

MARTY ROSENBERG
MARCH 15, 2023
GridTalk #323

KENNETH SEILER INTERVIEW

Welcome to GridTalk. Today may be the most important podcast we've done in some time and it may be dry but it's very important. We have with us, Kenneth Seiler who's vice president for PJM Interconnection where he's been upwards of 23 years.

Q: Hi, Ken. How are you?

A: Very good, very good, thank you, Marty.

Q: Okay so let's tell you why I reached out to you. You know but the audience doesn't know, there was a *New York Times* article recently that made a very important point that at a time of heightened concern about climate change and addressing the need to reverse carbon emissions in this country, it's been pointed out that while applications for new wind, solar, and battery installations have skyrocketed, approvals have gone way down because of bottlenecks. Just a couple of quick stats from that *Times* article: there are 8,100 requests for interconnections of wind, solar, and battery to the grid and the end of 2021. That was up a mammoth 44% of 5,600 the year before, but that's one

hand. The other hand, the approval rate has gone way down. The installations have fallen 16% in 2022 because of a bottleneck and one major developer said, "The biggest challenge is the sheer volume of projects coming on. In fact, PJM has had to pause its review of new applications as it overhauls its review process." So, that's the big picture as I see it. Correct it if there's any errors and then tell us the situation as you see it, Ken.

A: Yeah, thanks for that, Marty. Look, I mean we've had a tremendous increase in volume in the interconnection side of the house and you know, we've been through a number of these transitions. We've been a power-pole for over 95 years in our existence as a regional transmission organization. We've seen a number of energy transitions out there. Back in the early 2000s, we saw the Utica and Marcellus Shale Gas that came in that was a tremendous boom on the generation side for gas plants being built throughout the system. And this is another transition, frankly, that I think is absolutely critical that we do reliably and we transition in the right way, and one of the things you're pointing out is the interconnection side of the house where the vast majority of our interconnection queue is renewables, meaning it's solar, wind, and storage, and there's a lot of people who have interest in interconnecting to our grid and we're working very hard as part of this change that we're going through and the

transition that frankly we saw coming, and we prepared for it in a way that I think is going to serve us well in our future. So, a lot of activity in this space and we're going to try to expedite the interconnection requests that we have as quickly as possible. We just went through a pretty massive interconnection reform process...

A: So, Ken, real quick, is there a pause in reviews right now or have you gone past that?

A: So, we're still reviewing projects. We still go through an onboarding process to make sure all the documentation is there that we need in order to process the requests but what we're doing is we're reprioritizing those oldest projects in our queue so that we can get those studied, get the agreements out to the developers so those projects can be built as quickly as possible.

Q: So, just to paint how big this issue is, First, PJM is the largest regional grid in the United States...

A: Right.

Q: For those who are not familiar. It extends from Illinois to New Jersey, a vast part of our industrial heartland and major population center. According to the *Times*, you had 2,700 projects under review, which is up three-fold in three years. Is that correct?

A: That's correct, yes.

Q: What is...why a surge of a three-fold increase?

A: Well, I think there's a lot of things going right now. There's a combination of factors; there's not one silver or there's not one single item that's causing this surge. I think you have a lot of state policy that's where we have the 13 states plus Washington, DC, the vast majority of our states have renewable portfolio standards where they're looking to decarbonize their systems. You have federal policy right now as well where DOE and others are looking at any number of transmission that's required in order to connect renewables, make the system more resilient, make it much more reliable. And, you also have a market where we have a lot of fossil units that are retiring, again partly due to state mandates and federal mandates as well as economics. You have a lot of old fossil units that are retiring and they're getting off the system. And you have a renewed interest in renewables such as wind, solar, and batteries wanting to interconnect to our grid.

Q: According to that *Times* article, people that are in a holding queue of several years, Lawrence Livermore did a study and 20% of them just give up. Is that correct?

A: I'm not sure that's accurate, Marty. I'm not sure what that data reflects. There's a number of people in our queue who are looking to develop projects who can't get the financing frankly.

We have one example I'll give you is currently we have over 36,000 megawatts; that's 36 gigawatts that have signed interconnection agreements so they've completed all the studies. They have all the agreements but we're not seeing facilities getting built. The one example I'll give you is that last year in 2022, we only had 2,000 megawatts interconnect to the grid with over 30,000 megawatts of agreements that were out with the developers. So, there's other reasons far beyond the queue of why these projects aren't getting built and some of those consist of local opposition, siting issues with trying to site their different projects. We also hear there's supply chain issues yet, getting transformers, getting solar panels, that kind of thing. And the other thing we hear about is the financing is often difficult at times for some developers to procure so, a lot of different factors that we're working through with our stakeholders, with our developers right now that I think are important for us to be successful going through this energy transition.

Q: So, let's tease out some of the factors here. Is there enough transmission, long distance and short distance? Is there enough distribution in PJM to accommodate all of this or is there a need for a massive build-up? Is that a contributing factor?

A: That's one of the factors but I have to tell you, we have a very tightly integrated system. The vast majority of our existing generation fleet is located; that's 87% actually is located. We went back and looked at it actually; 87% of our existing fleet is located within 100 miles of the major load centers. We also took a look at the queue. What is in queue to be studied and interconnected and it's almost the same exact number: 87% of the new queue is located within 100 miles of the major load centers that we have within our region so with that being said, what that means is we don't need huge amounts of transmission buildout in our system. We do need some; however, what I will tell you is that the vast majority of the 36,000 megawatts that have all the signed agreements and studies already completed have very little if any upgrades that are required for the transmission systems, so they can basically interconnect today with very little upgrades other than attaching to the existing transmission lines.

Q: So, I usually don't do this but I think it's germane here and that is, our very last podcast was with Audrey Zibelman who is the architect of the New York REV and she's calling for the creation of a digitized spine to increase the flow of information back and forth. From your perspective, how significant is that and will that because basically, what we're doing here is talking about here is increasing the number of points of contact into the

grid. They'll be many, many, many more sources of storage and generation. How much of it is just a system of plain old intelligence and signaling and coordinating a much more complicated orchestra?

A: Well, the digitized spine concept is one way I think we're looking at vast digitization of information going to the consumers who need it most to make intelligent decisions around how they want to use electricity. The vast majority of people want to turn on the lights or turn on their computer whenever they want to. We're seeing an electrification of the grid with electric vehicles, with people moving from gas heating in large apartment buildings to electric heating so a lot of things are occurring on the system that will require much more information flowing between system operators, grid operators, utilities and their consumers at the end of the day whether it's residential, commercial, or industrial, so the entire U.S. grid right now is going through a massive transformation, and a lot of transitional elements are occurring right now and our main role as the regional operator, regional grid planner and market operator is to ensure that we go through this transition reliably and we keep the lights on 24x7, 365 days each year, and that's what we're aiming to do.

Q: So, is the back office there yet? Do you have all the computers you need? Do you have all the technologies, all the software written? How much of this; is just a matter of rolling it out or do you need new product development? Talk about what digitization will mean for PJM in terms of getting it in place.

A: I think we have a lot of very advanced systems. We have some of the most advanced power grid control systems in the world. We've refurbished those and we continue to improve those each and every year. It's not like we need a massive changeout of systems. We're continuing improving and growing those systems in terms of our energy management systems to run the grid because one thing about electricity is it flows at the speed of light. It's very difficult to store. We have a lot of computer systems and a lot of information coming from the various substations and the various control devices inside the substations that allow us to manage grid in a very efficient manner. We have very sophisticated market systems that allow us to bring the cheapest units online when needed in real time and we have a lot of tools that look out one minute, two minutes, three minutes, clear out through a day or two days or three days that allow us to plan and operate the grid in an efficient way, so we have a lot of very advanced control systems compared to many throughout the world. In fact, I'd say we have some of the most sophisticated systems

but again, based on the transition that we're seeing, we're going to continue have to invest in those tools, automate a number of more manual type of tasks, and continue to look downstream five years, 7 years, 10 years so that we can continue to improve these toolsets.

Q: So, as we sit here today, do you and you may not have a precise number, but do you have an expert feel on the number of points of generation that connect to PJM? We're migrating from central station technology to many, many points of energy production. Do you have any way to help us understand how many generators you have now...

A: Sure.

Q: And if you're looking at 2,700 projects and you're going to be adding thousands every year, give us a sense of the complication there.

A: Yeah, so let's talk about that which is a really good point so we're looking at generation that was traditionally like mine mouth coal units, large nuclear units. In our fleet today we have nearly 1,500 generation units throughout the transmission grid. With the amount of renewables that we're seeing with solar and wind and storage facilities, that number will increase greatly. I don't know what that number will be in the next five years but I will tell you that a lot of the people who are looking to build

solar panels and solar farms right now are looking to interconnect at the same exact spot where we have a retired fossil unit, whether it's coal or oil, whatever it may be, so I think the number of points of interconnection will increase but not greatly because people are going to look to optimize the system and use those same points of interconnection where we have a retired fossil unit because the transmission grid's already built out to handle that sort of power injection so again, it's very little cost to interconnect. Very little transmission would be needed in order to upgrade the system to accommodate that additional injection at that same exact location, so that's the good news. The bad news is...

Q: But I want...if I could interrupt you.

A: Yeah, of course.

Q: You had one coal-fired plant that's being retired. If that becomes a node to collect wind and solar, instead of one unit that you have to monitor, you may have 500 units that you have to monitor, is that correct?

A: Not entirely. We will monitor the points of interconnection such that we know how many megawatts are coming on to the grid that are eventually going to funnel through that same substation facility so we have all the metering, all the SCADA systems, supervisory control and data acquisition systems already

available. We already have the telemetry that brings the information back to the utility and back to our control room so all that infrastructure, all those systems are already there so that's the great news. The other piece I will tell you, Marty, is that we're also going to see an influx of solar panels on top of people's homes as the supply chain issues loosen up so that's going to require us to get much more intimate and have much more visibility with the distribution systems and with the various distribution utilities that are out there because we're going to see a lot more solar panels, wind farms interconnecting at a distribution level which is something that we have traditionally not monitored so we're going to see a lot more of that interaction as well, and the lines of distinction between transmission and distribution are going to have to be integrated much greater than what they are today as well.

Q: So, I would imagine that's a change of role for PJM because it's the local utility that has the visibility into the customer's home. Are you going to have to work more closely hand in glove with local distribution utilities to get that intelligence?

A: That's exactly right, yeah, so FERC put an order out about a year ago called Order 2222 and it was an order that mandated the Independent System Operators, the various utilities, integrate

those systems together and allow people to build plants to interconnect to the distribution systems, aggregate that information and then bring it back to the system operators so that we can manage the system much more efficiently. So, for example, the one example I'll give you is in parts of North Carolina today in the spring and fall where we have a very light load period, we'll see a lot of solar panels on the distribution system and the sub-transmission system feeding up and reversing power from the distribution system to the transmission system. Traditionally, we go from the generator out onto the transmission system and then down to the consumers. What we're seeing today in certain parts of our system is power flowing up from the distribution system up onto the transmission grid. It's something that most people haven't seen before and we've been seeing that. We've been working with the local utility in order to manage the flow of power, get more forecasting and predictive prices so that we know when that's going to happen so that we can better control the flows on the power grid.

Q: And this is during solar peak or when wind's blowing? When does it happen?

A: This is happening on a bright, sunny day in the spring and the fall when our load is down, meaning when our load is at lower levels and it's during the daytime periods so we're seeing that

energy flow from those distribution systems up onto the transmission grid.

Q: Are there going to be a conceptual, major conceptual changes or are you going to have to look at maybe industrial processes that can offload some of that power when it's available and store it somehow? What are you considering?

A: Well, there's a number of factors that have to be considered. One is just have the visibility in order to be able to manage it and plan for it and forecast it so if we can forecast it a day ahead, we can include that into our normal unit dispatch so that we know what generation we need to run and when. And then there's times where we've got to make sure that energy isn't overloading that distribution system so the local distribution utility is going to have to make sure that they have the necessary robust wires in the air to manage that sort of injection. And then you also get into a number of things at a distribution level with the local utility around power quality like lights flickering, intermittent issues, things switching on and off; all those things seem to impact some maybe more commercially sensitive type customers who really need a smooth power quality level, so there's a lot of factors that need to be considered by the local utility in coordination with us as the grid operator.

Q: So, Ken, talk a little bit about what the EV phenomena means from Illinois to New Jersey in the PJM footprint. Is this something only the local utilities have to worry about, or is it something you're tracking very closely and have to be responsive to?

A: Yeah, that's a good question. We're tracking it very closely so we have a load analysis subcommittee that is made up by all of our utilities as well as our economists in this very building upstairs and we work very closely with them. They work very closely with the EV community to understand the buildout of electric vehicles and charging stations and the sales of electric vehicles throughout our system. We monitor not only in our system but in frankly, the rest of the U.S. so there's a lot of work done in order for us to monitor, plan for it.

Q: Why are you monitoring throughout the U.S.? Just to spot trends?

A: Yeah, and identify trends; see what areas are moving maybe faster than what was anticipated; and then looking for ways others have solved the problems and sharing information across all the grid operators so that we can kind of be planful and thoughtful on how we want to manage it. Again, there's going to be a much tighter integration in coordination and collaboration with those local distribution utilities yet again so we can get

the visibility into where the charging stations are going to be. Where we need to plan the transmission system in order to accommodate the necessary load in those areas so that there's no reliability issues for folks who are wanting to charge morning, day, or night.

Q: So, for somewhat time now, there's been kicking around the concept of using all those EVs as mobile storage out there in space. Are we any closer to utilizing those batteries in a way that optimizes the grid?

A: Yeah, we are, I mean, there's been a number pilots that we ran for example a number of years ago. We ran a pilot program with the University of Delaware and the State of Delaware and we piloted, piloted a number of EV interconnections and charging stations such that we would withdraw energy during light load periods in the evening and maybe inject that power into the system when it's most stressed, back into the grid so we've done a number of pilots throughout the footprint. A lot of that technology is becoming better but it goes back to one of your prior comments around that digitization spine where that information has to flow to those who are consuming the energy or maybe injecting the energy back into the grid so they know when the system's most stressed, and when we need the energy versus the optimal times to take the energy off the system.

Q: Bottom line for the growing number of EV vehicle owners, do you see a day and how far off might it be where the owner of an EV gets a check from PJM and/or their local utility, or an offset against their bill because of the storage made available on their vehicle?

A: It's entirely possible, I mean I could see where if you're consuming energy, you get a bill. If you're producing energy and putting it back onto the grid much like folks with rooftop solar, they receive checks at times as well from their local utility. I think it's a win-win for everybody and if you're consuming energy, you pay the bill. If you're injecting energy, the local utility pays you for what you're injecting onto the grid, and I think it's a win-win.

Q: To get back to the point that we talked about at the outset, the *Times* reported that last year, you paused new project review. Is that pause still underway or what can you tell us about that?

A: Well, we're still processing requests so we're just in the process...

Q: Is there a pause? Are people, say told to come back in 6 months?

A: No, no. Look, we're still accepting requests; that's a misnomer. We're still accepting requests; we're still processing requests. We're prioritizing the older projects first so we're

not studying those newest projects that were submitted this month today. We'll be processing those later on downstream as we clear this backlog, so as part of the interconnection reform, what we're doing is we're cleaning out the oldest projects and getting us ready for this new interconnection reform process that we've set up in such a way that we can go from first in, first out to first ready, first out. That's the goal, is if you're ready to interconnect to the grid, we want to get you in, study you and get you connected as soon as possible. One, because it's the right thing to do. Two, we're in a position where we're going to need the energy and we appreciate folks having an interest in wanting to interconnect to our system, participate within our markets, and help make our grid much more reliable.

Q: So, my last question of course, is not going to be the easiest one. I'm going to ask you to call on your 23 years of experience at PJM and I suspect that you've been at other places in the industry. We have this need to address climate change. We have the Biden Administration passing the Inflation Reduction Act to stimulate development of renewables. We have this bottleneck in processing interconnections. What does your gut and your intelligence tell you about our ability to really negotiate this tough spot we're in in an effective way so all the resources that we need to marshal to address climate change in a meaningful way

and frankly in a world leading way, so the rest of the countries of the world can follow us? What's your sense of being able to negotiate the difficult spot we are in and get all the projects that we need reviewed in a timely basis renewed and get the buildout that we need?

A: Yeah, well a lot packed into that question, Marty, so let me work my way through some of those items you brought up here so look, we have a lot of really, really high technical, highly talented people that we have on our staff and the local utility staff who will work on these issues, I can assure you, and we have a number of plans in mind. For example, we just went through the interconnection reform process to get those most-ready projects out the door. We're performing additional automation with our toolsets. We're hiring additional people, and we're bringing in the best and the brightest that we can get, including folks fresh out of school. There's a lot of energy being put on this right now to address any number of these issues whether it's the queue reform and the bottlenecks that we're experiencing based on the volumes we've been seeing; whether it's supply chain issues; whether it's the financing; whether it's local opposition. A lot of people are working these issues and I think like any transition, it's going to be a little bumpy. It's going to be a little trying. It's going to be a little stressful at

times but we have an obligation to our 65,000,000 people within our region as well as the rest of the nation to do this transition reliably in a way that we can keep the lights on for people. I think as we look at any number of things in terms of the growth rate in our system where we're seeing a large concentrations of data centers wanting to interconnect in the Virginia area, in the Ohio area. We're seeing low growth in various pockets throughout our region. We're also seeing generation retirements. We're seeing a rapid pace of change where with the generation retirements, a slow uptick in the terms in the number of units that have signed interconnect action agreements interconnecting to the system. We're working all those issues but the good new is, we saw this transition coming. We've been working this. We've been working the queue reform and we're in a position where I think we're going to do this reliably but we're going to do it as a community and it's going to take all the brightest minds from the academics, from the national labs, and from the regulatory agencies as well as all of the utilities to come together to solve some common problems. The good news is we're all seeing the same problems. We're all trying to solve these problems, and it's an exciting time to be within the industry. When I go out and give speeches or I serve on panels and we talk about any number of these things, I tell all the

parents out there who have high school aged children, if you have a child who's interested in STEM and mathematics and science, this is a great time to study engineering, computer science, data analytics, to be part of this industry because we need the best and brightest minds to help us solve some of these issues so, very exciting time. Probably in my 37 years in being in this career, it's extremely exciting, one of the most exciting times. I'm proud to be part of it to solve some of these issues and we're going to keep at it here until we get these issues solved but I can assure you, we'll get these issues solved. We'll get beyond some of these discussions we're having today and we'll be addressing other issues downstream I'm quite sure.

Q: Okay. One final, final question. Whatever the governors of your state and the states have said its carbon goals by 2030 or 2050, will the electric grid in PJM be carbon-free?

A: I don't know if it will be carbon-free and there's a lot of different ways to define it. We have some people like we've seen in other parts of the world, whether it's Asia or Europe, define carbon-free, meaning it's 100% renewable for one hour a month or one hour a day, that sort of thing. We'll be in a position where we'll have renewables, meeting our state's renewables portfolio standards and our national standards where we'll have all carbon-free generation resources running in order to serve that load.

There may be times though where the system's stressed where we may need some fossil unit, some natural gas combined cycle units in order to provide the energy that the grid needs throwing certain system conditions; Black start scenarios, for example. So, the system will be ready. We will meet our state renewable portfolio standards...

Q: Black start, that would be what, a hurricane or a terrorist assault? What's Black start?

A: Black start are those resources that can start without being synchronized to a grid so there would be a separation in some part of the Eastern Interconnection. Black start units are units that can start at the push of a button, come online and synchronize to the grid to restore a certain power in certain areas. That's what that means so...

Q: Oh, okay.

A: So, I think we're in good shape, Marty.

Q: Right. Thanks, Ken, for talking with us.

A: Thank you.

Thanks for listening to GridTalk and thanks to our guest, Ken Seiler, who's vice president of PJM Interconnection. Please send us feedback or questions at GridTalk@NREL.gov and we encourage

you to give the podcast and give us a rating on your favorite platform. For more information about the series or to subscribe, visit www.SmartGrid.gov.

END OF TAPE