



Beyond the Electron Podcast

Storm Protection

Season 2, Episode 1



Energy, Sustainability and Infrastructure**Beyond the Electron Podcast****Storm Protection**

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Speakers**Hector Artze**

Partner
Energy, Sustainability, and
Infrastructure

Barry Andersen

Regional Senior Vice
President, Customer Delivery,
Duke Energy

Chris Warren: Basing big investment decisions and long-term strategies on personal experience and anecdotal evidence is never a great idea. But when it comes to the increasing frequency and severity of natural disasters, the experience so many of us have of scorching heat, chilling cold floods and droughts is backed up by a lot of objective data. For example, in 2020, there were 22 separate billion dollar weather and natural disaster events in the US. That number broke the previous record of 16 events in 2017 and 2011. It's also a 30% increase since the year 2000. No other industry faces quite the same challenges and responsibilities in responding to increasingly severe natural disasters as the electric utility industry. Put simply society depends on the safe and reliable delivery of electricity. It's a challenge that utilities clearly need to face because extreme weather events cause nearly 70% more power outages in the US between 2010 and 2019 than during the previous decade. Understanding how to devise and implement effective storm protection plans will be our topic on this episode of Beyond the Electron: The Energy Cloud Podcast series.

I'm your host, Chris Warren, and I'm pleased to be joined today by two guests who have unique perspectives on this topic. With us today are Hector Artze, a partner in Guidehouse's Energy, Sustainability, and Infrastructure Group. Hector brings over three decades of experience in the electric utility and energy fields. And his work today is focused on helping utility and other clients plan for the transition to net zero carbon emissions. As part of that work, Hector helps clients create grids resilient to natural disasters and climate change. Also with us today is Barry Andersen, a regional senior vice president for customer delivery for Duke Energy in Florida.

Barry is going to give us unique insights from his work developing the utility storm protection plan. Before Barry joined Duke, he worked at California's Pacific Gas and Electric Utility, where he spearheaded efforts to harden the grid against the dangers of wildfires. I'd like to welcome both of you guys. Hector, I'm going to start with you. We're going to get into the details of Duke storm protection plan in just a minute, but from an industry-wide perspective, so big picture, where do you see resilience against severe weather being a top priority? Is it tend to be in places where there are regular hurricanes wildfires and snow storms, or is it something that's really on the priority list of utilities everywhere?

Hector Artze: Thank you very much. I submit that the risk exists everywhere. It's clear that it's a matter of degree and it's a matter of the type of peril that affects a particular area. Hurricanes affect utilities in the coast, the East Coast of the United States, the Gulf, I would say Hawaii and other island territories while wildfires is a peril that affects utilities in the West. But I would say that there are other perils, extreme temperature. It could be cold or extreme heat. Floods or droughts are more geographically disperse and really have the potential affecting utilities anywhere within our US territory.

Chris Warren: Right, yeah. I mean, just thinking, as you were saying that, just pulling from the news recently, I've read about Hawaii, one of the wettest places on the planet now being concerned with wildfires in the forest in Hawaii. So, it does seem that places where traditionally there haven't been particular extreme weather concerns that's changing. And that may be as one of the things that's characteristic of what's happening is that it's changing and evolving and people have to rethink how they've regarded, how they protect the grid and the infrastructure that everybody relies on. So, I mean, that kind of gets us to the point of the investment that utilities make in grid resilience. Hector, I want to stick with you on that. What drives those? I think no one likes outages and customers and regulators tend to make a lot of noise when there are extended outages. What are some of the drivers that you see industry wide around investments in grid resilience?

Hector Artze: I would agree customers, regulators, even legislators, they are important drivers. I would add though that more recently we have a growing trend where investors are focusing on the risk of climate change on utility assets. That is, I would say new and it's important to utilities because they are the sources of funding for their operations and their investments. So, they result in a significant investment in grid resiliency. And in order to address the risks of climate change. And utilities are beginning to address the issue of climate change as a driver for resilience investment. It's early days, it will depend on how fast utilities move to decarbonization and how that will indeed impact the need for further resilience.

I'll explain by saying that we see a trend towards increased demand on the transmission and distribution grids from the electrification of buildings and vehicles as a means to decarbonize the economy. We also see a need for resilient transmission and distribution systems when it comes the integration of energy resources. So, from that perspective, there is a new sort of stakeholder group that has an interest in utilities to assess the climate change risk and develop programs to improve the resilience of the grid to climate change.

Chris Warren: Right. Oh, that's an interesting point about investors voicing their concerns and prompting utilities to think a little bit harder about that. Okay. So Barry, let me bring you in. You're going to be able to give us some more specifics to some of these big picture drivers that Hector was just outlining. Can you talk about some of the things that led to Duke's storm protection plan? I mean, most people will understand that Florida has its share of severe hurricanes, there's hurricane season. What are some of the factors that led to the storm protection plan being developed?

Barry Andersen: All right, Chris. Well, a couple of them have been talked about, and that was, I like to think of it in terms of customers, communities and costs. The expectations of our customers have just really changed over time. Long duration outages after hurricanes are met with frustration from our customers and our ability to timely communicate accurate information to them is just key. Now, having said that, resiliency of your assets give you a much stronger understanding on how they'll behave under extreme weather conditions. And that's really fundamental to be able to provide that level of communications to customers. When I think about communities, I think about main thoroughfares, making sure that if there is an outage to a main thoroughfare, that the restoration time is quick. Bringing up grocery stores and gas stations are just essential to bring that community back up. And the third component and as I mentioned cost, when you consider the assets that are destroyed or damaged, that must be rebuilt.

And it requires a significant amount of outside resources to bring in to do that job that requires a long travel times, lodging, et cetera. So really an investment in a storm protection program just really pays back in several ways.

Chris Warren: Let me just dig in a little bit on something that you mentioned. So you just talked about resilience and its connection to communication. Can you explain that in a little more detail? That's intriguing to me.

Barry Andersen: Yeah. Sure. So the distribution system in most utility, all utilities I'll just say that, it's a hundred years in the making. A lot of the assets perhaps have been replaced 30 years ago or 40 years ago. At the end of the day, it's very difficult to understand how your system will behave to any particular hurricane and any particular wind speed. And that creates challenges for the utility in understanding when the lights are going to come back on. And our customers, they want to know... Once the hurricane clears, they want to get life back to normal. So a resiliency program now allows you to have confidence in how much damage it will sustain, how quickly you can restore those assets, because they're not disabled in terms of damage. So the outage time is much more minimal and you're able to communicate that ahead of time. So it really is the game changer here.

Chris Warren: Right. Okay. So let's talk a bit about how you went about... I mean, I know it wasn't just you. I'm sure there were a lot of people involved with formulating the plan. What kind of analysis went into identifying vulnerable assets? And I guess another thing that occurs to me is I'm sure Duke had a sophisticated way to respond to storms in the past. How is this different? Is it about codifying where resources go? Identifying vulnerabilities, is that what gives the power to the plan? If you understand what I'm asking.

Barry Andersen: I do. Let me start with maybe breaking it down into its basic elements. So the first component is just having an understanding. What's the probability distribution? I guess that's the mathematical term. And how often you're expected to see extreme winds, what those tracks are. And those are from NOAA and FEMA models. But what they do is they give you a picture of how your assets will perform. So we've got a model that we have a geospatial look at where our assets are and when you couple the frequency and the wind speeds over our assets and then you simply look at it as older poles that are thin will break at lower wind speeds than thick poles that are new over lower winds. So if you follow that logic, that's really how you arrive at a model that says my current infrastructure will withstand wind speeds to this amount. Once they're hardened to an extreme wind condition, you have a lot more confidence in how they will withstand and how they will behave after a hurricane.

Chris Warren: Right. Okay. That makes plenty of sense. I mean, you're able to model out real world conditions and then plan accordingly. So let's talk about the elements that have gone into the plan. And I asked that because oftentimes I feel like whenever I read about hardening and resilience, undergrounding is always mentioned. And I'm sure that's part of the menu for any utility, but I know it's not the only one. So could you walk through some of the pieces of the storm protection plan? And part B of that is also how does that relate to other efforts around grid modernization? Because I imagine the two things can go in tandem.

Barry Andersen: Absolutely. So our plan is basically broken down into three programs. So one of them we'd call a standards-based program. That's where you're referring to the undergrounding. So that's taking overhead circuits and putting them underground. Another standards-based program is feeder hardening. And through the main thoroughfares in our service territory, we've got circuits and they're called feeders. They serve roughly two to 3000 customers. Those feeders are brought up to extreme wind standards of very, very thick poles, large wire, smaller span lengths. So getting yourself a picture of, they can withstand extreme winds to a greater degree. That's really our core program. A second piece is targeted and targeted would be in areas that are flood prone, where that you'd want to put in different type of underground equipment in anticipation of the flood plain. Once again, that you could restore, I mean, you can't serve it if it goes underground, but of course the time to get customers back in service with the right equipment in place really helps that.

And then the third program approach is we call it enabling, and that would be vegetation management, primarily. Once you harden your system, either on the overhead side... if you put it underground, obviously you reduce the vegetation risk of a tree blowing in your line, but at the same time the vegetation cycle that you're on in most for like a feeder, for example, we have a three-year vegetation cycle, which you trim the lines back first three years of growth. And what that does is when you do get extreme winds and branches and debris and things like that fly on your circuits you minimize the amount of debris from the trees and that keeps your circuit healthy.

Chris Warren: Right. Okay, great. Well, Hector, I want to bring you back in. We've learned here a little bit about Duke's approach. I wonder in your survey of utilities, how similar or different is what they're doing to other examples you've seen and is there a common set of tools and approaches utilities can use to improve resilience?

Hector Artze: I would say that Duke's approach is generally similar to the approach other utilities employ. I would say that a Duke's approach focuses on the development of a framework that allow them to identify their risk to their transmission and distribution assets and quantify the benefit of the different hardening measures. This tool, this analytical framework, I think was developed with the idea that it would be consistently utilized to support the evolution of the SPP program over time. Because the program is meant to evolve and ideally incorporate the lessons learn and results that are found if a storm were to hit Duke's Energy Florida's territory in the coming years. I think what is somewhat unique to Duke is that in developing this framework, they were able to identify the value on the cost of the different measures and develop a benefit analysis that was used to identify the best solutions and then prioritize the implementation of those solutions. And that framework was used to communicate the value of the programs to regulators and customers and other stakeholders. And I think that that is key in the process of developing infrastructure resilience programs because you need to bring in stakeholders, make them part of the process and explain to them the value of the investments that you're doing.

Chris Warren: Right. I asked Barry this, but I want to get you to chime in as well, Hector, about the idea of grid modernization and improved resilience. What do you see, I mean, in terms of other utilities that are pursuing improved resilience protection against extreme weather and simultaneously modernizing the grid? I mean, a lot of it does seem to go hand in hand. What's your view of those two things and whether they interlap or how utilities are pursuing it?

- Hector Artze:** Absolutely, they are very much related. Resiliency impacts the reliability of the grid and benefits from the modernization of the grid. It depends on having the sensors, having the equipment, modern equipment in the grid, to understand the situation of the grid. It's not just investing in undergrounding or investing in poles with more strength, it's also investing in technology that will enable the restoration processes to be more effective, efficient, and that can reduce costs. It's also investing in the processes themselves and in their organization. It's the investment in technology, tools or processes, and the organization itself, how you're trained and ready to respond to mitigate the impact of a natural disaster. There is no way to build a grid that will stand all natural disasters and not fail. Being prepared to respond quickly, effectively, know where the issues are, and reduce the time that customers are affected is part of their resilience.
- Chris Warren:** Right. Having that visibility that sensors and other technologies can provide about where there might be an outage, how you need to deploy resources to bring customers back online has got to be an important part of any storm protection and response plan, and there's new capabilities to do that.
- Hector Artze:** Yep. Barry mentioned something that is, I think, worth repeating, and that is to the extent that a utility is able to develop analytic tools and predictive models to prepare for the natural disaster such as storms, and in the case of hurricanes you have a little bit of a warning so you can use those predictive tools to position your organization and summon resources and get ready for it. It's more than just, like I said, poles and wires. It's technologies, models, it's intelligent use of data.
- Barry Andersen:** Chris, I was going to add to that. Another aspect of this is your system is more resilient and hardened. You can take advantage of the automation you have on the grid. It's cases when you have a storm approaching, once again, if you can have confidence that your lines, based on your vegetation practices, the age of your lines and so forth, you can take advantage of switching around circuits based on temporary faults. I know that's a little technical, but the more hardened your system is allows you to also do that with confidence, that the technology you have, the fault sensing capability. Really, these switches are very smart, where that they operate on their own and they can take an outage and reduce it by 75% in a matter of a minute. As a storm, hardening ties with that automation is just key and keeping as many customers on through these types of events.
- Chris Warren:** Well, Barry, can you talk a bit about some lessons learned so far in the implementation of the storm protection plan? Hector brought up what I think is a really important point around communicating the value of these efforts to all stakeholders. I think there's really something important to that. I don't want to put words in your mouth about lessons learned, but that struck me as something really important because these are events that have the potential to impact people in deeply personal ways. Understanding what a utility is planning and doing to prepare for and respond to inevitable events seems really wise and impactful. That's a big lead up to guide you. I don't know if that's your experience, but tell us what it is.
- Barry Andersen:** Oh, well, that's good insight there, Chris. I kind of see it as being heavily engaged with the rulemaking process upfront. As the regulators, they understand the impacts to the utilities, and ultimately customers, in regards to extreme winds and hurt from hurricanes and so forth. When you're involved early in the process with them, it sets the stage for some of the things that that Hector mentioned, and that is having a good cost-benefit analysis. These programs require a lot of capital funding and they to be challenged that way from a cost-benefit analysis. Making sure that your modeling is tight, you're using good industry practices for your maintenance programs and so forth, and when they tie those together and bring them forward, you bring those stakeholders along with you.
- Also, another lesson learned is work with your utilities that are within your state as well. They're under the same program and they have to do the same filings, and just making sure that you have some insight into their best practices can go a long way too. Third, always good to bring along stakeholders when you respond quickly to the questions they may have and interrogatories and so forth. I would say another lessons learned is really having a strong team, cross-functionally. Tie in your legal team, your rates and regulatory team, your engineering team, those are all good things that galvanize the program, so to speak, and help you get the approvals from the regulatory bodies.
- That's that side of it. The other side I want to mention, Chris, was just the other lessons learned are things like your design standard changes. When you've been using standards that have been similar for 30 to 40 years, when you go to make a change to have a more resilient system, you need time. You need time to socialize those things with your standards team and your engineers and the field resources that are going to be doing the building. The other piece is it adds a lot of work, and so you got to have good contracting strategies to add resources and so forth in order to get the work done efficiently and effectively to deliver the commitments that you've made with the regulators.
- Chris Warren:** Yeah, the implementation really means something. It's not just a throw away term, it has real consequences. Tell me what's next in terms of resilience. I have to imagine that it's a constantly evolving process that extends beyond the program, even just gauging where those vulnerabilities are and constant monitoring and adaptation, what's kind of next for you?

Barry Andersen: Well, for us, we filed a 10 year road map. That was the requirement. We built up a ten-year plan. And then we'll also file, along with that, a three-year detailed plan. What circuits that we're going to underground, what circuits we're going to harden, where we're going to do the flood mitigation that I mentioned. So those are more detailed plans and it really is, it's a good way to follow our progress. Make sure our costs are in line with what our commitments are and show the regulators we're being cost-effective here. But our program is going to be 20 years, maybe even 30 years in some areas. We have a very large system and it was built over many, many years, so, that's the next phase. After we get through these 10 years, we'll file more, but it's really a continual type of filing.

What we plan to learn is after every event we have, we'll take a look at those assets that I mentioned that we have geo spatially. We have the technology where we overlay the wind speeds on our assets. We know the last time we trimmed trees on that circuit. So, if you just left a circuit yesterday, chances are, you're not going to have as many vegetation outages, for example, as one that you trim two and a half years ago. So what we'll do is we'll validate our models against our new assets that we have in place and the wind speeds, and then we'll learn from there. And if you have to make some adjustments in your pole spacing, or your pole thickness or your vegetation cycles, those are the things that we'll draw off of as we move forward.

Chris Warren: Great, okay. So we're going to wrap up here with a question for both of you and Hector, I'll have you go first. Based on what you've observed, any best practices and industry successes that you've seen? What kind of advice do you have for utilities that are trying to evaluate the investments they're considering in resilience?

Hector Artze: I believe that the lessons Duke Energy Florida and Barry have learned are in essence generates the answer to your question. The only one that I would add is that as a final step is to continuously measure progress. Progress in the deployment of your investments, resiliency investments, to the extent that you are impacted by an event to make sure that you also measure the results and report to your stakeholder group, what benefits may have derived from the investments that you've made?

I think it's terribly important to continue to engage with regulators, customers, and other stakeholders in the process of adding resilience to the assets, the utility assets. Other than that, it's the framework and the models that you use to identify the risk and determine mitigation strategies and all of that will continue to evolve and improve as more and more experience and data is added to it. I think that applied the lessons that Duke have learned and you have the makings of an excellent program.

Chris Warren: Excellent. Well, Barry, I'll give you the last word here. Any advice you would give to, let's say someone who's not as far along as you and is closer to the beginning of this journey?

Barry Andersen: All right, Chris. Well, first I'd just say resiliency works. It's an investment in your infrastructure, but it will certainly pay dividends to regulators, customers, communities that I mentioned. But really take a hard look, and Hector mentioned it, understand your asset base, look at your previous outage history from other severe weather events that you've had and continue to learn from each new storm you get, and stay updated on the models that are out there from NOAA and FEMA and not add a lot of personal judgment on what may or may not happen. Stick to the models that the professionals develop.


And the cost benefit analysis is really important, as Hector mentioned. Continually look back, make sure that you've made the best decision you had at the time, but then also adjust, adjust for what the data may point you along. It's a long journey and it's going to take time to get through your system but as you experience a tropical storm headed your way or a hurricane, and I can speak from experience, the more hardened and resilient and automated your system is, the better off you're going to be in terms of communicating to customers the expectations after the event.

Chris Warren: That's all the time we have today. I want to thank Hector and Barry for a great conversation. I want to wrap up by underlining what Barry and Hector just talked about. Resilience strategies are obviously going to vary from utility to utility, but it's also clear that the best resilience strategies combine a clear view of the impact of extreme weather in the past, and a willingness to continuously review and analyze what's working and what isn't. The ability to do both of those things and evolve and change course when necessary, is going to be really important going forward.

Thanks again for joining us. We'll see you back here next time. On the next episode of Beyond the Electron. Goodbye.



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