narrow 20 acre farm will now be cut in half. The far 10 acres is only accessible by crossing the right of way that will be controlled by Williams. The bedrooms will now be in the hazard zone which guarantees catastrophic burns or death in the event of an explosion. My story is echoed by neighboring landowners, 36 who had refused to sign easements in Lancaster County. People like John and Deb Swanson who own a small farm. Much of their land will be taken, and their home will lie well within the hazard

zone. John is a proud Marine veteran who served America with honor. The country he defended is planning to allow a private corporation to take land that has been in his family for generations. Or David and Laura Banta who will have the pipeline pass feet from their bedrooms. Or Linda Like has owned a small tract of farmland she planned to sell for building lots to finance her approaching retirement...no one can build on it, so retirement is no longer in her plans. She is trying to sell, but no one is interested.

We get that sometimes land needs to be taken for the benefit of the community. So we looked for benefits. There were none locally, and beyond that we found negatives that outweighed the positives. We hired pipeline feasibility expert Dennis Witmer, whose results can be found in the youtube video A Perspective on Natural Gas Markets, who found there was no domestic demand. In fact, we currently enjoy low natural gas prices because there is a glut. There is no local access, so our community and our neighbors cannot connect into the line. Claims of jobs are misleading, as most workers come from far out of state. And how do you justify supporting new job to create wealth for some, at the expense of other hard working American citizens?

We discovered our beloved preserved farms, with world class soils, 106 supposedly protected for eternity with tax dollars and private donations, were targeted because of their open space and reduced land value. We started following the news and saw catastrophic pipeline failures in San Bruno, CA, Appomattox VA, Salem Twp., PA, Sissonville, WV, and just this week in Baton Rouge, LA where two are gravely injured and one is presumed dead, to name just a few. This raises the risk of evacuation,

contamination, catastrophic explosion or death in our community from 0 to something much higher. The route through my township of Conestoga passes through 4 state registered Native American cultural sites, and 86 recognized on the route. We learned fracking was contaminating water and frack waste is dangerous to dispose of. And natural gas is not as clean as advertised since leaking methane is over 80 times worse as a contributor to climate warming than carbon.

I would like to quote directly from the GOP platform for 2016 defining the American Dream. "It means a decent place to live, a safe place to raise kids, a welcoming place to retire. It bespeaks the quiet pride of those who work hard to shelter their family and, in the process, create caring neighborhoods."

The reality of a decent, safe, guaranteed place to live is about to be ripped away from us... many of us. If 30,000 more miles of new pipeline are slated for PA as John Quigley told State Impact in July of 2015, and using the ASP landowner per mile ratio from my county, simple math shows over 137,000 PA landowners could face seizure of their private property.

And as powerful corporations profit from the gas that flows, they will pay inflated executive salaries and dividends to shareholders. The reality is our financial assets, will be seized and redistributed. That sounds like corporate welfare at its worst.

This is what it has come to. In our small, very conservative town, in just 3 weeks, over 500 local residents have pledged to participate in non-violent civil disobedience to stop this project. And their numbers are growing daily. Although framed as radicals, and far left crazies, they are really just counselors, ministers, construction workers, students, grandparents, farmers, teachers, many Republican and a few Democrats, mostly who never protested anything, but believe the sacred right of land ownership is worthy of protecting. And now that they are awake and informed, expect them on your phones, at your offices and speaking at your town hall meetings.

You are charged, each of you, Republican and Democrat with finding a solution to this issue. Citizens are no longer willing to tolerate the abuse of eminent domain to line the pockets of others.

Mr. UPTON. Thank you.
Mr. Ferry.

STATEMENT OF REX FERRY

Mr. FERRY. Thank you Chairman Upton and members of the subcommittee for inviting me here today to testify. On behalf of the National Electrical Contractors Association, we greatly appreciate the opportunity to submit a statement for this important hearing.

My name is Rex Ferry. I am President and CEO and owner of Valley Electrical Consolidated, VEC, which is located in Girard, Ohio. I am also past president of NECA and having served from years 2009 to 2011.

Shortly after graduating from high school, I entered the electrical trades and began working for Valley Electrical. I quickly moved up through the ranks from foreman to project manager before making the decision to purchase the company in 1990. Our vision, VEC's vision is to serve others with integrity for the sake of our future generations and resulted in significant growth. VEC started as a family-owned business providing electrical contracting services in regional factories, automotive production lines, steel mills, and created the diversity it needed for sustainability for the future and employing as many as 400 workers across multiple trades during the height of the construction season.

And our business is truly a family firm. We have 26 family members working across the spectrum. With the arrival of my granddaughter, I am pleased to say we now are a third-generation family-owned company.

Energy production within the oil and gas industry has proven to be one of the most promising job creators and revenue generators in oil and gas markets are both directly and indirectly and they make up over 65 percent of our revenue over the past 6 years, which has allowed Valley to reinvest tens of millions of dollars in vehicles, equipment, tools, technology, and buildings.

Prior to the oil and gas energy boom, this scope of work experience was not prevalent in Ohio. In fact, it did not even exist in the Midwest. The area surrounding Youngstown, Ohio, has tremendous growth, directly and indirectly, because of the Utica and Marcellus Shale oil and gas industry. In its peak, there wasn't a hotel room during the week available. And so this also is helping the hospitality industry.

A 2012 study commissioned by the U.S. Chamber of Commerce's 21st Century Energy Institute says the extraction of unconventional shale oil and gas through horizontal hydraulic fracking has created job booms even in States that do not actually have shale deposits; 1.7 million jobs have already been created and a total of 3.5 million jobs are projected to be created by 2035.

This growth extends into the chemical industry. A recent Price Waterhouse study shows that by 2025, Ohio, Pennsylvania, West Virginia will be the number one capitol producer in the world and creating one million new jobs.

The electrical construction industry has played a key role in assuring the U.S. will have adequate and reliable electrical power supply. In fact, the concept of the electrical construction worker has evolved dramatically over the past decade. Today, nearly 50 per-

cent of the electrical contractors are performing work on almost 40 different project services.

In today's global economy, widespread adoption of the new energy technologies has slowed due to economic, Government, and marketplace barriers. We believe there is a fresh opportunity for the Federal Government to unleash unprecedented development, exploration, construction, and production of this sector.

There are some challenges that must be met if we are to achieve these goals in moving the fruits of our energy development to market. Now is the time to fully invest in the Nation's infrastructure. We are very encouraged by the actions of the pipeline construction taken by the Trump administration. From VEC's experience, I can report in the last couple of weeks the opportunities have increased dramatically.

Thankfully, this committee has helped overhaul environmental review of infrastructure projects and we believe even more can be done to ensure permitting decisions are made in a timely manner. Electrical construction companies want to grow and they need capital to make that happen. We urge Congress to examine how to better increase the access to capital and credit for the construction industry.

It is also necessary we recruit young and talented workers through our apprenticeship training programs, which offer high-tech, high-skilled, high paying careers that come with rewarding pay, with full health benefits and a promise of retirement plans.

We hope that Congress will enact a comprehensive energy strategy that promotes the development on all available energy resources.

Thank you for this opportunity to testify in this very important hearing. NECA and VEC applauds the committee's efforts and we continue to offer our support to advance the committee's agenda and look forward to working with you in the future.

Thank you.

[The prepared statement of Mr. Ferry follows:]



Statement of Mr. Rex Ferry
President and Owner of VEC, Inc.

on behalf of the
National Electrical Contractors Association
to the

Subcommittee on Energy
Committee on Energy and Commerce

U.S. House of Representatives

for a hearing on

“Modernizing Energy and Electricity Delivery Systems:
Challenges and Opportunities to Promote Infrastructure
Improvement and Expansion”

February 15, 2017

NECA is the voice of the \$130 billion electrical construction industry that brings power, light, and communication technology to buildings and communities across the U.S. NECA's national office and 119 local chapters advance the industry through advocacy, education, research and standards development.

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Statement of Mr. Rex Ferry
President and Owner of VEC, Inc.
On behalf of the National Electrical Contractors Association (NECA)
Subcommittee on Energy
Committee on Energy and Commerce
February 15, 2017

Thank you Chairman Upton, Ranking Member Rush, and members of the Subcommittee for inviting me to testify today at this very important hearing. On behalf of the National Electrical Contractors Association (NECA), we greatly appreciate the opportunity to submit a statement for the record to the Subcommittee on Energy hearing on “*Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion.*” The subcommittee is to be commended for holding this important hearing to address a critical role that the oil and gas industry yields in creating jobs in the American energy sector, something that has allowed me to exponentially grow our family business.

My name is Rex Ferry and I am the President and Owner of Valley Electrical Consolidated, Inc. (VEC), which is located in Girard, Ohio. Shortly after graduating high school, I entered the electrical trades and began working at Valley Electrical. I quickly moved through the ranks from Foreman to Project Manager before making the decision to purchase the company from then-owner Mike Russell in 1990. While our family-owned business began providing electrical contracting services to the region’s many factories, production lines, and steel mills, it is now a multifaceted construction company that is wholly dedicated to constant improvement and sustainability. Our vision – “*To serve others with integrity for the sake of our future generations*” – has resulted in significant returns for our company. This success has intensified recently due to heavy involvement with the Utica and Marcellus Shale projects.

The growth in our company’s employment tells a wonderful story. During the height of the construction season, our total employment numbers exceed over 400 employees, with an average of 250 in-house employees, as we hold agreements with multiple trades in the field. I am proud to say we have 26 family members in the business including daughters, a son-in-law, sisters, a brother-in-law, nieces and nephews in the office and in the field. With my granddaughter coming on board recently, we are now a third-generation family company.

Although Valley Electrical began as a small, family-owned electrical construction firm, we have always had a greater vision for what we can accomplish. By the mid-2000’s, VEC had expanded into new markets, adding diverse capabilities and gaining experience, cultivating expertise and respect as it grew. In 2001, VEC Systems Integrator was created to meet the low-voltage and information-technology demands of our customers. Soon after in 2003, we acquired Evets Electric Inc., a specialty electrical contractor focusing on the oil and gas industry. In 2009, VEC purchased JAllen, a General Contractor in the Oil and Gas Industry. These acquisitions transformed VEC Inc. into a total solutions provider for clients throughout the United States.

As opportunities continue to present themselves to VEC, we continue a path of steady and sustainable growth. While it has been almost 40 years since the end of the steel era, the oil and gas boom in the Midwest has revived and modernized the region's economy and is creating new job opportunities that are here to stay. The development of fracking and horizontal drilling expands beyond the Ohio borders. The U.S. Energy Information Administration's Rankings of the Natural Gas Marketed Production tell us that oil and natural gas development is occurring in at least 32 states. It has increased access to reserves for oil and gas in Alabama, Arkansas, Colorado, Illinois, Louisiana, Michigan, New York, North Dakota, Oklahoma, Pennsylvania, Texas and Wyoming.

We are proud members of the National Electrical Contractors Association (NECA). I also had the honor of serving as President of the association from 2009 through 2011. NECA is the nationally recognized voice of the electrical construction industry, comprised of over 60,000 electrical contracting firms, employing over 750,000 electrical workers and producing an annual volume of over \$130 billion in the electrical construction industry that brings power, light, and communication technology to buildings and communities across the United States. NECA continues to build on a legacy of protecting the public and making innovation possible. We, as member contractors, strive to be solution-providers for our customers and our industry expertise benefits everyone working on an electrical construction project.

NECA contractors work across the commercial and industrial sectors and specialize in a broad range of areas including traditional power and lighting, power quality, lighting controls, fire, life safety and security systems, backup power generation, communication and connectivity systems, automation controls and energy efficiency projects. We believe a comprehensive federal energy policy measure is needed to address current and future demands of the entire electrical construction industry.

Across the country, electrical contractors are the market-leading businesses that are providing electrical infrastructure and services to the oil and gas industry. Widespread extraction of shale gas will have a significant impact on our ability to create new energy reserves as well as boost America's manufacturing sector.

According to the U.S. Energy Information Administration, natural gas accounts for 33 percent of electricity generation, on par with coal. This rapidly growing industry is taking place in the oil and gas fields of Utica and Marcellus shale. The new energy economy in these areas is creating new job opportunities for the construction industry, particularly for the electrical construction industry. More jobs have been created for the first time since the decline of the steel industry in the 1980's. This industry is poised to keep growing. As technologies continue to develop, the production of natural gas continues to rise.

Growth in this arena is helping to address the loss of jobs in the electrical construction industry and we certainly hope the turnaround will continue. The Bureau of Labor Statistics recently reported that construction employment is now at its highest level since November 2008. We believe we can do even better.

Driving Change and Growth in the Electrical Construction Industry

As the construction industry suffered historically high unemployment rates almost a decade ago – as high as 27 percent – the electrical construction industry endeavored to increase its scope of construction services. As our industry continues to work through the recovery, electrical contractors across the country have looked for ways to grow causing the concept of electrical construction work to evolve dramatically over the past decade.

According to *Electrical Contractor* magazine's 2016 *Profile of the Electrical Contractor*, 56.4 percent of electrical contractors are performing work on energy construction projects. More specifically, 51 percent of companies with less than ten employees worked on energy projects and almost 57 percent of companies with more than 100 employees engaged in this type of work. A significant increase in companies performing energy work resulted in a significant increase of interest in training programs.

When the U.S. energy boom began a decade ago, one of the many markets that grew at a rapid pace was the oil and gas industry. The natural gas revolution is giving new hope to America's manufacturing sector, including the electrical construction industry. Our manufacturing sector must be as productive and efficient as possible to ensure our economic competitiveness and continue to grow our economy. The electrical construction industry undoubtedly plays a key role in assuring that the U.S. will have an adequate and reliable electric power supply in the future.

A 2012 study commissioned by the U.S. Chamber of Commerce's 21st Century Energy Institute says the extraction of "unconventional" shale oil and gas through horizontal hydraulic fracturing has created a job boom even in states that do not actually have shale deposits. 1.7 million jobs have already been created and a total of 3.5 million jobs are projected by 2035.

While this is good news for the future of the construction industry, we believe a key part of the solution is enacting a national energy plan that will address our energy needs, ensure our energy independence, and grow our economy. We applaud those efforts of this Committee and hope that Congress will enact a comprehensive energy strategy that promotes development of all available energy resources including upgrading and modernizing transmission lines, increasing domestic oil, expanding natural gas exploration, investing in nuclear power, and further investments in clean and renewable energy sources.

Barriers to Greater Success

In today's global economy, widespread adoption of new energy technologies has been slow due to economic, government, and marketplace barriers. We believe there is a fresh opportunity for the federal government to unleash unprecedented development, exploration, construction and production of this sector.

Transportation Challenges

We must address the many challenges we have in moving the fruits of our energy development to market. Now is the time to fully invest in our nation's infrastructure. This includes investing in the pipelines, rail, roads, and airport infrastructure we need to transport people and equipment. We need better ports to allow ships will carry liquefied natural gas to other parts of the world. We believe that shale energy has the potential to help revive not only our manufacturing industry, but it will help most transportation modes, as they will be needed to move products domestically and abroad.

That said, we are very encouraged by the actions President Trump undertook on January 24 to help address these issues. We strongly support the memorandums fostering the construction of the Keystone XL and the Dakota Access pipelines. The memorandum calling for all new pipelines, as well as retrofitted, repaired, or expanded pipelines to use materials and equipment produced in the United States is another step forward. These actions are long overdue and will complement our energy network, further the goal of energy independence, and create jobs.

Regulatory Burdens

This Committee helped overhaul the environmental review of infrastructure projects under the National Environmental Policy Act (NEPA) when the FAST Act was passed in 2015. Additional reforms are needed to ensure decisions are made in a timely manner and to block frivolous legal actions that are intended to delay project schedules and increase project costs. There should be a six-month maximum time limit for completing all federal NEPA reviews. If no decision has been made by the end of those six months, the project should be allowed to proceed without further delay. Lastly, the administration and Congress should examine past regulations that encourage the filing of frivolous lawsuits and establish a loser-pays provision requiring any plaintiff who files a legal challenge to block an infrastructure project to pay all related legal fees if their challenge is unsuccessful. This would help discourage low probability-of-success lawsuits filed by individuals and organizations against the development of infrastructure projects.

The recent Executive Order (EO) *Expediting Environmental Reviews and Approvals for High Priority Infrastructure Projects* is another positive move forward. It is our experience that many projects are held up due to an unnecessarily complicated and protracted approval process. Time truly is money. Analysis by the nonpartisan reform group Common Good found that delays in regulatory approval for U.S infrastructure projects cost our nation \$3.7 trillion, which is more than twice the cost of fixing them. In America, the problem is not any one individual regulation. It's the accumulation of decades of state, local and federal regulations that are often contradictory, redundant or outdated. To accelerate the construction of important infrastructure, the federal government should designate officials to streamline the regulatory process for energy infrastructure projects. Funding for infrastructure is scarce and we cannot afford to waste critical resources on unjustifiable red tape.

This new EO should help improve coordination between the government and industry and working together, we believe more can be done. From my personal experience, I can report that request for quotes and opportunities have kept my phone ringing in the few short weeks since the EOs were signed. There is a great amount of excitement in the oil and gas industry and many tradesmen are ready to get to work immediately. A recent Price Waterhouse study shows that by 2025 Ohio, Pennsylvania and West Virginia will be the chemical producing capitol of the world, creating 1 million new jobs.

Access to Credit

Electrical construction companies want to grow, and they need the capital to make it happen. The majority of our firms are subcontractors. While they perform much of the work on their projects, they are hindered by lack of cash flow and must consequently finance large portions of their projects themselves. Accordingly, many of our firms need to access outside resources. Traditional bank loans are a usual option, but for many years now, bank credit remains tight. The number of traditional lenders actively in the market has shrunk and remained so due to industry consolidation. Consequently, they are not releasing capital to newer clients. Another challenge is that financial institutions have tightened up their lending standards and increased the overall cost of lending. Some of this is also due to newer regulations and tighter federal lending rules. We believe creditworthy businesses should have better access and opportunity to capital sources.

Building the Next Generation Workforce

Considering the energy agenda of the 115th Congress and the new administration, the electrical construction industry must continue to prepare itself for additional growth and diversification. A major component of this growth for NECA contractors is that they must continue to recruit young and talented workers. Historically, market share grows for companies possessing the talent and skills necessary to meet the needs of their clients.

Accredited Apprenticeship Programs: A Viable Education Option

Our company has had tremendous opportunity to offer high-tech, high skilled and high paying careers. Jobs in the natural gas industry that are provided by NECA businesses such as VEC come with rewarding pay with full health benefits and promised retirement plans. VEC is not your typical construction company. We look for talented, ethical people with integrity and the necessary hardworking characteristics and we then teach them the business. VEC's vision, mission and purpose focus on sustainability; integrity and serving others, unlike the many companies that have negatively impacted the U.S. economy because of greed. VEC is proud to have helped our local universities and technical colleges by hiring many of their graduating students. Job growth in oil and gas operations, trucking and welding has allowed us the chance to work through community college programs to hire and train workers to meet these new skill challenges.

It is well documented that there is strong competition for talent in every profession. Cultivating talent is becoming more and more critical to successful electrical contracting companies. With the increasing sophistication of the construction industry, electrical contracting needs a well-rounded workforce prepared to improve the delivery of electrical construction projects to enhance company profits.

We are quite proud of the opportunities our apprenticeship programs offer around the country. While there is measurable value in a traditional college education, we would be remiss if we did not discuss some possible alternative routes for students who might not think a standard four-year degree is the right path for them or do not wish to take on the burden of graduating with hundreds of thousands of dollars in student loan debt and no guarantee of a job or attaining valuable skills.

The BLS released a comprehensive list of jobs that require degrees—and those that do not. The agency reports and lists the top ten job employment agencies found hardest to fill in 2013. Fourteen of the 20 fastest-growing occupations in America require an associate degree or less. Of the 20 occupations leading job creation trends through 2020, 90 percent will require on-the-job training, an associate's degree or a postsecondary credential. Most these include many professions within the construction industry.

Today, as the millennial generation graduates from high schools, vocational schools, and colleges, they are presented with many career opportunities. Our experience tells us there is demand for people who are ready to work right out of high school and that there are opportunities for them to obtain the training they need to be set up with a career in the skilled construction trades. After a few years of dedicated training, they will end up with what every one of us would like to have to be a successful adult: a good paying job with health and retirement benefits. We strongly believe the best entitlement program out there should be a job.

Over 70 years ago, NECA and the International Brotherhood of Electrical Workers (IBEW) embarked on a joint venture to develop the National Joint Apprenticeship Training Program (NJATC). Today, the newly rechristened “*electrical training Alliance*” invests \$100 million in private funds annually in what we believe is the largest and most successful apprenticeship and training program in the nation. Today, there are more than 300 jointly administered local programs that are trust financed and together we have trained over 350,000 apprentices to journeyman status.

Our apprenticeship program is a well-organized and supervised method to train people with little or no prior knowledge of a craft or trade to become capable, qualified craftspersons or journeypersons. It is an “earn while you learn program.” The “on-the-job” portion of the training is a full-time, well-paid job. The goal is to provide the electrical construction industry with the highest level of training and highly skilled workforce possible. To accomplish this goal, apprentices receive the highest level of training in the industry, with a requirement of 8,000 hours of on-the-job training and 900 hours of classroom time over a five-year period. Upon completion of the curriculum and on-the-job training, apprentices receive certificates documenting their successful completion of the program. Incidentally, all electrical apprentices receive incremental raises as they reach certain set milestones. They are not a burden to the taxpayers because the training is fully funded by the industry without any taxpayer assistance. Perhaps the greatest

benefit is that in the end they are earning while they are learning. Each year, participants in the program contribute in excess of \$600 million dollars in federal, state, and local taxes. Lastly, they also receive retirement plans and medical coverage for themselves and their families that are also provided at no cost to the American taxpayer.

I expect there will be opportunities for Congress to address apprenticeship programs in a manner that is intended to empower employers, and provide America's workers with access to a network of job training services. I know Ranking Member Rush has had important legislation pending in the last Congress and I urge the Committee to consider his legislation this time around.

Addressing our nation's current and future employment needs is critically important and we believe the existing apprenticeship infrastructure provided by construction trades is a sure-fire bet for success. More important, the program is 100 percent industry designed and funded and is a wheel that does not need to be reinvented.

Technology

A major challenge is that each year the electrical industry experiences significant advances in technology, both on the jobsite and in how individual contractors run their businesses more efficiently. In order to be an efficient and independent construction company, we must continue to expand the technologies that are available to us. We are in a constant state of learning and adapting to new tools and ways of doing things, coupled with an aging workforce, that's led us in the Mahoning Valley, to place an emphasis on education and training. We are using and experimenting with technologies that are revolutionizing the construction industry. These include: Google Glasses, 5-D Drawings, Augmented Reality, 3-D Printing (Additive Manufacturing), GPS Positioning Tools, Tablets, and Pre-Fabrication. Employing a trained and available workforce enables the local contractors to confidently and competitively bid on the broadest range of commercial, industrial and residential electrical projects. That said, we have incorporated the more technical nature of building trades electrical work into their apprentice recruiting efforts. For example, some of our apprentice classrooms also use audience-response technology for instructors to gauge apprentices' familiarity with the material in real time, and so they can adjust lessons accordingly. We must meet the technology challenge if we are to go to build the next generation workforce.

Helping Employees Fight Prescription Drug Abuse

Recent studies by the Centers for Disease Control and Prevention (CDC) show that nearly two million Americans are abusing prescription opioids, with sales of those prescriptions nearly quadrupling from 1999 to 2010. Employers need additional resources to help combat and limit employees' use of prescription painkillers. We should have laws in place that require personnel to take drug tests for prescription painkillers and encourages employees to seek alternatives to their use. Prescription opioid-related dependence and abuse cost the country an estimated \$78.5 billion. Employers bear a large share of those costs; some \$16.3 billion is lost due to reduced productivity and increased disability, and \$14 billion is borne by private health insurers. We need to do better.

Opportunities Ahead

Energy production within the oil and gas industry has proven to be one of the most promising job creators. There is no better example of job creation than VEC. By building and updating its current petroleum infrastructure, VEC's goal is to help America become energy independent. To date, VEC has invested over \$10 million in vehicles, equipment, and buildings over the last three years alone. In 2014, VEC again enhanced its capabilities with a \$4 million expansion to its fabrication shop in Hubbard, Ohio. This 22,000-square-foot fabrication facility created more than 30 jobs fabricating equipment for oil and gas and other industries. It is only one example of VEC's plan to continue embracing technology and recognizing possibilities for the benefit of its clients, employees and community. The facility will have the capabilities to manufacture skid design and fabrication, pipe fabrication, ASME-coded pressure vessels, launchers and receivers, separators, hydrotesting, sandblasting, coating and painting and walkways.

Prior to the oil and gas energy boom, this scope of work experience was not prevalent in Youngstown, Ohio. In fact, it did not exist in most of the Midwest. The area surrounding Youngstown has seen tremendous growth directly and indirectly because of the oil and gas industry. As noted, the direct economic impact can be seen in VEC's rapid expansion in not only its revenue but also the number of employees the company has hired and retained. Oil and gas has both directly and indirectly made up over 65 percent of our revenue over the last three years. We expect to have 350 to 400 employees by this summer. These numbers continue to rise as the company continues to expand. Many of these new team members come from a whole variety of industry backgrounds, including teachers, policeman, factories (now closed), students, non-profit, and food services industries, just to name a few.

This economic impact expands beyond the walls of VEC in Ohio, creating a positive economic impact on the regional economy. While we are now focusing on staying east of the Mississippi, we are currently working in eight different states including Ohio, Pennsylvania, Kentucky, Virginia, North Carolina, South Carolina, North Dakota and Wyoming.

Conclusion

Thank you for the opportunity to testify at this very important hearing. NECA applauds the Subcommittee's unwavering efforts to examine these important components of our booming energy economy. We were pleased with the progress this Committee made last Congress in moving comprehensive energy legislation forward and hope a final package can quickly come together this year. We will continue to offer our support in helping advance the Subcommittee's agenda and look forward to working with you all as you move forward in enacting smart and sound policy to help foster American energy independence, grow the construction industry, and expand our nation's economy.

Mr. UPTON. Thank you, Mr. Ferry.

Mr. O'Sullivan, if you are ready. Right here. We were a little worried, you didn't take that water.

Mr. O'SULLIVAN. I am wearing a tie.

Mr. UPTON. All right.

Mr. O'SULLIVAN. I am recovering from a cold, thanks.

Mr. UPTON. All right. Well, welcome.

STATEMENT OF TERRY O'SULLIVAN

Mr. O'SULLIVAN. Chairman Upton, Ranking Member Rush, and members of the Subcommittee on Energy, on behalf of the 500,000 strong, proud, and united men and women of the Laborers' International Union of North America, I want to thank you for the opportunity to testify here today. It is both an honor and a privilege to do so.

As the people who build, repair, and maintain our Nation's critical energy infrastructure, LIUNA members support a reasonable, rational, fact-based energy policy. We support regulatory reform that streamlines the permitting process, allows reviews by separate agencies and entities to proceed concurrently, and provide, for timely, definitive decisions that enable approved projects to proceed without delay. This should be a bipartisan agenda to create millions of new jobs across many sectors of the economy, while modernizing our vital energy infrastructure and ensuring America's energy independence.

The American Society of Civil Engineers has given our energy infrastructure a grade of D plus, yet opposition to almost every energy project has threatened to derail all serious attempts to address this crisis. It also threatens the creation of good, middle-class-family-supporting jobs.

For workers in communities throughout the United States, pipeline projects are lifelines. Today, LIUNA has more than \$50 billion worth of pipeline work under contract. Tens of thousands of highly trained, safe, and skilled building trade members are being put to work for years to come on projects such as the Dakota Access Pipeline that the President's Executive Order has allowed to move forward, the Atlantic Sunrise pipeline, the Rover pipeline, the Atlantic Coast pipeline, the Sabal Trail pipeline, and the PennEast pipeline. And these are just the tip of the iceberg.

Although these jobs, like all construction jobs, are temporary by nature, anyone who has a clue about the work we do knows that by stringing together one temporary job after a number, construction workers are able to provide for their families and save for retirement.

At a time when it is harder and harder to succeed without a college education and the debt that goes with it, LIUNA and other building trades unions are one of the few places where a high school graduate can enter an apprenticeship program, learn a trade, become a qualified journeyman and build a rewarding middle class career.

LIUNA does not deny climate change. In fact, we are one of the few unions that supported cap-and-trade legislation and that sought to build common ground with some environmental groups. But we became disillusioned, disenchanted, and disheartened as we

watched many environmentalists abandon reason and oppose each and every pipeline project and the jobs they would create because they want to leave all oil and gas in the ground, which would leave many Americans in the cold, in the dark, and in the red from high energy prices. This keep it in the ground mentality ignores the reality that these resources continue to be pulled out of the ground anyway and transported by means that are riskier and less environmentally sound than the pipelines these groups loudly oppose.

Again and again over the past few years, some of these groups have misled legitimate regulatory processes to delay projects indefinitely and to needlessly repeat environmental reviews in the hopes that they will get the answer that they want. Frankly, it is not the pipelines that are dirty. It is the politics surrounding them. Keep it in the ground isn't a viable energy policy. It's an unreal, unattainable, uninformed slogan. It is time to embrace a comprehensive, rational, common sense energy policy.

Finding realistic, environmentally responsible solutions to our energy infrastructure problems isn't a Republican issue or a Democrat issue. It isn't a conservative issue or a liberal cause. It is an American issue.

Thank you for the opportunity to offer this testimony. I look forward to answering any questions you might have and to working with you in the future.

[The prepared statement of Mr. O'Sullivan follows:]

Laborers'
International
Union of
North America

LIUNA!

Feel the Power

**TESTIMONY OF TERRY O'SULLIVAN
GENERAL PRESIDENT
LABORERS' INTERNATIONAL UNION OF NORTH AMERICA
ENERGY AND COMMERCE COMMITTEE
SUBCOMMITTEE ON ENERGY
U.S. HOUSE OF REPRESENTATIVES
FEBRUARY 15, 2017**

Chairman Upton, it is an honor to be invited to this hearing. On behalf of the 500,000 strong, proud, and united men and women of the Laborers' International Union of North America (LIUNA), thank you for the opportunity to offer testimony to your committee. Thank you, as well, for your longstanding support for the members of our Union; for your commitment to protecting the living standards of all workers and their families; and for your leadership in reauthorizing the James Zadroga 9/11 Health and Compensation Act. I also want to thank Ranking Member Rush, and all the committee members for all your work, and for listening to what I have to say.

As the people who build, repair, and maintain our nation's critical energy infrastructure, LIUNA members support a reasonable, rational, fact-based, all-of-the-above energy policy that creates middle-class jobs, meets America's growing energy needs, fosters energy independence, protects the environment, and minimizes greenhouse gas emissions. We have watched with dismay as environmental extremists have distorted the facts, disrupted work sites, harassed our members, and abused the regulatory process to obstruct and delay critically needed projects. I therefore appear before you today to voice our support for regulatory reform that:

- Streamlines necessary review processes
- Allows reviews by separate agencies and entities to proceed concurrently
- Provides for more definitive permitting processes that enable projects to move forward without delay once all regulatory concerns have been addressed.

I also wish to add LIUNA's voice to those calling for the speedy filling of vacant spots on the Federal Energy Regulatory Commission (FERC), so that FERC has the quorum necessary to move forward with regulatory reviews and approvals.

Moving forward with this non-partisan agenda will facilitate significant private investment that will create millions of new jobs across all sectors of the economy. It is also critical to addressing and improving the vital energy infrastructure that keeps our lights on, that heats and cools our homes and businesses, and that moves people and goods across the country. This infrastructure is in desperate need of repair and modernization. In its most recent report card on the state of America's infrastructure, the American Society of Civil Engineers gave our energy infrastructure a grade of D+. Yet while we continue to rely on aging electrical grids and pipeline systems, opposition to almost every energy project threatens to derail any attempt to strengthen and improve that infrastructure. It also threatens the creation of good, middle-class jobs.

During the Great Recession, the unemployment rate in the construction sector reached nearly 30%. Were it not for the jobs created by the boom in North American energy development, tens of thousands more workers would have been forced into unemployment. These were good unionized jobs that require a high degree of training and expertise; pay family-sustaining wages with good health insurance benefits; and help provide pensions for the workers when they retire. During the height of the Great Recession, pipeline projects served as lifelines to workers and communities that might otherwise have gone under.

President Trump's executive order clearing the way for the completion of the Dakota Access Pipeline put approximately 4,400 building tradespeople, including 1,000 LIUNA members, back to work. His approvals of the Atlantic Sunrise and Rover pipeline projects will generate several thousand construction jobs, including approximately 2,000 for LIUNA members.

These three projects are among 20 unionized pipeline projects spanning 20 states that are either under construction, about to begin construction, or awaiting approval. At their peak, we expect all of these projects will employ tens of thousands of highly trained, safe, skilled union tradespeople, including approximately 13,000 LIUNA members. The more than five thousand miles of state-of-the-art pipeline these projects are leaving behind are safer, more environmentally sound, and emit fewer greenhouse gases than any other method of transporting energy resources.

For the hard-working members of LIUNA and other building trades unions, these figures are far more than mere numbers on a spreadsheet. They are the means to put food on their families' tables, roofs over their heads, and gas in the tanks of their cars and trucks. These jobs enable them to put their children through college, to save for retirement, and to spend money in business establishments that employ others. Although, like all construction jobs, these jobs last only as long as it takes to complete the project, a steady succession of such so-called "temporary" jobs is what enables construction workers to build rewarding, middle-class careers, and to lift themselves and their families out of poverty. It is ironic that among those who dismiss these jobs because of their "temporary" nature are Hollywood celebrities whose careers are built on similarly temporary jobs in the entertainment industry, and politicians whose own jobs have specific end dates.

Our country needs a common-sense energy policy. Replacing foreign sources of energy with domestically produced energy makes sense. Fostering domestic job creation instead of funding foreign extremists is a rational goal. Incrementally lowering emissions makes more sense than the "all or nothing" approach embraced by the political extremes. And if everyone has a stake in the future of the planet, then everyone deserves to have a voice in the debate. All work has dignity, and no one should be attacked or degraded because s/he seeks to earn a living and provide for his/her family.

LIUNA's support for an all-of-the-above energy strategy reflects the fact that our members work not only on pipelines, but in every sector of the energy industry, including nuclear, wind, and solar. As we meet here in the comfort of this hearing room, our members are hard at work building solar plants in the heat of the California desert, wind farms in the Midwest, and a nuclear facility in Georgia.

LIUNA and the other building trades unions invest hundreds of millions of dollars in training that enables our members to develop the knowledge and skills they need to work safely and productively while constructing energy and other infrastructure to the highest standards. At a time when it is harder and harder to succeed without a college education and the debt that goes with it, LIUNA and Building Trades Local Unions and training funds are the only places where someone can graduate from high-school, enter a training and apprenticeship program, become a qualified journeyman, and build a rewarding middle-class career, all without spending a dime

in tuition. Indeed, apprentices earn while they learn, bringing home steady paychecks that increase as their training progresses. LIUNA is proud that for 114 years, we have provided generations of working-class Americans a pathway to the middle class. We are equally proud that, from the start, we have made that pathway available to all, regardless of race, ethnicity, or national origin.

LIUNA was one of the first unions to endorse a comprehensive cap-and-trade system. Because so many of our members hunt, fish, bike, hike, and camp in the very places they work, they have a vested interest in working in ways that protect nature, reduce harm, and leave the smallest environmental footprint possible. Several years ago, we sought to build common ground with many environment groups, but we became disillusioned, disenchanted, and disheartened by former allies who have found it impossible to embrace rational dialogue and compromise as a model for positive change.

Unleashing the wealth of *all* of America's energy resources will create economic opportunities in communities across the country, while making us less dependent on energy from nations that seek to undermine the American ideals of freedom and liberty. Adequate investment in surface transportation, water infrastructure, and domestic energy will create millions of jobs for workers across all segments of the economy. We can help grow our economy, rescue struggling working Americans, and leave behind real assets that will benefit taxpayers and our entire nation for generations to come. This isn't a Republican issue or a Democratic issue; it's an American issue. Every American benefits from good roads, safe bridges, clean drinking water, and affordable energy.

Thank you for the opportunity to offer this testimony. We are eager and excited to work with you in the future. Together we can build America so America works.

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Mr. UPTON. Thank you very much.
Mr. Mahmoud, welcome.

STATEMENT OF JOEY MAHMOUD

Mr. MAHMOUD. Thank you. Thank you, Mr. Chairman, it is a pleasure to be here. My name is Joey Mahmoud, I am the Executive Vice President for Energy Transfer Partners.

Over the course of the last 6 months this project, and our company, have been subjected to a series of politically motivated actions by the previous administration, accompanied by a host of half-truths and misrepresentations in both social and mainstream media.

Dakota Access is a \$3.8 billion, privately funded pipeline project which, during the course of construction, has employed more than ten thousand skilled workers and unskilled workers. During its entire 1,172-mile journey from North Dakota to Patoka, Illinois, it does not cross a single inch of Tribal reservation or trust land, and it only crosses a mere 1,094 feet of Federal land.

During the greater than 2 1A½-year-long permitting process for the whole project, we and the Army Corps of Engineers reached out to and accommodated 55 different Native American Tribes or groups. Of these Tribes, the Standing Rock Tribe was the first Tribe we actually approached and gave a presentation to in September, 2014. It was clear from their response they had no interest in discussing the project with us. In addition to our efforts, the Army Corps reached out to the Tribe on nine separate occasions. Despite these efforts, the Standing Rock declined to participate in any meaningful way.

On July 25, 2016, the Army Corps brought to conclusion its 2-year-plus review of the project, issuing an Environmental Assessment approving, among other things, our application for a crossing of the Missouri River at the current location, as it sits today.

After declining to participate in any meaningful consultation, the Tribe, supported by Earthjustice, brought a legal action seeking to block the project.

On September 9, 2016, a Federal judge issued a 58-page opinion rejecting the Tribe's request for a preliminary injunction and finding that the Tribe largely refused to engage in consultations.

However, within minutes of the judge's ruling, the Departments of Justice, Interior, and the Army issued a joint statement indicating that, notwithstanding their successful defense of the permitting process in Federal court, they were not deciding to issue an easement at that time.

Perhaps the most prominent, and ill-founded, of the misconceptions is that Dakota Access represents a threat to the Missouri River and those who rely on it for drinking water. Nothing could be further from the truth. Much of the oil from the Bakken is currently being transported across the Missouri River via truck and rail transportation, modes which, statistically, are far more likely to experience a spill than pipelines.

Perhaps even more, the greatest irony in a saga replete with ironies is that the Standing Rock have just relocated their Missouri River water intake more than 70 miles downstream from this pipeline. However, there is a rail crossing that crosses 1.6 miles from

their new intake that moves hundreds of thousands of barrels per day.

Others have asserted the route chosen for the pipeline was indifferent to, and would disrupt, archeological sites of importance. Again, this is totally contrary to the facts.

Dakota Access employed dozens of cultural experts to work alongside State and Tribal cultural officials to ensure that nothing of cultural, historic, or sacred significance was disturbed. Based on these experts' findings, the project

undertook 140 different route changes in North Dakota alone.

Indeed, the selection of the river crossing itself was largely driven by a desire to ensure the protection of cultural resources. The river crossing site for the Dakota Access Pipeline is located in an existing utility corridor which already includes two pipelines, the Northern Border Natural Gas pipeline and a high-voltage electric transmission line, both built in 1982.

The easement, which has been the focus of so much public attention since this has occurred is a simple ministerial document which was part and parcel of the river crossing permit. The easement was arbitrarily withheld by the former Assistant Secretary of Civil Works and was not received until last week. We can only speculate as to her motivation, but what is abundantly clear is that the Department of the Interior, and most likely senior members of the White House staff, interfered deeply and inappropriately in the waning stages of the regulatory process.

What is also clear is that I and other senior representatives of my company sat in the Department of Justice, while representatives of that agency, the Army and the Department of Interior repeatedly made factual misrepresentations about the process and their intentions.

Finally, it is abundantly clear that notwithstanding the repeated public pronouncements that the Army Corps and Dakota Access had complied with all applicable requirements for construction of the pipeline, and notwithstanding two successful defenses of the permitting process in two Federal courts, these agencies have made the political decision that they were not going to issue the permit or the easement at that time.

Mr. Chairman, we came to realize that even a company as large as Energy Transfer is helpless in the face of a Government that will neither obey nor enforce the law. We came to realize that playing by the rules can count for little. And we came to realize that good faith efforts to accommodate with the many different stakeholders involved can be a fool's errand when political motivation overrides the law.

I suggest, and as I indicated, the easement withheld by the politically appointed Assistant Secretary was the sole remaining administrative step needed for completion of this project. This \$3.8 billion, 1,172-mile pipeline had already received all other necessary Federal, State and local permits, as well as all the rights-of-way necessary for completion of the project. All of this was accomplished over a 2-year period.

I would respectfully submit that a project of this size does not receive those approvals in that time frame unless it places a heavy

emphasis on cultural and social concerns, is sensitive to diversity and gives great deference to the environment.

With that, sir, I thank you for your time and I look forward to your questions.

[The prepared statement of Mr. Mahmoud follows:]

House Energy and Commerce Committee
Subcommittee on Energy
Hearing on Modernizing Energy and Electricity Delivery Systems
February 15, 2017

Testimony of Joey Mahmoud
On behalf of Energy Transfer Partners

Mr. Chairman, it is a pleasure to be here today. I am Joey Mahmoud, project executive for the Dakota Access Pipeline and Executive Vice President of Energy Transfer Partners.

Over the course of the last six months this project, and our company, have been subjected to a series of politically motivated actions by the previous administration, accompanied by a host of half-truths and misrepresentations in both social and mainstream media. These have inflicted significant financial and reputational damage on our company. For the most part we have refrained from public comment while we worked directly with the regulatory agencies, the Native American community and the last administration in an effort to bring this matter to a satisfactory close. Sadly, those efforts came to naught.

We are now prepared to tell our side of the story. In so doing, I hope to introduce some important, and badly needed, reality to the discussion.

Dakota Access is a \$3.8 billion, privately funded pipeline project which, during the course of construction, has employed more than ten thousand skilled and unskilled workers. During its entire 1172 mile journey from the Bakken shale in North Dakota to Patoka, Illinois it does not cross a single inch of tribal reservation or trust land. It crosses a mere 1094 feet of federally owned land.

During the greater than two year-long permitting process for the project we and the Army Corps reached out to, and accommodated, 55 different Native American groups. Among the tribes, it has been the Greater Sioux Nation, led by the Standing Rock Sioux Tribe, who have resisted to a degree that have generated national attention. The Standing Rock Tribe was the first tribe we approached and our initial presentation to them was made in September, 2014. Over the next two years we continued to reach out to the tribe, both publicly and privately. It was clear from their response they had no interest in discussing the project with us. In addition to our efforts, the Army Corps reached out to the tribe on nine separate occasions. Despite these efforts the Standing Rock declined to participate in any meaningful way.

On July 25, 2016, the Army Corps brought to conclusion its two-plus year review of the project, issuing an environmental assessment approving, among other things, our application for a crossing of the Missouri River at the current site. After declining to identify specific objections to the project and repeatedly rejecting any meaningful efforts at consultation, the tribe, supported by Earthjustice, brought a legal action seeking to block the project. On September 9, 2016, a federal judge issued a 58-page opinion rejecting the tribe's request for a preliminary injunction and finding that the tribe "largely refused to engage in consultations."

Within minutes of the judge's ruling the Departments of Justice, Interior and the Army issued a joint statement indicating that, notwithstanding their successful defense of the permitting process in federal court, they were declining to issue an easement—the only outstanding document needed for completion of the project. That easement was not issued for another five months,

during which time a host of misconceptions about the nature of the project attracted nationwide attention.

Perhaps the most prominent, and ill founded, of these is that Dakota Access represents a threat to the Missouri River and those who rely on it for drinking water. Nothing could be further from the truth. Much of the oil from the Bakken is currently being transported across the Missouri River via truck and rail transportation—modes which, statistically, are far more likely to experience an oil spill than a new, state-of-the-art pipeline. The Dakota Access pipeline, which will be at least the 15th pipeline to cross the Missouri, will employ state-of-the-art technology and will be buried more than 90 feet *below* the lowest part of the river.

Perhaps the greatest irony in a saga replete with ironies is that the Standing Rock have just relocated their Missouri River water intake to a point more than 70 miles downstream from the pipeline crossing, but less than two miles downstream from a railroad crossing that is known to carry large amounts of crude oil in tank cars. To cast this as a dispute about protection of water resources is, quite simply, at variance with the facts and it ignores universally accepted scientific and engineering practices.

Others have asserted the route chosen for the pipeline was indifferent to, and would disrupt, sites of archeological importance to the tribe. Again, this is totally contrary to the facts. Dakota Access employed dozens of cultural experts to work alongside state and tribal cultural officials to ensure that nothing of historic significance was disturbed. Based on their findings, the project undertook 140 route changes in North Dakota alone. Indeed, the selection of the river crossing

site was largely driven by a desire to ensure the protection of cultural resources. The river crossing site for the Dakota Access Pipeline is located within a utility corridor which already includes the Northern Border Natural Gas Pipeline and a high voltage electric transmission line.

Some have alleged that the crossing site was chosen in an effort to avoid crossing at the more populous site north of Bismarck. That is simply not true. The Army Corps' extensive alternatives analysis found that crossing at the northern site would require the crossing of an additional 33 waterbodies that are connected to or drain to the Missouri River and 21 additional wetland crossings. Quite simply, the site chosen is, by far, the most benign site for the crossing, and would reduce impacts to stakeholders and the environment.

The facts above were conspicuously absent from either the social or mainstream media coverage of the protest movement. To have followed this dispute only through those media would have led one to believe that the protest movement was all about a small band of Native Americans peacefully expressing their First Amendment rights in opposition to the project. While that may have been the case at the outset, it quickly ceased to be so as the protest grew in size and intensity. And, whatever the motivation of the protestors, this movement was far from peaceful.

Protestors assaulted numerous pipeline personnel, one of whom required hospitalization. Millions of dollars in construction equipment was destroyed. Two publicly owned vehicles were burned and a pistol was fired at law enforcement personnel. The makings of improvised explosive devices were found at a bridge crossing, one of which exploded causing a protestor to lose her arm. Local ranchers reported incidences of stolen cattle, buffalo, fuel, and farm

equipment. As of February 9, over 660 protestors have been arrested for arson, criminal trespass, interference with law enforcement personnel, and in one case, attempted murder. Fewer than 6% of those arrested are from North Dakota.

Beyond the protest at the river crossing site, Energy Transfer offices across the country were vandalized. Our employees have been and continue to be subjected to disparagement and threats. Most frighteningly, several of our employees and their children have been subjected to death threats.

Whether directly or not, the protest movement induced individuals to break into and shut down pump stations on four operational pipelines. Had these actions been undertaken by foreign nationals, they could only be described as acts of terrorism.

The unfortunate truth, which I would respectfully urge this Committee and the Congress to recognize, is that this is a well-organized and well-funded effort based primarily on hostility to fossil fuels. We have received numerous reports that some of the protestors are being paid, and the North Dakota Commissioner of Revenue is investigating. Law enforcement personnel have also reported that a number of the protestors appear to have been professionally trained.

Whether those being paid for their protest efforts share the agenda of those paying them is unknown, but what is known is many are now showing up in resistance to other pipeline projects. Far from being an exception, I fear the aggressive tactics we have seen in North Dakota will soon be the norm—if they are not already.

Perhaps most troublesome is the support given these efforts by the recently departed administration. Their politically driven interference in the statutory and administrative permitting process first became apparent in late July of last year. As I indicated, Dakota Access had received all necessary permits for completion of the project, including approval to cross the Missouri River, as of July 25. The "easement" which has been the focus of so much public attention since, is a simple ministerial document which was part and parcel of the river crossing permit. That easement was arbitrarily withheld by the former Assistant Secretary of the Army, Civil Works and was not received until last week.

We can only speculate as to her motivation, but what is abundantly clear is that the Department of the Interior, and most likely senior members of the White House staff, interfered deeply and inappropriately in the waning stages of the regulatory process. What is also abundantly clear is that I and other senior representatives of my company sat in the Department of Justice while representatives of that agency, the Army and the Department of Interior repeatedly made factual misrepresentations about the process and their intentions. Finally, it is abundantly clear that notwithstanding their repeated public pronouncements that the Army Corps and Dakota Access had complied with all applicable requirements for construction of the pipeline, and notwithstanding two successful defenses of the permitting process in federal court, these agencies had made the political decision that they were not going to issue the easement.

Mr. Chairman, we came to realize that even a company as large as Energy Transfer is helpless in the face of a government which will neither obey nor enforce the law. We came to realize that playing by the rules can count for little. And we came to realize that good faith efforts to reach

accommodation, whether with the Native American community or our own government, can be a fool's errand when political motivation overrides the rule of law.

As I indicated, the easement withheld by the politically appointed Assistant Secretary was the sole remaining administrative step needed for completion of this project. This \$3.8 billion, 1172-mile pipeline had already received all other necessary federal, state and local permits, as well as all other rights of way necessary for completion of the project. All of this was accomplished over a two-year period. I would respectfully submit that a project of this size does not receive those approvals in that time frame unless it places a heavy emphasis on cultural and social concerns, is sensitive to diversity and gives great deference to the environment.

When that is no longer enough, the ability to build infrastructure in this country is in grave jeopardy.

I look forward to your questions.

Mr. UPTON. Thank you. Thank you. Thanks, all of you, for your testimony.

So let me just say a couple of things. So as you all know, I am from Michigan. I am no stranger to controversies surrounding pipeline safety. I want to say one of my first bills when I when I first elected was establishing an oil spill response team from the Great Lakes, something that we did not have when I served on the Transportation Committee.

I would note that the rate of accidents has fallen significantly in recent years and we have seen more stringent Federal regulations and closer oversight but there is, obviously, more work that has to be done.

I had a spill not too far from my district back in 2010 in the Kalamazoo River. I worked across the aisle with then-Chairman Dingell. This is the Dingell Room. Chairman Dingell was here to cut down on the time that it takes to report a spill. The old rules were it had to be reported on a timely basis. In the case of the Kalamazoo River, it was days. It is now 24 hours without heavy fines.

So we have, in the last couple of years, we have actually done two reauthorizations of pipeline safety bills. Both bills passed out of this committee. We worked with the Transportation Committee. Overwhelmingly bipartisan. I want to say, I don't think there was a single Member that voted against that bill when it reached the floor. President Obama signed it into law, both of the bills. And I would note that we have a Line 5, which connects the upper peninsula with the lower peninsula. So, when you say you are from Michigan, make sure you put both hands up. But we had some special provisions from here. I had some special provisions that were added for safety and transparency available to the public.

So the bottom line is, this committee is not afraid to tackle this issue. We don't want any pipeline spills. And in the case of the Kalamazoo spill, a million gallons, it cost the pipeline company, Enbridge, a billion dollars to clean that up. So these are not the light issues.

Mr. Mahmoud, you talked about there are other alternatives to pipelines that include rail, they include truck. I think we know the answer but is there a safer, more economical way than a pipeline?

Mr. MAHMOUD. Thank you. No, sir, there is not. Statistically pipes are significantly safer than other forms of transportation. Actually, the safest form of transportation of any mode of transportation are pipelines.

Mr. UPTON. Mr. Harrison noted in his testimony that there were some secret documents, the words that you used, relating to safety. Can you expand on that?

Mr. HARRISON. Real simply, during some of the meetings when we asked for that very transparency that some of these bills are pushing, we get met with words such as proprietary and confidential and we can only give you certain things. A pipeline of this nature, it would go a long ways to have that transparency up front. What are we dealing with? What are we trying to sign off on as individuals?

Mr. UPTON. One of the things that was in the testimony from Mr. Mahmoud was that you did look at alternatives, right? You looked at a number of different alternative routes. Is that correct?

Mr. MAHMOUD. Yes, sir.

Mr. UPTON. And how many different routes did you look at?

Mr. MAHMOUD. In the U.S. Army Corps of Engineers, there was one additional alternative route in addition to what is called the no action alternative. However, in preparation for the development of the project, my company looked at many, many alternative routes to connect the Bakken crude oil to Patoka, Illinois.

Under the Environmental Assessment for the U.S. Army Corps of Engineers, they are only required or looked at the crossing at Lake Oahe which, in this case, included the two alternatives which one being the route alternative and two being the no action.

Mr. UPTON. Now, one of the things that I did, as we moved this legislation forward, it was called the Upton-Dingell bill, was when a pipeline goes underneath a major water source, a river, a lake, rather than the old days of simply what they called trenching it, laying the pipe down, putting cement bags or rocks on either side to bolster its security, they actually now, for major water sources, they actually bore underneath that water source. Is that what you are doing in Lake Oahu? Is it Oahu, is that how you say it?

Mr. MAHMOUD. Lake Oahe.

Mr. UPTON. Oahe.

Mr. MAHMOUD. Yes, sir. And that is correct.

Mr. UPTON. Is it correct that it is like 90 feet underneath? So you are doing exactly what we said in this committee when we passed the reform legislation that instead of trenching, you are actually going fairly deep underneath that water body. Is that correct?

Mr. MAHMOUD. Yes, sir, that is correct, 90 to 115 feet.

Mr. UPTON. All right, my time has expired.

Let me yield to the ranking member of the subcommittee, my friend Bobby Rush from Illinois.

Mr. RUSH. I want to thank you, Mr. Chairman. Mr. Chairman, I just want to say that I am always—most of my life I have always been a fighter for those who don't have a voice, those who are marginalized, those who have little respect. Instinctively, I am concerned about this issue, although, Mr. Chairman, I want to be open-minded on this because I am interested in how the energy sector in its entirety produces jobs for people in my district and similarly situated districts all across the Nation. So, this is a challenge for a lot of us who want respect, progress, jobs, economic viability. We also want to have environmentally sound policies and projects.

I have a question I am going to ask Mr. Harrison. First of all, Mr. Harrison, in your testimony you said that the Tribe does not philosophically or etiologically oppose economic development, energy independence, or protection of national security. But you oppose development that is unattainable without your consent that puts your people, your cultural sites, and your natural resources at risk.

Were you consulted at all during this decisionmaking process?

Mr. HARRISON. Just to clarify, were we consulted?

Mr. RUSH. Yes.

Mr. HARRISON. Not at the level that we feel that the law should provide or actually does provide.

A lot of the issues have centered around the words “meaningful consultation.” Attending a couple of public hearings does not fit that bill. And I just want to reiterate, at the very meeting that Mr. Mahmoud mentioned, in 2014, the Tribal Council adopted a resolution opposing this. That is the strongest statement that we can make, as a Government, in opposition to this project.

At that point, there was little to no real consultation as to resolve that resolution or to address it. The project went forward, and there were some attempts at some minor communication, but consultation, no.

Mr. RUSH. So when you say that they tried to ram this project down the throats, would you say that this company tried to ram this project down your throats without any respect or any real input, without any buy-in from you and your Tribe?

Mr. HARRISON. I think this project was going to go forward whether we objected or not. And we feel that that should be addressed at the front end. There should be some consensus, some real input, which we did not have.

Mr. RUSH. Mr. Mahmoud, would you answer the same question or respond to what he said? Did you all include them in at the various stages of decisionmaking that would satisfy their need for buy-in or input into this process?

Mr. MAHMOUD. Thank you for the question. And yes, sir, I believe we did.

From the very beginning, as I mentioned, September of 2014, we gave our first presentation to the Standing Rock Sioux Tribe. From that time forward, we met with them or on occasion invited them to participate in seven different opportunities to have sit-down, very one-on-one dialogues to discuss their concerns, as well as any information that we could share regarding the routing, as well as the operation or design of the pipeline. And those requests for consultation were mostly denied.

We had some conversations with the Tribal chairman, who I respect greatly. But at the same time, we were not able to have meaningful consultation because of a lack of engagement.

Mr. RUSH. I have one final, one follow-up.

Did you all attempt to get a third party involved in this at all, either the Tribe or the company? Did you all attempt to get a third party to referee, if you will, the discussions?

Mr. MAHMOUD. Yes, sir, we did. We hired a Tribal liaison, who was a NEPA expert and an outreach specialist. She is actually an archeologist.

Mr. RUSH. An independent third party, not somebody that you hired.

Mr. MAHMOUD. Yes, sir, an independent.

Mr. RUSH. Thank you.

Mr. UPTON. Thank you.

Mr. WALDEN.

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

I have a question, Mr. Mahmoud: When you talk about NEPA, doesn't the Army Corps of Engineers have to follow a NEPA process?

Mr. MAHMOUD. Yes, sir, they do.

Mr. WALDEN. And does that NEPA process require consultation with Tribes?

Mr. MAHMOUD. Yes, sir, it does and they did.

Mr. WALDEN. And they did?

Mr. MAHMOUD. Yes, sir.

Mr. WALDEN. All the Tribes?

Mr. MAHMOUD. In the Northwest Region of the United States, they have a list of approximately, I think it is 55 different Tribes. They did reach out to all 55 Tribes, a total of 389 different attempts or consultations with those 55 Tribes occurred as part of the NEPA process.

Mr. WALDEN. And did they listen to those Tribes? Did they make any changes as recommended through the NEPA process from the Tribes to the route of the pipeline or any conditions?

Mr. MAHMOUD. Absolutely. On multiple occasions, we modified the route. In North Dakota, 140 different modifications. In particular, we made multiple alterations of the route, specifically as the result of consultations and surveys conducted in coordination with the Native American groups that participated.

Mr. WALDEN. And did the Native American groups also employ archeologists?

Mr. MAHMOUD. I am sorry.

Mr. WALDEN. Did they employ archeologists, as well?

Mr. MAHMOUD. Yes, sir, they did.

Mr. WALDEN. To identify any sacred grounds, any of those sorts of issues, right?

Mr. MAHMOUD. They provided their cultural and heritage specialists and some of those may or may not have been archeologists by training.

Mr. WALDEN. I understand.

Mr. MAHMOUD. Yes, sir, they did.

Mr. WALDEN. OK, fine. Thank you.

Mr. O'Sullivan, I know I support the Keystone pipeline. We voted on it here. It had 60-plus, I think, as I recall, additional safety requirements above and beyond the underlying American pipeline safety laws.

When I went home, I had Democrats and others attack me because these weren't real jobs because they were temporary jobs. I would like to get your view on that because I hope that like, if I build a house, which I have never done, but if I did, I would want it to be temporary in the sense I would want you to finish. But aren't those jobs kind of valuable? Isn't that what your folks do is a whole bunch of temporary jobs that make up for full-time family wage jobs with great benefits?

Mr. O'SULLIVAN. Absolutely, Congressman. And I want to thank you, personally, for your support on Keystone pipeline.

In my testimony, I talk about these are good, middle-class-family-supporting jobs.

Mr. WALDEN. What would the annual salary be, on average?

Mr. O'SULLIVAN. On a pipeline job, it depends on where it is at because that is the wage would depend on it. But it isn't anything for a member of my union to make \$70,000 or over \$100,000 on a pipeline project.

Mr. WALDEN. And do they get health insurance and retirement, things of that nature?

Mr. O'SULLIVAN. They get health insurance and they do get retirement security through a defined benefit pension plan.

So, there are some of the best jobs, those heavy in the highway sector, that we have in our entire organization.

Mr. WALDEN. Thank you.

Now, Mr. Mahmoud, the pipeline itself, are you going to pay any property taxes? Is anything going to local communities?

Mr. MAHMOUD. Yes, sir.

Mr. WALDEN. How much?

Mr. MAHMOUD. Millions of dollars. In North Dakota, \$13.1 million. In South Dakota—

Mr. WALDEN. Is that just a one-time payment?

Mr. MAHMOUD. It is an annual payment. So every year from now and for as long as that pipeline exists in the ground as property, it is taxed as real property.

Mr. WALDEN. So how much a year?

Mr. MAHMOUD. The valuations are done by the State taxing authority. But in year one, I will give you the stats: \$13.1 million for North Dakota, \$13.5 million for South Dakota, \$27.4 million in Iowa, and \$750,000 in Illinois.

Mr. WALDEN. So would I be right to assume that it would be somewhere in that range going forward per year?

Mr. MAHMOUD. That is a reasonable estimate, yes, sir.

Mr. WALDEN. All right, I am going to yield now to the gentleman from North Dakota, Mr. Cramer, the balance of my time, Mr. Chair.

Mr. CRAMER. Thank you, Mr. Chairman, and thanks to all of you for being here. A special welcome to Mr. Harrison, my constituent, and Mr. Mahmoud, my newest corporate citizen. It is great to have you all here.

I am going to start out by letting you know I was on the Public Service Commission in North Dakota for nearly 10 years. I carried the pipeline portfolio. I sited the original Keystone pipeline through North Dakota, through 600 landowners' land, nine counties, and they are very grateful, those rural counties, for that property tax relief that is offered.

Before I run out of time I will tell you that my intention going forward as I get to questions will be to dig in a little bit, Mr. Harrison and Mr. Mahmoud, on the consultation process, both as it has happened in this case and, probably as important as anything, Mr. Harrison, going forward, if in fact we can improve some of those things.

But I am also going to offer into the record some very specific documents to tackle it, including Judge Boasberg's ruling from last fall, Colonel Henderson's memo of record on December third, one day prior to the Acting Secretary of the Army for Civil Works changing that memo, at least the conclusions of that memo. So, with time running out, I will yield back, and those are the areas of exploration I want to go down.

Mr. UPTON. The gentleman from Oregon's time has expired.

The Chair recognizes the gentleman from Texas, Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman. And I want to thank our panel for being here. Normally, we don't have two panels in a day but I appreciate you all's patience.

First, Mr. President, I appreciate your being here. I have a great Laborers' Local in Houston that I work with all the time. You stated that the Dakota Access Pipeline would put about a thousand laborers back to work, and I see some of the orange shirts. Thank you all for being here.

You mentioned it and I have heard it that these jobs are temporary jobs, unlike refineries and chemical plants for my steel workers. They go there every day. But laborers literally in all of our building trades, they work on a project and then they may go down the road or go across the country the next day. So even though they are temporary jobs, but if you do that—and, where I come from, we have lots of pipelines and we need to keep making them better. So, but you mentioned about the temporary jobs. You could probably explain it better than I can, these jobs are site-temporary but they are full-time jobs that are created.

Mr. O'SULLIVAN. And thank you for your support, Congressman.

At the end of the day, we pride ourselves because we are builders. So we build pipelines, we build buildings, we build highways and bridges. And when that project is over, we move on to the next one.

So it is nothing for a member of my organization to have five or six different jobs in a year. Some of them may work on one job for multiple years, but ideally—not ideally, but regularly—what happens is that we move from project to project. We like longer-term projects better than shorter-term projects, but, at the end of the day, that is the nature of the construction industry. And, as I said in my testimony, we cobble together a temporary job after temporary job and create a construction career for those that we proudly represent and the building trades men and women as well.

Mr. GREEN. The Dakota Access Pipeline you said was a thousand laborers working. How many man-hours would a pipeline project like that create?

Mr. O'SULLIVAN. It would be millions. Congressman, I could get that for you. There was 4,500 building tradesmen and women that were also—so, there was a total of 4,500 union building tradesmen and women; 1,100 of them were laborers.

Mr. GREEN. What type of workforce programs do you have or development programs that—I know you have an apprenticeship program. I went through a 4-year apprenticeship as a printer, but I couldn't print the newspaper today. But could you also partner with local community colleges for training in your apprenticeship programs?

Mr. O'SULLIVAN. In many instances, we do, Congressman, in various places across the country. As an organization, we train almost 200,000 laborers a year and over 100 different environmental and construction skills training programs. We spend \$145 million of our own money training, upgrade training, apprenticeship training, the skills and abilities of those that we proudly represent. I believe it is one of the things that we do best and serves as the cornerstone of our organization is our ability to provide that quality training to keep up with new technologies to make sure that our members

have the diverse skills so that they can have a career as a construction laborer.

Mr. GREEN. Thank you, Mr. Chairman. I yield back my time.

Mr. UPTON. Thank you. Did you want a minute of his time? Well, there is a minute left.

Mr. RUSH. Mr. Sullivan, congratulations on our outstanding work. Laborers are a very important part of the Chicago workforce. My question to you is what about diversity among your members, diversity among your labor force, diversity among those who will be employed on this pipeline? Can you answer the question of diversity of workforce with the tens of thousands of people that you have trained and have been employed by your union?

Mr. O'SULLIVAN. So, Congressman, I could answer it in a general sense because we have about 350 local union offices across the United States and Canada, but the diversity of the community is usually very reflective of the diversity of our local unions and our membership.

And we are a very diverse organization. Now, if you go to Montana or other places, we would reflect the diversity there. But if we go to Chicago or if we go to New York, we go to California, usually, the diversity of the community is going to reflect the diversity of our organization.

Mr. RUSH. How diverse was your workforce on this pipeline?

Mr. O'SULLIVAN. On the Dakota Access?

Mr. RUSH. Yes.

Mr. O'SULLIVAN. I could get you that information. I don't have it at my fingertips, Congressman, but I would be happy to get it.

Mr. UPTON. The gentleman's time has expired. Thank you. Thank you for getting that information to us. We will look forward to seeing it all.

Vice Chairman of the Subcommittee Mr. Olson, from Texas.

Mr. OLSON. I thank the Chair and a big Texas howdy and welcome to Mr. Harrison, Mr. Ferry, Mr. O'Sullivan, and Mr. Mahmoud.

And a special howdy for Ms. Kann. You mentioned your friend named John, who served our Marine Corps. Is that correct? Was that his first name, John? I served in our Navy. So, please thank John for his service. And please remind him that he is within the Department of the Navy as a Marine. He will love you for it.

VOICE. The men's department.

Mr. OLSON. I am an optimist. As I said in my opening statement, we have to find a balance between jobs and growth and historic lands. If it is all black and white, nobody wins; we all lose.

And as I mentioned in my opening statement, I have got a great example back home in Sugar Land, Texas, a park for our veterans that kids go fishing in, have barbeques in, fly kites on. It is all on top of a natural gas pipeline. It has been that way for 10 years. Sugar Land found a balance and surely, North Dakota can find a balance. We can't seek perfection.

Mr. Mahmoud, you know we lost perfection the day Eve bit that apple. It has never happened since then. Nothing made by men is perfect. So please tell us, with that said, can you talk about some of the safety advances we have seen, what is going on with the pipeline right now to make it the safest pipeline ever?

Mr. MAHMOUD. Yes, sir and I appreciate that because this pipeline, by the pure fact that it is being built today, is safer than a pipeline that was built in the 1950s. The technology has improved. The steel that is used is higher quality. The formulas are better suited in our design to withstand the different forces that the earth puts on it on a daily basis, as well as the preventative steps that we take to ensure safety because that is our number one goal. Safety is always our number one goal. When we designed and we build a pipeline and we place it in these diverse communities, that is the number one thing we think about. So we always design to the latest standards and, most often, we go above and beyond.

So we use things such as automated valves. It is probably one of the greater technologies that a lot of pipeline companies and including Energy Transfer that we put in place so that you don't have to rely upon a field operator to go close that valve, but then you can actuate that valve remotely. So there are a lot of technologies that we employ above and beyond.

[Simultaneous speaking.]

Mr. OLSON. Shut off manually?

Mr. MAHMOUD. That is a complicated question. For oil pipelines, it doesn't quite work that way, but for a natural gas pipeline it absolutely works that way.

Mr. OLSON. Sorry for the confusion.

My final question is there for Mr. O'Sullivan and Mr. Ferry. One thing that divides us on this issue is a lack of pipeline certainty. Right now because FERC does not have a forum, nothing is moving from FERC. So please tell us, beyond that, and even beyond pipelines, can you talk about how important it is for project certainty when it comes to attracting and keeping skilled labor?

Mr. O'Sullivan, Mr. Ferry, whoever is up first.

Mr. O'SULLIVAN. Congressman, it is critically important. When I talk about, and I know this committee has, about the approval process, I mean in many instances, as we work with community colleges where we are training to need is that you don't want to train somebody and then they don't have a job for 6, or, 8, or 9 months, they feel as though they have been let down. So that training is absolutely critical and particularly as Joey was talking about, new technologies and things like that we try and keep our members and our apprentices up to speed on all of that.

And so if we could cut down, without cutting any corners—I am certainly not suggesting that—that every stakeholder should be heard, that it should be a fair, but there should be a beginning and an end. And that gives the kind of certainty to ramp up training, to ramp for jobs.

Mr. OLSON. Mr. Ferry, do you care to comment on that, sir?

Mr. FERRY. Yes, sir. Just to help everybody understanding, I will give you a little metaphor. When I went to work in the trade, I went to work every day to work myself out of a job. That is the type of temporary construction we are talking here. So we build buildings and when the building is done, we move on.

So to support what Mr. O'Sullivan is saying right here, yes, we go to work every day to work ourselves out but it is the training. It is the safety. It is all that.

We are doing the ETC Rover pipeline with ETC in Ohio right now. And I will tell you, everything is marched to the drawings, to the specifications. There are certifications we have to follow. There are testing procedures we have to follow, and it is all done with the whole intent of safety, of going to work every day to make sure my workers come home safe, but to make sure every day the product is completed and it is safe for the community.

Mr. OLSON. Thank you. My time has expired. I yield back.

Mr. UPTON. I like that answer because Rover is coming to Michigan, and we are going to need it. It is going to impact my district, I know.

Mr. Welch is recognized for 5 minutes.

Mr. WELCH. Thank you very much. I want to thank the panel.

A couple of things. One, the big issue about the pipeline is not so much the pipeline, the big issue about where it goes and how it affects folks there, and it is not about the jobs. Mr. O'Sullivan, you have a fantastic union and fantastic workforce. And if I have my way, we are going to put them together rebuilding America with a big infrastructure bill. I mean we need to get them doing the work. So I just want to thank you.

And also, Mr. Walden made the point we get it that if you are in construction, by definition, those are temporary jobs. So see the union folks here. Thanks for being willing to do the work where it needs to be done. That means spending time away from your family. That is hard.

The other thing I think we understand is that America has a lot of work that needs to be done. There is a lot of jobs. We have got low unemployment. There is not a lot of good paying jobs. And the challenge for us is more the paycheck than it is actually the job. And anything we can do to maintain those jobs, we should.

But there is another issue that hasn't really been discussed here that is important to a lot of us that is not about the union and it is not even about the location of where this pipeline goes. And that is, obviously, of enormous importance to the Tribal peoples and that is the whole climate change issue and how we get our energy. And that is a point of enormous contentious debate here in Congress about what should be our policy to try to move to less carbon-intensive forms of energy.

And I feel as though in the pipeline a lot of really good people, including these workers here, get caught in the crossfire. But that is an issue that we are not going to resolve here but where there is a lot of things that we can do that would achieve or move us toward the goal that I have of less carbon in the atmosphere that would involve good jobs for folks in your union.

You know the energy efficiency stuff that we have been working on, Mr. Chairman, that requires skilled workers to retrofit places and it requires real skills. And I hope we find an ability to work on the common ground so that we are going to pay some respect to these workers.

I do want to ask Mr. Harrison, I know for you this whole situation is in not just your backyard, it is in your yard. And I think all of us should have the capacity for some awareness that if it were our yard, we would have a passion about protecting our historical cultural rights.

Just tell me about your interaction with the pipeline folks and whether there was an effort to have you—you made an effort to try to locate the pipeline away from places that would encroach on important issues for you.

Mr. HARRISON. Thank you for pointing that out, Congressman. We often have to put it in that perspective that if the shoe were on the other foot, how would you react. So, I appreciate that.

One of the elements that we have consistently tried to say in our opposition is that much of the pipeline and the risk, and there is a risk, as the Congressman and vice chairman said. There is always a risk, but we bear the greatest risk. How is that shared with the rest of the State? How is it shared with the rest of that?

We are approximately, well I should say we are about 20 miles, a little over 20 miles from the South Dakota border, so we are at the southernmost edge of North Dakota and before the Missouri hits South Dakota. In the State of South Dakota, we are going to bear the greatest risk.

I would also submit, and this goes right to the point of how does it affect us, that we also bear the least benefit. And whenever this oil starts to pump through the pipeline, I can submit that a year from there, I would wager that our county, Sioux County, which is also part of North Dakota, would have the smallest tax revenue from it. We have no workers on this pipeline, and we are right there.

So, the benefits of this, these economic development portion of it, the economics behind it, don't benefit us but yet we bear the greatest risk. We have been opposed on many of those platforms.

Mr. WELCH. Thank you.

Mr. UPTON. The gentleman's time has expired.

The Chair will recognize the gentleman from Illinois, Mr. Shimkus.

Mr. SHIMKUS. Thank you, Mr. Chairman. It is great to have you all here.

It is always great to talk about jobs, the economy, and energy security. I believe in pipelines. I believe they are the safest, most reliable, cheapest way to move bulk, liquid crude. Undeniable.

So, having said that, I want to put up, Mr. Mahmoud, this pipeline that you are speaking of ends up here?

Mr. MAHMOUD. Patoka, around Vernon.

Mr. SHIMKUS. Patoka is in my district. I have been to the Patoka Tank Farm numerous times. It is one of our pride and joys.

And so the two pictures that everybody can see is the one on the left is our pipeline system in our country right today. Sometimes what has happened in this debate, because of the PR is that the country thinks that there is only one pipeline being built and we are only operating one pipeline. But there is, obviously, thousands and thousands of miles of pipeline and hundreds of pipelines that go across the transcontinental line.

So, if we were debating the other pipeline controversy of a Keystone XL, you would think that we had never had a pipeline go across a country boundary. But as the map shows, we have got gazillions. No, no, go back to that.

So the red is crude oil refined product, the blue is natural gas. And again, the right one is the big red dot, that is Patoka. So you

can see in my congressional district, one, two, three, four, five, six, seven, eight crude-oil-refined pipelines, and look at all the blue ones, which is the natural gas. So, let's go to the next slide.

So I also deal with—this weekend I leave for Brussels. I am a member of the NATO Parliamentary Assembly. NATO is also a big new story today. Russia has used energy extortion to our allies.

So this picture tells another story. The ship on the right is actually an LNG import terminal in Lithuania called Independence, aptly named because it is the hope of our allies that as we build these pipelines and we move them to the east coast, and then we build LNG terminals, compress it, put it on ships, that they are no longer extorted by Russian natural gas or Russian crude oil. They are our allies. They are our friends. They fought together in Afghanistan with us. They fought together in Iraq with us. And that is critical.

Now, the other ship on the left is just an LNG terminal ship delivering LNG to Independence.

Now, why do I weave this story? So a lot of people will say there is no economic benefit. There is huge economic benefit. If we are putting natural gas on the world market, it dramatically increases our balance of trade. It makes us a stronger nation. It makes communities stronger. There are 30 applications for LNG terminals pending. I don't think they will all get built. To build an LNG terminal is about \$10 billion. And that is good jobs, good wages, good benefits.

And not only that, I always talk about the tax benefit to these communities. I have rural America. I have high-powered transmission lines. And I have some of my community folks that don't like them. But when they go to the power plant in that community that has the power plant, has the tax base to fund its schools and it has the tax base to do its county, we lose the focus of the benefits of energy when we have this narrow focus and we don't look at how it is benefiting the whole country.

So I am all in on the bet that it is the safest, most reliable, cheapest way to move it. I am in it that it creates job. And I just want my colleagues here to understand the additional benefits that are happening not just in our country but to our friends and allies in Europe.

And with that, Mr. Chairman, no questions. I yield back.

Mr. UPTON. The gentleman yields back.

The Chair recognizes the ranking member of the full committee, Mr. Pallone, for 5 minutes.

Mr. PALLONE. Thank you, Mr. Chairman.

I wanted to get one question in to Councilman Harrison and one to Ms. Kann. So, I will try to use my time wisely here.

In my opening statement, I mentioned that most of the problems with pipeline construction result from disputes over the siting of these lines. Streamlining will solve this problem for the developers of the project but at the expense, often, of people and resources along the project pathway.

So Councilman Harrison, in your testimony, you point out that consultation with Tribes doesn't just mean telling landowners and communities what you are going to do and how you are going to do it. It means listening to community concerns and making nec-

essary changes to ensure these projects do not harm people, land, and other resources.

Mr. Mahmoud said that Energy Transfer Partners negotiated with and accommodated 55 Native American groups and that only the Sioux Nation has been unwilling to talk with or work with them. I just wanted your response to that. When did the company first approach the Tribe about the proposed pipeline and the proposed route near your Tribe's water supply? What offers, if any, did the company make to alter the route or design the project in response to your concerns?

Mr. HARRISON. Thank you for the question. I want to back up just a hair. The map that was up that showed all the pipelines, if you notice right above the North Dakota-South Dakota, there is a big hole where there are no pipelines. And that is treaty lands. The Native American treaties have been assigned that from the mid-1800s on, and that is a large portion of that.

So to your question, how do these pipelines affect people and their resources, that is a good example. You start cutting through there without the proper consultation, now we are cracking the seal on something else, which is infringement on treaty rights. And that, my contract with the Government of the United States is something we take very seriously.

Now, to answer your question about when they approached us, September of 2014 is the initial time. At that time, we adopted a resolution, as a Tribe, opposing this project. From that, we don't feel that any of the meaningful consultation about the—not just the objection, but any kind of meaningful reroute, was not taken seriously.

Now, there may have been some rerouting to the tune of a few feet or maybe a dozen feet here and there to avoid a little site, but there has never been a real conversation about let's look at some place else to cross that river.

Mr. PALLONE. All right, thank you.

And then I wanted to ask Ms. Kann, in your testimony, you seemed to indicate that you come from a pretty conservative, predominately Republican area. In fact, I think that area went pretty strongly for President Trump. Mr. Chairman, I am glad I am not running there. It doesn't seem like you come from an area that is part of the keep it in the ground or anti-fossil fuels movement. In fact, you go so far as to say regarding your community that, and I quote, we get that sometimes land needs to be taken for the benefit of the community.

So am I right in my assumption about the Republican conservative nature of your area?

Ms. KANN. Can you say the last part of that for me again?

Mr. PALLONE. Well, in other words, I am just trying to point out that your area is pretty conservative, predominately Republican.

Ms. KANN. Oh, it is strongly Republican.

Mr. PALLONE. All right.

Ms. KANN. You know as people speak up with regard to this issue, they almost feel like they are kind of not in keeping with their Republican roots. But then the issue becomes the rights of individual landowners and the actual protection under the Bill of

Rights which is probably the most important protection that either party provides their constituents.

Mr. PALLONE. All right. Well, let me get to my questions, I have only got a minute left.

I just found it interesting in your testimony when you say the citizens are no longer willing to tolerate the abuse of eminent domain to line the pockets of others. Because many in the gas line industry would argue that eminent domain is only used as a last resort and almost never involves seizure of private property and that they are constantly adjusting routes to minimize the impact on land owners.

But what is your experience? Do you feel like your concerns were listened to and there was a good faith effort to reach an accommodation with you and your neighbors to avoid eminent domain? Do you feel like there should be an eminent domain reform for natural gas pipelines that perhaps there should be a higher standard for a gas company to take land?

Ms. KANN. Absolutely. And to maybe start at the end of your questioning and work backwards, the standard that seems to bring the most angst to my community is the division between the intent of natural gas for domestic use to meet the needs of our communities, to keep our schools warm, our factories running, our homes lit, and the intent of resources to be used for corporate profit. And we have felt that the standard should be different for the two. We are much more open and accepting of the idea of eminent domain when you are talking about upgrading electrical grids and supplying local power plants than we are about gas, in particular, that is specifically slated for export.

That difference is huge. That difference is the difference between what is protected by the Bill of Rights and what is not. That difference is part of what is spoken to repeatedly in the Republican platform of 2016 of protecting individual land owner rights as a sacred compact between our Government and our citizens.

Mr. PALLONE. All right, thank you so much.

Thank you, Mr. Chairman.

Mr. UPTON. Thank you, Mr. Pallone.

The Chair will recognize Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman.

My first question is to Mr. Mahmoud. Is that the way you say it? You are an employee of the Dakota Access Pipeline. Is that correct?

Mr. MAHMOUD. I am an employee of Energy Transfer Partners, which is the managing partner in the joint venture. Yes, sir.

Mr. BARTON. I am told that this particular pipeline, if built, would go through an existing right-of-way. Is that correct?

Mr. MAHMOUD. Yes, sir, part of it does.

Mr. BARTON. Part of it does.

Mr. MAHMOUD. Yes, sir.

Mr. BARTON. Does the part of it that is under debate go through an existing right-of-way, the one that seems to be the most controversial?

Mr. MAHMOUD. At Lake Oahe, there are two existing natural gas pipelines for the same system called Northern Border that we parallel, two existing 42-inch pipes.

Mr. BARTON. OK, so there is already pipelines there. Is that correct?

Mr. MAHMOUD. Yes, sir, two of them.

Mr. BARTON. I am also told by my staff that this particular pipeline has complied with every State and Federal environmental review and all the various permitting requirements. Is that correct?

Mr. MAHMOUD. That is correct. We have permits from each State, every jurisdiction, local, State, as well as Federal.

Mr. BARTON. OK, so there is not any existing hold up in terms of an agency of the Federal or State Government that says no.

Mr. MAHMOUD. That is correct.

Mr. BARTON. OK. What is the issue with the Indian Tribe or Tribes that seems to be controversial in their mind?

Mr. MAHMOUD. You know it stems back to the consultation. And I cannot speak for the Government, but what I can say is that the meaningful consultation that we have mentioned today—as a private company, we are not a Government. And so, therefore, resides the issue is that the Tribe, although we attempted seven different times, and actually more than that, but seven official times, to have consultation, and the Corps did it nine times, so that is 16 attempts with the Standing Rock. We don't have the Government-to-Government relationship that the Tribe was seeking to have that consultation. So there lies the issue is that we cannot enter into formal consultation with the Tribe to resolve some of the issues that they claimed and, therefore, it is the Government that has to have those consultations.

Mr. BARTON. Well you could, but you can't force them. Isn't that correct?

Mr. MAHMOUD. Well under Government-to-Government consultation, by definition, we are not a Government. So therefore, we don't have consultation other than informal consultation, which we did do and we attempted to have very meaningful.

Mr. BARTON. But under State and Federal law, you don't have the right to consult with an Indian Tribe because you are not a Government. Is that correct?

VOICE. Yes, thank you very much! You don't have a treaty. You are not—

Mr. BARTON. I am asking the question to him, not to you. I am just trying to understand it. I am not trying to be adversarial or controversial. I just wanted the basic facts.

Mr. MAHMOUD. That is correct, sir. We have the right to communicate with anyone as a U.S. citizen, and I think we do that very well. Communicating with the Native American community is something that we hold very near and dear to our heart. We treat all stakeholders with the utmost respect. But when it comes to the official process, under the permitting that we have to go through, we do not qualify to be a Government to enter into Government-to-Government consultation.

Mr. BARTON. My time is about to expire. I don't necessarily have a question for Ms. Kann.

Both my family farms were taken by eminent domain. So, I have a high-speed project going through my congressional district that a lot of my constituents opposed. So, I have great respect for indi-

viduals who are having to give some of their right-of-way by an eminent domain process.

As I understand it, you have said in answer to questions and in your comments that this particular project—because, as you put it, is for-profit—is objectionable. But if it were used for domestic purposes or if it were used for a product in or near your home, you wouldn't be opposed.

I said I wasn't going to ask you a question, but is that correct?

Ms. KANN. I believe the members of my community who are most opposed to this would be less opposed and more willing to consider it as a viable option and not a violation of their rights as citizens, if that were the case.

Mr. BARTON. But your property is not affected by the Dakota Access Pipeline.

Ms. KANN. No. No, sir. It is the Atlantic Sunrise pipeline.

Mr. BARTON. Thank you, Mr. Chairman.

Mr. UPTON. Thank you.

Mr. Tonko.

Mr. TONKO. Thank you, Mr. Chair and let me welcome all of our members of the panel. Thank you for your input.

My effort here, or I think our effort should be to strike balance where there is opportunity with comprehensive energy plan to grow significant jobs that pay well and respond to all of the energy needs. And I understand fully that expression coming from our union force—union labor force but there does have to be that balance.

And Ms. Kann, I thank you for being here today to speak up for many private property owners that often feel left out of the process. How long have you owned your property?

Ms. KANN. The property has been in my family since 1990.

Mr. TONKO. And can you describe the process of dealing with the company, the pipeline company as they work to site its project and obtain permits?

Ms. KANN. The pipeline company, characterizing their behavior, the best word that I can think of is bully. They have shown up on-site with demands. They have left messages on my answering machine indicating that if they can have access to my property, their goal is to move it from my property, which I knew was not something that was within the power of the land agent speaking to me to do.

There was, at one time, a very important need to gain access to as many properties as possible for the purpose of surveying, and many people in my community were treated in a way that was very disingenuous and very misleading, and very preying upon the lack of understanding that the people in the community had.

Mr. TONKO. And do you sense that they heard your concerns and worked with you to resolve any issues from the beginning of the process?

Ms. KANN. Absolutely at no point.

Mr. TONKO. Well this subcommittee considered legislation last year that would have allowed companies to use areal surveying done by drones to obtain surveying data. This could allow companies to get the data that they need, while doing minimal outreach to property owners.

Now, while I do not expect you to know the details of this legislation, based on your experience, do you have any thoughts on changing the permitting process that would allow pipeline companies to do less community outreach and engagement with private property owners?

Ms. KANN. I can't imagine anything more objectionable than not having to deal with the people that are directly affected by this. If anything, individual property owners need to have a larger voice in this and I think we need to redefine the concept of voice. Being invited to FERC hearings and being allowed to testify and have testimony on the record does not equate to being involved in meaningful dialogue that affects any kind of influence on a project like this. It doesn't serve to educate anybody, and it doesn't serve to allow anybody to have input.

To end run the obligation of energy companies that want to do projects like this and not require them to engage with the communities that they intend to go through, I believe would be a horrific violation of our rights as citizens and landowners.

Mr. TONKO. Well, I tend to agree that these procedures that process needs to include respect and transparency and that means respecting the communities that host pipelines, inheriting all of the risks and none of the benefits. And respecting Tribal rights and property right, private property owner rights should be obvious. But sadly, the process has tilted the way from the public dialogue necessary to determine whether these projects are justified and how they will seek to minimize the damage to aggrieved parties.

I also want to point out that there have been officials that, despite supporting high profile pipeline projects have opposed interstate high-voltage direct current transmission projects, energy infrastructure projects that even many members of the environmental community support.

So while I, too, have my concerns about potentially cutting States out of the process, these projects will bring clean energy from America's heartland to the rest of the country. Instead of exploring yesterday's fuel supply to foreign countries tomorrow, let's work on getting tomorrow's domestic electricity to Americans today.

I would just ask for consistency in how we evaluate these projects. For me, that means ensuring a robust community-oriented process that respects landowner and Tribal rights, regardless of the type of infrastructure in question. I hope those same standards can be applied by everyone, whether it is a pipeline benefitting the oil industry or a transmission line benefitting utility scale clean energy.

I have a few seconds remaining, and I will yield those to Mr. Rush, please.

Mr. RUSH. Thank you.

Mr. O'Sullivan, I have just got to come back to the same line of questioning that I had for you before.

First of all, I am a strong union supporter. I am very close to the local in Chicago and I have a lot of admiration for the Laborers'. But I just can't settle in my mind you made a statement. You said that you move from community to community and, therefore, you reflect the demographics of that community. But you also said that these are temporary jobs and the way that these jobs becomes per-

manent is that you string together jobs. That gives a picture of a team of people going from one job to another, from one State, one community to another, and they become the workforce. I don't see that. I have a problem how can at one time reflect the demographics of a standing community and then also moving people in and out of your jobs who may or may not be from that community. How do you know that?

Mr. O'SULLIVAN. Congressman, you have always been a strong supporter of organized labor, and we certainly appreciate that.

By that I mean this: If we take ETP's job, it is 1,100 miles. And so we will have to do it by 100-mile spreads. So I will have laborers and the other trades will have members that work within that 100-mile spread. And then I will have a group of other laborers that will work on the next 100. Sometimes we will cross over, but what happens is that, when somebody gets out of that particular pipeline job, they will go back and they may be working on building construction or heavy and highway construction out of their local union hall after that particular job. Sometimes they stay with the company but most of the time when that particular spread is over, they will go back to the local union hall and then get dispatched out, maybe on another pipeline job, but possibly—

And what we do, Congressman, is go through training. And so somebody that doesn't have training that is a pipeline laborer, we put him through training so that we give him the skill sets to be able to do building construction, heavy, and highway construction.

Mr. RUSH. I yield back.

Mr. UPTON. Thank you. The gentleman's time has expired.

The Chair will recognize Dr. Murphy.

Mr. MURPHY. Thank you very much.

Mr. O'Sullivan, I want to follow-up with what you just said there.

So, in terms of work of being a laborer, or an electrical worker, or a carpenter, or anything else, I guess in some ways all work is somewhat temporary in terms of a particular project. But it is long-term in terms of they are involved in multiple projects, correct?

Mr. O'SULLIVAN. Correct, Congressman.

Mr. MURPHY. So how long will it take one of your workers, for example, on one of those 100-mile stretches?

Mr. O'SULLIVAN. It depends on the project and the terrain but I believe that Dakota Access, the time line was for 7 months or somewhere in that neighborhood to complete that 1,100 mile section of pipeline. Some are a little more complicated, more compressor stations. And I don't want to get into the intricacies of it. Joey has forgotten more than I know about it. But at the end of the day, those spreads, when they are over, it could be anywhere from 2 months to 7 months, depending on the particular project, or longer.

Mr. MURPHY. Well, that is the nature of all construction work—

Mr. O'SULLIVAN. Absolutely.

Mr. MURPHY [continuing]. Unless it is a multi-year project.

May I remind my colleagues, we are temp employees. We only have a 2-year contract. We have to go back to our boss every couple of years and ask for a renewal on the contract. We don't have tenure. We are not permanent employees here.

I want to ask a question, Mr. Mahmoud, on the safety issue. I was a private sponsor a few years ago of a bill called Mark and Chelsea's Law, which included a comprehensive pipeline safety bill to keep families safe from ruptures from gas lines. And it basically said that if a utility worker, construction worker, anybody, punctures or ruptures a gas line, they have to notify the owners of that gas line and local emergency responders immediately on that.

Let me expand that to other areas of safety. In terms of during the construction, or inspection of what is in place, or response if there is a problem, can you give me an idea of what has happened over the years here, what is currently in place in terms of what you have to adhere to in terms of doing these projects to assure public safety?

Mr. MAHMOUD. Thank you for that. There are multiple levels of safety, number one. And safety is always our number one criteria. Putting aside operational safety, if we are looking at construction safety, one, we are bound by the rules under OSHA for all of the workers that are employed not only by LIUNA, or some of the other trades, or the contractors, but also for Energy Transfer, or whomever they may work for.

So we comply with those laws and regulations, but we also employ a very robust construction safety program that is executed by our contractors, primarily, but it is driven by our company to make sure that the culture of safety is pushed down to all the different layers so everybody behaves and acts in a safe manner.

Mr. MURPHY. Some are Federal, some are State, some are other local safety issues you have to be adhering to at all times?

Mr. MAHMOUD. Yes, sir, that is correct.

Mr. MURPHY. What if a local citizen has a concern about safety or risk factors, are you required to respond to that?

Mr. MAHMOUD. We are. And typically, on a gas pipeline for an interstate pipeline, when those concerns are raised, they usually are raised as part of the NEPA process through FERC. And we address those through that environmental document or through data requests from that Federal agency.

If it is not a federalized project, we do, we have a very robust outreach program that we educate the public, as well as other individuals that may live by or near, the 811 programs that you may be familiar with. So we have a very robust, very—

Mr. MURPHY. And I guess this also goes to Mr. Sullivan. Are the workers on the project empowered also that if they see a problem, they report it right away?

Mr. MAHMOUD. Absolutely.

Mr. MURPHY. Mr. O'Sullivan is that true in terms of your workers and their training to report something immediately if they see a problem?

Mr. O'SULLIVAN. Absolutely, Congressman.

Mr. MURPHY. And I just think it is always extremely important to have someone who can pull the whistle or something and say there is a problem, we have to act on it. And the responsiveness then within the construction is—

Mr. MAHMOUD. Immediate. There is no delay. If there is a safety-related incident, it is addressed right then.

Mr. MURPHY. OK. Finally, I only have about 30 seconds left here, but back to Mr. O'Sullivan.

Expand this some more, labor's role, a seat at the table in terms of the regulatory process. Do you play a role in that? Does labor play a role in that?

Mr. O'SULLIVAN. We do, Congressman. What we do is we find our members that are along the pipeline route. We encourage them to show up at the town hall meetings and public hearings that are going on all along the whole pipeline.

So we do engage because they are residents of the community as well. So, they do show up at the town hall meetings and public listening sessions.

Mr. MURPHY. Let me just add one final comment with regard to what you said before about whether someone is working 2 months or 7 months and multiple jobs put together may not seem like much, if someone is on the outside looking in, but I am sure it means a lot to that worker—

Mr. O'SULLIVAN. Absolutely.

Mr. MURPHY [continuing]. Who would much rather be getting a paycheck than an unemployment check.

Mr. O'SULLIVAN. Absolutely.

Mr. MURPHY. Thank you very much. I yield back.

Mr. OLSON [presiding]. The gentleman yields back.

The Chair calls upon the gentleman from West Virginia, Mr. McKinley, for 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman. I thought you were going to go to the other side.

Quickly, if I could get into it, 51 years ago I picked up a lunch pail and went out on my first construction job. It has been something that means a lot to me as a construction industry and I spent, again, 51 years in it. And now in the Washington, I am the chairman of the Construction Trades Council Caucus, trying to make sure that all our members understand the construction trades and what the impact of our construction industry has on the economy of this country.

Curiously, we only have about 12 or 15 members in Congress that have ever performed construction work. So you can imagine the educational process that we have to go through when people are concerned about part-time jobs. That is what we have done for 51 years is understanding that.

But my question, in part, is maybe it is almost an opening statement of sorts is I am frustrated for us in West Virginia because the last 8 years we have seen our coal industry collapse. So, we tried to switch over to natural gas and be able to exercise what we use in the Utica and Marcellus but we can't get permits to build our pipeline.

So my question, I guess maybe it would be at your, Mr. O'Sullivan, with laborers. Are you seeing a slowdown around the country of the ability to build pipelines and put our people to work?

Mr. O'SULLIVAN. Congressman, we are seeing a slowdown in the permitting process and I hate to keep going back to that but shovel-ready projects are only shovel-ready if there is a reasonable review process. And again, we are for comprehensive process but there has to be a beginning and an end.

West Virginia, in particular—and I am a proud member of Laborers' Local 1353 in Charleston, West Virginia, and worked in the State for a number of years, and I appreciate your support all the years as well.

What we are seeing in West Virginia, in my local particularly, with what has happened to coal in the State, we have lost half our members. In many instances, natural gas pipelines have really helped our members out in the State. To be honest, we would have lost more than half our members if it wasn't because of that.

Mr. MCKINLEY. We have apparently, if we can tap into it properly, the Marcellus, the Utica, and West Virginia, we could produce 50 percent of all the natural gas in America using that. However, we just can't get the permits to get those pipelines built. Of course, they are building some but not at the speed that we need to help out.

And so it is coming down to elected bureaucrats and delays and tactics or are we just putting people to work? If we can't mine coal for 8 years, we have seen the employment situation occur in West Virginia, well, actually, across the country, this anti-coal fervor that the Obama administration put in place; 83,000 coal miners lost their job, 246 power plants closed down, 400 coal mines closed.

So we turn, with hope, that we can use the natural gas and build the pipelines so that we can put our people to work and find a new way, a different economy. But we are stymied and I don't want to see that happen in the Dakotas or elsewhere, where people are trying to find jobs, just jobs it comes down to.

So what advice would you give us? What would be the best thing that we could do here in Congress to try to get the regulatory bodies to be more responsive so that the people that want to work, our building trades and elsewhere, what could we do to eliminate some of those barriers? The process is there but what else do we need to do?

Mr. MAHMOUD. Yes, I think it all boils down to predictability, predictability in the process. And as long as it is fair across all industries, and for our industry on the energy side, we need predictable regulations that we can rely upon when we make these multi-billion-dollar decisions and we need finality. So what happened on the DAPL project is very devastating to a company like ours, when we are investing nearly \$4 billion all of a sudden just to be halted by a political intervention.

Mr. MCKINLEY. We talked to, I guess it was Barton, someone brought up the NEPA process and we saw that process abused in the last 8 years. They were trying to ship export coal from Beltingham, Washington, and they didn't—the NEPA process was underway with it, but the administration just stepped in and stopped the NEPA process. That has got to be very frustrating to people that have spent \$7 million or \$8 million to get something approved.

I have got problems with this bureaucratic nonsense that we have to put up with sometimes around here.

So I yield back my time.

Mr. OLSON. The gentleman yields back. The Chair calls upon the gentleman from Virginia, Mr. Griffith, for 5 minutes.

Mr. GRIFFITH. Thank you very much.

Ms. Kann, let me ask you a couple of questions. As a part of the pipeline going through Pennsylvania, did you participate in the FERC processes?

Ms. KANN. I participated at every opportunity. I am registered as an intervenor and I have spoken at the FERC hearings.

Mr. GRIFFITH. And was your experience with FERC a good one?

Ms. KANN. It was very neutral. There was no dialogue. There was no back and forth. There was a panel of people sitting on a stage who just sat. It wasn't dialogue. It was testimony.

Mr. GRIFFITH. And I have a pipeline coming through my district, which is why I am asking these questions.

And do you feel that FERC should be able to look at, as opposed to one individual pipeline, perhaps multiple pipelines going through a region so that they might consider whether or not all the pipelines are needed?

Ms. KANN. Absolutely. Pennsylvania is slated for up to 300,000 miles of pipelines in the next several years, and they are both collection lines and interstate distribution lines.

The collective impact of that is an entirely different story than what FERC considers on a pipeline-by-pipeline basis.

Mr. GRIFFITH. Yes, ma'am, that has been our experience, as well.

And as a part of that, do you know if in your situation they looked at highway right-of-ways or co-location opportunities for the pipeline?

Ms. KANN. There was a great deal of dialogue in my community. The initial proposal from Williams for this pipeline route rather extensively used some existing public land and existing right-of-ways in our township. There was some outcry over that because some of the public lands had been bought with taxpayer and donation dollars. It was a conservancy land. And Williams quickly rerouted through private properties after that.

There was a second wave of proposals made by some of the residents in my township in particular to reroute back to some of that public land and FERC did not choose to make that move.

Mr. GRIFFITH. I appreciate your testimony here today.

Mr. Mahmoud, I know that you have already testified that you all did do some co-location. As your company was looking at this, did you all look at opportunities where you might be able to co-locate? And is the gas that you are piping through, is that something that you all believe is necessary, exclusive to other projects or are we—my question is are we getting into a situation where we are using eminent domain for competing projects? Each standing alone would meet FERC's requirements but maybe together, we are overdoing it and building an oversupply of pipeline. Do think there are any concerns? And I will just open it up. You answer however you wish.

Mr. MAHMOUD. Sure. Thank you very much.

You know, in the context of natural gas, we do have the Rover pipeline, which is up partially in Pennsylvania for a small section. It is a 713-mile pipeline that gathers natural gas from the producing region of the Utica and Marcellus and takes it to market.

I can tell you there is about 20 Bcf of stranded gas in the Utica and Marcellus today. Our project moves 3.25 billion cubic feet of that 20. So that means there is a need for more pipelines to be

built in that region to take care of that capacity to de-bottleneck the production in that region.

So in my mind, those infrastructure projects are necessary to transport the volume coming out of that production region.

Mr. GRIFFITH. One of the concerns that Ms. Kann has and I know gas companies want to try to work it out the best they can but everybody has got to make money while they are doing this, too, is that her region apparently isn't going to benefit from it. The gas is being transported through. Is that going to be the case in the Dakota pipeline as well or are there going to be some opportunities after the pipeline is built for opportunities there for people to get the gas?

Mr. MAHMOUD. So the Dakota Access Pipeline is a crude oil pipeline.

Mr. GRIFFITH. OK.

Mr. MAHMOUD. That is a little bit different than natural gas.

Mr. GRIFFITH. Sure.

Mr. MAHMOUD. And I would suggest on the connectiveness or interconnectiveness to an interstate natural gas pipeline is the process for which to get access to that gas really resides with the States, with the State public utility commissions. That is where the work needs to be by the local constituents to help them develop programs to build LDCs to distribute that gas. Because from an interstate perspective, we would love to have more connections.

Mr. GRIFFITH. All right, now on the oil in particular, a number of folks have brought up the fact that there have been some pipeline problems over the years, but, just on either side of my district, I have had train problems with transporting oil. Which do the studies say is safer, the pipeline or running it on train?

Mr. MAHMOUD. Pipelines by far, by a factor of between 3 1A½ to 4 1A½ times more incidents on a rail than there are on pipe.

Mr. GRIFFITH. All right, I appreciate that. I yield back, Mr. Chairman.

Mr. OLSON. The gentleman yields back.

The Chair calls upon the gentleman from Ohio, Mr. Johnson, for 5 minutes.

Mr. JOHNSON. Well thank you, Mr. Chairman, and thank you for having this important hearing today.

I want to turn to Mr. Ferry, if I could. Mr. Ferry, it is always good to have someone that has seen the impacts the shale plays in the oil and gas boom in the Marcellus and the Utica in the great State of Ohio here to talk a little bit about our experiences.

In your testimony, you state that widespread adoption of new energy technologies has been slowed by economic, Government, and marketplace barriers. Could you identify these barriers? And how can we reduce these barriers to help the industry utilize new technologies?

Mr. FERRY. I think you heard a lot of it today from Mr. Mahmoud. Those are some of the issues that are going on that have slowed down—in the year 2016, we were supposed to be well done with the ETC Rover pipeline project, and it is only going to kick off here in the middle of February. But it has been the permitting. It is the FERC permitting, the EPA issues. We need to—and the balance between this side of the room and this side of the room,

and I am in the middle. I understand because I respect what is going on over there, but we do want to put people to work.

We do have investors that have a lot of money sitting on the table that they need to get it to get a TAP capital return.

So, I would say the permitting issue is number one, and then once this finally gets worked out, we are going to have major issues of finding talented people to get it done, that can do it safely. Number one, it is driven from the top. In our company, it is: you see it, you own it, you have to get involved to stop it. But the other thing that we talked earlier about is I am really concerned about having a drug-free workforce out there to do it safely as we respect it on all jobs. The owners demand that we have a drug-free program in place and I think that is another issue that is going to hurt us in the long-run.

Mr. JOHNSON. OK, could you discuss the Electrical Training Alliance Apprenticeship Program and how important it is in developing a skilled workforce?

Mr. FERRY. President Lonnie was here earlier from the IBEW but we, together, it is called the NJATC, the National Joint Apprenticeship Training, which was the alliance, we invest, like the Laborers, over hundreds of millions of dollars a year, and there are over 300 training facilities across the United States, and they are all keyed for every area what the training needs to be.

So, just like Mr. O'Sullivan says, if the pipeliners are not working, there is other training that we can do to get our electricians to work. So our trade, the electrical trade, has went from just pipe and wire, and lights and switches, to a vast array of training needs to get that done.

Mr. JOHNSON. And I am thinking that many in our region of the country, in our State of Ohio are going to be paying very close attention to this hearing, so I want to make sure that I get this question out there. Is it safe to say that if you are a part of that trained workforce and you put forth the effort, that your chances of getting opportunities for good paying jobs, high paying jobs are real good?

Mr. FERRY. I would say it is an excellent opportunity.

Again, one of the things, one of jobs as being the leader of the company and having the vision, that is the biggest fear I have is having the talented people to make that happen. There are going to be great opportunities in Ohio, West Virginia, Pennsylvania, just the cracker facilities, along with the fracking and gas and oil, there are going to be a lot of great opportunities.

Mr. JOHNSON. You know, I have talked to a lot of the labor groups and the career tech centers, and whether it is the building trades, the plumbers and pipefitters, the operating engineers, you name it, about these opportunities, can you talk a little bit about, especially in our region, you have got a lot of young people that don't really see a 4-year college education as something that they want to do. And there are a great number of opportunities in those trades, in the oil and gas industry.

Can you address that some?

Mr. FERRY. Absolutely. I think the universities have done a great job in marketing that you need a 4-year degree to have an opportunity to raise a family, but I am classic example of that. I come out of high school, I was the oldest of seven. We didn't have the

money for college. I went into the trades, and now I am the owner and CEO of a company.

So the possibilities to get into the construction industry is unlimited. It is all driven by the individual and how far they want to go in this industry.

Mr. JOHNSON. Anything that we can do in Congress to help this process along?

Mr. FERRY. I am leaning this side over here. The regulations have really slowed the processes down.

Mr. JOHNSON. We are working on those. You know that.

Mr. FERRY. Yes, sir, but I know when President Trump signed those orders on the 24th, our phones started ringing off the hook of opportunities.

Mr. JOHNSON. Our phones are ringing off the hook, too.

Mr. FERRY. Yes, sir.

Mr. JOHNSON. Good deal. Well, thank you, Mr. Ferry.

And Mr. Chairman, I yield back.

Mr. FERRY. Thank you, Congressman.

Mr. OLSON. The gentleman yields back.

The Chair calls upon the gentleman from Missouri, Mr. Long, for 5 minutes.

Mr. LONG. Thank you, Mr. Chairman. And as I was hearing you introduce my friend Mr. Johnson, I thought, well, I am next, so I had better get my questions ready.

And I looked and I couldn't find my questions. Then I started to listening to Mr. Johnson. I thought he is answering my questions. He had stolen my paper.

Mr. JOHNSON. Would you like some of mine?

Mr. LONG. So, all I can do is, I am going to yield to my friend from North Dakota.

Mr. CRAMER. Thank you, I think. And thank you, Mr. Chairman. Again, thanks to all of you.

As I said, I want to dig into the consultation issue, because I think it is important. And I am going to start by reading from an important-to-note December 3, 2016, memorandum of record from the Department of Army Corps of Engineers, Omaha District. December third is important because it was on December fourth that the Acting Secretary of the Army called me to tell me, "I have changed my mind."

OK, so December third, this was the memorandum. I am going to start at the end. It says, "The Corps of Engineers, through the Department of the Army, is required by statute to notify Congress when an application is received and when the Corps is going to grant an easement for a pipeline that is greater than 24 inches in diameter. ... The Army notified Congress of the application on September 13, 2015," and, "In accordance with this memorandum, I recommend the Army notify Congress that the Corps intends to grant the attached easement to Dakota Access."

And it ends by saying, "After notification to Congress, the Omaha District intends to execute and issue the easement to Dakota Access." December 3, 2016.

I am going to highlight a couple more points in this memo. About halfway through: "Corps policy is that it will coordinate and consult with federally-recognized Native American tribes when res-

ervation lands are involved. ... The proposed DAPL crossing at Lake Oahe is not on reservation lands; therefore, by policy there is no requirement to coordinate with any federally-recognized tribe. However, the Corps reached out to the [Standing Rock Sioux Tribe] to coordinate and to consult on the DAPL project. As established in the analyses set forth in the Final [Environmental Assessment]—that is this document, Mr. Chairman—“the Corps attempted to engage in meaningful discussions with the [Standing Rock Sioux Tribe] on numerous occasions about the nature of the project, cultural resources, and the Lake Oahe crossing beginning in October 2014 and continuing through March 2016.”

Mr. Chairman, I would respectfully request that both the Environmental Assessment and this memorandum be entered into the record.

Mr. Upton [presiding]. Without objection.

[The information appears at the conclusion of the hearing.]¹

Mr. CRAMER. I also wanted to then turn to a decision by DC District Court, U.S. Judge James Boasberg for the United States District of Columbia, appointed by President Barack Obama, for what it is worth.

I am going to skip several references to the consultation process that he references, but I am going to jump to page 48 of this 58-page order.

“Plaintiff’s last point on the merits is that the Corps failed”—this is important, because Mr. Mahmoud referenced the importance of a Government-to-Government responsibility here—“the Corps failed to offer it a reasonable opportunity to participate in the Section 106 process as to the narrow scope of the construction activity that the Corps did consider to be an effect of the permitted waterway activities.” And then it goes on to talk about the process.

He writes, “The Corps has documented dozens of attempts to engage Standing Rock in consultations to identify historical resources at Lake Oahe and other PCN crossings. To the reader’s relief”—and he is right—“the Court need not repeat them here. Suffice it to say that the Tribe”—the Tribe—“largely refused to engage in consultations. It chose instead to hold out for more...”

And then he writes, “In fact, on this record, it appears that the Corps exceeded its [National Historic Preservation Act] obligations at many of the ... sites.”

I am going to skip several other references. I will read this one on page 55: “The record contains abundant evidence that the Corps also repeatedly sought other input on known cultural sites at these locations, and, in many cases, other tribes conducted site visits to search for any resources likely to be affected ...” And on he states.

But I think it is really important to highlight that he actually references here that, “In fact, on this record, it appears that the Corps exceeded”—exceeded—“its NHPA” requirements.

In conclusion, he writes, “As it has previously mentioned, this Court does not lightly countenance any depredation of lands that hold significance to the Standing Rock Sioux. Aware of the indignities visited upon the Tribe over the last centuries, the Court

¹The memorandum appears at the conclusion of the hearing. The Environmental Assessment has been retained in committee files and also is available at <http://docs.house.gov/meetings/IF/IF03/20170215/105567/HHRG-115-IF03-20170215-SD007.pdf>.

scrutinizes the permitting process here with particular care. Having done so, the Court must nonetheless conclude that the Tribe has not”—has not—“demonstrated that an injunction is warranted here.”

I will ask questions at my next opportunity. I yield.

Mr. UPTON. The gentleman's time has expired.

Dr. Bucshon.

Mr. BUCSHON. Mr. Chairman, I yield my time to Mr. Cramer.

Mr. CRAMER. Thank you, Mr. Bucshon. Thank you, Mr. Chairman.

And I would then ask for unanimous consent to enter into the record Judge Boasberg's ruling.

Mr. UPTON. Without objection.¹

Mr. CRAMER. All right, thank you. I do want to get into this consultation process a bit. One of the things that we heard that I want to dig into, Mr. Mahmoud, is that Mr. Harrison in his testimony references consultation, meaningful consultation, Government-to-Government. These are all things I think we need to be talking about, especially going forward. I don't think you can change in midstream.

But he also references something that I think is relevant to this entire hearing, and he references the need for consent. Now, consultation is one thing. Consent means something completely different. Could you tell me, as a developer, what would it mean if every development of any type required the consent of Tribal entities on private property outside of a reservation? How would that impact development going forward?

Mr. MAHMOUD. Thank you for the question. Consent is something that we, from a development standpoint, would probably not have a—we would not agree to that from a standpoint of—the process already exists today, where the consultation under the Federal laws is intact. Where, if the Tribes, no matter what Tribe in what State, would engage in that consultation and really engage in meaningful consultation, then I believe that their voices would be more heard and I believe that their questions could be answered. And then I believe that we would have a more robust process.

So, I don't believe consent is the answer. I believe meaningful engagement is the answer under the current laws, as they stand today.

Mr. CRAMER. Thank you for that. Mr. Harrison, I want to ask you, because you have referenced—and I think this is an important point—you have referenced treaty issues. I think you acknowledge that this DAPL does not cross reservation land. Is that correct?

Mr. HARRISON. The reservation as it stands today, yes.

Mr. CRAMER. Correct. And the big hole that you referenced in the previous map really wasn't treaty land where there is a hole because, clearly, the two pipelines that are in the same corridor as the DAPL are on the land that is in dispute right now.

So you referenced treaty. Tell me which treaty you are referencing, and maybe give us—I don't know if 30 seconds is enough.

¹The information has been retained in committee files and also is available at <http://docs.house.gov/meetings/IF/IF03/20170215/105567/HHRG-115-IF03-20170215-SD008.pdf>.

You are a good educator, but I don't know how much time you need. Just tell us about that treaty and what is at stake here.

Mr. HARRISON. OK, the treaty that we reference is the 1851 Fort Laramie Treaty. And that is a larger part of four or five States, basically the western corner, the southwest corner of North Dakota, large part of South Dakota, probably half of South Dakota, I should say, parts of Montana and Wyoming, as well. And that is the treaty line that we reference.

Mr. CRAMER. So since we are on that, then what can you tell me about the Laramie Treaty of 1868, which is obviously after 1851, because that is on your Web site. You probably know that. And that, I believe, in that treaty the Tribe gives up some of its authority, if you will, over these other treaty lands.

Can you sort of clarify that for us a little bit?

Mr. HARRISON. I will clarify this, that the Tribe has never given up anything. It was taken. And that is a big point of contention on this.

Mr. CRAMER. So what is your recourse then with regard to the Treaty of 1868? Because I think, if I am not mistaken, I think that is sort of where we land on some of what is in contention. Because clearly, again, it is not on the reservation.

Mr. HARRISON. I guess I would disagree a little bit on the fact that that is not where we land. We land on the fact that we do have a Government-to-Government relationship. It is very clear that this process is not only flawed, but it is not in the Tribe's favor at all. And whether meaningful consultation is had, the big question is, Is it listened to? We can object until we are blue in the face and if that pipeline, or any other pipeline, or any other project, whether it affects us or townspeople like Ms. Kann here, it still goes in and says we noted that is the problem we have. We do not approve of the checking-the-box attitude of it.

We reached out to you. Check. We oppose that. We want consultation. We want meaningful dialogue.

Mr. CRAMER. But Judge Boasberg claims that there were dozens of attempts at meaningful consultation, but the Tribe wouldn't—

Mr. HARRISON. Judge Boasberg also scrutinizes the process and acknowledges that there has been decades, if not centuries, of problems with this.

Mr. CRAMER. Well, and I think that is the problem. We are not going to litigate the history in this one project, but that is why I wanted to clarify things going forward so that perhaps we can do better going forward.

I yield back.

Mr. HARRISON. And we would really like to be a part of that dialogue going forward, to look for some resolution to a lot of these things and to be included.

As I stated at the outset, we are Americans. We are the first Americans, and we want to be treated as such.

Mr. CRAMER. Thank you.

Mr. HARRISON. Thank you.

Mr. OLSON [presiding]. The gentleman yields back. The Chair calls upon the gentleman from Maryland, Mr. Sarbanes, for 5 minutes.

Mr. SARBANES. Thank you very much, Mr. Chairman. Obviously, a very important hearing. I want to thank the panel. This is a critical discussion whenever we are siting a pipeline or any other kind of energy infrastructure project, it is important that we balance all of the various interests. I certainly think that means being sensitive to impacted constituencies and that is a challenge for us and a challenge for all the agencies that have to weigh these important decisions. So, it is a very important discussion that we are having.

I would like to yield the balance of my time to Mr. Ruiz from California.

Mr. RUIZ. Thank you. And thank you, Mr. Chairman. I want to thank the committee for holding this important hearing and our witnesses for coming. Thank you for coming to tell your stories. They are important stories. Each and every one of your stories is an important story.

And this is a story of the Federal permitting process being rushed and fast tracked without meaningful Tribal consultations. We have had multiple conversations of what that means to be meaningful. And if done properly, and according to law, could have avoided the delays that are harming families, harming workers, and could have prevented the desecration of very important sacred sites. It is a story about environmental injustice taking a risk burden from one community and putting it on a more vulnerable community's shoulders. It is a story about how our Nation is, once again, trampling on the rights of Native Americans and threatening the health, environment, and cultural survival of the surrounding Tribes.

It is also a story of an administration that fast tracked the project, despite the serious warnings and strong recommendations by the EPA, the Department of the Interior, the National Council of Historic Preservation, circumventing the already-in-process Environmental Impact Statement review in order to line its own pockets. You see the Federal Government has a moral and legally enforceable obligation to protect Tribal treaties, land, and resources under the Federal trust responsibility. Tribes have the right to regular and meaningful consultation under Executive Order 13175 for projects that can have an impact on health or Tribal land.

Under the Historic Preservation Act, Federal agencies are required to be responsible stewards of the Nation's historic resource and consult with Tribes when their actions may impact sacred sites.

Furthermore, under the Clean Water Act, the Army Corps has the responsibility to protect our Nation's waters from contamination by conducting accurate Environmental Assessments to determine if construction permits should be granted and all those other agencies said that that initial assessment was inaccurate.

So, it is not just the right thing to do, based on our historical experiences and historical traumas with Native Americans, it is the law.

So, now we find ourselves confronting an historical violation of both civil rights and Tribal sovereignty, all because the procedural safeguards of the meaningful consultation process were not followed.

The proposed pipeline was determined to be too risky already for one community in Bismarck. So, let's put it in a more vulnerable community. Why did that happen? Why is it now acceptable that we give the risk—put the risk onto the Tribes?

I want to reiterate again that the workers are caught in the middle of this failed system. Tribes and working families want the same thing, a better quality of life for themselves and their families, a fair opportunity to have a say in decisions that may affect their health, cultural preservation and their environment. They want to be heard, a seat at the table.

So I stand with the Tribes, and I am greatly disappointed that this administration has ignored scientific evidence requiring an Environmental Impact Statement. I also stand with the workers, because it is unfair to them and their families that they should suffer because of a failed permitting process.

So in terms of the sacred sites, on September 2, 2016, shortly before my visit to Lake Oahe and the Sacred Stone Camp, the Tribe filed paperwork with the court that identified sacred and culturally significant sites that were miles apart from the construction site but in the proposed line of construction. Not even 24 hours later, in the middle of the night, on a holiday weekend, Labor Day, DAPL bulldozed and completely demolished the site the Tribes were trying to save and had identified earlier.

Time after time Tribes have seen their treaties broken, their lands taken, and sacred sites desecrated.

So, Mr. Mahmoud, I want to ask is it standard practice to go and at 3:00 a.m. on a holiday weekend to bulldoze a site that has been designated as a culturally significant site by the Tribe?

Mr. MAHMOUD. Thank you for the question. And let me start off with I believe that a lot of what you said is the reason we are here today is to correct the record.

Mr. RUIZ. Well, the record shows that you guys at 3:00 a.m. on a holiday weekend went over and specifically bulldozed over a site that was so sensitive to the Tribe. So, that is what the record shows.

Mr. MAHMOUD. So let me back up a little bit and start off with the pipeline parallels and existing utility corridor, that was constructed in 1982. As part of that, the swath of the land where our pipeline sits simply disturbed all the land—

Mr. RUIZ. Well my question is on the timing and the day of the actual decision to go in and desecrate a sacred site.

Mr. OLSON. The time has expired.

The Chair calls upon the gentleman from Texas, Mr. Flores, for 5 minutes.

Mr. FERRY. Mr. Chairman, I need to excuse myself. I have a flight to catch and I apologize.

Mr. OLSON. Oh. Thank you very much for coming, Mr. Ferry. Safe travels home.

Mr. FERRY. Thank you.

Mr. OLSON. Mr. Flores, your time, sir.

Mr. FLORES. Thank you, Mr. Chairman. Mr. Ferry, I want to tell you thank you for your story and your testimony today, as well as the rest of the panel. Your story was inspiring.

Mr. O'Sullivan, when I talk about the Keystone pipeline back home and the DAPL, most of my constituents get it. They under-

stand the value of jobs, any job. But there are some that don't. Some say that we shouldn't build these infrastructure projects because they are temporary jobs. And so I would like you to ask the people who would be affected by that logic, that failed logic, who would be affected? If every job was a temporary job and so, therefore, there should be no temporary jobs, who would be affected? Would you ask them to stand up?

Mr. O'SULLIVAN. Well Congressman, I mean those that say that, and there have been some—

Mr. FLORES. But would you ask them stand? I mean you have got some here with you, don't you?

Mr. O'SULLIVAN. Yes, whether it is Keystone pipeline, we could argue over the amount but there has been estimates as high as 42,000.

Mr. FLORES. I know but I want the American people to see the eyes of the people who would be affected by that false logic.

Mr. O'SULLIVAN. And the eyes of the people who would be affected are sitting right behind me.

Mr. FLORES. Would you ask them to stand?

Mr. O'SULLIVAN. Yes, I would.

Mr. FLORES. OK, thank you.

Mr. O'SULLIVAN. Would my brothers and sisters from LIUNA stand?

Mr. FLORES. Thank you. OK, sit down. Thank you. Apparently, I was out of order. Anyway, people got to see that.

So that logic doesn't work. And essentially, an infrastructure project—you know we are talking about infrastructure in this country and trying to renew our infrastructure. So, infrastructure is a series of temporary projects. Is there any difference between the value of a temporary paycheck and a full-time paycheck? It is still a great paycheck, right, based on what you told me you pay earlier.

Mr. O'SULLIVAN. Absolutely.

Mr. FLORES. OK, that is good to hear.

So, I would like to continue. Even as we migrate to a low-carbon economy, fossil fuels are still going to be a key fuel, a key energy source for the years to come. And so in that regard, why is it important that we establish a more reasonable and predictable permitting and review process for complex infrastructure projects like pipelines?

Mr. O'SULLIVAN. From my perspective, the reason for that is that there has to be, as I have said, a beginning and an end. The regulatory process, and it needs to be thorough, no question about that, it needs to be a process where there is a reasonable expectation that when these projects are announced and they are thoroughly reviewed, that they lead to middle-class-family-supporting jobs. And one of the challenges we have, and I know Joey and ETP, and others have, is the delivery system of workers because if we start training now for a project that isn't complete, those individuals may never go to work and we can turn them off about a whole sector of an industry.

So, if we don't fix some of the things that we have been talking about in this hearing, it is going to affect our ability to provide a capable and skilled workforce.

Mr. FLORES. I think you answered the question pretty well and I am sorry to cut you off.

Mr. O'SULLIVAN. That is all right.

Mr. FLORES. So in order to move forward with the big infrastructure ambitions that we have as a country we need to modernize the permitting process so that we can benefit these hard-working American families and so that their so-called temporary jobs become a series of temporary jobs that leads to a vibrant middle class. And I thank you for that.

Mr. Mahmoud, you talked about the fact that if this pipeline is not built, we are going to have to use trucks or trains. You talked about the relative safety impacts.

One of the things we didn't talk about is the climate impact of a pipeline versus trucks or trains. So when you look at trucks, trains, and pipelines, which has the lowest carbon footprint in terms of fuel transportation?

Mr. MAHMOUD. Pipelines by far.

Mr. FLORES. OK, thank you. And one of the things you talked about, you touched on this a minute ago, you are going to bury this thing 90 to 115 feet below this reservoir and below the river, which is very unusual. Most pipelines are in the 15- or 5- to 25-foot range.

Tell me about why you did that. I mean there is a geological subsurface issue here that—just tell me why you are doing that.

Mr. MAHMOUD. OK. And you are right, it is all about geology. So we have to span—the crossing of the waterway in that particular location is 5,400 feet. So, it is an engineering issue and it is also a geology issue.

At that location, there is sand, and clay, and some gravel, and then there is what is called a clay shale. And so part of the design was to put the pipeline in the soil band that is most conducive to allow that drill to be successful. And then you have to engineer to make the inflections or the bends in the pipe so the pipe can withstand the forces on it when you are pulling it through the hole. So, it is a combination of engineering design and geology that puts you to a depth. And in this case, we wanted to be as deep as we could.

Mr. FLORES. And the bottom line is, it becomes a much safer pipeline because you are doing it that way.

Mr. MAHMOUD. One hundred percent. That is exactly right.

Mr. FLORES. Thank you. I yield back.

Mr. OLSON. The gentleman yields back.

The Chair calls upon the gentleman from Oklahoma, Mr. Mullin, for 5 minutes.

Mr. MULLIN. Thank you, Mr. Chairman. And as my colleague from West Virginia was referring to, there is only a few of us that have been on construction sites. I traded in my Carhartt's and Red Wings when I got elected to office and had to learn how to tie a tie and buy my first suit. True story.

For my guys that are sitting in the back representing the labor force, special labor force across the country, I wish you guys weren't here. I wish you were on a jobsite. You know if they use the logic that this is considered a temporary job, than all 150 of my employees are a day-by-day employee but I think they consider themselves full-time, considering some of them have been working

for me from 17 to 20 years. It just shows the lack of understanding and the lack of knowledge.

And we are talking about construction jobs. And Republicans and Democrats have all been saying we have got a job package, we have got a job package. And the only reason why I ran is because I was saying get your foot off my neck and I will go to work but we can't because of all the political correctness and all the in-house fighting and all the permits that has got to be used and it gets old.

And Mr. Harrison, I am Cherokee. I understand very well sacred sites and heritage sites. It is our heritage. I want to protect them, too. It is vitally important to me. I live in the same spot that my family literally quit walking on the volunteer walk until we got to Indian territory which is known as Oklahoma.

I still own the same land that was allotted to my family, and there is a utility easement that goes across it. And I was glad to grant the utility easement because it is not just about our back yard, but it is about the country as a whole. What is good for your back yard is good for the country, and it is going to create jobs in your back yard, too. And you misrepresent it by starting to say that it is an 1851 Treaty, but you are not referring to the 1868 Treaty—is that what it was? But yet you want to talk about Government-to-Government relationships and yet you want to honor what is in one treaty but you don't want to use that one; you actually want to refer back to the other treaty. It seems a little hypocritical to me.

We want to talk about not engaging and having meaningful conversations between Government-to-Government, but yet they try to engage with you guys 389 times. Is that not enough? What do you consider meaningful meaningful conversations between Government-to-Government?

Mr. HARRISON. An actual dialogue, perhaps.

Mr. MULLIN. You have been engaged 389 times. You have had time to have a dialogue. Because coming out of those nonmeaningful, according to you, but 389 times which, by the way, is why we can't build pipelines, they moved it 140 times.

Mr. HARRISON. Not on our land. That was on—

Mr. MULLIN. Well those were meaningful conversations, weren't they?

Mr. HARRISON. Those weren't our conversations.

Mr. MULLIN. Were they not taken into consideration?

Mr. HARRISON. Those were not our conversations.

Mr. MULLIN. How many times have you guys been invited to be at the table?

Mr. HARRISON. Numerous. I met with Joey myself.

Mr. MULLIN. And those weren't meaningful?

Mr. HARRISON. No, they were proprietary and confidential.

Mr. MULLIN. So the only way that it was going to be is, it was going to be moved, regardless of what you guys wanted. It was going to be—go where? You didn't want it on an existing easement that has already been there since 1982, which means that that soil had already been dug before. There has already been Environmental Impact Studies. There have already been sacred sites looked at. And you don't want it there. So, where do you want it?

The answer is you don't want it. You just don't want it.

Mr. HARRISON. No, we just——

Mr. MULLIN. Because if you don't want it right there, you are wanting it to reroute it someplace else. But through Indian country, every time we dig up certain places because we occupied all the land, it can all be considered sacred at some point.

Now, if I am making a decision of where I want a pipeline because we need the infrastructure, I would rather put it on an existing easement that has been there since 1982 that we already know, for the most part, what is underneath the soil. Wouldn't you?

Mr. HARRISON. Not in this case, no.

Mr. MULLIN. So you would rather it just be routed someplace else and dig up new soil and you are not worried about those sacred sites.

Mr. HARRISON. At the risk of——

Mr. MULLIN. At the risk of what?

Mr. HARRISON. Can I finish?

Mr. MULLIN. Yes. I mean, risk of what?

Mr. HARRISON. At the risk of us guys taking all the risk——

Mr. MULLIN. Us guys, who is us guys? This isn't going across Tribal land because this wasn't actually in the last treaty. So a risk of what?

Mr. HARRISON. A risk of a breach. A risk of a spill.

Mr. MULLIN. A breach of what?

Mr. HARRISON. The oil pipeline.

Mr. MULLIN. What are they breaching? They are not going across what you consider the current treaty. They were going outside of it.

Mr. HARRISON. The river that flows goes into our treaty land, across our reservation.

Mr. MULLIN. But they have already crossed it, and it has been crossed upstream multiple times, too.

Mr. HARRISON. They could have crossed anywhere else upstream.

Mr. MULLIN. So you are OK with it going upstream, which doesn't make any sense, because if there was a breach, that means the oil would flow downstream.

Mr. OLSON. The gentleman's time has expired.

The Chair now calls upon the gentleman from California, Mr. Ruiz, for 5 minutes.

Mr. RUIZ. Thank you very much. You know, this is the same old song that we have been dealing with in our relationships with Tribes throughout our country's initiation. It is a historical trauma of paternalistic disrespect, political trickery that abuses laws and policies, then we interpret them during our own convenience, in terms of the Federal Government, in order to tell you what to think, what to say, and then also put the blame of that historical trauma and experience on your shoulders to then turn around and say it is your fault.

I think it is a shameful way to treat Native Americans and the first people, and this must end. This must end in our country. This must end to relieve our historical trauma. You are not a hypocrite for standing up for your historical reasons to say that that water that is not on your land has a vital component to your land, your life, your drinking water, and all those people that depend on it downstream.

It is not hypocritical when somebody does not ask you where your sacred sites are to bring your opinion in there to say, wait a minute, all throughout the pipeline construction, can you just at least ask me, ask our Tribe where we think our cultural sites are? We will work with you. It is not hypocritical for you to extend your hands with labor and others to say listen, build it somewhere else. Right now we are living in the now and the moment and this is a great risk for our Tribe, for future generations, for our ability to drink this clean water. So hey, if you want to reroute it into some other place and build more pipe and lay more pipes for more hours of work and more construction and more jobs, then go for it but just not now, not in the water source that we drink.

Executive Order 13175 says any project that has an impact to the land or the health of Tribes. Don't we all, as Americans, deserve the right to self-determination and have a right on decisions that may affect our children's health, our sacred lands and our future? Isn't that a fundamental value of the democratic process? Isn't that a fundamental American value that we must stand up for? Isn't that the value of the working families that want to have a say in what we do for our livelihood and have a fair shot and benefits package so that we can claim our rightful place in this Nation's great industry and economy?

So this is what is at stake now, and I am so tired of the Federal Government not respecting the meaningful consultation.

Notification is not meaningful consultation. Engagement is not meaningful consultation. Asking somebody to come to your meeting so they can check off a box and use that as an excuse to say "See, we did consult with these Tribes" is political trickery. It is not meaningful consultation.

Meaningful consultation is consulting, having dialogue, understanding the concerns, the risks at the beginning, before a plan was made and come to say, "Hey, listen, this is what we are going to do. I want you to sign this box so we can get on with it." No, it is to talk about not only the design, the location, the compromises, the negotiations, the rerouting, the mitigation risks, and all the cleanup Superfunds that need to exist so that the burden of cleanup and the risks aren't just placed on Native Americans. That is meaningful consultation.

This is not about not creating jobs. This is not about not helping the labor force to have a dignified job with a future for your families. This is about respecting Tribes and ending, once and for all, the historical trauma that they have faced in our Nation.

What is meaningful consultation for you, Mr. Harrison?

Mr. HARRISON. It is an actual dialogue. I just want to refer to Congressman Mullin. That wasn't meaningful dialogue. That is the way things have been going when we get peppered when we walk into the room. Rather than hear our side out, we get peppered with the hypocrisy, the numbers of however many times they dialed our phone number. That is not meaningful consultation.

Consultation comes in the planning stages. Consultation comes beforehand, when they can actually make some adjustments prior to. They have consulted other Tribes. Apparently, they have made 144 two-foot diversions. The pipeline is still going where it is going to go.

Mr. RUIZ. I really want to get to the bottom of this and fix a problem so that our workers don't have to be caught in the middle of this anymore and in the future. Let's define what meaningful consultation is.

I have a GAO study that I requested to determine whether or not the Federal Government is in compliance with that. The previous administration has conducted a multi-agency investigative study to determine what does "impact" and "meaningful consultation" mean. So, let's start looking from those to put those into practice and implementation.

Mr. OLSON. The gentleman's time has expired.

The Chair now calls upon Mr. Cramer from North Dakota.

Mr. CRAMER. Thank you, Mr. Chairman. Again, thanks to all of you for being here. Mr. Harrison, special thanks and welcome to you.

It is hard to respond to that kind of raging nonsense, but I do have to say a couple of things.

First of all, you have to, if you are invited into meaningful consultation but don't show up, it is not the person that invited you into the consultation, that there wasn't meaningful consultation. You have to show up when you are invited and at least respond to the request.

I want to get to another thing that Mr. Ruiz kept saying. There are many fake news stories, many fake news stories related to this, but perhaps one of the most egregious is this notion that there was once a route through north of Bismarck that was denied by all the white people in Bismarck, therefore, they had to move it down upstream from the reservation. That is just not true. That is blatantly not true.

I have sited many pipelines, and this route was chosen because it is the most direct, because it is an existing corridor that the Tribe, by the way, did not oppose 35 years ago when 2 other pipelines and a transmission line went across it.

So we have just got to get back to reality. There is a Tesoro refinery on the west side of the Missouri River in Mandan, North Dakota, that employs many union workers. We are very proud of that refinery. That refined product goes under the Missouri River, right through Bismarck, on to Fargo, North Dakota. Nobody ever complains about it. We are happy to have it. There is a pipeline two houses down from mine. I am glad to have it there. I am grateful the warmth it brings.

I want, though, to speak in my final moments maybe with you, Mr. O'Sullivan. One of my dearest friends in this body is David Scott, a Democratic Member of the Congressional Black Caucus from Atlanta, Georgia, who might be organized labor's biggest friend in the Congress. He and I worked together on the Keystone pipeline. We worked together on several other energy projects. We have introduced this year legislation similar to what he wanted in the Keystone pipeline to encourage the unions, encourage the companies, encourage the Government in their process of utilizing labor, obviously, training and apprenticeship programs to put a special emphasis on a social problem, and that is jobs for young black men.

I would just love to hear more about how your union and how your membership reaches out to our minority community to provide—OK, call me biased, I suppose, for wanting to give a hand up, a leg up to certain populations that I think need it, frankly, and that have earned it, but help me understand how we can maybe do more with our minority population and identify opportunities.

Mr. O'SULLIVAN. Well, Congressman, I can tell you what we do in the Laborers' International, and that is when we have opportunities like we do with ETP and other pipeline owners and users. And a lot of times because work is good in the energy sector, we have to recruit young men and women into our organization, train them, and put them on projects like Dakota Access Pipeline.

We work with faith-based groups. We work with local high schools, as we have we talked a number of times today about those that aren't ready to go to college or want an alternative career. So, our commitment to diversity in trying to do as much local hire as we possibly can is second to none.

There are golden opportunities to work with people of color, faith-based groups, community groups, even community colleges, to recruit the workforce of tomorrow.

Mr. CRAMER. So Mr. Harrison raised a very important point about what is in it for us, so to speak. Those are my words, not yours. You are more eloquent. But related to "none of the workers are ours," could we try—they have wonderful community colleges. Sitting Bull is a great college down in Standing Rock. United Tribes Technical College in Bismarck has worked with the industry to identify some skills that they could train. Let's commit at least to that, to providing more opportunities to provide jobs that I think could cure a lot of the social challenges, as well as the relationship challenges, that we seem to be facing today.

Mr. MAHMOUD, how does that sound for a plan going forward?

Mr. MAHMOUD. We absolutely support that plan. We would love to increase diversity in our workplace, as well as on the construction side.

Mr. CRAMER. With that, my last 10 seconds, Mr. Chairman. Thank you. Again, thanks to all of you. A special thanks and welcome to Mr. Harrison and Mr. O'Sullivan.

Mr. O'SULLIVAN. Congressman, I could say that along with faith-based groups and the other groups, we have worked with Native American Tribes, not only in the U.S., but in Canada, as well.

Mr. CRAMER. All right, I appreciate it. Thank you.

Mr. OLSON. The gentleman's time has expired. Seeing there are no further Members who wish to ask questions of the second panel, I would like to thank all of the witnesses today for being here.

And pursuant to committee rules, I remind Members that they have 10 business days to submit additional questions for the record. I would ask that the witnesses submit their response within 10 business days upon receipt of those questions.

I also ask unanimous consent to enter these five lists of documents for the record: The Clean Line Energy Partners letter, the Industrial Energy Consumers of America letter; the National Rural Electrical Cooperative Association letter; the Association of Oil Pipe Lines letter; and a letter from the National Urban League, without objection. So ordered, without objection.

[The information appears at the conclusion of the hearing.]

Mr. OLSON. This subcommittee is adjourned.

[Whereupon, at 3:58 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

EXHIBIT 12

Standing Rock Sioux Tribe v. United States Army Corps of Engineers

Case No. 1:16-cv-1534 (JEB)

United States Army Corps of Engineers' Memorandum in Support of its Motion to Dismiss and
in Opposition to Dakota Access, LLC's Motion for Summary Judgment



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
1616 CAPITOL AVENUE
OMAHA NE 68102-4901

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MEMORANDUM FOR RECORD

SUBJECT: Application for an Easement for an Oil Pipeline to Cross U.S. Army Corps of Engineers-Managed Federal Land at Lake Oahe, North Dakota

1. References.

- a. 30 U.S.C. § 185, Rights-of-way for Pipelines through Federal Lands.
- b. 33 U.S.C. § 408, Taking Possession of, Use of, or Injury to Harbor or River Improvements.
- c. Engineering Regulation 405-1-12, Real Estate Handbook, September 30, 1994.
- d. Engineering Regulation 1130-2-550, Recreation Operations and Maintenance Policies, September 30, 2013.
- e. Engineering Circular 1165-2-216, Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 U.S.C. 408, June 21, 2016.
- f. CEMP-CR/CECC-R, Memorandum, Subject: Real Estate Guidance Letter No. 27 – Official U.S. Army Corps of Engineers Real Estate Policy, October 29, 2008.
- g. Notice of Availability, Dakota Access Lake Oahe Crossing, December 03, 2016.

2. Purpose. The purpose of this memorandum is to document the U.S. Army Corps of Engineers (Corps) decision on the Dakota Access, LLC (Dakota Access) application for an easement to cross Corps-managed federal lands at Lake Oahe, North Dakota. See the attached Unexecuted Easement, Exhibit A, for a map of the area that would be covered by the easement.

3. Authority. Congress authorized “appropriate agency head[s]” to grant rights-of-way or easements through federal lands for oil pipelines in the Mineral Leasing Act. 30 U.S.C. § 185(a). Congress outlined how agencies were to exercise their discretion under this authority -- before granting a right-of-way, agencies must impose conditions, including requirements to control or prevent damage to the environment, public or private property, hazards to public health and safety, and measures to protect the interests of individuals living in the general area who rely on certain natural resources in the area for subsistence. 30 U.S.C. § 185(h)(2). Further,

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section 185 requires agencies to impose requirements for the operation of pipelines that “protect the public from sudden ruptures and slow degradation of the pipeline.” 30 U.S.C. § 185(g).

4. Background. The Corps received an application for an easement on October 21, 2014 from Dakota Access. Specifically, the application requested an easement for a 30-inch diameter light crude oil pipeline. The approximately 1,168 mile Dakota Access Pipeline (DAPL) will connect the Bakken and Three Forks oil production region in North Dakota to an existing crude oil market hub near Patoka, Illinois. The pipeline crosses three Corps districts: Omaha, Rock Island and St. Louis. The Corps was required to consider three categories of requests submitted by Dakota Access for: (1) individual verifications that activities at more than 200 locations along the DAPL route satisfied the terms and conditions of Nationwide Permit (NWP) 12 (under the Clean Water Act, 33 U.S.C. § 1344, or the Rivers and Harbors Act of 1899, 33 U.S.C. § 403), which authorizes activities required for the construction of utility lines in federally-regulated waters; (2) a real estate easement to lay the pipeline under a Corps-managed lake (Lake Oahe) and adjacent Corps-managed property; and (3) permissions to cross or lay the pipeline in seven locations used by the Corps for navigation or flood control under section 14 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 408 (section 408). Of the total length of the pipeline, only approximately three percent of the route is subject to Corps jurisdiction.

The pipeline would cross Lake Oahe at approximately one-half mile upstream of the northern boundary of the Standing Rock Sioux Tribe’s (SRST’s) reservation. Dakota Access would use a technique called horizontal directional drilling (HDD) to place the pipeline approximately 92 feet below the lake bed. The Corps would need to provide Dakota Access with three separate permissions for this specific crossing. Dakota Access required and received verification that the crossing meets the terms and conditions of NWP 12. Because the pipeline would cross Corps-managed property, section 408 required the Corps to “grant permission for the alteration or permanent occupation or use of [the project] when in the judgment of the Secretary such occupation or use will not be injurious to the public interest and will not impair the usefulness of such work.” 33 U.S.C. § 408. Finally, the Corps would need to grant Dakota Access an easement (*i.e.*, a “right-of-way”) because the pipeline would cross Corps-managed federal property. 30 U.S.C. § 185(a).

The Omaha District prepared environmental documentation under NEPA to support the required section 408 permission to cross Lake Oahe. The District published a draft EA on December 8, 2015, which was circulated for public comment. See 40 C.F.R. § 1508.9 (defining EAs). After reviewing the comments received, the Corps published the final EA and a Finding of No Significant Impact (FONSI) for the crossing on July 25, 2016. See 40 C.F.R. § 1508.13 (defining FONSI). The Corps must now take action on the application for an easement by Dakota Access.

5. General Policy Evaluation. The Corps evaluated the Dakota Access application as a policy matter under the Non-Recreational Outgrant Policy at ER 1130-2-550, Chapter 17.

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a. ER 1130-2-550 requires that the Corps determine that “[t]he impact associated with an individual action or the accumulated impact of a series of actions must not adversely impact the capability of the project to generate the benefits for which the project was congressionally authorized, constructed, and is operated” before granting an easement. ER 1130-2-550, paras. 17-3 and 17-9.b.(1) (2013).

The Lake Oahe project was authorized by the Flood Control Act of 1944, Public Law 78- 534, along with four other Missouri River main stem projects. The five reservoirs are elements of a plan for the development of the Missouri River main stem. The main stem plan is a component of the comprehensive river basin development program in the Missouri River Basin, the Pick-Sloan Plan. Formed from separate proposals recommended by the Bureau of Reclamation and the Corps, the Pick-Sloan Plan was one of the first plans nationwide that recognized the role of tributary basins and the importance of comprehensive planning in flood control. The Congressionally-authorized purposes of the Lake Oahe project include flood control, navigation, hydropower, recreation, water supply, and water quality.

The Omaha District found that the proposed DAPL crossing at Lake Oahe “will not impair the usefulness” of the Lake Oahe project when the District granted permission to impact the project under 33 U.S.C. 408. FONSI at p. 6 (July 25, 2016) and District Commander’s Approval of Section 408 Decision Document (July 21, 2016). This finding is supported by the Final EA that was issued on July 25, 2016 and various memoranda supporting the District Commander’s Section 408 approval. The analysis supporting the grant of permission under 33 U.S.C. 408 is adopted in support of the Corps finding that granting an easement for the pipeline to cross Lake Oahe will not adversely impact the capability of the project to generate the benefits for which the project was Congressionally authorized.

b. Corps policy is to evaluate whether the proposed easement would be “[c]onsistent with complete land use classifications and resource objectives identified in the approved project master plan.” ER 1130-2-550, para. 17-9 b.(3). The Corps has reviewed the proposed easement and has determined that it is consistent with the Final Oahe Dam/Lake Oahe Master Plan (September 2010).

c. Corps policy is to evaluate whether there is no viable alternative to utilization of public lands and waters. ER 1130-2-550, para. 17-9 b.(2). Corps policy specifically lists pipelines as examples of instances where there is no viable alternative. Here, that policy is supported by the alternatives analysis in the Final EA. See Final EA at Section 2.0, Alternatives. Accordingly, the Corps finds here that there is no viable alternative to utilization of Corps-managed public lands at Lake Oahe.

d. Corps policy requires that the grant of the easement must be consistent with the applicable appendices to ER 1130-2-550. ER 1130-2-550, para. 17-9b.(4). The applicable appendices are Appendix E, General Outgrant Application Information, Appendix F, National Environmental Policy Act (NEPA) Guidance, Appendix G, Mitigation Guidance, and Appendix H, Additional Guidance for Specific Outgrant Applications. The applicant submitted the materials that are

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required in Appendix E. The Corps' evaluation of the proposed pipeline crossing at Lake Oahe complied with NEPA requirements upon the completion of the Final EA and FONSI, thereby meeting the requirements of ER 1130-2-550, Appendix F. The easement will also comply with the mitigation guidance in Appendix G. The Final EA outlined the various mitigation measures that the applicant will undertake. Final EA at Table 8-2. Further, various mitigation measures are conditions in Unexecuted Easement. *See* Unexecuted Easement para. 2 b. and Exhibit "D," Special Conditions. The applicant complied with the portion of Appendix H relevant to oil pipelines. Appendix H, para. f, requires the applicant to make certain disclosures of ownership. The applicant made the ownership disclosures in its application and has provided updated information to the Corps as recently as December 2, 2016. *See* Dakota Access, LLC, Standard Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands, Attachment, Section I, at pp.1-2 (submitted June 29, 2015).

e. Corps policy is to grant an easement when it is in the public interest. ER 1130-2-550, para. 17-9b.(5). The Omaha District found that the proposed DAPL crossing of the Corps project at Lake Oahe "will not be injurious to the public interest" when the District granted permission to impact the project under 33 U.S.C. 408. FONSI at p. 6 and District Commander's Approval of Section 408 Decision Document (July 21, 2016). This finding is supported by the Final EA that was issued on July 25, 2016 and various memoranda supporting the District Commander's Section 408 approval. The analysis of the public interest supporting the grant of permission under 33 U.S.C. 408 is adopted in support of the Corps finding that granting an easement for the pipeline to cross Lake Oahe is in the public interest.

f. Corps policy is to determine whether the applicant has a demonstrated need for the project. ER 1130-2-550, at para. 17-9b.(6). As described in the Dakota Access application, the overall project purpose or need is to move a supply of crude oil from the Bakken and Three Forks production region in North Dakota to a crude oil market hub located near Patoka, Illinois. Dakota Access, LLC, Standard Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands, at p. 6 (submitted June 29, 2015). The overall pipeline project will improve overall safety to the public and the environment by reducing crude oil shipped by truck and by rail and significantly increase the amount shipped by pipeline. As stated above, Dakota Access has shown that there is no viable alternative to crossing the federal project. The Corps finds that the applicant has a demonstrated need for the project.

g. Corps policy is determine whether the applicant has the technical and financial capabilities to comply with the easement's consideration, mitigation and administrative expenses. ER 1130-2-550, at para. 17-9b.(7)&(8). The applicant's parent company, Energy Transfer, has completed more than 30 capital projects over \$50 million. Energy Transfer Capital Projects in Excess of US\$ 50 million, 2006-2014 (provided Dec, 2, 2016). Many of these projects were pipelines of 30 inches or more in diameter. *Id.* The Corps finds that the parent company's completion of those projects demonstrates that the applicant possess the technical and financial capabilities to comply with the easement.

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h. Corps policy is that it will coordinate and consult with federally-recognized Native American tribes when reservation lands are involved. ER 1130-2-550, para. 17-3. The proposed DAPL crossing at Lake Oahe is not on reservation lands; therefore, by policy there is no requirement to coordinate with any federally-recognized tribe. However, the Corps reached out to the SRST to coordinate and consult on the DAPL project. As established in the analyses set forth in the Final EA, the Corps attempted to engage in meaningful discussions with the SRST on numerous occasions about the nature of the project, cultural resources, and the Lake Oahe crossing beginning in October 2014 and continuing through March 2016. Final EA at 85; see also *Standing Rock Sioux Tribe v. U.S. Army Corps of Eng'rs*, No. 16-cv-01534, Memorandum Opinion Denying Plaintiff's Request for Preliminary Injunction, Docket No. 39 at 48 (D.C. Dist. Sept. 9, 2016)(finding that, on the preliminary injunction record, the Corps exceeded its NHPA obligations at many sites).

The Department of the Army also invited the SRST to engage in additional discussions about whether to grant this easement. See Letter from The Honorable Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works) to The Honorable Dave Archambault II, Chairman, Standing Rock Sioux Tribe, dated November 14, 2016. Specifically, the Army invited the SRST to engage in discussion with the Corps concerning the following topics:

- Potential conditions in an easement for the pipeline crossing, which would further reduce the risk of a spill or rupture, hasten detection and response, or otherwise enhance the protection of Lake Oahe, the Tribe's water supplies, and its treaty rights;
- With such conditions, the risk to the Tribe of a spill from the pipeline crossing Lake Oahe at the proposed location; and
- In light of such conditions, whether to grant an easement for the pipeline to cross Lake Oahe at the location currently proposed.

On November 22, 2016, the Corps extended an offer to the SRST to discuss those topics and to seek conditions that would address the Tribe's concerns. Letter from COL John W. Henderson, District Commander, to Mr. Dave Archambault II, Chairman, SRST, dated November 22, 2016. The SRST responded the following day, November 23, 2016, stating that "[t]he Tribe's fundamental position remains clear -- the easement to cross Lake Oahe at the Tribe's doorstep must be denied," but added that, "I am willing to talk further with you, including on issues relating to pipeline safety. But for such discussions to be productive, it is my view that they must take place in the context of the Tribe's basic position regarding the pipeline and the Lake Oahe crossing." Letter from Mr. Dave Archambault II, Chairman, SRST, to COL John W. Henderson, District Commander, dated November 23, 2016. In this letter, the Tribe requested that the Corps:

. . . [P]rovide the Tribe with the information sought in our expert's October 28, 2016 report. The information provided should be sure to include: 1) Comprehensive construction and design documentation that includes piping, instrumentation, control system and electrical design; 2) Documentation that lists the industry codes, standards and recommended practices that have been adopted and applied to the design,

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construction and operation of the Dakota Access Pipeline project. Include both codes and standards required by regulation and recommended practices applicable to the project adopted and applied voluntarily; 3) Material specifications including analysis of selected grade of pipe, wall thickness, pipe yield strength, corrosion allowance, ductility, pipe and weld coating systems and stress induced by installation of the pipe; and 4) Data and source materials underlying and relied on in any risk analysis. We are continuing to consult with pipeline experts who may have additional questions, but our experts cannot proceed without the fundamental baseline.

Letter from Mr. Dave Archambault II, Chairman, SRST, to COL John W. Henderson, District Commander, dated November 23, 2016.

On December 2, 2016, representatives of the SRST, Dakota Access, and the Corps met to discuss the Tribe's request, along with potential terms and conditions that could be placed in the easement.

Accordingly, the Corps finds that it provided more than adequate coordination and consultation with the federally-recognized SRST, in accordance with ER 1130-2-550, para. 17-3, despite the fact that SRST reservation lands are not involved and the SRST reservation would not be directly impacted by the easement.

i. The Corps finds that granting Dakota Access an easement for the pipeline to cross Lake Oahe would be consistent with the Corps policy on non-recreational outgrants, ER 1130-2-550, Chapter 17, and Omaha District policy.

6. Specific Statutory Findings. An easement must meet the statutory requirements of 30 U.S.C. § 185. Additionally, the grant of an easement must be consistent with Corps policy implementing that statute. See Reference 1.c., ER 405-1-12, 8-182 (1994).

a. The Corps must determine that the proposed easement will not be inconsistent with the authorized purposes of the federal project. 30 U.S.C. § 185(b)(1). As discussed above, at para. 5.a., pp.2-3, the proposed easement would not be inconsistent with the authorized purposes of the Lake Oahe project.

b. The Corps cannot grant an easement if the width of the easement exceeds 50 feet plus the ground occupied by the pipeline and related facilities, unless it is determined that a wider right of-way is necessary for operation and maintenance after construction, for protection of the environment, or for public safety. The width of the requested easement will not exceed 50 feet, plus the ground occupied by the pipeline. See attached Unexecuted Easement at p.1 (stating width of a right-of-way being 50 feet plus the ground occupied by the pipeline (that is, the pipe and its related facilities)).

CENWO

SUBJECT: Application for an Easement for an Oil Pipeline to Cross U.S. Army Corps of Engineers-Managed Federal Land at Lake Oahe, North Dakota

c. Any special requirements for safe operation of the pipeline or related facilities should be imposed. See Exhibit D to the Unexecuted Easement containing special conditions addressed during discussions on December 2, 2016.

d. The Corps is required to impose necessary stipulations to prevent or control damage to the environment, including fish and wildlife habitat, damage to public or private property, and hazards to public health and safety; and require restoration, revegetation, and curtailment of erosion of the surface of the land when deemed appropriate. See 30 U.S.C. § 185(h)(2); ER 1130-2-550, para. 17-5, Mitigation, and App. G, Mitigation Guidance (2013). The proposed easement requires mitigation and has added special conditions to the easement to mitigate any impacts to the environment. See Unexecuted Easement, at para. 2.b., and Exhibit D to the Unexecuted Easement, Special Conditions.

e. The Corps is required by statute to obtain ownership information from the applicant. 30 U.S.C. § 185(i). The applicant made these disclosures in its application and has provided updated information to the Corps as recently as December 2, 2016. See Dakota Access, LLC, Standard Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands, Attachment, Section I, at pp.1-2 (submitted June 29, 2015).

f. The Corps is required by statute to determine whether applicant has the technical and financial capability to construct, operate, maintain, and terminate the project for which the permit or right-of-way is requested, in accordance with this law. 30 U.S.C. § 185(j). As discussed previously in this memorandum, the Corps is satisfied that the applicant has the required technical and financial capability.

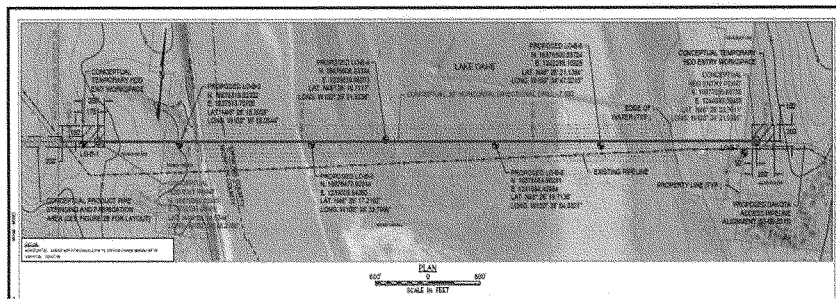
g. The statute requires the Corps to provide federal, state, and local governments, as well as the public, the opportunity to comment on the easement application. 30 U.S.C. § 185(k). Corps policy is that no further comment periods are necessary if the pipeline proposal and related aspects have previously been scrutinized through NEPA procedures. ER 405-1-12, para. 8-182c.(8) (1994). The Corps provided a public comment period for the NEPA process that evaluated the DAPL crossing at Lake Oahe. Thus, this process satisfied the public comment requirement in 30 U.S.C. § 185(k). See Final EA, App. J.

h. The Corps must also include certain other conditions required by statute and policy. The grantee must pay all costs of environmental assessment and monitoring. ER 405-1-12, para. 8-182c.(5) (1994). This is included in the attached Unexecuted Easement at para. 2.c and in the Special Conditions in Exhibit D. The Corps must also be reimbursed for costs and be paid consideration for the easement. 30 U.S.C. § 185(l). This requirement is included in the attached Unexecuted Easement at para. 2.a. and 2.c. The easement cannot be for a term of more than 30 years. 30 U.S.C. § 185(n). The attached Unexecuted Easement is limited to a term of 30 years. See Unexecuted Easement at para. 1. The easement must also contain certain language about suspension or termination of the easement. 30 U.S.C. § 185(o). This requirement is included in the attached Unexecuted Easement at para. 16. The easement must also contain a condition that allows for the joint use of the easement area for other easements granted under 30 U.S.C. § 185.

SUBJECT: Application for an Easement for an Oil Pipeline to Cross U.S. Army Corps of
Engineers-Managed Federal Land at Lake Oahe, North Dakota

i. The District Engineer may require the holder of a license or right-of-way to furnish a satisfactory bond or other security for all or any of the obligations imposed by terms and conditions of the license, right-of-way, or regulations. This requirement is discretionary. The attached Unexecuted Easement does not include the requirement to furnish a bond or other security.

k. The Corps is required to utilize easements in common with other pipelines to the extent practical. 30 U.S.C. § 185(p). This proposed DAPL crossing at Lake Oahe is co-located with an existing natural gas pipeline crossing, as depicted on the following map:



I. Based on the foregoing information, and after reviewing the attached Unexecuted Easement, including the special conditions discussed by the applicant, Dakota Access, and representatives of the SRST, and included in Exhibit D to the Unexecuted Easement, I have determined that that issuance of the attached Unexecuted Easement to Dakota Access would be consistent with the statutory requirements at 30 U.S.C. § 185.

CENWO

SUBJECT: Application for an Easement for an Oil Pipeline to Cross U.S. Army Corps of Engineers-Managed Federal Land at Lake Oahe, North Dakota

7. The Corps of Engineers, through the Department of the Army, is required by statute to notify Congress when an application is received and when the Corps is going to grant an easement for a pipeline that is greater than 24 inches in diameter. 30 U.S.C. § 185(w). The Army notified Congress of the application on September 13, 2015. In accordance with this memorandum, I recommend that the Army notify Congress that the Corps intends to grant the attached easement to Dakota Access.

8. After notification to Congress, the Omaha District intends to execute and issue the easement to Dakota Access.

Encl


JOHN W. HENDERSON, P.E.
Colonel, Engineer
Omaha District Commander

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 16-5259**September Term, 2016****1:16-cv-01534-JEB****Filed On:** October 9, 2016

Standing Rock Sioux Tribe,

Appellant,

Cheyenne River Sioux Tribe,

Intervenor-Appellant,

v.

United States Army Corps of Engineers,

Appellee,

Dakota Access LLC,

Intervenor-Appellee.

BEFORE: Brown, Griffith, and Pillard, Circuit Judges

ORDER

Upon consideration of the emergency motion of appellant Standing Rock Sioux Tribe for injunction pending appeal, the oppositions thereto, the reply, the administrative injunction entered September 16, 2016, and the oral argument of the parties, it is

ORDERED that the administrative injunction be dissolved. It is

FURTHER ORDERED that the motion be denied. Our precedent requires the party seeking an injunction to clearly show (1) a substantial likelihood of success on the merits; (2) the existence of irreparable harm absent injunction; (3) the equities favor injunctive relief; and (4) injunctive relief will not negatively impact the public interest. *See Davis v. Pension Ben. Guar. Corp.*, 571 F.3d 1288, 1291 (D.C. Cir. 2009); *Cobell v. Norton*, 391 F.3d 251, 258 (D.C. Cir. 2009). We find the Tribe has not carried its burden of persuasion on these factors, and so we deny the motion.

Although the Tribe has not met the narrow and stringent standard governing this extraordinary form of relief, we recognize Section 106 of the National Historic Preservation Act

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 16-5259**September Term, 2016**

was intended to mediate precisely the disparate perspectives involved in a case such as this one. Its consultative process—designed to be inclusive and facilitate consensus—ensures competing interests are appropriately considered and adequately addressed. But ours is not the final word. A necessary easement still awaits government approval—a decision Corps' counsel predicts is likely weeks away; meanwhile, Intervenor DAPL has rights of access to the limited portion of pipeline corridor not yet cleared—where the Tribe alleges additional historic sites are at risk. We can only hope the spirit of Section 106 may yet prevail.

Per Curiam

FOR THE COURT:

Mark J. Langer, Clerk

BY: /s/

Laura Chipley

Deputy Clerk



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

FEB 07 2017

The Honorable Rob Bishop
 Chairman, Committee on Natural Resources
 United States House of Representatives
 Washington, D.C. 20515

Dear Chairman Bishop:

Pursuant to the Mineral Leasing Act of 1920, as amended (30 U.S.C. §185 (w)), the Army is hereby providing notice of an intent to grant an easement to Dakota Access LLC, a Delaware limited liability company ("Company"), with its principal office at 1300 Main Street, Houston, Texas, operating as a subsidiary of Energy Transfer Partners and authorized to do business in the State of North Dakota, for installation, construction, operation, maintenance, and repair of a 30-inch diameter underground light crude pipeline. The Army provided notice on September 3, 2015, that the Company filed an application with the Army for an easement for a right-of-way across Government land at Lake Oahe Dam and Reservoir, North Dakota.

On Government land, the pipeline will cross approximately 7.37 acres at Tracts 3214, 3215, 3218, 3219-1, and 3225 at Lake Oahe Dam and Reservoir. The pipeline will cross Lake Oahe and Government property on both the east and west of Lake Oahe. The crossing is located in Section 10, Township 134 North, Range 79 West in Morton County, North Dakota, and Section 11, Township 134 North, Range 79 West in Emmons County, North Dakota. A map and legal description are enclosed. Since the line is being buried using a horizontal directional drill under the lake, a construction license will not be needed. The pipeline will not cross the property of any other federal agency.

The Army intends to issue the easement for a term of 30 years. The width of the right-of-way will not exceed fifty feet plus the ground occupied by the pipeline. Easement terms will establish the following major responsibilities on the Company: mitigation of any damages to the property or to the Lake Oahe Project during construction, operation, and maintenance of the pipeline; construction, operation, and maintenance in accordance with applicable federal, state, county, and municipal laws, regulations, and ordinances; pipeline installation in accordance with the U.S. Department of Transportation's Minimum Federal Safety Standards and any other applicable federal or state safety requirements; supervision of the pipeline with inspections at reasonable intervals; the immediate repair of any defects or leaks found by such inspection; protection of government property; Company liability to the United States for damage or injury which may arise from or be incident to the activities of the Company under the easement; soil and water conservation measures including restoration, revegetation, and erosion control; environmental and natural resource protection requirements; non-disturbance of any historical, archeological, architectural or other cultural artifacts encountered; hazardous waste management; a plan for responding to hazardous waste, fuel, and other chemical spills; and compliance with the conditions set forth in the Federal Energy Regulatory Commission's Order Issuing Certificate

dated December 24, 2014, as applicable, to Docket No. OR14-42-00, Dakota Access LLC. In addition, special easement conditions include: responsibility for commitments and mitigation measures in the Final Environmental Assessment; consideration of Army comments prior to the Company's submission of a Facility Response Plan, Geographical Response Plan, Operations and Maintenance Manual, Risk Assessment (Integrity Management Plan), and Spill Models to the Pipeline and Hazardous Materials Safety Administration; as-built drawings; execution of training exercises; and compliance with specified pipeline safety conditions during construction and operation of the pipeline.

Consistent with the direction in "Presidential Memorandum Regarding Construction of the Dakota Access Pipeline" dated January 24, 2017, the U.S. Army Corps of Engineers intends to waive its policy to wait 14 days after Congressional notification before granting an easement under 30 U.S.C. §185. The Corps intends to execute this easement at a time that is mutually convenient to the Corps and the Company, no earlier than 24 hours following delivery of this notification letter.

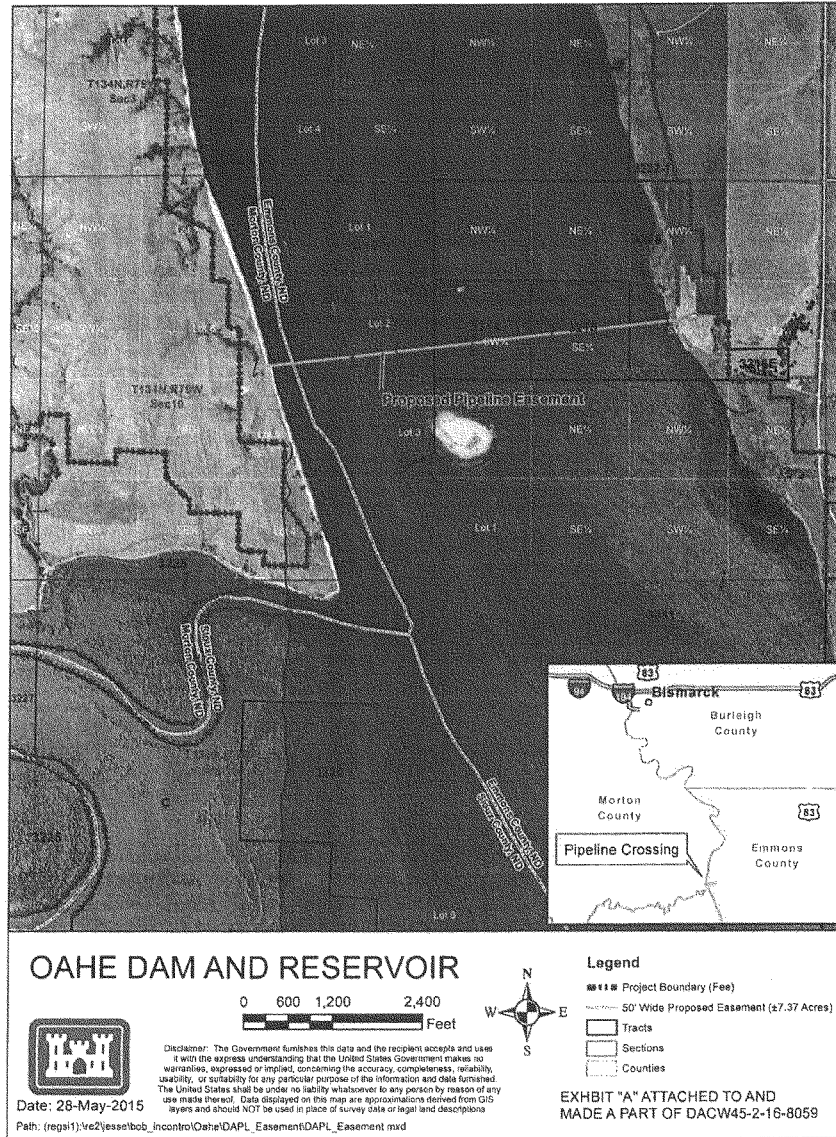
If you have questions on this action, MAJ Richard Trimble, Office of the Chief of Legislative Liaison, may be reached at 703-697-2417 or LTC Elizabeth Walker at (703) 697-0275.

Sincerely,



Paul D. Cramer
Deputy Assistant Secretary of the Army
(Installations, Housing and Partnerships)

Enclosure



METES AND BOUNDS DESCRIPTION
CENTERLINE 50' WIDE PERMANENT EASEMENT

Being a centerline description located in the Section 10, Township 134 North, Range 79 West of the 5th P.M., in Morton and Emmons County, North Dakota and Section 11, Township 134 North, Range 79 West of the 5th P.M., in Emmons County, North Dakota, and crossing the following tracts of land and described as follows:

Basis of Bearing:
Bearing are based on UTM Zone 14 Grid North.

Tracts of land:
Tract 1: Portion of Lot 4 and Lot 7; Book 125, Page 395; Deed Records, Morton County.
Tract 2: Lake Oahe.
Tract 3: Portion of the N1/2 of Section 11; Civil Case No. 406; Probate Records, Emmons County.

COMMENCING at a 3/8-inch iron rod found for the Northwest corner of said Section 10;

THENCE, crossing said Section 10, South 46 degrees 08 minutes 26 seconds East a distance of 3,664.72 feet to the west line of said United States of America Tract 1 for the **POINT OF BEGINNING** of this centerline description;

THENCE, crossing the United States of America tracts and through said Section 10 and said Section 11, North 83 degrees 59 minutes 34 seconds East a distance of 6,420.72 feet to the east line of said United States of America Tract 3 for the **TERMINAL POINT** of this centerline description, from which a 1-inch USGS monument found on said east line bears South 01 degrees 17 minutes 30 seconds West a distance of 296.68 feet. Said centerline having a length of 6,420.72 feet, 389.14 rods, and said fifty foot (50') wide.

Permanent Easement containing 7.37 acres of land.

Wood Group Mustang, Inc.
17325 Park Row
Houston, Texas 77084
(832) 809-8000
April 23, 2015
Job No. 103957

Exhibit "B"
DACW45-2-16-8059



February 13, 2017

The Honorable Fred Upton
 Chairman, Subcommittee on Energy
 Committee on Energy and Commerce
 U.S. House of Representatives
 2125 Rayburn House Office Building
 Washington, D.C. 2015

Dear Chairman Upton:

Thank you for scheduling the hearing on February 15, 2017 entitled, "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion." Clean Line Energy has substantial experience with developing large-scale, electric transmission infrastructure, and we consider congressional attention on this to be timely and important.

Clean Line Energy is developing the largest electric infrastructure project in the United States, a 720-mile long high-voltage direct current transmission line that will connect America's best wind energy resources to market. When completed, the Plains & Eastern project will move sufficient power from the Oklahoma Panhandle region to Arkansas, Tennessee and surrounding states to meet the needs of more than one million homes.

After a laborious six-year review process, the Plains & Eastern project has been approved by the U.S. Department of Energy (DOE) under authority provided by Congress in Section 1222 of the Energy Policy Act of 2005.

The Plains & Eastern project involves some of the biggest companies in the US including General Electric and Quanta Services. Recently, Clean Line Energy announced that it will source insulators for the project from a new factory that is opening its doors this year in West Memphis, Arkansas. Overall, the \$2.3 billion project will require more than 67,000 tons of steel and create more than 2,500 jobs.

Mr. Chairman, as you well know, new electric infrastructure is incredibly challenging to build in the US. Still, new electric transmission projects are critical for both U.S. energy security and for U.S. competitiveness. In that regard, I am attaching a January 12, 2017 article from *The Economist* which frames up the advantages of modern HVDC infrastructure and includes a smart explanation of how these projects come together. In *The Economist's* words, America is "Johnny-come-lately" to the world of HVDC infrastructure.

1001 MCKINNEY, SUITE 700 HOUSTON, TX 77002 TEL 832-319-6310 FAX 832-319-6311

CLEANLINEENERGY.COM



We are happy to discuss our experiences with the Plains & Eastern project and our other transmission projects and serve as a technical resource for you and the subcommittee members as you further explore these important issues.

Sincerely,



Michael Skelly

Clean Line Energy Partners
1001 McKinney, Suite 700
Houston, TX 77002

cc: Rep. Bobby Rush, Ranking Member
Subcommittee members

200

The Economist

JANUARY 14TH-20TH 2017

Trump v the spooks

The stain of Guantánamo

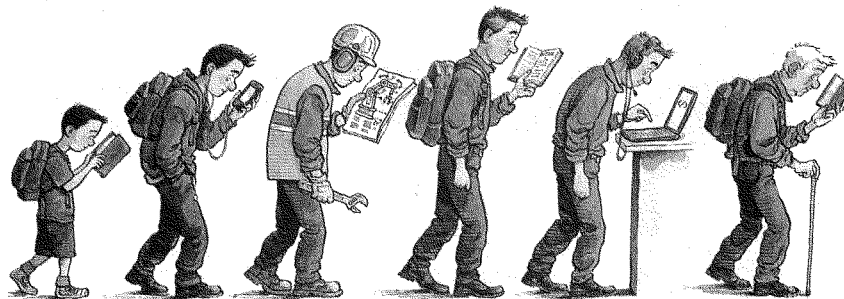
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Brazil.....	R\$42.90	Croatia.....	€10.795	St. Maarten.....	CH\$13.80	Venezuela.....	B\$99.00

► “the worst trade deal maybe ever signed anywhere”, launches a trade war, Mexico will probably fall into a recession. That would worsen a political environment that is already poisonous. Mexico’s president, Enrique Peña Nieto, has the lowest approval ratings of any recent leader. He is reviled for failing to control corruption and for allowing crime to surge. On January 1st the government raised petrol prices by up to 20%. Enraged drivers blocked roads, looted shops and occupied petrol stations; six people died in the unrest.

Mexico is due to hold its next presidential election in 2018. The nationalism and misery provoked by Mr Trump could bring to power Andrés Manuel López Obrador, a left-wing populist. Mr Peña’s weakness threatens to discredit vital reforms he enacted early in his tenure, including liberalisation of energy and telecoms. A dismantling of NAFTA, which helped create the right conditions for reforms, would doom them.

America would suffer, too. Its trade with Mexico is worth just 3% of its GDP, but some 5m American jobs depend on it. The design, manufacture and servicing of everything from appliances to medical equipment is spread across both borders. Cars made in Mexico are stuffed with parts manufactured in America; some 40% of the value of Mexican exports consists of inputs bought from the United States. If Mexico is not allowed to sell cars, aerospace equipment and fruit to America, it is likely to send more immigrants and drugs.

Accentuate the positive

How should Mexico respond to Mr Trump? First of all, by reminding his administration that the relationship is mutually beneficial. Alongside trade, Mexico has been a partner in controlling illegal immigration. It stops many of the 200,000-300,000 Central Americans and others who try every year to

sneak across Mexico into the United States. And Mexico has paid a price to keep relations warm: some 100,000 Mexicans have died since Mexico joined America’s war on drugs.

Mexico should also seize on Mr Trump’s occasional hints that he is open to renegotiating NAFTA rather than ripping it up. The 23-year-old agreement could usefully be updated to cover new sectors, such as digital commerce and energy.

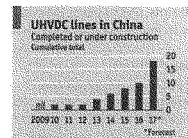
If Mr Trump is really determined to start a trade war, Mexico has few good options. A broad strategy of fighting tariffs with tariffs will hurt its own consumers most, while inflicting only modest damage on America’s vast economy. There is scope for artful use of targeted measures within the rules of NAFTA and the World Trade Organisation, an approach that Mexico has wielded adroitly before. In 2009, after America blocked Mexican lorries from operating north of the border—to protect the jobs of American drivers—Mexico imposed tariffs on nearly 100 American products, from Christmas trees to felt-tipped pens, choosing industries with clout in congressional districts whose representatives had a say in the dispute. The American block was eventually lifted.

Mexico’s best defence against a bullying neighbour, however, will be to seek freer trade elsewhere and to strengthen its own economy. It needs to build more infrastructure: whereas northern Mexico has good transport links to America and the coasts, the poor south is largely cut off. Most Mexican workers have unproductive informal jobs. Shifting firms into the formal economy will be hard so long as the government fails to curb corruption; many Mexicans are loth to pay taxes they assume will be stolen. Mr Trump’s anti-Mexican populism threatens to help usher in a leftist government that will abandon reforms. But it makes those modernising policies more necessary than ever. ■

Renewable energy

A greener grid

China’s embrace of a new electricity-transmission technology holds lessons for others



renewables and drive down carbon-dioxide emissions, a way must be found to send energy over long distances efficiently.

The technology already exists (see page 71). Most electricity is transmitted today as alternating current (AC), which works well over short and medium distances. But transmission over long distances requires very high voltages, which can be tricky for AC systems. Ultra-high-voltage direct-current (UHVDC) connectors are better suited to such spans. These high-capacity links not only make the grid greener, but also make it more stable by balancing supply. The same UHVDC links that send power from distant hydroelectric plants, say, can be run in reverse when their output is not needed, pumping water back above the turbines.

Boosters of UHVDC lines envisage a supergrid capable of

moving energy around the planet. That is wildly premature. But one country has grasped the potential of these high-capacity links. State Grid, China’s state-owned electricity utility, is halfway through a plan to spend \$88bn on UHVDC lines between 2009 and 2020. It wants 23 lines in operation by 2030.

That China has gone furthest in this direction is no surprise. From railways to cities, China’s appetite for big infrastructure projects is legendary (see page 35). China’s deepest wells of renewable energy are remote—think of the sun-baked Gobi desert, the windswept plains of Xinjiang and the mountain ranges of Tibet where rivers drop precipitously. Concerns over pollution give the government an additional incentive to locate coal-fired plants away from population centres. But its embrace of the technology holds two big lessons for others. The first is a demonstration effect. China shows that UHVDC lines can be built on a massive scale. The largest, already under construction, will have the capacity to power Greater London almost three times over, and will span more than 3,000km.

The second lesson concerns the co-ordination problems that come with long-distance transmission. UHVDCs are as much about balancing interests as grids. The costs of construction are hefty. Utilities that already sell electricity at high prices ►

are unlikely to welcome competition from suppliers of renewable energy; consumers in renewables-rich areas who buy electricity at low prices may balk at the idea of paying more because power is being exported elsewhere. Reconciling such interests is easier the fewer the utilities involved—and in China, State Grid has a monopoly.

That suggests it will be simpler for some countries than others to follow China's lead. Developing economies that lack an established electricity infrastructure have an advantage. Solar farms on Africa's plains and hydroplants on its powerful rivers can use UHVDC lines to get energy to growing cities. India has two lines on the drawing-board, and should have more.

Things are more complicated in the rich world. Europe's utilities work pretty well together but a cross-border UHVDC grid will require a harmonised regulatory framework. America is the biggest anomaly. It is a continental-sized economy with the wherewithal to finance UHVDCs. It is also horribly

fragmented. There are 3,000 utilities, each focused on supplying power to its own customers. Consumers a few states away are not a priority, no matter how much sense it might make to send them electricity. A scheme to connect the three regional grids in America is stuck. The only way that America will create a green national grid will be if the federal government throws its weight behind it.

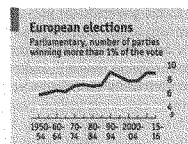
Live wire

Building a UHVDC network does not solve every energy problem. Security of supply remains an issue, even within national borders: any attacker who wants to disrupt the electricity supply to China's east coast will soon have a 3,000km-long cable to strike. Other routes to a cleaner grid are possible, such as distributed solar power and battery storage. But to bring about a zero-carbon grid, UHVDC lines will play a role. China has its foot on the gas. Others should follow. ■

Proliferating parties

Splitters

Too many parties can spoil politics



care about animal rights. In the next election, this March, polls suggest the total could rise to 13, with the addition of a pro-immigrant party and an anti-immigrant one (the country's second). As small parties multiply, the large ones are shrinking. In the 1980s governing parties often held 50 seats in the 150-seat parliament; today they are lucky to reach 40.

As with the Netherlands, so with Europe. The ideologies that held together the big political groupings of the 20th century are fraying, and the internet has lowered the barriers to forming new groups. So parties are multiplying (see page 48). Some see this as cause for celebration. A longer menu means that citizens can vote for parties that more closely match their beliefs. This is good in itself and also increases political engagement. Countries with proportional-representation systems, which tend to have more parties, have higher voter turnout than first-past-the-post countries like America and Britain.

Yet excessive fragmentation has drawbacks. As parties subdivide, countries become harder to govern. A coalition of small parties is not obviously more representative than one big-tent party. Big parties are also coalitions of interests and ideologies, but they are usually more disciplined than looser groups, and so more likely to get things done.

Having too many parties is often unwieldy. Coalitions become harder to form and often include strange bedfellows. In Greece the far-left Syriza party governs with the far-right independent Greeks; in Denmark the centre-right government needs the support of the Liberal Alliance, which wants to cut social spending, and the Danish People's Party, which wants to raise it. Such oddball pairings rarely act decisively and fall

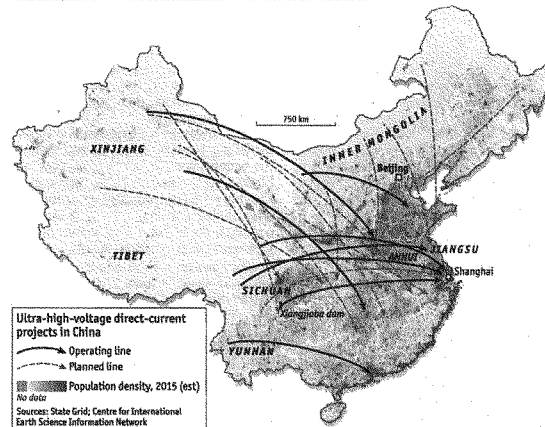
apart easily. They also take longer to form, distracting politicians from the business of governing. Spain's recent shift from two major parties to four produced a stand-off that left it without a government for most of last year. Its citizens had more choices when they voted, but then spent ten months under the rule of unelected caretakers—not a clear gain in democracy.

Small parties may render government incoherent by seizing control of the policy areas they care about. In Israel tiny right-wing parties in effect write the rules for West Bank settlements. Splintering can also foster graft. In Brazil politicians form new parties to get public subsidies and then demand more goodies to join coalitions. Far from increasing real choice, multiplying parties can allow politicians to hide the fact that what matters is patronage. Voters may be bewildered when confronted with the People's Front of Judea and the Judean People's Front—or with National Liberals, Democratic Liberals and Liberal Reformists, as they were in Romania in 2014.

What have the Romanians ever done for us?

Sometimes, new policies need new parties to champion them. For all their flaws, the left-wing Podemos party in Spain and the populist, anti-immigrant Sweden Democrats represent voters whose voices were not being heard. But some politicians form new parties for selfish reasons. Candidates who receive a low spot on their party's list may decide to start their own. Others hunger for the subsidies and free broadcasting time that many countries grant to each party.

For all these reasons, thresholds are a good idea. Germany's requirement that parties win 5% of the vote to enter parliament keeps cranks and extremists out without disenfranchising parties that poll strongly, like the new Alternative for Germany. The 5% rule also keeps German coalitions from growing unwieldy. Parties are middlemen between government and voters, organising a multiplicity of policies into a simpler menu of options. That menu can be too short (as in China). But it can also be so long and confusing that voters can't tell what they are ordering—and probably won't get it. ■



Power transmission

Rise of the supergrid

Electricity now flows across continents, courtesy of direct current

THE winds of the Oklahoma panhandle have a bad reputation. In the 1930s they whipped its over-tilled topsoil up into the billowing black blizzards of the Dust Bowl. The winds drove people, Steinbeck's displaced, away from their livelihoods and west, to California.

Today, the panhandle's steady winds are a force for creation, not destruction. Wind turbines can generate electricity from them at rock-bottom prices. Unfortunately, the local electrical grid does not serve enough people to match this potential supply. The towns and cities which could use it are far away.

So Oklahoma's wind electricity is to be exported. Later this year, lawsuits permitting, work will begin on a special cable, 1,100km (700 miles) long, between the panhandle and the western tip of Tennessee. There, it will connect with the Tennessee Valley Authority and its 9m electricity customers. The Plains and Eastern Line, as it is to be known, will carry 4,000mw. That is almost enough electricity to power Greater London. It will do so using direct current (DC), rather than the alternating current (AC) that electricity grids usually employ. And it will run at a higher voltage than such grids use—600,000 volts, rather than 400,000.

This long-distance ultra-high-voltage direct-current (UHVDC) connector will be the first of its kind in America. But the problem it helps with is pressing everywhere. Fossil fuels can be carried to power stations far from mines and wells, if necessary, but where wind, solar and hydro-electric power are generated is not negotiable. And even though fossil fuels can be moved, doing so is not desirable. Coal, in particular, is costly to transport. It is better to burn it at the pithead and transport the electricity thus generated instead.

Transmitting power over thousands of kilometres, though, requires a different sort of technology from the AC now used to transmit it tens or hundreds of kilometres through local grids. And in China, Europe and Brazil, as well as in Oklahoma, a new kind of electrical infrastructure is being built to do this. Some refer to the results as DC "supergrids".

Higher voltage

AC's ubiquity dates from the so-called "war of the currents" that accompanied electrification in the 1880s and 1890s. When electricity flows down a line as AC, energy travels as a wave. When it flows as direct current, there is no oscillation. Both work well, but the deciding factor in AC's

Also in this section

- 72 Predicting a stellar explosion
- 73 A cheap medical centrifuge
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favour in the 19th century was the transformer. This allows AC voltages to be increased after generation, for more efficient transmission over longish distances, and then decreased again at the other end of the line, to supply customers' homes and businesses. At the time, direct current had had no such breakthrough.

When one eventually came, in the 1920s, in the form of the mercury arc valve, AC was entrenched. Even the solid-state thyristor, a cousin of the transistor invented in the 1950s, offered no great advantages over the tens or hundreds of kilometres that power grids tended to span. Some high-voltage DC lines were built, such as that under the English Channel, linking Britain and France. But these were justified by special circumstances. In the case of the Channel link, for example, running an AC line through water creates electromagnetic interactions that dissipate a lot of power.

Over transcontinental distances the balance of advantage shifts. As voltages go up, to push the current farther, AC employs (and thus wastes) an ever-increasing amount of energy in the task of squeezing its alternations through the line. Direct current does not have this problem. Long-distance DC electrical lines are also cheaper to build. In particular, the footprint of their pylons is smaller, because each DC cable can carry far more power than an equivalent AC cable. Admittedly, thyristors are expensive—the thyristor-packed converter stations that raise and lower the voltage of the Plains and Eastern line will cost about \$1bn, which is two-fifths of the project's total bill. But the ultra-high voltages required for transcontinental transmission are still best achieved with direct current. »

For all the excitement surrounding the Plains and Eastern Line, however, America is a Johnny-come-lately to the world of UHVDC. Asian countries are way ahead—China in particular. As the map on the previous page shows, the construction of UHVDC lines is booming there. That boom is driven by geography. Three-quarters of China's coal is in the far north and north-west of the country. Four-fifths of its hydroelectric power is in the south-west. Most of the country's people, though, are in the east, 2,000km or more from these sources of energy.

China's use of UHVDC began in 2010, with the completion of an 800,000-volt line from Xiangjiaba dam, in Yunnan province, to Shanghai. This has a capacity of 6,400MW (equivalent to the average power consumption of Romania). The Jinping-Sunan line, completed in 2013, carries 7,200MW from hydroelectric plants on the Yalong river in Sichuan province to Jiangsu province on the coast. The largest connector under construction, the Changji-Guquan link, will carry 12,000MW (half the average power use of Spain) over 3,400km, from the coal- and wind-rich region of Xinjiang, in the far north-west, to Anhui province in the east. This journey is so long that it requires 11m volts to push the current to its destination.

China's UHVDC boom has been so successful that State Grid, the country's monopolistic electricity utility, which is behind it, has started building elsewhere. In 2015 State Grid won a contract to build a 2,500km line in Brazil, from the Belo Monte hydropower plant on the Xingu River, a tributary of the Amazon, to Rio de Janeiro.

China's neighbour India is following suit—though its lines are being built by European and American companies, namely ABB, Siemens and General Electric. The 1,700km North-East Agra link carries hydroelectric power from Assam to Uttar Pradesh, one of the country's most densely populated areas. When finished, and operating at peak capacity, it will transmit 6,000MW. At existing levels of demand, that is enough for 90m Indians. The country's other line, also 6,000MW, carries electricity 1,400km from coal-fired power stations near Champa, in Chhattisgarh, to Kurukshetra, in Haryana, passing Delhi on the way.

Overdose

Valuable though they are, transcontinental links like those in China, Brazil and India are not the only use for UHVDC. Electricity is not described as a "current" for nothing. It does behave quite a lot like a fluid—including fanning out through multiple channels if given the chance. This tendency to fan out is another reason it is hard to corral power over long distances through AC grids—for, being grids, they are made of multiple, interconnected lines. Despite

UHVDC connectors being referred to as supergrids, they are rarely actual networks. Rather, they tend to be point-to-point links, from which fanning out is impossible. Some utilities are therefore looking at them to move power over relatively short distances, as well as longer ones.

One such is 50Hertz, which operates the grid in north-east Germany. Almost half the power it ships comes from renewable sources, particularly wind. The firm would like to send much of this to Germany's populous south, and on into Austria, but any extra power it puts into its own grid ends up spreading into the neighbouring Polish and Czech grids—to the annoyance of everyone.

50Hertz is getting around this with a new UHVDC line, commissioned in partnership with Germany's other grid operators. This line, SuedOstLink, will plug into the Meitingen substation in Bavaria, replacing the power from decommissioned south-German nuclear plants. And Boris Schucht, 50Hertz's boss, has bigger plans than that. He says that within ten years UHVDC will stretch from the north of Sweden down to Bavaria. After this, he foresees the development of a true UHVDC grid in Europe—one in which the lines actually interconnect with each other.

That will require new technology—special circuit-breakers to isolate faulty cables, and new switch gear—to manage flows of current that are not simply running from A to B. But, if it can be achieved, it would make the use of renewable-energy sources much easier. When the wind blows strongly in Germany, but there is little demand for the electricity thus produced (at night, for instance), UHVDC lines could send it to Scandinavian hydroelectric plants, to pump water uphill above the turbines. That will store the electricity as potential energy, ready to be released when needed. Just as sources of renewable energy are often inconveniently located, so, too are the best energy-storage facilities. UHVDC permits generators and stores to be wired together, creating a network of renewable resources and hydroelectric "batteries".

In Asia, something similar may emerge on a grander scale. State Grid plans to have 23 point-to-point UHVDC links operating by 2030. But it wants to go bigger. In March 2016 it signed a memorandum of understanding with a Russian firm, Rosseti, a Japanese one, SoftBank, and a Korean one, KEPCO, agreeing to the long-term development of an Asian supergrid designed to move electricity from windswept Siberia to the megalopolis of Seoul.

This project is reminiscent of a failed European one, Desertec, that had similar goals. But Desertec started from the top down, with the grand vision of exporting the Sahara's near-limitless solar-power supply to Europe. Today's ideas for Asian and European supergrids are driven by the

real needs of grid operators.

Such projects—which are transnational as well as transcontinental—carry risks beyond the merely technological. To outsource a significant proportion of your electricity generation to a neighbour is to invest huge trust in that neighbour's political stability and good faith. The lack of such trust was, indeed, one reason Desertec failed. But if trust can be established, the benefits would be great. Earth's wind-blasted and sun-scorched deserts can, if suitably wired up, provide humanity with a lot of clean, cheap power. The technology to do so is there. Whether the political will exists is the question. ■

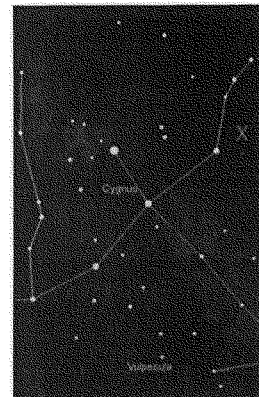
Astronomy

De Nova Stella

Astronomers predict a stellar explosion will happen in five years' time

AMATEUR astronomers have a new date for their diaries. In 2022, in the constellation of Cygnus, they will be treated to the sight of a nova, or "new star". By themselves, novae are not particularly noteworthy. Several dozen a year happen in Earth's home galaxy, the Milky Way, alone. But this one will be special for two reasons.

One is its intensity: provided you are somewhere reasonably dark (in the countryside, in other words, rather than a big city) it will be bright enough to be seen by the naked eye. The second is that it will be the first nova whose existence was predicted. ➤



X marks the spot

Subcommittee on Energy

Hearing on

**“Modernizing Energy and Electricity Delivery
Systems: Challenges and Opportunities to
Promote Infrastructure Improvement and
Expansion”**

February 15, 2017

**Comments
of**

**Paul N. Cicio
President
Industrial Energy Consumers of America**

Chairman Upton, Ranking Member Rush, members of the Subcommittee, thank you for holding this important hearing and providing an opportunity for public comment.

1. Position on electric transmission infrastructure

Congress and the Administration should not place electric transmission infrastructure projects as a high priority. The majority of the electric transmission projects are not needed and needlessly increase the cost of electricity to all consumers and can result in the shutdown or the idling of electric generating capacity of existing natural gas, coal or nuclear facilities. All of which are generating assets that we consumers are paying for in our electric rates. Transmission is the fastest growing cost portion of our electricity bill.

2. Industrial Energy Consumers of America

IECA is a nonpartisan association of leading manufacturing companies with \$1.0 trillion in annual sales and with more than 1.6 million employees worldwide. It is an organization created to promote the interests of manufacturing companies through advocacy and collaboration for which the availability, use and cost of energy, power or feedstock play a significant role in their ability to compete in domestic and world markets.

IECA membership represents a diverse set of companies from industries that include: chemicals, plastics, steel, iron ore, aluminum, paper, food processing, fertilizer, glass, industrial gases, building products, independent oil refining, and cement. Member companies are energy intensive trade exposed (EITE) and are some of the largest industrial consumers of electricity and natural gas in the U.S. As a result, the cost of energy can directly impact competitiveness. The manufacturing sector consumes 26 percent of all U.S. electricity.

3. IECA supports natural gas pipeline infrastructure projects

IECA is concerned that Congress and the Administration will include electric transmission projects as a priority. They are not. Energy infrastructure projects like natural gas pipelines are a priority. Without increases in pipeline capacity, industrials cannot get the fuel needed to expand facilities directly impacting economic and job growth.

4. Electric transmission projects are driven by mandates and subsidies

The majority of the electric transmission projects are driven by state mandated renewable portfolio standards (RPS) and federal subsidies for renewable energy production, such as the production tax credit (PTC). The cost of the transmission projects will be passed onto us, the consumer, thereby increasing electricity prices and impacting manufacturing competitiveness. And, the federal government should not place a priority on projects that are paid for by "socializing" the costs of electric transmission. (FERC Order 1000) Many electric consumers will pay for these projects but few would benefit.

5. Future electric demand does not justify new electric transmission

According to the Energy Information Administration (EIA)¹, electricity demand will increase only 0.44 percent per year from 2016 to 2025. Low electric demand growth means that these expensive

¹ "Electricity Sales by Sector," U.S. Energy Information Administration (EIA), Annual Energy Outlook (AEO) 2017, http://www.eia.gov/outlooks/aeo/tables_ref.cfm

electric transmission projects are not needed for purposes of serving the needs of the electric consumer. The North America Electric Reliability Corporation (NERC) data indicates that there is significant existing electrical reserve capacity.

6. Electric transmission projects are neither an emergency or a national security issue

Some electric transmission projects are promoting themselves as “Emergency & National Security” related. In our view, they are neither. Renewable electricity capacity is unreliable and can weaken grid reliability. Transmitting renewable energy capacity into other markets can result in the shutting down of existing baseload nuclear, coal, and natural gas-fired electric capacity, a detriment to reliability. These existing generating assets are already included in our electric rates. Existing capacity of electric generation can reliably supply the market. Electric consumers, especially manufacturing companies, need reliable baseload power for security and safety. Industrial company electric demand is most often 24/7, which requires reliable power generation.

7. Market distortion

Renewable energy transmission projects move electricity from states that generate renewable power to other states for purposes of competing with local non-renewable electric power. This is a form of unfair competition because of the economic advantages of the PTC. The economic advantage is so great that sellers of renewable energy often sell power to the grid for free and still generate a handsome profit.

The real beneficiaries of the electrical transmission projects are a small group of companies who build transmission lines and sell renewable energy – not the electric consumer.

Thank you.



February 15, 2017

Jim Matheson
Chief Executive Officer

The Honorable Fred Upton
Chairman
Subcommittee on Energy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

The Honorable Bobby Rush
Ranking Member
Subcommittee on Energy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Chairman Upton and Ranking Member Rush:

On behalf of America's electric cooperatives, I commend you on holding today's hearing on "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion." This hearing addresses important policies that impact the country's ability to meet its ongoing energy needs.

Co-ops depend on diverse and changing mix of fuels to generate electricity. But our use of natural gas and renewable resources has increased significantly in recent years, resulting in even more needs for infrastructure development. For instance, co-op use of natural gas increased from 12% of our total generation in 2009 to 17% in 2014, and even more since then. As a result, co-ops support policies to streamline the process to approve natural gas infrastructure needed to develop and deliver that resource. Non-hydro, renewable energy is also becoming a larger portion of the fuel mix. Over the past eight years, co-ops increased their use of renewable energy by more than 250 percent, from 2.9 GW in 2009 to 7.5 GW in 2016. The construction of high voltage transmission facilities would foster renewable energy development. However, the planning of these facilities should result from an open regional planning process.

In addition, co-ops use a significant amount of hydropower. Hydropower is the single largest source of renewable electricity in the United States, and it accounts for approximately 10% of co-op electricity generation. This flexible and sustainable energy resource significantly helps to diversify the co-op energy generation portfolio. Overall, hydropower promotes energy affordability and reliability while also replacing other carbon-emitting generation sources. Great opportunities exist for expanding the use of hydropower in many places across the country. However, in order to realize this potential, there is a discernible need to reform the regulatory licensing procedures. Under current processes, new projects as well as re-licensing of existing projects take an inordinate amount of time to be approved. Modernizing this process can be accomplished while preserving the environment, and we encourage Congress to adopt this reform.

Regarding grid security, the electricity sector continuously strives to improve its efforts to protect assets from threats. These efforts include the implementation of programs and protocols designed to protect electric utility systems. Key to reliability efforts are the crisis management

and site-specific security plans developed by co-ops and other electric utilities to ensure that operations and infrastructure systems are properly supported. In addition, a number of redundancies are built into the system to allow electric utilities to re-route power around damaged facilities. Electric utilities also partner with federal, state/provincial, and local government and law enforcement agencies in both the United States and Canada to ensure that they can respond effectively to any event that may impact their operations.

This cooperation includes sharing needed information about potential threats and vulnerabilities related to the bulk electric system. In 2013, the electric utility industry reorganized the Electricity Subsector Coordinating Council (ESCC) to ensure high level engagement and to serve as the primary liaison between the federal government and the electric power sector. The ESCC's mission is to coordinate efforts to prepare for, and respond to, national-level disasters or threats to critical infrastructure. Finally, these structures are complemented by the NERC-FERC statutory process for developing and implementing reliability standards, which NRECA strongly supports.

Co-ops have a consumer focus that drives them to investigate distributed energy resources and other new technologies and services and to integrate them into their portfolios. Co-ops are among industry leaders in community solar programs, and they have invested in electric storage resources. Co-ops have a demonstrated leadership capacity in the use of additional technologies such as Advanced Metering Infrastructure, load management, energy efficiency initiatives, demand response programs, and interoperability standards. As consumer-owned electric utilities, co-ops are uniquely qualified to use these technologies to meet consumer demands for safe, reliable, and affordable power.

NRECA appreciates the opportunity to present its views on these issues. As the Subcommittee continues its efforts to address electric grid modernization policies, we urge you to focus on policies that keep consumers' costs affordable, promote system reliability, and refrain from imposing undue burdens on consumer-owned utilities like co-ops.

We look forward to working with the Subcommittee as you proceed with developing legislation to address these and other issues.

Sincerely,



Jim Matheson
CEO, NRECA



Association of Oil Pipe Lines
1808 Eye Street, NW
Washington, DC 20006

February 15, 2017

The Honorable Fred Upton
Chairman
Energy & Power Subcommittee
Committee on Energy & Commerce
U.S. House of Representatives
Washington, DC 20515

The Honorable Bobby Rush
Ranking Member
Energy & Power Subcommittee
Committee on Energy & Commerce
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Upton and Ranking Member Rush:

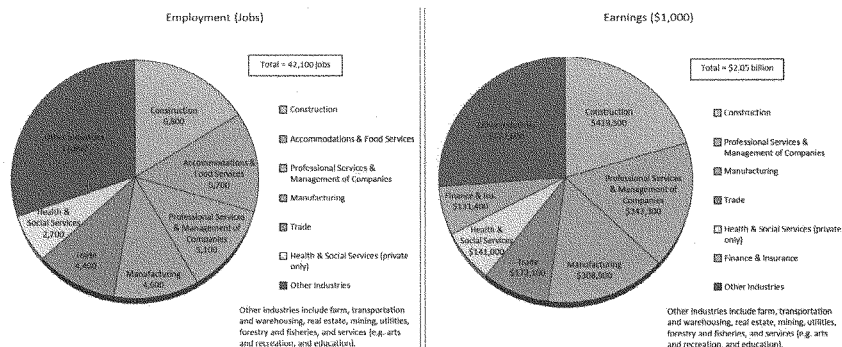
Thank you for holding a hearing on the challenges and opportunities to infrastructure improvement and expansion. Pipeline infrastructure offers American workers and consumers great opportunity for good-paying jobs and plentiful, affordable energy supplies. The Dakota Access Pipeline (DAPL) is a prime example of the benefits that can come to the American people from pipelines. DAPL is also an example of avoidable challenges faced by a project with no significant impact to the environment and with a review that comported with the law and met or exceeded its stakeholder outreach obligations.

New pipeline infrastructure offers American workers the opportunity for thousands of good-paying jobs and billions of dollars in worker payroll. A federal government study of a major 875-mile crude oil pipeline found construction of the project would deliver over 42,000 jobs and approximately \$2 billion in worker payroll. The pipeline project would create 16,000 direct jobs at firms awarded contracts for construction goods and services. Another 26,000 jobs would result from goods and services purchased by construction contractors and spending by employers working for contractors or suppliers. Residents along the construction route would hold about 12,000 or 29 percent of the jobs.¹

Pipeline construction projects supply both construction jobs and many more types of good-paying jobs beyond construction trades. A federal government study of a major pipeline project found it would provide 6,800 construction jobs with \$420 million in payroll, 4,600 manufacturing jobs with \$309 million in payroll, 4,400 jobs in trade with \$172 million in payroll, 2,200 jobs in finance and insurance with \$131 million in payroll, 5,100 jobs in other professional services with \$343 million in payroll, 2,700 jobs in health services with \$141 million in payroll, and 5,700 jobs in food and accommodations with \$278 million in payroll.²

¹ Final Supplemental Environmental Impact Statement for the Keystone XL Project, U.S. Department of State, Jan. 2014, p. 4.10-2, <https://2012-keystonepipeline-xl.state.gov/finaiseis/index.htm>.

² Id. at 4.10-4.



Thousands of Jobs and Billions of Dollars in Payroll from a Single Major Pipeline Project

While construction of DAPL is largely complete, the pipeline will continue to contribute to the local economy and local government revenue for years to come. Each year, DAPL will pay \$55 million in property taxes in the states along its route.³ That is revenue local school districts can use for new teachers, local law enforcement and fire departments can use for public safety and local governments can use on social services. Additionally, economic activity related to DAPL will boost local revenues by \$155 million.

Major pipeline projects such as DAPL also offer American consumers the potential to benefit from lower energy prices resulting from plentiful energy supplies. The American energy renaissance of greater crude oil and natural gas production over the last 5 years resulted in American consumers benefiting with lower gasoline prices. Five years ago, a barrel of crude oil cost \$100 and U.S. gas prices consistently averaged above \$3.50 per gallon. American technology and ingenuity responded by increasing domestic crude oil production by 3 million barrels per day.⁴

Pipeline operators connected America to these new energy supplies by building 25,000 miles of crude oil pipeline between new production areas, existing refineries and U.S. population centers. New U.S. supplies flooded the market driving down world and U.S. crude oil prices. Today, the average national average price for regular gasoline is \$2.28 per gallon.⁵ As long as U.S. consumers want to benefit from lower gas prices, they will need new pipelines to connect them to new energy sources.

Unfortunately, DAPL also illustrates the challenges of delivering more jobs and lower energy prices to American consumers. Even after extensive environmental review, exhaustive stakeholder outreach and review by the courts, some still are trying to withhold these benefits from the American people.

³ Investing in the Dakota Access Pipeline, An Energy Boom is Underway, Energy & Capital, Jun. 2015, <http://www.energyandcapital.com/articles/investing-in-the-dakota-access-pipeline/4879>.

⁴ U.S. Energy Information Administration, https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbb1pd_a.htm.

⁵ AAA Gas Prices, <http://gasprices.aaa.com>.

This summer, career field staff of the U.S. Corps of Engineers (Corps) formally found DAPL would have no significant impact on the environment.⁶ Required by the National Environmental Policy Act (NEPA), the finding represents the federal government's official assessment of the environmental and cultural impacts of the project. The 1,000 pages of environmental analysis and documentation in the DAPL environmental assessment reflect its thorough review.

The Corps found all alternatives to DAPL, including truck, rail, no project and an alternative route, would do more harm to the environment and public safety than the proposed project. The alternative pipeline route north of Bismarck, ND advocated by some would actually have a greater impact on the environment and water resources. The alternative DAPL route would have a greater impact on green space crossings (+48 miles), 100-year flood plain crossings (+11), waterbody crossings (+33) and wetlands (+21).⁷ The environmental assessment also documented how DAPL would tunnel nearly 100' beneath the bottom of Lake Oahe, ND, never coming anywhere near the actual water of the lake.⁸

In response to concerns about the adequacy of stakeholder outreach on DAPL, a federal district court judge in September found the 250 interactions between the Corps, Dakota Access representatives and consulting tribal, cultural and historic representatives met or exceeded the Corps' legal obligations.⁹ The judge, appointed to the bench by President Obama, documented how DAPL project sponsors changed the route of DAPL to avoid 91 Native American stone features and made 140 total route modifications to avoid potential cultural resources. To further reduce impact, the pipeline wherever feasible follows the route of existing pipeline and electric utilities. At the Lake Oahe crossing, DAPL is 100% adjacent to, and within 22 to 300 feet of an existing pipeline, making it less likely that new disturbances would harm intact cultural or tribal features.¹⁰

Political appointees of the previous administration in Washington, DC nonetheless halted further work on the project by overriding the decision of Corps career staff in the field and their findings under the NEPA process. Subsequent review by the Department of the Army found the previous decisions, which included issuing a finding of no significant impact and permits reflecting the finding, "comported with legal requirements." Nevertheless, political appointees still ordered further study of the project.¹¹

Political appointees of the previous administration continued their manipulation of the NEPA process by issuing a notice of intent to conduct an environmental impact statement, but never formally withdrawing the previous July 25 record of decision finding no significant impact.

⁶ Dakota Access Environmental Assessment and Finding of No Significant Impact, U.S. Corps of Engineers, Jul. 25, 2016, <http://www.nwo.usace.army.mil/Missions/Civil-Works/Planning/Project-Reports/Article/633496/dakota-access-pipeline-environmental-assessment/>.

⁷ *Id.* at 9.

⁸ *Id.* at Appendix B.

⁹ *Standing Rock Sioux Tribe v. U.S. Corps of Engineers*, D. D.C., No. 16-CV-1534, 9/9/16, <http://www.aopl.org/wp-content/uploads/2017/02/DAPL-Injunction-Denial-Decision.pdf>.

¹⁰ *Id.* at 14.

¹¹ Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works), Department of the Army, Nov. 14, 2016, http://www.aopl.org/wp-content/uploads/2017/02/Corps-Letter-Continuing-Discussions-11_14_16.pdf.

This action allowed the past administration to continue drawing out the process without taking a final agency action that would make their delay reviewable by a court. The political appointee requiring further delay through additional review and analysis admitted this was her “policy decision” even while once again admitting previous actions of the Corps “comported with legal requirements.”¹²

Thankfully, the new administration has put an end to attempts at “death by delay” by issuing the final easement necessary to construct DAPL. As the Corps identified in its notice that it would issue the easement, the previously issued formal finding of no significant impact demonstrates there is no cause for completing any additional environmental analysis.¹³

DAPL builds on a consistent pattern of federal reviews demonstrating pipeline projects have less impact on the environment than the alternatives, including the status quo of no project. The U.S. State Department’s environmental impact analysis of Keystone XL showed canceling Keystone XL and forcing its crude onto trains would result in 830 times more crude oil releases per year and 2 ½ times more barrels of crude released into the environment each year.¹⁴ Similarly, no action on Keystone XL would result in 48 additional injuries and 6 additional fatalities.¹⁵

Pipelines remain the safest and most environmentally friendly way to deliver large quantities of crude oil and petroleum products. Federal review consistently shows pipelines are better than the alternatives. Pipeline opponents may have unrelated policy reasons for trying to block a pipeline, but the benefits of pipelines themselves are not in doubt. Thank you for the opportunity to share with the subcommittee the value of pipelines and hear from witnesses who will confirm the benefits of pipelines to American consumers and workers.

Sincerely,



Andrew Black
President & CEO
Association of Oil Pipe Lines

¹² Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works), Department of the Army, Dec. 4, 2016, http://www.aopl.org/wp-content/uploads/2017/02/Corps-Filing-12_14_16.pdf.

¹³ Douglas Lamont, P.E., Senior Official Performing the Duties of the Assistant Secretary of the Army (Civil Works), Department of the Army, Feb. 7, 2017, <http://www.aopl.org/wp-content/uploads/2017/02/Corps-Notice-of-No-EIS-and-Decision-Memo-1.pdf>.

¹⁴ U.S. Department of State, *supra*, at 5.3-8.

¹⁵ *Id.* at 5.3-9.



**National
Urban League**

*Empowering Communities.
Changing Lives.*

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February 15, 2017

Honorable Fred Upton
Chairman
House Subcommittee on Energy
U.S. House of Representatives
Washington, DC 20515

Honorable Bobby Rush
Ranking Member
House Subcommittee on Energy
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Upton and Ranking Member Rush:

As President and CEO of the National Urban League, and on behalf of its 88 affiliates in 36 states and the District of Columbia, thank you for holding this important hearing on "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion." The National Urban League's (NUL) approach to these issues is from the lens of inclusion and equity, given that the employment and economic opportunities for African Americans and other minorities are compelling.

As a country increasingly dependent on technology, we have become more reliant upon energy in our everyday lives. Indeed, much of this nation's critical infrastructure (e.g. healthcare, telecommunications, defense, transportation, energy and water) is dependent on the power grid. Consequently, having a reliable, cost-efficient and secure energy supply has become particularly important in urban communities, not only for quality of life, but also because it is a competitive plus, a job creator, and can affect the overall economy of a region or locality. Today, we are witnessing a convergence of energy, telecommunications and transportation technologies and industries. These changes will only accelerate, and if not managed properly, will result in energy "Haves" and "Have Nots." The National Urban League is committed to an action plan aimed to thwart another critical economic divide in our urban and other underserved communities.

As Congress and the Administration begin to grapple with comprehensive investments in our nation's infrastructure and the needs of our energy and electricity delivery systems, in order for such investments to be fair and inclusive, they must include the following provisions clearly written into any legislative proposal:

- 1) **Specific provisions that ensure and commit to the inclusion of and meaningful participation by MINORITY BUSINESS ENTERPRISES (MBEs).** For far too long, too many have treated MBEs as an afterthought. This must stop and it is time for Congress to ensure that MBEs obtain meaningful participation in any energy modernization and infrastructure initiative. It requires assurance of supplier diversity, i.e. proactively promoting business programs that encourage the use of African American owned businesses as suppliers of goods and services. It includes an emphasis on the creation of a diverse supply chain that ensures the inclusion of diverse groups in the procurement plans for the entire energy industry and infrastructure improvements and expansions.
- 2) **A specific commitment to fund JOB TRAINING and WORKFORCE DEVELOPMENT as a central and essential part of any plan.** Provisions must focus on enabling young workers and urban residents to benefit from any infrastructure and energy modernization plan through training, pre-apprenticeships, and related approaches. It must promote meaningful skills development, technical training, internships and job placement opportunities for African Americans and urban community members. This must be fully integrated into any proposal. Once again, it cannot be separate or an afterthought. We loudly and forcefully champion this. Without this, the benefits will not be broadly and fairly shared.

- 3) **Investments that include community facilities such as SCHOOLS, PARKS, LIBRARIES, COMMUNITY CENTERS, NEIGHBORHOOD CENTERS AND COMMUNITY FACILITIES.**
 These are tools that mayors and urban advocates will insist on so that the benefits will be broadly and fairly shared.

The National Urban League has long advocated for a major investment in our nation's neglected infrastructure. Recognizing the role that infrastructure investment can play as a "job-creation machine," the National Urban League called for the concept of an infrastructure bank when we released our blueprint for economic equality, *The Opportunity Compact*, in 2007. The *Compact* called for the creation of an Urban Infrastructure Bank to fund reinvestment in urban communities. In 2008, we provided written testimony to the Senate Committee on Banking, Housing and Urban Affairs, in support of the National Infrastructure Bank Act, with recommendations to improve the bill for urban communities. As part of the release of our 2016 State of Black America report, we introduced our Main Street Marshall Plan that calls for a plan to fund comprehensive urban infrastructure investments. And in our testimony before the DNCC Platform Committee on our Main Street Marshall Plan, we highlighted that investments made in building and sustaining schools, community centers, libraries, water systems and urban transportation can result in short-term GDP boosts and job growth that will have long-term positive impacts, especially in our urban communities.

In the specific area of Energy, the National Urban League recently released a special report, "**21st Century Innovations in Energy: An Equity Framework**." The report is intended to: 1) provide overviews of the domestic electricity, solar, and oil and natural gas industries; 2) present current employment numbers in each sector; and 3) highlight economic and employment opportunities in each sector. The report concludes by launching the NUL's Energy Plan.

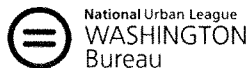
On behalf of the National Urban League, I look forward to working with Congress to ensure that our concerns and recommendations are fully integrated into any final plan to invest in energy modernization and our nation's vast infrastructure needs.

Very truly yours,



Marc H. Morial
 President and Chief Executive Officer
 National Urban League

Attachment



21ST CENTURY INNOVATIONS IN ENERGY: AN EQUITY FRAMEWORK

By Donald Cravins, Jr.

SVP for Policy, National Urban League

Report Overview

The National Urban League (NUL), through its Washington Bureau, submits this report focusing on the economic opportunities of the American energy industry and hereby issues the National Urban League Plan for Working with Private and Public Partners (NUL Energy Plan). At the onset it is important to point out this report is not intended to serve as an environmental position paper on the various types of energy. NUL will continue working with its diverse partners on climate change and environmental justice issues. However, this report has a very specific scope. It is an economic and inclusion report. It is intended to 1) provide overviews of the domestic electricity, solar, and oil and natural gas industries; 2) present current employment numbers in each sector; and 3) highlight economic and employment opportunities in each sector. The report concludes by launching NUL's Energy Plan. The NUL Energy Plan provides a framework for building a dialogue and partnerships with the various aspects of the energy industry on issues important to the NUL, its mission, and the constituents it serves.

Engaging at this important moment in the energy sector and in the 2016 State of Black America makes sense for several reasons.¹ First, NUL's mission calls it to engage. The mission of the National Urban League Movement is to enable African Americans and other underserved urban residents to secure economic self-reliance, parity, power and civil rights. The energy industry, with all of its sectors, is a conduit to achieving this mission. Second, with proper education, engagement and advocacy, NUL can play a unique role in ensuring that the future of the industry is more diverse both in its workforce as well as its downstream ecosystem. This paper is intended to serve as the starting place for an action plan around creating more equitable policies in how energy is used and greater participation in how our community can help shape those policies.

Overview of the American Energy Sector and Workforce

The United States enters a new era in domestic energy abundance characterized by rising use of renewable energy as well as an increased oil and natural gas production.² Today America is the world's leader in oil, natural gas and refined product production. Oil and natural gas supplies more than 60% of the energy Americans use every day.³ This nation's electric power grid is the largest interconnected machine on Earth. It consists of more than 9,200 electric generating units with more than 1,000,000 megawatts of generating capacity connected to more than 300,000 miles of transmission lines. As a country increasingly dependent on technology, we have become more reliant upon energy in our everyday lives. Much of this nation's critical infrastructure (*e.g.* healthcare, telecommunications, defense, transportation, energy and water) is dependent on the power grid. Consequently, having a reliable, cost-efficient and secure energy supply has become particularly important in urban communities, not only for quality of life, but also because it is a competitive plus, a job creator, and can affect the overall economy of a region or locality.⁴ In order

to meet these energy needs, as a country we have adopted an "all of the above" strategy, which reflects the fact that for the foreseeable future we will continue to be dependent in varying degrees on coal, natural gas, oil, nuclear, and renewables as our primary sources of energy.⁵ This mix however must continue to evolve by reflecting advances in technology and by getting cleaner every day.

In 2015, 36% of the energy consumed in the United States by all energy consuming sectors (transportation, industrial, residential and commercial, and electric power) was from oil; 29% came from natural gas; 16% from coal; 9% from nuclear; 4.9% from bio mass; 2.5% from hydro; and 2.7% from solar, geothermal and wind.⁶ Domestic energy production met approximately 91% of this country's energy demand. Simultaneously as our dependence on energy is growing, the energy industry, the electricity sector in particular, has begun to undergo significant changes as a result of the introduction of new technologies and sources of power.⁷ We are witnessing a convergence of energy, telecommunications and transportation technologies and industries. These changes will only accelerate and if not managed properly will result in energy "Haves" and "Have Nots."

The convergence of these sectors is an opportunity for us to grab hold of and participate both as consumers and as part of the labor force it is creating. Due to energy's ubiquitous role in our daily lives and broader economy, we should be more aware and active in its importance to African American and urban communities. Think for a minute about the home appliances and electronics that use gas or electricity, or about the fuel that gives Americans mobility to travel or receive goods and services, not to mention the jobs that are associated with all aspects of this industry. And take another minute to consider if you know anyone who has trouble deciding whether to pay an energy bill or for some other important need like food or medication. Balancing the opportunity and cost is challenging. But we don't run from challenges, we meet them head on.

There is a great deal at stake. Government and industry data vary in determining exactly how to measure the amount of energy industry jobs, but it is safe to say that millions of people are employed either directly or indirectly by the broader industry. For example, according to one report, the three segments of the U.S. oil and gas industry and the petrochemical industry together employed a total of 1.4 million people in 2015.⁸ The electricity sector reports approximately one million direct and indirect jobs in the energy infrastructure transmission, storage and distribution sectors. The solar industry claims over 200,000 employees. The takeaway here is that the energy sector is a people intensive industry with opportunities to explore across the nation and at all levels.

Looking forward, these industries are projected to have nearly 1.9 million job opportunities available through 2035 in all regions of the country. Part of these opportunities comes from the fact that the industry is "graying" and many current industry employees are eligible for retirement. With the right emphasis, training, and preparation, the prospects for growth in employment among African Americans and Latinos in the energy industry are good.⁹ In the next 7 to 10 years, electric and natural gas utilities will see up to one half of their personnel retire.¹⁰ Addressing this skills gap presents an historic opportunity to create a workforce that reflects the increasing diversity of our nation. Further, as America continues to transition to cleaner and renewable energy, the employment and economic opportunities for African Americans and other minorities could be immense.

All of this growth also presents opportunities for minority business enterprises seeking joint ventures and for individuals seeking to form new enterprises. According to Advanced Energy Economy, the U.S. advanced energy market generated \$200 billion in revenues in 2015, more than the pharmaceutical manufacturing industry and almost as much as consumer electronics. Last year, revenues grew 75% in the wind segment and 21% in the solar market, while revenues related to building efficiency grew 11% and those in energy storage multiplied more than 10 times. The opportunities are compelling.

The Electric Power Sector of Today and Tomorrow

This nation's electric industry is quite sophisticated. Electricity is supplied through a nationally integrated grid involving interconnected generation plants, high voltage transmission and lower voltage distribution lines, gas pipelines, substations, transformers and smart meters—all linked in a network designed to provide ubiquitous service.¹¹ There are thousands of electric and gas utilities including co-ops, public and investor owned ("IOUs") entities and these utilities are considered to be critical infrastructure industry ("CII") companies. Many of these utilities (including all of the IOUs) are regulated on the state level by public service commissions ("PSCs") and on the federal level by the Federal Energy Regulatory Commission ("FERC"). These regulated utilities have a legal public service obligation to provide ubiquitous service and to be the providers of last resort for all consumers. As a result of federal and state deregulatory policies in some states, many local power companies no longer own generation plants or control the transmission of high voltage electricity, and instead are required to purchase power from the competitive market. Likewise, retail choice or "competition" laws in some states allow third party merchant energy suppliers to market power directly to customers with no infrastructure requirements, while the local companies are still responsible to both deliver gas and electricity supply to end users and maintain the infrastructure necessary to do so. Moreover, some customers are now generating some of the power they use through the use of (rooftop) solar panels that they procure directly, through third party providers or their utility.

The electric industry as a whole is undergoing a significant transformation as a result of a number of factors, including new technologies, lower cost of fuels, environmental protection, and consumer preferences. Innovative technologies and offerings along with new sources of power are being introduced at an unprecedented rate, including but not limited to renewable energy technologies and distributed energy resources such as solar and wind, electric vehicles, energy efficiency, and demand response.¹² Also, microgrids, for example, are being deployed to enhance the reliability, stability, and resilience of the grid. New services and products are being offered to consumers using the grid as the platform to enhance consumer choice, value and flexibility. These new technologies and services will provide increased consumer benefits. They also have the potential for creating new jobs and new businesses opportunities as investment in existing infrastructure increases and new and existing businesses within the electric sector expand and evolve.

In order to 1) support the requirements of the new technologies, services and sources of power; 2) ensure the continued safety, reliability, sustainability, and security of the grid; and 3) enable the provision of the innovative electric offerings that consumers will desire; power companies are investing billions of dollars in modernizing the electric grid. For example, in 2016 electric companies are projected to invest more than \$52 billion in transmission and distribution systems. Also, throughout the last decade electric companies have increasingly invested in clean

power projects, energy efficiency, and demand response programs.¹³ Moreover, the electric industry has begun to develop large (universal), medium (community) and small solar projects in order to serve large segments of urban areas with solar energy. Although one study showed utility-scale solar came in at half the cost of residential rooftop solar,¹⁴ some consumers still wish to own or procure their own renewable power. Community solar, for instance, is a model that is gaining traction since it allows individual consumers to have their own share of solar even if they do not meet the requirements to have their own system at home (e.g. apartment living, shaded or not optimal roof, etc.). It is a model that can also help avoid the appearance of a national energy divide littered with "Haves" and "Have-Nots" since it allows the new energy technologies and services to be made available in all neighborhoods if done properly with fair and equitable policies.

Employment Numbers and Opportunities for Growth in the Utilities Sector

Employment is indeed a major issue for the energy industry as a whole. The industry's workforce is graying. It is estimated that overall 38% of the employees in the electric and gas utility sector may retire in the next decade, along with nearly half of the oil and natural gas industry employees. At the same time both the direct and indirect employment in the electric and gas utility, and oil and natural gas industries are expected to grow by approximately 1.9 million jobs by 2035. Many of these jobs are skilled craft trade jobs.

According to the U.S. Department of Labor's Bureau of Labor Statistics, there were an estimated 1,267,000 persons employed by utilities in 2015. The data shows that 8.5% or 107,635 are Black or African American, 3.3% or 41,811 were Asian and 11.1% or 145,000 were Latino.¹⁵ Within the utility sector, the majority of African Americans, Asians and Latinos are employed in the electric power, transmission, and distribution and electric gas, and other combination sectors. Of the estimated 661,000 persons employed in the electric power sector, 7.6% or 50,236 are African American, 3.8% or 25,118 are Asian and 9.22% or 60,815 are Latino. With regard to the electric and gas and other combination sector, of the estimated 85,000 employees, 9.4% or 7,990 are Black or African American, 3.4% or 2,890 are Asian and 14.2% or 12,070 are Latino. According to the U.S. Bureau of Labor Statistics, African Americans made up 12% of the U.S. labor force in 2015. Since African Americans do not constitute at least 12% of the workforce in any of the utilities sectors, there is definitely room for improvement.

There are also opportunities at the senior executive and board levels of these companies. A review of the top ten publically owned utilities by market capitalization determined that approximately 13% of the companies' directors were African American or Latino. Again, while this represents progress, there is room for improvement.

The Solar Energy Sector

The expansion of solar energy in our nation provides a powerful example of how developing new technologies are being integrated into our nation's energy mix and the employment opportunities that can result. One of the most significant threats to America's future is climate change. The United States solar industry represents one of the strongest options to address this issue. According to GTM Research and the Solar Energy Industries Association (SEIA), in 2015 the U.S. installed 7,430 megawatts (MW). Now with over 27 gigawatts (GW) of total capacity, solar energy was expected to comprise 1% of total U.S. energy generation by the

end of 2015.¹⁶ This was a 42% increase over 2013, making it the best year for solar installations in America to date.

From an environmental perspective, solar helped offset an estimated 20 million metric tons of harmful CO2 emissions in 2014, which is the equivalent of taking 4 million cars off U.S. highways or saving 2.1 billion gallons of gasoline.¹⁷ Simply put, when looking at America's energy future, solar can be a real game changer, providing more and more homes, businesses, schools and government entities across the United States with clean, reliable and affordable electricity while also helping states to meet proposed new obligations under Section 111(d) of the Clean Air Act, commonly known as the Clean Power Plan.

Employment Numbers and Opportunities for Growth in the Solar Industry

Solar jobs continue to grow across the country throughout all 50 states – almost 12 times faster than the overall economy. According to the most recent installment of the National Solar Jobs Census, a product of The Solar Foundation (TSF), the U.S. solar industry currently employs 208,859 workers, a figure which represents 20.2% growth in employment over the previous year. This growth rate makes 2015, the third consecutive year in which employment increased by 20% or more. Since TSF first began tracking solar employment in 2010, the industry has grown by 123%, resulting in nearly 115,000 new domestic jobs.¹⁸ According to TSF's National Solar Jobs Census 2015, when direct solar jobs are combined with indirect jobs created by the industry (610,650), the total employment factor for the U.S. solar industry is 818,309 jobs.

Notwithstanding the huge potential in the solar industry for all Americans, there must be a concerted effort to ensure African Americans and communities of color are part of the solar equation. African Americans make up 12% of the U.S. labor force according to the U.S. Bureau of Labor Statistics, yet in 2015, they constituted just 5.2% of the solar workforce – a decline from the 6.0% in 2014. According to 2015 National Solar Jobs Census from the Solar Foundation, African Americans continue to represent the smallest proportion of any racial group in the solar industry.¹⁹ In contrast, Asian Americans, while only 6.1% of the U.S. workforce, represent 8.7% of solar workers, an increase of 1.7 percentage points since 2014. When looking at employment numbers in the various sectors of the solar industry (manufacturing and demand side), the industry needs to do more to increase its workforce diversity.

For example, the solar manufacturing sector manufactures a variety of products and component parts for domestic and international solar markets. It reports that African Americans are at the bottom, comprising just 9.7% of that workforce, compared to 16.2% for Asians and 11.3% for Latinos.²⁰ The 2015 National Solar Jobs Census also looked at the demand-side sector (installation, sales and distribution and project development) of the solar industry. Installation represents the end of the solar food chain and is its largest sector. Nearly two-thirds of new solar jobs in 2015 were created by the installation sector. African Americans comprise 4.9% of the installation employment, while Asians comprise 7.0%, and Latinos comprise 13.50%.²¹ The sales and distribution sector is made up primarily of wholesale and retail trade establishments. These establishments are engaged in the selling, but not the installing of solar services. Sales and distribution firms are less diverse than other sectors of the industry. Latinos, African Americans and Asians together represent less than 14% of all solar sales and distribution employees. Among the group, Africans Americans have the smallest share, with just 2.3% compared to 7.8% for Asians and 3.3% for Latinos.²² The project development sector includes utilities and companies

that work with the largest, utility-scaled solar projects. There is only a 4.8% representation for African Americans compared to 7.0% Asian and 12.9% Latino.²³

Interestingly enough, TSF also analyzed employment numbers related to “other” entities that play a role in the solar industry. TSF looked at 570 organizations such as research and development firms, finance and legal firms, nonprofits, government agencies solar training providers and academic research centers. Within those entities, African Americans comprised only 3.1% of the employment as compared to 11% Asian and 3.2% Latino.

NUL is concerned about equitable opportunities in all sectors of the energy industry, and particularly interested in understanding how we can help address the very low employment numbers in emerging green markets. Companies must work to ensure the barriers that often exist between sustainability programs and low-income communities are erased. In order to halt or to prevent this “green divide”, there must be a concentrated focus on employment, job training, and procurement opportunities in the solar and renewables sector.

The Oil & Gas Industry

As the world’s top producer of oil and natural gas, and the world’s leading refiner of petroleum products, America now occupies a position of energy leadership that was unthinkable a short time ago. Natural gas’s use for the generation of electricity is increasing as coal-fired plants continue to be retired.²⁴ At the same time as the use of natural gas is increasing, the natural gas industry is undergoing a transition driven in part by the utilization of shale. In 2013, shale gas made up 40% of the gross production of natural gas and is the dominant source of domestically produced gas.²⁵ Another tangible benefit of clean, abundant natural gas is that the United States is experiencing the lowest levels of carbon emissions since 1994.²⁶ Oil production has increased such that the United States is now producing more oil than it imports. Net U.S. imports of energy declined from 30% of total energy consumption in 2005 to 11% in 2015 as a result of strong growth in domestic oil and natural gas production and slow growth of total energy consumption.²⁷

In addition to its importance in the U.S. and global economies, the oil and natural gas industry represents a significant opportunity for job growth among racially and ethnically diverse communities. In 2015, there were nearly 1.4 million people employed in the oil & gas and petrochemical industries, with nearly 94,000 African Americans and 283,500 Latinos.²⁸ And the numbers look to grow in the future. As an example, a report titled “*Minority and Female Employment in the Oil & Gas and Petrochemical Industries*,” estimates that millions of job opportunities could be created by 2020 and nearly 1.3 million job opportunities through 2030, and 1.9 million through 2035, across the country in the oil and natural gas and petrochemicals industries. At a minimum, the report estimates that African American and Latino workers could make up nearly 37% of all new and replacement jobs. It is important to note that these projections are base-line estimates of current and projected trends in factors such as labor participation, population growth, and educational attainment rates. Increased awareness about industry jobs, training, and opportunities in the industry among communities of color could greatly improve this outlook.

While the oil and natural gas industry should be acknowledged for assessing the opportunities by providing the data on current and future workforce opportunities as well as

starting a conversation about greater inclusion, the industry still has a long way to go. In 2014, African Americans represented only 7% of the oil and gas workforce. Further, according to their own projections, African Americans are expected to make up slightly more than 6% of the workforce by 2035 if significant improvements are not made.²⁹

Diagnosing One of the Problems

African Americans are underrepresented in the workforces of most industries and such low numbers can be attributed to a number of factors. In order to design precise tools and resources to address employment disparities in any industry, it is necessary to diagnose the root causes of the low employment numbers for people of color.

For decades industry experts and workforce advocates have believed a key element in achieving higher levels of African American and Latino employment in the energy industry is to increase the education and training of these groups as well as strengthening overall skills in the critical Science, Technology, Engineering and Mathematics (STEM) disciplines. However, from an early age, many African Americans and communities of color are at a disadvantage. Less than one-third of public high schools serving predominantly African American students offer calculus.³⁰ Only about 40 % of public high schools serving predominately African American students offer physics.³¹ And according to the U.S. Department of Education, many African Americans in high school do not benefit from such resources as Advanced Placement (AP) courses where they can acquire college credit. African American students represent 16 % of all high school students, but only 9 % among students enrolled in an AP course.³² Of the African American students enrolled in an AP course, only 4 % received AP test scores that qualified for college credit. No African American students took the AP computer science exam in nine states: Idaho, Mississippi, Montana, New Hampshire, New Mexico, North Dakota, South Dakota, Utah, and Wyoming. Mississippi has the highest share of African Americans of any state.^{33 34}

Moreover, although African American and Latino college enrollment is up by more than a million students since 2008, students of color still have low degree completion rates and low representation in STEM fields.³⁵ African American students, like their Latino and Asian counterparts, are underrepresented in STEM programs and courses of study compared to their overall college enrollment rate. African Americans received just 7.6 % of all STEM bachelor's degrees and 4.5 % of doctorates in STEM.³⁶

As discussed below, there must be sustained efforts to direct students of color into STEM disciplines starting in primary education and continuing through secondary school. Further, there must be a focus on vocational training as many jobs in the energy sector require only such training yet pay competitive salaries. Finally, there must be continued efforts to see students of color complete two year and four year college programs.

Steps in the Right Direction

In spite of the challenges, there are several examples of programs, initiatives and success stories in the energy sector that show positive steps to address workforce and supplier diversity. For example, the Center for Energy Workforce Development (CEWD) was formed in March 2006. It is a non-profit consortium of electric, natural gas and nuclear utilities and their associations: the Edison Electric Institute, American Gas Association, Nuclear Energy Institute,

American Public Power Association and National Rural Electric Cooperative Association. CEWD was formed to help utilities work together to develop solutions to the coming shortage of skilled workforce in the utility industry. CEWD has worked on a comprehensive set of tools and processes to attract, train, and hire a diverse, qualified workforce and has partnered with education, government agencies and community groups to create workable solutions to address the need. CEWD has also established a partnership with the International Brotherhood of Electrical Workers and the Utility Workers Union of America.

The oil and natural gas industry has also been developing strategies, research, and programs to better understand the challenges and create greater public awareness of the opportunities associated with engaging and growing high impact strategic partnerships based on shared interests in job creation and workforce opportunities in the industry. This focus on greater collaboration, outreach and education with African Americans and other minorities, Millennials, Veterans, and Women begins with in-depth research and is in support of developing and preparing for the industry's workforce of the future.

There are also examples of the opportunities for small businesses and African American entrepreneurs. The first African American-owned solar manufacturer, WDC Solar, was formed in 2009 in the Washington D.C. neighborhood of Anacostia and began creating high quality jobs for local residents. The residents of that neighborhood face some of the highest rates of unemployment in the nation. WDC's owner, former NBA player Mark Davis, says he got into solar power after realizing it was mostly wealthy people who could afford the upfront cost to install solar power and reap the added extra reward of hefty tax credits for using the renewable energy. WDC Solar, not only provides free solar energy to low-income residents in Washington, D.C., but it has also created close to 20 jobs in the area -- with pay that starts at \$15 to \$23 an hour.

The utilities and oil and natural gas industries have also undertaken efforts with regard to diversity and education. In states such as Maryland and California many utilities and telecom companies have entered into voluntary Utility Supplier Diversity Memorandums of Understanding (MOU) with their public service commissions. In the MOUs, the companies have agreed to take various steps to enhance their utilization of diverse suppliers.

The energy industry as a whole has taken steps to support STEM programs in recognition that exposure to STEM subjects, college majors and careers is especially important to the workforce of the future in all energy segments. Since communities of color are particularly underrepresented in these areas, the National Urban League sponsors a program called Project Ready STEM. It is an effort to provide middle and high school students with the academic and experiential support necessary to increase their interest in and understanding of STEM subjects. These types of STEM programs are critical if we are to have a pipeline sufficient to supply the large number of minority candidates necessary to supply the future needs of the energy industry. In addition to typical STEM fields such as engineering, computer science, and other technology related disciplines, the energy industry is emphasizing the importance of STEM for success in all of its jobs at every level from plumbers, pipefitters, and electricians to meteorologists, data analysts, accountants, and equipment operators.

NUL's Project Ready STEM affiliates collaborate with local STEM partners, who utilize the Project Ready STEM curriculum guide and related tools to improve STEM education in their

communities. NUL has intentionally structured the Project Ready STEM enhancement to provide a wide range of opportunities and supports for underrepresented youth in order to broaden their participation in the STEM fields. The program offers informal and formal STEM academic supports, project-based learning, mentoring, and engagement with role models in STEM-related careers and academia. In 2015, in order to improve STEM practices in Project Ready programs and deepen local partnerships, the NUL established the STEM Coach Model. In the pilot phase, the model is focused on elevating promising STEM practices and building the capacity of local staff, teachers and partners. With support from national funders, NUL currently funds Urban League affiliates for Project Ready STEM, targeting approximately 380 high school youth.

NUL's Plan for Working with Private and Public Energy Partners

In conclusion, NUL endeavors to build a dialogue and partnership with the various sectors of the energy industry and with organizations dedicated to inclusion. For example, NUL has a long standing relationship with The American Association of Blacks in Energy (AABE). AABE is a national association of energy professionals founded and dedicated to ensure the input of African Americans and other minorities into the discussions and developments of energy policies regulations, R&D technologies, and environmental issues. Through these relationships, ongoing education about the developments in the industry and meaningful dialogue on inclusion, NUL will continue to develop an action plan focused on the following key areas of interest:

1. **Jobs:** To advocate for and work with a diverse set of stakeholders including labor organizations, the Center for Energy Workforce Development, the oil and natural gas industry, and the renewable energy sector to promote meaningful skills development, technical training, internships and job placement opportunities for African Americans and urban community members.
2. **Diversity:** To develop written community-based diversity plans that clearly define measures for success advancing diverse employment across all levels and sectors of the energy industry including in its C-Suites, Boards and outside consultants.
3. **Ownership:** To promote entrepreneurial activities, not just in the traditional fields of construction and procurement, but also in other areas by expanding utility MOU programs and developing financing mechanisms.
4. **STEM:** To develop and promote programs which lead to jobs and ownership through partnerships among utilities, energy companies, HBCUs, NUL affiliates and others. To lend our advocacy for a broader definition of STEM that works to educate and engage diverse communities about the critical importance of STEM – as fields of study, in related career opportunities, and through practical application with a focus on all disciplines that incorporate science, technology, engineering and math.
5. **Ubiquitous Service:** To work to ensure that electric rates are fair and affordable for all customers and that all neighborhoods and customers receive the benefits and share the costs of the energy transformation regardless of the technology used.
6. **Housing:** To work in conjunction with NUL affiliates, utilities and energy companies to promote increased funding for LIHEAP, the broader utilization of energy efficiency

programs, and the development in all communities of projects such as solar gardens, microgrids and EVs.

7. **Environmental Justice:** To promote energy policies that fairly and meaningfully involve all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies ensuring African Americans have access to clean and healthy environments.
8. **Renewable Energy:** To recognize renewable energy as a vital part of an overall energy strategy that recognizes all sources of energy. To promote the expanded utilization of renewable energy in a manner which ensures that its benefits are shared, promotes jobs, builds local economies, address environmental concerns and reduces overall energy costs.
9. **Consumer Protection:** To educate consumers on energy issues and advocate for increased consumer protections.
10. **Supplier Diversity:** To proactively promote business programs that encourage the use of African American owned businesses as suppliers of goods and services. These programs and policies should emphasize the creation of a diverse supply chain that ensures the inclusion of diverse groups in the procurement plans for the entire energy industry.

¹ The State of Black America is the National Urban League's seminal annual publication now in its 40th edition.

² American Petroleum Institute, *State of American Energy Report 2016* (January 2016).

³ Ibid.

⁴ Power outages and interruptions cost Americans at least \$150 billion each year. Department of Energy, *the Smart Grid: An Introduction*.

⁵ See Council of Economic Advisors, *The All-of-the Above Strategy as a Path to Sustainable Economic Growth* (May 2014).

⁶ http://www.eia.gov/energyexplained/index.cfm?page=us_energy_home

⁷ National Regulatory Research Institute, *Recent Developments in the U.S. Electric Industry: Options for State Utility Regulators* at 3-4 (November 2014).

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⁸ IHS, *Minority and Female Employment in the Oil & Gas and Petrochemical Industries, 2015-2035* (March 2016).

⁹ American Petroleum Institute, *Employment Outlook for African Americans and Latinos in the Upstream Oil and Natural Gas Industry* at p. 20 (November 2012).

¹⁰ Center for Energy Workforce Development Gaps in Energy Workforce Pipeline 2013 Survey Results at 3, ("CEWD Study")

¹¹ See e.g. National Council on Electricity Policy, *Electricity Transmission A Primer* at 6 (2004).

¹² QER at 3-3. (MODERNIZING THE ELECTRIC GRID)

¹³ IEE, *Energy Efficiency: A Growing Utility-Business solution to Reliability, Affordability, and Sustainability* at 1 (September 2013). [Attachment 4].

¹⁴ *Brattle Group's Fox-Penner says utility scale significantly more cost-effective than residential*,

<http://www.eenews.net/tv/videos/2043/transcript>

¹⁵ <http://www.bls.gov/cps/cpsaat18.htm> - It is important to note that the Department of Labor's definition of utilities includes electric power, natural gas, steam supply, water supply, and sewage removal which is why the overall number of employees is greater here than in other sections of this report.

¹⁶ SEIA/GTM Solar Market Insight Q3 2015 (<http://www.thesolarfoundation.org/wp-content/uploads/2016/01/2015Census-Factsheet-FINAL1-12-16.pdf>)

¹⁷ U.S. Environmental Protection Agency, Greenhouse Equivalencies Calculator, available at: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

¹⁸ <http://www.thesolarfoundation.org/wp-content/uploads/2016/02/TSF-State-Solar-Jobs-Census-2015-Fact-sheet.pdf> (<http://www.thesolarfoundation.org/national/>)

¹⁹ <http://www.thesolarfoundation.org/wp-content/uploads/2016/01/TSF-2015-National-Solar-Jobs-Census.pdf>

²⁰ *Ibid* at p. 31.

²¹ *Ibid* at p. 24.

²² *Ibid* at p. 35.

²³ *Ibid* at p. 40.

²⁴ Brattle Report at 3.

²⁵ EIA Natural Gas Annual, September 2015. <http://www.eia.gov/todayinenergy/detail.cfm?id=18951>

²⁶ EIA Monthly Energy Review, August 2016. <http://www.eia.gov/totalenergy/data/monthly/pdf/mer>

²⁷ EIA Monthly Energy Review, August 2016. <http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>

²⁸ American Petroleum Institute, *Minority and Female Employment in the Oil and Natural Gas and Petrochemical Industries* (February 2016).

²⁹ Of the more than 1.9 million jobs that will be available between now and 2035, only 130,000 are expected to go to African Americans, while 576,000 are expected to be filled by Latinos.

³⁰ <http://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn04>

³¹ Simon, Stephanie. "Racial Divide Runs Deep in U.S. Schools, Study Finds." Reuters. March 6, 2012.

³² <http://www.reuters.com/article/us-usa-education-inequality-idUSTRE82507620120306>.

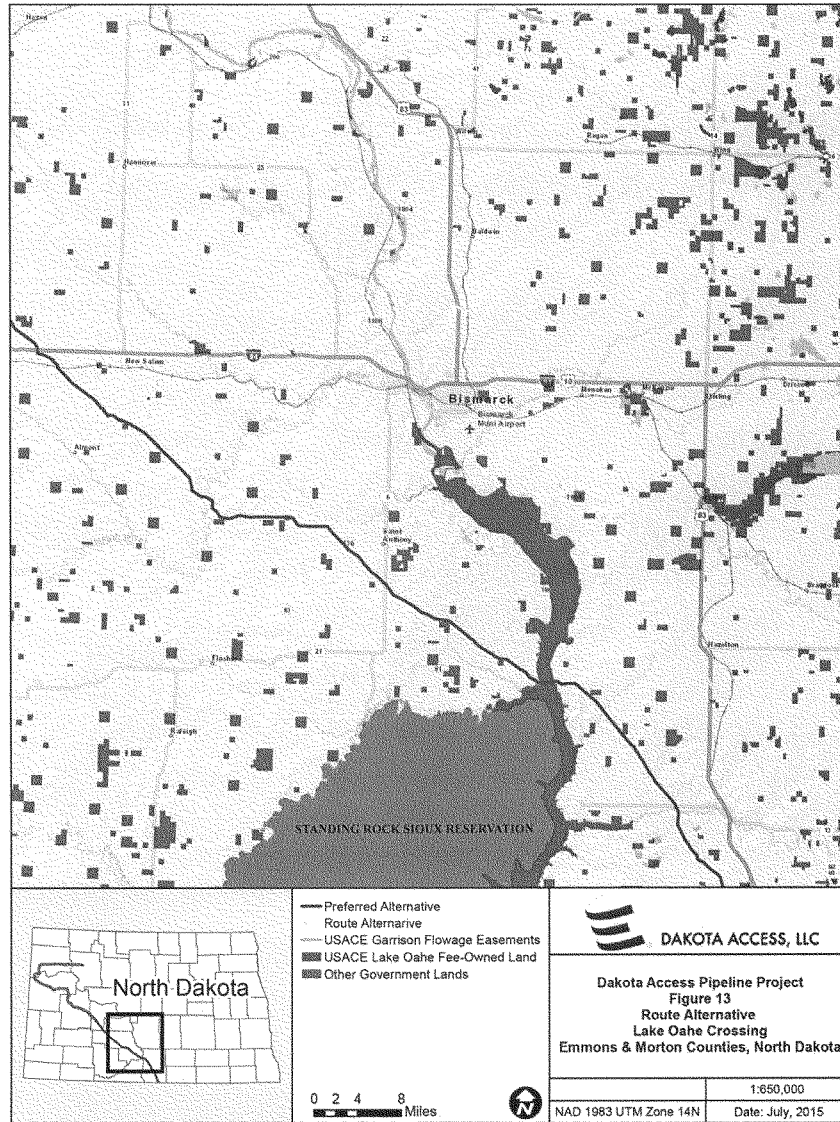
³³ <http://www2.ed.gov/about/offices/list/ocr/docs/crdc-college-and-career-readiness-snapshot.pdf>, pg. 11

³⁴ <http://research.collegeboard.org/programs/ap/data/archived/ap-2014> (state report summaries)

³⁵ <http://www.wiche.edu/info/knocking-8th/profiles/ms.pdf>

³⁶ http://nces.ed.gov/programs/digest/d13/tables/dt13_306.30.asp

³⁷ https://nces.ed.gov/programs/digest/d14/tables/dt14_318.45.asp



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March 8, 2017

Dr. Michael W. Howard
President and CEO
Electric Power Research Institute
1300 West WT Harris Boulevard
Charlotte, NC 28262

Dear Dr. Howard:

Thank you for appearing before the Subcommittee on Energy on Wednesday, February 15, 2017, to testify at the hearing entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion."

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. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on March 22, 2017. Your responses should be mailed to Will Batson, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Annelise.Rickert@mail.house.gov.

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

Sincerely,


Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy

Attachment



MICHAEL W. HOWARD, Ph.D., P.E.
President and
Chief Executive Officer

March 16, 2017

Will Batson
Legislative Clerk
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515

Re: Question From The Honorable Fred Upton Regarding February 15, 2017 Testimony
“Are the efforts to modernize the grid and maximize the benefits to consumers of time-of-use rates, demand response, and smart meters hindered by the lack of real-time pricing rates at the modal level?”

Response:

Grid modernization investments in reliability and adaptability, and price responsive demand, are the building blocks to a grid that best serves the customer needs for power. Power system investments, especially in the delivery system, consider financial and physical factors to reflect planning and operating considerations. Selecting from among alternatives should be based on the expected net benefits to the customer, which includes, but is not restricted to, current supply costs. Customers responding to prices based on marginal supply costs provide signals to what aspects of grid modernization are most essential, and many elements of grid modernization are needed to achieve the desired level of price response. Linking retail prices to system marginal supply costs (which may be better if nodally distinguished) is a necessary condition. The availability of time-differentiated prices alone will not be sufficient. Customers must see and realize the benefits of becoming price responsive. Hence, grid modernization should extend beyond attending to the physical needs of the grid and to better enable the customer to produce, use, and manage their energy choices.

Sincerely,



Michael W. Howard, Ph.D., P.E.
President and Chief Executive Officer

MH/kes

c: Annelise.Rickert@mail.house.gov

Together . . . Shaping the Future of Electricity

1300 West W.T. Harris Boulevard, Charlotte, NC 28262-8550 USA • 704.595.2531 • Fax 650.855.2339 • mhoward@epri.com

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
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6115
Majority (202) 225-2927
Minority (202) 225-3841

March 8, 2017

Mr. Steven Hauser
CEO
GridWise Alliance
1800 M Street, N.W., Suite 400 S
Washington, DC 20036

Dear Mr. Hauser:

Thank you for appearing before the Subcommittee on Energy on Wednesday, February 15, 2017, to testify at the hearing entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion."

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. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

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

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy

Attachment



March 22, 2017

The Honorable Fred Upton
Chairman
Subcommittee on Energy of the House Energy and Commerce Committee
2125 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Upton:

Please find attached my response to the Question for the Record from the hearing at which I testified entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion."

Thank you again for the opportunity to testify. We look forward to working with you and your colleagues going forward. For questions about this Submission, please contact me at: shauser@gridwise.org or Ladeene Freimuth, Policy Director of the GridWise Alliance, at: lfreimuth@gridwise.org.

Sincerely,

A solid black rectangular box used to redact the signature of Steven G. Hauser.

Steven G. Hauser
CEO
GridWise Alliance

Cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy

Attachment

1. Are efforts to modernize the grid and maximize the benefits to consumers of time-of-use rates, demand response, and smart meters hindered by the lack of real-time pricing rates at the nodal level?

One of the key benefits of modernizing the grid is engaging consumers to benefit them both directly and indirectly. Smart meters are used to monitor consumers' energy usage and provide them better information to manage their own energy consumption and costs, thereby providing a direct benefit(s). Typically this is done in hourly increments but, in some cases, can be done in near real-time. With smart meters and rates that reflect real-time prices, consumers also can modify their energy usage to benefit the operation of the grid. This is typically referred to as demand response and involves decreasing some customers' electricity consumption specifically when electricity demand in a particular area is at its highest. Doing so at these "peak" times increases the available electricity supply to the utility, reduces the overall cost(s) to these customers for their utility bills, and also reduces costs to other consumers by lowering the marginal cost of supplying load. Utilities often provide incentives for customers to do this by offering real-time rates that are higher during peak periods and lower during off-peak times. These rates are referred to by different names, including time-of-use rates, critical peak pricing, or real-time rates and, in many cases today, still are specified by formulas based on expected costs, rates of return on equity, and so forth.

Nodal prices are calculated by a grid operator, i.e., an Regional Transmission Organization (RTO) or Independent System Operator (ISO). They are reflected in the market prices seen by local utilities. Currently, only the utility can see the nodal price, not the customer, so customers seeking to use time-of-use rates and some customers who may wish to provide demand response are unable to see the price signals. The exception would be for some large commercial and industrial customers who often have access to real-time rates. If a utility uses nodal prices to design real-time rates offered to consumers, such rates, coupled with the use of smart meters, could maximize benefits to customers by empowering them to make decisions based on actual electricity costs, rather than based solely on a specified formula-based rate determined by the utility, particularly when actual and/or peak rates are high. Nodal prices also can result in lower peak rates in some areas, better reflecting the true costs.

In sum, time-of-use rates, demand response, and smart meters are being very successfully deployed across the country with many benefits to consumers. Nodal pricing being better reflected in consumers' rates can provide additional benefits in cases where congestion and other issues may be driving the cost of providing electricity higher.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
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March 8, 2017

Mr. Terry O'Sullivan
General President
Laborers International Union of North America
905 16th Street, N.W.
Washington, DC 20006

Dear Mr. O'Sullivan:

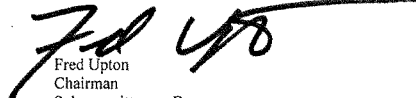
Thank you for appearing before the Subcommittee on Energy on Wednesday, February 15, 2017, to testify at the hearing entitled "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion."

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

Sincerely,


Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy

Attachment



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ARMAND E. SABITONI
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LiUNA!

March 22, 2017

The Honorable Fred Upton
Chairman
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Upton:

Attached you will find my answers to the questions that I was asked for the official record of the subcommittee hearing on "Modernizing Energy and Electricity Delivery Systems: Challenges and Opportunities to Promote Infrastructure Improvement and Expansion," on February 15, 2017.

I want to thank you again for the opportunity to testify at this hearing. The friendship and support you have given to our organization and our membership is greatly appreciated.

With kind regards, I am

Sincerely yours,


TERRY O'SULLIVAN
General President

rj
opeiu2liuna
Attachment

Feel the Power

Answers to the Questions for the Record

The Honorable Tim Walberg

1. What steps should we be taking to enable greater investment and buildout of energy infrastructure?
 - a. Streamlining the environmental review and permitting process in order to create a clear and final decision on infrastructure projects would help project developers and workers have more certainty about when a project would move from proposal to actual commencement of work. A more rational approach to the approval of energy infrastructure projects would create more jobs and grow the U.S. Economy.
2. Could you comment on how energy infrastructure, particularly natural gas pipeline development, will support your organization's goals?
 - a. Currently there are 20 unionized pipeline projects spanning 20 states that are either under construction, about to begin construction, or awaiting approval. If they are all constructed, we expect that these projects will employ tens of thousands of highly trained, safe, skilled union tradespeople, including approximately 13,000 LIUNA members. These state-of-the-art pipelines are safer, more environmentally sound, and emit fewer greenhouse gases than any other method of transporting energy resources.

Additionally, the wages and compensation packages that our members receive while working on these projects underpin not only their ability to keep a roof over their families' heads and food on the table, but they also provide for private health care coverage and the ability of members to earn credits toward a defined benefit pension plan. Also, because of the collective bargaining agreements we have in place, our contractors and members are able to invest in skills training that assures that the workers who build these projects are the very best in their profession and that projects are completed safely and efficiently.