

MARTY ROSENBERG
June 5, 2024
GridTalk #418

SHAY BAHRAMIRAD INTERVIEW

Hi, and welcome to GridTalk. Today we're very pleased to have with us Shay Bahramirad who's LUMA's Senior Vice President of T&D, Strategy and Sustainability. What that all means is she's the point person helping to rebuild the grid in Puerto Rico and restore and go beyond what existed prior to Hurricane Maria hitting in 2017.

Q: Hi, Shay. Thanks for joining us.

A: Hi, Marty. Thank you for having me.

Q: So, you are in the rare elite of repeat guests of our four-year-old podcasts. You were on in February 2020 to talk about the dawn of the urban microgrid and its ability to withstand climate change so I'm very interested in joining you today on your journey to talk about what you're doing in Puerto Rico and what you're doing as President of IEEE PES, the Power Engineering Society, so let's jump right in and start talking about Puerto Rico. Two hurricanes swept through in 2017 with unprecedented ferocity and the end result was the island was without power for upwards of 11 or full power, not restored, for

upwards of 11½ months. What has transpired since then? What have you rebuilt? And then we'll get into a discussion of what's gone beyond rebuilding of what's previously existed.

A: Marty, I'm a fan of your podcasts and I'm honored to be back for this conversation. LUMA took over the responsibility of rebuilding the grid in Puerto Rico just over three years ago in June 2021 and already we have made significant progress. It is important to remember where we started. The grid in Puerto Rico hadn't just been hit by as you mentioned two severe hurricanes in 2017 but it also suffered from decades of under investments and lack of maintenance that led customers and citizens of Puerto Rico to experience outages three times more frequently than any other utility in the United States. When we started, the reliability of the system was 300% worse than the second worst utility in the United States and so, we got to work. The frequency of outages experienced by customers has gone down by about 25% since we started. It's an impressive result compared to any other improvement that you can see in any utility in the United States.

Q: Well, we've been watching very closely what's been going on in Puerto Rico because it's really been a testbed I think for how do we harden the grid in the face of more devastating weather patterns. We had; in December 2020, we had Wayne Stensby

on who was then President and CEO of LUMA Energy and he said that you were on the start of an investing campaign of \$10.5 billion dollars at that time so how much has been spent to date? Have you hit that number or have you exceeded it?

A: So, first of all I should say that the money since then has turned into be all the work that we have done with the federal government and local partners, government of Puerto Rico and other agencies to \$16 billion dollars. It's a combination of the largest settlement in the utility industry that FEMA has had. In addition to that, hazard mitigation that is a framework to build better than what it was. From that total \$16 billion dollars, we have initiated over \$13 billion dollars of scope of work and over \$4 billion dollars of it is approved by FEMA and over \$1.2 billion dollars has been constructed in the grid. That includes from poles that they would withstand 160 miles per hour winds to modernization of substations and that includes 20% of the substations in Puerto Rico, including Vieques and Culebra and elevation or relocations of the substations and transmission and distribution lines.

Q: So, where we stand today, let me just ask a headline news question that can frame our chat. If a Hurricane Maria was to come through this August or September, would the results of its

impact on the grid be different in your opinion than it was in 2017?

A: I believe so, we are ready but the system is still relatively fragile. The vegetation is not ready but we have 3,500 men and women at LUMA that they have been through numerous exercises of ICS and restoration. We had a Hurricane Category One in September two years ago in 2022, and we restored 90% of the customers in 12 days which is, compared to any other utility, even if you measure it, it was a historic restoration as part of, in Puerto Rico. There is still a lot that needs to be done in Puerto Rico. We just started and we work with the Department of Energy, Secretary Granholm's office and the governor of Puerto Rico and FEMA to clear the right-of-way's because of 50% of our outages and our largest outages are related to vegetation. To do one-time clearing and creating right-of-way's of 16,000 miles as a FEMA-funded project; we are about to start that three-year project in the next few days. All of those things, it's going to make us more ready compared to 2017 but still, we have a very long way to go.

Q: So, let's look at some of the changes, and you've been living and working in Puerto Rico for 3½ years; three plus years and relocated from Chicago where you were at ComEd as our previous discussion focused on. Talk about the 30,000 rooftop

solar units that have been installed. How did you do it? What's its impact, and where are you headed on that?

A: So, we have as you stated, we have installed; well, first of all, let me take a step back. Puerto Rico passed Act 17 which sets its goal of 100% energy use electric grid to be renewable by 2050 and we are committed to public policy of Puerto Rico and what people of Puerto Rico want.

Q: And the fine tune on that, is it still 40% by 2025, next year?

A: That's the goal.

Q: And will you be at 40% and how's that measure up to other states in other parts of the United States?

A: Let me be clear, we are a T&D operator and we; our responsibility is to enable renewable energy to connect into the system in alignment with industry standards and interconnection rules of Puerto Rico. We have interconnected as you mentioned over 100,000 customers that puts Puerto Rico fifth per capita in the nation, and in only the first year of the operation, we connected more than in the past 10 years in customers in Puerto Rico. In addition to that, we've been working with energy bureau on integration of utility-scale renewable generation and over 350 megawatts of battery. Our role is to only do the interconnection of enabling the grid. We also have been

designing the grid to enable those generation, like installation of automation devices, reconductoring, and redesigning the substation.

Q: So, these 100,000 customers, is that in fact 30,000 residences? How many residences?

A: 100,000.

Q: 100,000?

A: Yes.

Q: Okay. And how does that fit with your strategy or at least Puerto Rico's strategy of resilience to the extent that somebody has a solar on their roof and hopefully battery backup. Are they more immune to the kind of devastation that happened with Maria?

A: It really depends. It depends on the situation of the building codes. I can't answer; I can't speak to the building codes, how the roof are, and I can tell you that from a grid standpoint, it's better than the way it was.

Q: Okay.

A: In 2017, obviously supported by all the numbers and other facts.

Q: Talk a little bit about energy storage backup. Have you put enough in or do you have ambitious goals to ramp it up and are you facing supply chain issues on that?

A: Energy storage, we see as a chief part of enabling renewable. We are an island; we are an electrical island and energy storage is a very important component of frequency response and stability of the system. Unlike all other utilities in the United States, we don't enjoy the redundancy that exists so, for us, frequency's an important factor and energy storage is the right technology to understand and we are working with FEMA, of course, on a number of projects to deploy 100 megawatts of energy storage on the transmission system, both for frequency and stability and it will add resiliency to the substations. Additionally, as part of renewable procurement process of Puerto Rico, there are a number of developers that are installing energy storage, and then the residential solar that we connect, majority of them, they do have small-scale energy storage in addition to solar. What we have been thinking about and working on to create an off-grid solution or end of the feeder-type solutions as those are the ones that they get restored through the prioritization frequency so any to taking advantage of those technologies as part of our restoration strategy. You asked about supply chains. Supply chains is not only a problem for energy storage, it's a challenge all across the board from distribution transformer to larger scale transformer and some of the larger scale power transformers, the delivery time is over

three years, so when you want to modernize 432 substations, it can take quite some time. We've been trying to be creative. We've worked very closely with FEMA and of course, the federal government as well as the local government to initiate long-lead equipment. They agreed to provide us approval and even ahead, we purchased over \$600 million dollars of long-needed equipment instead of waiting to go through the process. So, these are things that we have been doing to tackle the problem of supply chain like everybody else.

Q: So, lets...just because you're on the leading edge of this, the goal of a lot of the federal spending on infrastructure, Inflation Reduction Act, Bipartisan Infrastructure Law has been to ramp up U.S. manufacturing. Do you see signs that that supply chain problem is a temporary aberration and manufacturing will be in place shortly to help eradicate some of these delays?

A: You know, Marty, this is a; so first of all, this is a Shay's opinion. It's not the representation of what IEEE or LUMA thinks or...

Q: We want Shay's opinion; go.

A: Is that the actions that are getting taken to address manufacturing and supply chain is a long game and it's something that it's very much needed, and if you look at the manufacturers in the United States that they would create, that they make

transformers, you can find as many as the infrastructure needed in the United States but these are the right steps are getting taken but that has not solved the immediate problem of industry.

Q: Well, Shay, as you know, we have a lot of topics I want to cover but I want to ask you one more question about the situation in Puerto Rico. You alluded to yourself, of the fact there was underinvestment in infrastructure primarily because of the political pressure to not raise rates and the complications of that. There also, as you know, has been a lot of media coverage of problems with the bureaucracy, with the utility, with the government, with corruption, and there are some American contractors that have left kind of nodding their heads saying it's hopeless to work in Puerto Rico. As someone who grew up there, can you tell me how is that situation is evolving and is it easier to get this done or do you still face a lot of difficult realities?

A: As you alluded to the mismanagement of the grid and also the different challenges associated with the history of bankruptcy and other issues, initially it was hard to attract. We have made tremendous efforts in a transparent way to communicate what's coming and communicating with the market. We do have commitment to local contractors, local suppliers but this is a massive task that requires partners from all over the

world including the mainline United States. We have been successful to attract contractors and manufacturers that would work with us in all sort of spectrums from different types of equipment to providing services or professional services. This is again, a long game and we continue sharing what's up in the market in a transparent way and I believe that it's going to get better every year.

Q: Okay. The last question for Puerto Rico is, to what extent can we view it as a laboratory, testing out new technologies cause whenever there's a devastation, you don't just build back what you had, you build new so, to what extent are you learning things that you think your friends back at ComEd in Chicago, in Bronzeville and other utilities around the country might leapfrog where they're at and take their assets in a new direction?

A: This is an exciting opportunity as you said, it's an opportunity to build in a very different way from a design standpoint. I'm going to give you a few examples. In any utility, rightfully so, there is a very conservative way to deploy technology; IEC 61850, that's the modern substation. Large utilities, they install one and take like a year to collect data and information to do risk assessment and then, three in like in five years after and we are at a point that we

have no choice what skipping three generations of technology in Puerto Rico, so it gives us an opportunity to rethink about how to utilize that new technology. We have been installing fiber optics sensors, which is a very cutting-edge technology, to have visibility to and structure information; not only helps with restoration but it also helps us where to go and spend the dollar and interestingly the position, I mean, the way that we are structured is that we are a grid operator. We are on the same side of the customersso it...we take the time to be smarter where we spend the money and where to enforce the infrastructure.

Q: You provide us the benefit of being able to talk At Change from two perspectives; one is what you're seeing and doing in Puerto Rico. The other is as President of IEEE PES which has 42,000 members all around the world, they all have their feet and hands and brains and hearts involved in redesigning the grid right now. You're a venerable society; I'm sure you're about to celebrate a major milestone in terms of its longevity. Talk to us about what the culture of your organization's been and how you would like to change it.

A: So, this is a very exciting time to be serving as President of IEEE PES, the organization that has members from globally, academia as well as industry professionals and regulators as our

scientific and engineering experts are, focusing on how societies must build the electric grid of the future including the grid that will help address the threat of climate change. And then as you said, this year is our 140th anniversary by this industry, this association, the founders of it were Thomas Edison and Tesla and others like them. It takes time. It was based on the principle that standards are based on building consensus and building consensus globally, it takes quite some time.

Q: So, Shay, let me just cut right to the heart of the question that I have on this. This is an unprecedented moment where tens of billions of dollars are being directed by the federal government into redesigning the grid to make it more sustainable, to incorporate renewables, to help Puerto Rico achieve its 100% renewable status, and states around the country achieve that. As I talk to people like yourself around the industry there's some concern that so much is being thrown at this issue, we run the risk of doing it in an uncoordinated fashion and things might not be done optimally; there might be waste and mistakes. How does IEEE, how do you use a professional? How do your colleagues see this moment and what the engineering community must do to make sure these resources are used most effectively?

A: Let me go back to your previous question because I think it's very important that it feeds into your second question related to industry. The IEEE develops, regulates from a technical standpoint how this industry should operate, design, build, and operate, and the standards and how under the guidelines comes from building consensus across the globe and at times it takes a decade. As you said, it's an unprecedented time to be in this industry and the challenges that we deal with cannot wait for a decade to make that coordination that we historically has taken the time to do that. What we have been; what I have been focused on is how to serve the industry and provide the guidelines in a timely manner. We have created a body within IEEE PES called Industry Coordination Taskforce which looks into we have done a number of white papers with global experts how to do the pandemic and how to do sequestering. How do you measure resiliency? It would take 15 years to come up with measuring resiliency in comparison to reliability, so these are the actions that we have taken to address that. The other thing is that there needs to be a closer collaboration to get the facts and work it with policymakers. No matter how fast the technology needs, at the end of the day, policy rules, and making sure that unbiased facts, fact-based scientific perspective is included in the decision-making of

policy makers, and at PES, I have been focusing tremendously on changing the perception of PES and being at the table of those decisions.

Q: So, is it your perception that we risk being too vulcanized with thirty states and multiple federal agencies setting the regulations and policies? Do we address the political realities of how utility regulations and rules are set?

A: So, the fact of the matter is that, Marty, and this is not only the problem of the federal in the United States; it's a global challenge. Unless those decisions have been made in accordingly good fashion, they are going to impact one state to the other, one country to the other. Why? Because the grid is interconnected. It's interconnected in Europe; it's interconnected in the United States and North America, so the decisions that are getting made in California are, it doesn't only impact California, it impacts the neighboring states. The decisions in Minnesota, it's going to impact other states and as long as we don't have a coordinated fashion to insure that they are aligned and there are not unintended consequences, you are going to be facing challenges, and this is the role that I truly believe is the cap that IEEE PES is trying to close.

Q: So, do you think that the initiative has to come from the professions that you represent, as opposed to the FERC

commissioners and their peers around the world, or the utilities? I mean, who needs to say that we need a united nations of energy policy or somehow to really escalate this? Is that coming do you think?

A: All of the above and I don't know if you the conversation that I had with economist Noble prizewinner Michael Pence about equity and affordability of equity in the energy sector. Today is the time to address several things. The organization that I represent, PES, and the engineers and experts play an extremely important role. The economist, like the unorthodox player need to be invited to the table at to discuss. The third thing I would say is, it is important to tell their story and explain to customers about the costs and about the need of the investment that needs to happen in the grid. I'm not sure if you have read; it's a book called "Planning as Persuasive Storytelling" that explains in Chicago why bringing stakeholders and telling their story during the nuclear time and all of the deregulation was important. We are at the tipping point so the freight common centers as well as the state regulators and industry associations like PES, as well as communication experts and economists need to come together because it's the perfect time to bring everybody together, tell the story, and solve the

solutions, not only in the United States; this is a global problem.

Q: So, my last question, Shay, is if you were going to bring Thomas Edison and Nikola Tesla to Puerto Rico, what would you show them and if you had them on the stage at your PES meeting in Seattle this summer, what would be some of the questions you would ask them?

A: What I would show them in Puerto Rico is that their vision of off-grid and economy of scale both at the same time is getting implemented in Puerto Rico. The second thing about IEEE PES is that there is a library in Alabama that has the history of this script, a different script of when there are arguments, how to talk about electricity to the public. Do you talk about it as kilowatts, kilowatt hour? How do you tell the public? And there are hundreds of pages of debate at the time. I would ask them the same question: you're at a time in history that we have to come together and talk about how we talk about the energy transition and energy transformation considering the challenges that we face because of climate change is equally important so we are back in the history and we need to have those debates.

Q: Very good. Thank you, Shay.

A: Of course. Thank you so much for having me, Marty.

We've been talking with Shay Bahramirad who's LUMA Energy's Senior Vice President of T&D, Strategy and Sustainability and also, she's IEEE PES President.

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