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PETER ASMUS INTERVIEW

Hi and welcome to Grid Talk. Today we have with us, Peter Asmus, who's newly-installed as Executive Director of Alaska Microgrid Group with some exciting trends and developments to share with the rest of the country.

Q: Hi, Peter, how are you?

A: I'm pretty good.

Q: Well, thank you for joining us. I want to start off right off the bat and have you describe what the market looks like in Alaska and how it has come to add more microgrids than any state in the country?

A: Well, I think Alaska...what's unique about Alaska is it's Number One in the U.S. for total microgrid capacity. At last count I saw something like 3,500 megawatts of installed capacity. Most of those systems are what I would call remote power systems where there is no grid and that's what's unusual about Alaska. It actually looks like the rest of the world microgrid market which tends to be those kind remote power systems in Africa and India and parts of Australia but there is also in Alaska some grid-

connected microgrids so it has a little bit of both and what's interesting about the market is the renewables being integrated into those microgrids are not being driven by policy or mandate. They're being driven by economics because it's the high cost of diesel that has actually been an incentive for utilities and most of these microgrids are run by utilities. That's another distinction with the Lower 48 that just want to save on operational costs.

Q: So, can you give us a rough breakdown of what percentage of the utility scale of microgrids are investor-owned utilities versus public entities?

A: Oh, by far, they're almost all public entities. That's the other thing that's unique, so Alaska has over a hundred electric utilities serving less than 800,000 people so it's a very decentralized, deregulated market and virtually no private utilities. Basically, all the utilities are some form of electric cooperatives with just a handful of private utilities, so I would estimate over 75% of that capacity is from publicly owned.

Q: So, I would say just right off the bat here, to what extent do you view Alaska as a testbed for what greater penetration of microgrids in the United States' Lower 48 would look like?

A: Yeah, well I think because it's such a, I mean, virtually, everyone in Alaska gets their electricity from a microgrid. There

is some transmission; it's called the Railbelt Grid, and that's where you have grid interconnected microgrids although they ironically enough have less renewable energy than the rest of the more remote power systems in general but the lessons learned I think are a lot of it is on integration. How do you best integrate renewables with different forms of storage? In Alaska we also have quite a few hydro-based microgrids which is also a little unusual. It's kind of the forgotten renewable resource, so there are a lot of projects that are integrating batteries and the diesel wind systems or diesel hydro systems, and then the latest trend which is now following the Lower 48, is solar. So, usually, people used to think parts of the earth, Alaska, the sun never sets, Other parts of the year, it never rises and so, solar was sort of...people said, well, no, that's too weird of a resource but now, more and more solar is being integrated into the microgrids as well so I think the lesson is more diverse renewables as opposed to just solar and storage and then on top of that, different forms of batteries including flywheels, lithium-ion and even pumped hydro storage has been integrated.

Q: So, Peter, to start the story at the beginning, what is it that Alaska Microgrid does for utilities in Alaska and why don't you start by saying why you joined the group. What are some of

the challenges that you see and what are some of the exciting opportunities?

A: Yeah, well AMG actually was started in about 2020 but that's when COVID hit and so it's taken a while to kind of get it together and so I was just joined a few months ago as the Executive Director mainly because I had done some work with the Alaska Center for Energy and Power which is kind of the main university in almost; it's kind of the prime entity where people look for energy innovation so AMG is essentially a subset of that Alaska Center for Energy and Power and I went there because one, I have been emerged as a global microgrid expert. My previous job was with Navigant Research which became Guidehouse Insights and there, I created the first global dataset on microgrids. I created a model to help forecast the future. I helped rank vendors so I have deep experience on global microgrids and so, this opportunity arose to basically work in the state that is leading the U.S. on microgrids and so part of what we do is help local communities on microgrids, so, for example, we're working with a small community in the interior of Alaska. They got some government grants to install some key components but they don't know what business model to use. How should they structure that arrangement? Who should own what? And so, we are advising them on different scenarios, the pros and cons. But the other aspect of

Alaska Microgrid Group is to harness the lessons learned from Alaska for other markets like in Puerto Rico, for example, or Australia. I recently attended a global energy event in a small community called Cordova, where we had people from around the world coming to Alaska to tour one of the local microgrids and to kind of learn what has Alaska learned that is relevant and as I said before, what's unique about Alaska is these microgrids are run by utilities. In the Lower 48, most microgrids are not run by utilities; they're run by the private sector. So, in a way, Alaskans can speak a language that other utilities would understand and probably have more credibility with some of those utilities as well.

Q: Educate us on why microgrids are so pervasive in Alaska. Is it simple as the fact that building transmission for widely-disbursed population would be difficult?

A: Yes, I mean Alaska is a huge state. If you put Alaska on top of the continental U.S., it actually almost spans the entire country although a lot of that is the Aleutian Islands which is just a narrow strip of islands that almost reach over to Russia, so it is basically simple where it doesn't make sense to interconnect all of these relatively small communities except this one spot called the Railbelt Grid which connects Fairbanks, one of the bigger cities to Anchorage and then it goes further

south to a city called Homer, Alaska, so that's where there's the Railbelt Grid and ironically, that's where they could learn some stuff from the Lower 48 and how to better maybe manage that grid, but it's really like I said, Alaska's really more like a global market where the most microgrids...if you said the word microgrid 30 years ago, everyone assumed you were talking about these remote power systems. It was only when DOE defined microgrids under the Obama Administration that the focus turned more to these grid-connected microgrids and then what happened is the extreme weather events with hurricanes, wildfires, freezes in Texas that led to people being more interested in what some people call resiliency microgrids; microgrids connected to a grid which connect when the power goes out and you still have the power flowing.

Q: So, what is the DOE definition of a microgrid that fits in Alaska?

A: Well, that's the irony...the definition which I unfortunately don't have right in front of me but is basically the idea is a distributed set of energy resources and loads that is integrated into a system that operates as a standalone entity that can disconnect from the grid. Now, most of those Alaska microgrids, there is no grid so I call those remote microgrids and I've been told that DOE has added a footnote to acknowledge that there are

these other microgrids so that's kind of the irony that the biggest state for U.S. microgrid capacity a number of those systems, theoretically don't need the original DOE definition but like I said, I was told there's like a footnote that the definition recognizing the Alaska experience.

Q: So, what is exactly that an Alaska microgrid does for utilities in Alaska and do you think that that's a template that there should be other statewide organizations like AMG filling a similar role?

A: Well, what we do is we offer advice. We connect them with sometimes possible sources of funding. Usually what we're doing is we're also doing some scenario planning like in this one community it's more on the business-model side. We're also involved in, I mentioned the Railbelt Grid, a study to how best to decarbonize that grid looking at different options, different technologies, so we serve...we have a lot of board members who've been involved with microgrids 25-30 years so we draw upon their experience. Like for example, this utility in Cordova where this conference was, they have figured out things that are unique to Alaska, for example, what kind of batteries can survive a cold winter; how best to use those batteries, basically things like that, so we draw upon utility leaders of these small cooperatives and basically share knowledge to lessons learned and then, we can

also bring them in touch with global players and make some recommendations along those lines like how best to finance something; how best to integrate batteries and stuff like that.

Q: So, you've been around for some time, Peter, and you know the situation in the states, Lower 48. Do you think the model in Alaska of having an organization like AMG makes sense for Ohio, Texas, Maine, California?

A: Yes, well, I think the microgrid market...so I started on microgrids about 12 years ago and the difference between then and now is pretty dramatic in terms of the market maturing, energy storage coming down, solar coming down, so there's still a lot of positive things but there's still a lot of challenges like how to best integrate into grids? What is the best business model? What is the role for a utility whether it's a private versus public? Is it vertically integrated? Does it operate in a deregulated market? So, my view is what I'm bring to AMG is more of a global perspective and lessons learned from the Lower 48 so it's kind of a bi-directional exchange so AMG is doing the same thing. I do think organizations like AMG will play a role as microgrids become more common and as utilities specifically become more involved. It used to be that very few utilities in the Lower 48 were involved in microgrids and they've run into regulatory issues with rate-basing concerns but now that's starting to

shift. You have Duke Energy and you have some other utilities; Green Mountain Power and SMUD (Sacramento Municipal Utility District), now really getting more involved with microgrids and seeing the value and the value they bring to the larger grid cause originally, utilities viewed microgrids as a threat to their revenue and some other things, but now, they can serve as demand response resources with FERC Order 2222 they can also provide value up to wholesale markets, so the whole world is really going through a transformation and groups like AMG, there could be regional groups like that or state-by-state. Either way, I think organizations like AMG will play a more critical role in the near future.

Q: So, let's dive-in to Alaska now and you've mentioned a couple of innovative microwave projects: Cordova, Kodiak Island, and Kotzebue (if I'm pronouncing it correctly). Talk about those three and what's unique about those projects?

A: Well, I think the Cordova one; I just came back from Cordova. They've actually had a microgrid operating for 100 years so that's first of all, a pretty long track record. It started out as 100% hydro, then went to 100% diesel, and now it's trying to back to 100% renewable energy but there it's, a lot of its challenges was just how to tweak a run of the river hydro first of all, not a big hydro dam but run of the river. They have huge

peaks and spikes. It's a big fishing village so in the summer the peak demand is huge. In the winter, it's very low. So, a lot of it was sort of innovation on how to deal with hydro diesel and basically they added a lithium-ion battery to better manage all that, so I think that's the Cordova story. They also did underground lines so they have super reliability because this is a microgrid so within the microgrid, all the power lines are now underground. Kodiak Island is a much bigger microgrid. That one's 28 megawatts. Cordova is basically more like about a 6-to-8 peak megawatt load so at Kodiak Island, it is an island. In fact, it's the second largest island in the entire U.S.; also a bit of a fishing area; isolated grid and there, they've actually integrated both a flywheel and a battery storage system and they get 99.9% of their energy from renewables, primarily wind, hydro, and batteries. And then Kotzebue is an older microgrid that was mainly relied on solar...I mean on wind and so now, it's about 30 miles above the Arctic Circle, obviously a pretty cold climate. But now they've added solar; it's a little over half a megawatt of solar to integrate with the existing wind turbines. They took out some of the real old wind turbines and the solar installation's actually the second largest in Alaska and the largest in rural Alaska. So, those are just three examples of relatively large remote microgrids in Alaska. There's many, many

that are smaller and then some of the other big ones are more like military bases that exist in this Railbelt Grid.

A: What are some of the advantages and disadvantages of publicly owned utilities pushing these microgrids?

Q: Well, I mentioned I hinted at this earlier. Some of the investor-owned utilities; I know Baltimore Gas and Electric is one, try to put new microgrid investments into the rate base and the regulators initially rejected that. The challenge for let's say a private-owned utility that might be relatively large is, do the benefits of that microgrid flow just to a select few ratepayers or to all the ratepayers? And I guess in that one example there, the utility was unable to prove that the benefits accrued to the entire rate base. Now that being said, microgrids now are becoming more common and so the utilities that have been most successful, like Duke Energy, one example, is that they've used it as a non-wires alternative so in that case you say the microgrid is a lower-cost solution than let's say building a new transmission line to a certain community or whatever. That's also sort of why the poster child of utility microgrids in the U.S., which is Borrego Springs off San Diego Gas and Electric, it was justified that it would be more expensive to reinforce a transmission line to a relatively remote community that was still grid connected than just build a microgrid and then they added a

solar farm to that microgrid where now, it's like 28 megawatts and it's now going to be going to a goal of 100% renewable energy. So, those are some of the uses. So, the public-owned utility though doesn't have to go to a public utilities commission. They tend to be smaller in size and so they don't necessarily have the same kind of regulatory scrutiny. They're smaller and basically the owners of the system probably can make it a little easier to fit in a microgrid; could even be the entire MUNY for small MUNIES might become a microgrid so in that sense they face less opposition but of course, MUNY's could be... they're fairly progressive or might not want to venture out into something that they feel is untested like a microgrid so, there's pros and cons with the utility.

A: You mentioned earlier on Alaska's historic dependence on diesel and the lack of fossil fuels for generation? How is the spread of microgrids in Alaska enabled greater penetration of renewables and brought on more renewables, and how is the mix of resources working out on these models?

A: Well, the mix is now I think a lot of the early microgrids; well, the earliest microgrids in Cordoba, Alaska were more hydro-based systems which kind of one of probably the earliest renewable and throughout much of the U.S., including here in California where I'm based and then they went to wind. When I

first started on microgrids about 12 years ago, Australia and Alaska were kind of held up as leading markets. In both markets, it was primarily wind/diesel sort of hybrids. Now, we're moving into more solar in Alaska. We also have a geothermal microgrid in Alaska, it might be the only one of the few in the country and now we're even looking at title power. Alaska has an incredible title resource which makes sense if you think about it. You're at the very top of the world so you're going to have wide title springs. You have coasts and there's even talk about modular nuclear reactors. There's a lot of interest in small reactors around 5 megawatts or so perhaps being integrated into some of the microgrids as well, so those, the diversity is the key. The more diverse resources you have in a microgrid, the more resilient it can be provided you have a microgrid control that can manage that variability. And that's the other good news I did mention, that's the other good reason the microgrid market has matured as those controls keep getting better with things like Artificial Intelligence and just a more decentralized approach to controlling a microgrid, rather than copying the big grid with a more top/down approach. It's been discovered that it's a bottoms/up approach is better for these smaller microgrids than sort of a top/down approach.

Q: So, what percentage of the customers or the load in Alaska would you say are served by microgrids right now? Is it most? Is it half? What's your best read?

A: Oh, close to 100%; close to 100%. Even where there's a Railbelt Grid the transmission system, it's all comprised of microgrids. That challenge there is that these microgrids are all self-balancing and this study I mentioned that AMG's involved with that decarbonization, one of the options we're looking at is maybe it should have some sort of independent system operator. There is a law that's looking at some more regional sort of transmission planning and enabling these microgrids to perhaps share resources more easily, make it more economic, do more so there's a demand side balancing to reduce the fossil fuel. The Railbelt Grid actually has a much higher reliance on natural gas as opposed to these remote systems which are almost all diesel so that's where a lot of the future innovation will lie, but essentially a hundred percent of all Alaskans you could say get power for some form of a microgrid.

Q: And do you think a wider embrace of that philosophy and approach in the Lower 48 without the massive need for transmission investments?

A: Well, I think...I mean, I'm in California where thank God, this year we haven't had quite the wildfires yet. Of course, this

could still happen. I think more microgrids part of grid modernization efforts, I think there is a recognition that having more resiliency and the ability to sectionalize the grid and enable and islanding is becoming more appealing and I think utilities now see these microgrids; I know there's two examples in California where microgrids kept the whole grid from collapsing in the San Diego area just by islanding and taking off a little bit of load from the grid. That enabled the grid to survive. One incident happened just a few years ago and the other one more distantly but more like within the last seven years or so, so I think there's...utilities now are not as opposed to microgrids as when I started on the research and like I said, they're now just trying to figure out which business model makes sense. What is their role in a microgrid since they usually still have to rely a little bit on outside vendors for some of the technology, but of course, they've done that historically. So, I see microgrids becoming a bigger and bigger thing as climate change impacts accelerate and the power outage rate keeps going up. People are so dependent on electricity; they're going to want some form of a microgrid resiliency in another format.

Q: Thank you, Peter. It's been great. I really appreciate talking with you.

A: Thank you. Thanks for having me on.

And thanks for listening to Grid Talk. We've been talking with Peter Asmus who is the Executive Director of Alaska Microgrid Group. Please send us your feedback or questions at GridTalk@NREL.gov and we encourage you to give the podcast a rating or review on your favorite platform. For more information about the series or to subscribe to the podcast, please visit SmartGrid.gov.

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