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SHAY BAHRAMIRAD INTERVIEW

Q: Hi, and welcome to Grid Talk. Today, we're extremely pleased to have Shay Bahramirad, Vice President of Engineering and Smart Grid at ComEd, to talk about an exciting new microgrid project ComEd has been working on right in its downtown core. It's been described as one of the most advanced urban microgrids in the nation. We're very pleased to explore what that means with Shay.

Welcome, Shay.

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

Q: So, tell us first why now. Why is the time ripe to build an urban microgrid?

A: Our industry is going through tremendous changes, but we have to live with a new normal as an electric utility and as an energy sector overall, and that's the fact about climate crisis. The number of severe weather-related events that we have to deal with-- the very hot days or very cold days is increasing significantly, and the system that has been developed over a century is not going to withstand all the challenges associated with climate change. Then, in order to slow down that negative pattern,

we have to think about accommodating more and more renewable energy and distributed energy resources in the system. That means that we have to rethink the design and how the electric grid works in a different way.

Q: Tell us what Bronzeville is. It's a community in Chicago. Describe a little bit the flavor of the community and what it entails, what's located there.

A: Yeah, Bronzeville is a neighborhood in Southside Chicago and parts of downtown. It has a very rich history of African American presence, and it's very diverse in terms of the types of people and businesses that are located there from a number of institutions like Illinois Institute of Technology to the College of Optometry, from a security standpoint, the Chicago Police headquarters and the number senior citizens' homes and public housing and residents and small and commercial-type businesses. The combination of that created a very unique opportunity to look into that neighborhood.

Q: I think it includes a police station and a library as well. Is that correct?

A: Yes, a number of high schools, a library, Chicago Police headquarters, and senior citizen's homes, and a number of universities-- 2 universities.

Q: My understanding is there are about 1000 customers in this area, and ComEd, of course, is one of the nation's largest utilities with more than 4 million customers across Northern Illinois. What do you hope to learn from these 1000 customers, and how large do you see it scaling up across the whole service territory down the road?

A: The beauty of this project is the learning associated with it can get replicated elsewhere without having the requirement to have a microgrid. I don't envision the grid is going to turn into the microgrid. What I see from this is distributed energy resources, organically-- hopefully, we will support the policy, and it gets more and more integrated in the system, and the modular line design, we are testing the implementation of it. In Bronzeville, we can facilitate providing a localized energy in different parts of our service territory. We are developing a microgrid control area, and the software that's basically the brain that sends command and control in a local of area will provide intelligence, and having the ability to make decisions locally is another aspect of it that can be utilized elsewhere.

Q: I'd like to come back to that controller in a minute, but just to finish painting the picture of the neighborhood,

you mentioned, I believe, that the Illinois Institute of Technology where you have a PhD in electrical engineering is right smack in the middle of this territory. What advantages does that give you, and how can you piggyback on initiatives that IIT has developed over the years?

A: First of all, from a technical standpoint and from the grid design, we are clustering ComEd or the neighborhood microgrid with Illinois Institute of Technology. They have a microgrid behind the meter, and they have the capability to withstand any kind of events. Making these two microgrids talk to each other is something that has not been done in the country in the past. The second part of it goes back to partnership with university and work force development. This is in the forefront of our strategy. What you're doing is working with students and integrating many of these learnings and practical aspects of the business into curriculum at IIT to develop the future work force. Partnering with a number of high schools within the neighborhood, we expose the kids to different possibilities in STEM as well as using their brain and intelligence to come up with different solutions that this microgrid platform has provided us within the neighborhood.

Q: Let's get back to something you touched on, the microgrid

controller. I believe ComEd has 3 Department of Energy grants associated with Bronzeville. One is a 1.2-million-dollar grant to build a microgrid controller. Tell us what that technology is, what failing it's meant to address and what do you think you're going to be able to demonstrate?

A: As you said, the project is funded by a 1.2-million-dollar grant by the Department of Energy and the number of universities, national labs, and technologists are our partners to develop this software. What it is does is it evaluates the state of the system in the local area and utilizes the grid infrastructure and distributed resources to make proper decisions to keep the grid up and running during any kind of event. During the process, we developed over 300 test cases and events and ran extensive lab testing, and it got challenged by MIT and a number of other national labs to ensure the capabilities of the brain within the microgrid then. We partners with Siemens and integrated the algorithms that the team developed into a cyber-secure platform that Siemens has and going through a number of testing and integration steps to make it ready for implementation in the field and the real world.

Q: So, it's developing a highly-sophisticated degree of intelligence at the very end of the grid. Is that correct?

A: That is very correct, yes.

Q: How might this be useful to ComEd across its vast surface territory?

A: As I mentioned, the reality of what we learned has changed, and it's evolving. Developing sophisticated control can give us the ability to control different types of generation and prioritize different types of modes of customers in many different types of emergencies. I will give you an example. There are parts of our service territory that, because of where they are and because of capacity factors, there are a number of solar developers that want to connect to that part of our service territory. Then, there's a significant amount of wind connected to those substations. If you want to think about traditional solutions for system upgrade, the cost associated with that is going to be over 20-30 million dollars. Having such controls can enable us to control the generation in a way that the integration cost of renewable is going to decrease significantly.

Q: I think a second grant is for 4 million dollars from DOE to design and deploy solar and energy storage. Is that part of this?

A: Yes, it is part of it.

Q: A lot of this generation, which heretofore had been utility-owned, I think, within the microgrid, it's going to be owned by diverse parties. Is that correct?

A: Yes, this is another learning of this project. We are pushing the boundaries of operation that not all the assets are needed to be owned by utility, so the generation is coming from solar and wind generation, both that come from a third party.

Q: While you say you don't envision building a microgrid of microgrids or a grid of microgrids, I would assume that kind of capability is something that might be very useful to ComEd and other utilities as they prepare for the future.

A: Absolutely. I would agree with that. The reason I said the entire grid is not going to be divided in smaller grids is by the Department of Energy's definition, and microgrid should go on an island and have dispatchable generation for the peak load for that portion of the grid. That wouldn't be necessary for the entire 4 million customer population, but many different aspects of microgrid is something that can be implemented depending on where they are and depending on circumstances in different parts of our territory or other utilities.

Q: If there, for example, is a hospital or a shopping mall complex, you might want a microgrid around that area but not ubiquitous across the whole surface territory?

A: Yes, I would agree with that. All the cases would need to be revisited one by one, so I cannot come up with a one-size-fits-all. Ironically, our business is built on a one-size-fits-all over time.

Q: Right, so I've been hearing, and I'm sure many in the industry have been hearing, about Bronzeville for several years now. Can you give us kind of a timeline of when it launched, where you're at now, and where you expect to be in the next few years?

A: The first phase of the project was commissioned last year in April. We went through extensive testing, and we brought portable generation, and at the point of interconnection, we looked at all the capabilities and integration of solar and energy storage, and it passed the test, and it was presented to the number of stakeholders and Department of Energy. The second phase of the project that we are working with right now-- and I am anticipating to be finished by the end of 2020-- is to go through and process and procure controllable generation. That's a work in process, and the implementation of communication

infrastructure and is happening as we speak.

Q: I wonder if I can pivot for a few minutes to a different topic, and we've been hearing a lot about how utilities have to be evolving their business model. At the time same it's preparing for changes in climate and customer expectations, how do you see the kind of work you're doing in Bronzeville contributing to ComEd's evolution of a future business model?

A: I would think-- so, from a grid perspective and the way that we design the system and operate the system, I went through a number of learnings associate with this project. From a business model perspective, I would say that going through an exercise, both from a contractual agreement as well as from an operation perspective and from a maintenance procedure, how to a rely on a third-party asset is something that is going to push the envelope on the operation frontier. I talked about a modular grid concept, and if you imagine that there's energy storage and if there's solar in part of our territory, this type of design or this type of asset can potentially prevent an upgrade if needed.

Q: Tell me a little more about how ComEd may be changing along with this technology. Are you going to be developing new

services? Might you start putting a value on reliability that's enhanced by the microgrid?

A: We are working with a large group of stakeholders on a microgrid as a service tariff, and we are looking at different options on how this can be provided to different types of customers as a service from industrial customers to different campuses, and we are working through the details of it as we speak. We've been engaging in a number of dialogues with different experts and both policy experts as well as technical experts in the past 6-7 months or so. On the value to the liabilities, I do believe there is an industry-accepted measure of how to value reliability, but that doesn't account for resiliency. That's something that a microgrid will provide. The type of events with that probability of happening is very low, but the consequences are high. They impact neighborhoods and people, and this is something that, as an industry, we have to come together, not only from a technical standpoint, but this is more from economists and social scientists and engineers have to come together to develop the value of resiliency. Our life is so much dependent on electricity, and this is something that lacks and cannot be done in a silo in one vertical energy sector.

Q: Right, I've been fortunate enough to tour both the IIT campus and Bronzeville, and one of the more remarkable things that I've seen is the degree of community engagement. You talk about the evolving utility to meet challenges, but there's a challenge, I think, of bringing customers along. Talk about how you think efforts like Bronzeville are a way to educate customers about the evolving technology and getting buy-in from them.

A: It's a very good point, Marty, and I put it as this education is two-way. It's not only we educate customers, but we learn a lot from engaging in different neighborhoods. The microgrid in Bronzeville is part of a larger effort. In Bronzeville, we call it the community of the future, and the thought is to design a human-centric neighborhood of the future, and technology is only the enabler of that vision. What we did was we brought together thought leaders within neighborhoods, people who have a voice, and they influence their neighbors. I can tell you it was an eye-opening experience for me personally. What we learned was that there's a lot going within the neighborhood with the number of not-for-profit organizations, and there is so much alignment from strategic priorities on accelerating low-carbon and the

future of electrification to advancing STEM and the work force of the future to increasing collaboration, so that was there. It was about-- what we needed to do was to tap into that energy. That's something that helps us tremendously. Instead of going in, we're providing solutions. We listen to what those priorities were, and to the extent that we could provide a solution, we worked on a number of projects that I'd be happy to share with you. We became catalyst to, a catalyzer if you will, to bring different partners together in working with different solution providers in the neighborhood.

Q: As one of the more advanced microgrid efforts in the country, talk about what you think ComEd's obligation as an industry tied to this DOE funding sources to promulgate what you're learning across the industry, and to what extent are utilities around the country contacting you to learn from what's happening in Bronzeville.

A: There is a-- I see it as a professional responsibility to share the learning. We've been fortunate that there has been a vision to work with a number of stakeholders to be able to do a project like this microgrid with the support of a number of federal grants. A number of universities and national labs and technologists share costs, and that's

brings a lot of learning. Our responsibility is to share those learnings across the industry, and that's something we've been taking very seriously from trying to talk about it at different technical conferences and transactions into mainstream media in a way that people will understand it, and explaining to partners not only from an engraving perspective but from social science from an economic perspective or economists to start thinking about these concepts. We have been reached out by many different utilities not only from within the country, but we have had visitors from UK or Australia that they've been interested in hearing more about. Many parts and pieces of the microgrid.

Q: What would you say this neighborhood is-- I would describe it not as an affluent neighborhood, working class perhaps? What have you found in terms of their concern about the issues that you're bringing to the table like climate change and renewable energy and grid resilience? Is there an appetite for that kind of information and that kind of activity?

A: They do take it very seriously, Marty. What we have learned is that the micro transit has been stressed by the community as a priority, and they would like to see more

efforts, more collaboration across the city of Chicago and utilities and solution providers to have electrified transit, and one of the reasons is that Chicago is one of the top 5 cities in the US with high air pollution. The most contributor to this pollution is the transportation sector, so that's something the neighborhood is aware of. If you look at the asthma, the rate of asthma in the working class communities or, I would take it to the next level, under-served communities is higher than other places within our territory or elsewhere in the country, and that's something that requires a lot of thinking both from a policy perspective and from a collaboration perspective to resolve it.

Q: Do you have any innovative projects that you're designing to try to address that specifically?

A: Yes, we do. We work with job creation, and economic development was another part of this focus of this project, and we worked with an entrepreneur in Illinois (the name of the company is Innova) to provide last-mile car-sharing service to senior citizens within the neighborhood. It's an electric car that the driver is hired from the neighborhood, and they take senior citizens, and they take a schedule from places to the train station, to the bus

station to close that gap, and then we work with universities, the 2 universities I mentioned to senior citizens and university students. They have different schedules and are developing an app to utilize the same electric car-sharing service to students to provide a similar service between different parts of the campus. If you see, we are not in a car-sharing business. We are only an enabler and catalyst of this partnership coming together to make it happen.

Q: I think it's a powerful example of how walking down the road to forming a microgrid takes you into a lot of different new and anticipated directions.

A: You're so very right. It's been an adventurous road.

Q: Fascinating. Thanks for talking to us, Shay, and we reserve the right to come back and visit with you down the road to see how things are going.

A: I would be lovely to join you again. Thanks, Marty.

Q: Thanks for listening to Grid Talk. Thanks to Shay Bahramirad of ComEd for sharing her insights about these incredibly exciting changes in the electric industry. You can send us feedback or questions and suggestions to GridTalk@NREL.gov. We encourage you to give the podcast a rating or review on your favorite podcast platform. For

more information about the series or to subscribe, you may
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