

MARTY ROSENBERG

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#015

JIM ROBB

Q: Okay, we're here today with Jim Robb who is the President and CEO of the North American Electric Reliability Corporation. Hi, Jim.

A: How are you doing, Marty?

Q: Great, we look forward to talking to you about the state of North America's grid and some recent trends and some long-term trends. I'm going to start out first with how the response to the coronavirus has been. Has the grid reliability been threatened at all? Have you had to put special policies in place?

A: The industry, I think, and the grid itself has responded as I would have expected-- in a very resilient manner. One of the things that serves the electric sector very well is we have a very well-choreographed and active Subsector Coordinating Council through the E-ISAC. Because of the way we've activated the ESCC through things like storms and so forth, we're very quick to pull the trigger to get that group engaged and to engage very effectively with our government partners. DOE and also DHS, and in this case, we also had Health and Human Services engaged with us. The ESCC activated its playbook very early on. I want to say in early-mid March and started the coordination and dialogue around kind of what we saw playing out with the virus, the needs of the sector around things like declaring the essentiality of workers so they could actually move and get to job sites, being priorities for personal protective equipment, testing when that becomes available, and eventually a vaccine. That process has worked very, very well from a situation awareness perspective, and then making sure that there's good dialogue between the leadership of the sector and the leadership of the government.

Q: Would you say investments in the grid and its evolution to a more decentralized network have enhanced your capability with these challenges?

A: I think the grid has performed very, very well. The segmentation and isolation and decentralization hasn't been an issue of great concern nor has it been necessarily a great asset during this. It's just been a feature of the grid. The move very quickly, I think, to get control room operators isolated so that they didn't run the risk of contracting the disease, I think the regulatory relief that NERC and FERC brought about to-- and to some extent DOE as well-- to make sure that people could focus on highly critical activities of running the grid all served the sector very, very well over this period of time. We did a special assessment of the

JIM ROBB

PAGE 1

performance of the grid during the pandemic, the issues that we were dealing with, and in general, the outcome of that was very positive. The grid's responded well. Some concern around major projects, restoration, power plant maintenance and so forth, but those seemed to have largely been addressed, and you know, the one thing we were concerned about was if this all happened at the start of storm season. We're projecting a pretty active storm season this year. In some of the work we've done as NERC in collecting information from the industry, two-thirds of the utility said they'd be prepared to support mutual aid deployments for major restoration, so I think in general the industry was prepared. The ESCC and a number of what we call tiger teams that were spun up underneath it to address cross cutting issues has been very effective at garnering lessons learned and preparing a resource guide for utilities that's now, I think, on its ninth or tenth iteration. The information and experience sharing, I think, has been very good as well.

Q: One of the issues across America, folks have been working from home. To what extent have grid operators been able to do that or have you had to have skeletal crews deployed?

A: For the most part, crews have been deployed. We, early on, prepared some guidance for the industry. If they needed to move control room operators to work in a remote posture so they could do so safely and securely, I mean, the big issue with control rooms is the security side of the equation and not wanting people to be accessing critical systems remotely.

Q: To be blunt about it, were there any cyber threats that surfaced while this was going on?

A: Of course there were.

Q: Were they handled with the same dispatch as you ordinarily would? Were there some trying moments?

A: I would say for the most part, from an electric sector perspective the performance and the resilience of the operators to the cyber threats remained very robust. You know, the attack vectors changed, right? One of the things we're always very, very concerned about are phishing emails which is the best way, time-proven way to get credentials and then do nefarious things. This created a whole new attack vector if you will. You know, if you want to find out the latest from the CDC, click here. The level of anxiety of employees is high. People working remotely has driven up the volume of email traffic, and so the diligence required to make sure people aren't clicking on something they shouldn't click on was of paramount concern. It's one of the number one concerns I had when we moved NERC into

working on a remote posture. Yeah, the systems performed well. The cyber defenses have performed well, and level of information sharing across industry participants, the stuff that the government has given us to distribute out through the [unclear] to raise awareness of different kinds of attacks and threats has been spectacular over the last couple of months.

Q: Let's talk about supply chain for a second. I know NERC has been working for years on trying to get critical equipment pre-deployed around the country. There's an aspect of the virus crisis where transportation between nations has been curtailed. Is that raising any difficulty on the ability to get needed supplies from outside our borders, and do we have adequate warehousing of critical infrastructure?

A: Yeah, we haven't run into any issues on that that I am aware of. One of the very early actions we took was in the first week of February. We put out what we call an all-points bulletin through the E-ISAC secure portal alerting people to the pandemic. This was in early days when this thing was still just forming. At that point, our primary concern was supply chain issues being driven out of Wuhan. We asked all the utilities to review their supply chain, look for critical equipment, ensure they have adequate inventories and to be prepared for disruption. We followed that up in mid-March with what we call a NERC level 2 alert where we basically ask the industry to report back to us. What actions have you taken around activating your pandemic plan, reviewing supply chain, and so on and so forth? The mutual aid question I mentioned. What came back from that was that everybody had done as we had asked, reviewed their inventory positions and, to date, nobody has reported any problems associated with that. You know, the longer this goes, that risk continues to escalate.

Q: Talk a bit about how the grid is changing. You've given speeches where you've addressed the fundamental and rapid evolution of the grid while the value of electricity is increasing as is electrification. How is the grid changing from your perspective, and what are some of the major trends that you think are under-appreciated, maybe outside the industry and maybe inside the industry as well?

A: Well, we kind of refer to it as a 3D transformation of the grid. We're clearly moving to a more distributed grid with more and more resources being put on the distribution system as opposed to the large central station generation power plants, and we're seeing those power plants coming under significant economic pressure, and we're seeing lots of retirements of coal and pressure on nuclear plants and being replaced with more distributed generation around the system, so that's one. The second is that we're seeing most of new additions being decarbonized, so wind and solar are capturing the lion's share of new additions along with gas, but very few traditional fuels. We're getting more decentralized,

more decarbonized, and the third is we're getting much more digitized. Expansion of industrial control systems, expansion of internet-connected devices in the home, advent of smart meters, remote monitoring, SCADA systems and the like is leading to a much more digitized system which has lots of advantages from a control perspective but lots of risks associated from a cyber perspective. Those are the three major themes that we see: distributed generation deployment, variable generation, and then much more electronic, internet-connected devices. The thing that makes this period so, I don't want to say, treacherous, but that's as good a word as any, but these are happening very quickly and at the same time. The electric sector isn't known for profound change. It's been a very staid sector for many, many years. This is challenging us in our understanding of the system in many different ways, that we're having to work extra diligently to understand how changes in the resource base, changes in the nature of generation, the uncertainty around loads that results from that, all comes together to how you plan and operate the system differently. Then, you layer on the cyber security concerns surrounding the extraordinary digitization of the sector. That creates a lot of moving parts for us and for the industry to deal with.

Q: How difficult is that making managing the grid as the grid becomes more digitized and distributed or as the elements on the grid become more distributed?

A: Well, I think everybody has to understand it's not your grandfather's electric grid anymore. One of the things that has been terrific to see is in three areas in particular that I referred to as real hot spots, so California, driven primarily by the constraints on gas because of the Aliso Canyon vulnerabilities and the extraordinary deployment of solar and its implications for how the rest of the fleet has to operate in order to balance the solar generation, in Texas where we're operating with very, very tight reserve margins but a very strong commitment to allowing the market to work to sort out and balance supply and demand, and then New England which is well-known for having extraordinary fuel security issues related to the limitations on gas and the extraordinary dependence on gas. Those are like the three really hard areas from an electric reliability perspective right now. What's been great to see is the innovation that California ISO, ISO New England, and ERCOT have put in place to deal with those situations. We're seeing it's typically, clearly different. We're seeing much more reliance on stochastic, probabilistic models than deterministic models and then a real premium on situation awareness because the speed at which things are changing on the grid now, where we used to think about scheduling a day and then plan a day or plan hour, now we're having to plan 15-minute intervals going to 5-minute intervals, and eventually, we may go to a minute-by-minute planning construct. That's putting a lot of stress on the operations of the system. Like I said, we're seeing lots of great innovation to deal with that.

Q: As the grid touches 400 million people, you deal with 1400 owners, operators, and users. How is the business model of that community changing? Specifically, let's start with utilities first. What will they be at the end of the day 10 years from now? Are they just going to be in the background playing a backup role? Are they going to orchestrate some of this? How do you see that changing?

A: That's the million-dollar question. You know, I think there's always going to be an important role for utilities. I think there will always be an important role for what we call the bulk power system which may be different from the role that it plays today. It may be much more of a reliability assurance and provider of last resorts type system than what we have today where it's the primary source of generation. I can certainly see its role changing. I think at the end of the day utilities are going to end up playing a very important role in how all the distributed devices, whether it's distributed generation, rooftop solar, small wind turbines, what have you, integrate with increasingly controlled loads on the customer side, and I don't see the utility ever going away. I see the role continuing to morph to deal with the operational realities that they will be faced with. They're going to be in the best position to manage, oversee, and ensure reliability at the local level as well at the bulk power level.

Q: Let's go to one area of the country that you just called out as a hot spot and really talk about something that's hot, and that's been the forest fires that have occurred in California. To what extent has NERC been involved with making sure that the [unclear] that's needed has taken place? Have mistakes been made by NERC and FERC, and are there moves to rectify that coordination with the utilities and other players in California?

A: Well, this is a very hot issue. No pun intended on that. Most of the fire activity in the west as we have looked at it, almost all except for one involved distribution equipment as opposed to bulk power equipment. Our jurisdiction is just at the bulk power level. You know, we have been very active in looking at the causes of the fires that have had transmission-related activity. For the most part, or maybe exclusively, everything that we have seen has been more related to asset management practices and so forth. That's really the purview of the state as opposed to us. We don't-- we're precluded from taking, making resource decisions and so forth, and asset management kind of takes you into that space. You know, we have been very attentive to whether or not there are any modifications to the vegetation management standards that we have that have been implicated. So far, we haven't seen that being the issue.

Q: One of the strategies that is played out around San Francisco and around LA in this past fire season is utilities have been very aggressive about shutting down power in advance of a storm. Certainly there are bulk power implications by that

kind of approach to dealing with this issue, is there not?

A: One of the key things that we need make sure that we are comfortable with is that CalISO as the reliability coordinator for California was aware of all the power shut offs, particularly those things that would involved bulk-power-related equipment and had studied and knew how they were going to reconfigure the system to make sure that the rest of the state wasn't implicated. This is a little bit of what happens in Vegas stays in Vegas issue. If Edison or PG&E or San Diego need to take a circuit out for their public safety power shut off public, that the ISO understands it, knows about it, and can keep the rest of the state safe. Those mechanisms have been working very well over the course of the last two years as that construct emerged.

Q: Are there any broad policy changes needed at the national level by FERC or recommendations by NERC as it applies to fire mitigation?

A: You know, I don't know the answer to that, Marty. At this point, my sense is no mainly because most of the issues are really distribution-related issues. One of the things that we're doing though is putting together what we call an assessment of the situation which is really an awareness building, and one of the things we want to pull out of that are best practices that are emerging in California, in other parts of North America but also elsewhere in the world that have similar climate issues that we're experiencing in the West, you know, prolonged droughts and so forth but haven't seen the same level of fire activity. We want to make sure that we learn internationally and bring those lessons to bear. That's where our focus is right now. I cannot speak specifically for FERC, but I think FERC's in probably a pretty similar space.

Q: As for out west, let me raise another issue. I understand that people in the industry are looking for greater coordination between California, the Southwest, and Mexico where they tried to bring solar and wind resources online. Where does that stand today, and do you see a growing market opportunity for California to sell off power during peak times and possibly bring in-- excuse me, sell off when there's abundance and bring in power from Mexico when there's need?

A: You know, absolutely. The west is a different than eastern interconnection. The western interconnection has always been designed, planned, and operated as a single integrated system. The eastern interconnection is synchronized, but it's really got a lot of subregions to it. The west really doesn't have that. It calls for, it has called for forever very good coordination among the utilities from an operating perspective as well as from a planning perspective. Those mechanisms have already been in place. Much of that occurs, in the planning area occurs at Western Electricity Coordinating Counsel which is the NERC region in the west.

At an operating level, it occurs through the reliability coordinators which, right now, predominantly for the area you mentioned CalISO, through their subsidiary RC West. That coordination already occurs, occurs in real time as well as in the planning horizon. The changing dynamics of the California resource mix absolutely creates opportunities for California to move power out of the state. In fact, they do that today through this structure that was put in place 2-3 years ago called the energy and balance market or the EIM. That was a way to allow California to continue to capture the value of its solar resource, and in particular on, and balance it real time with the rest of the interconnection. In certain times of the year, you think of sunny day in April where the solar generation is incredibly high but the loads aren't because you're not into the peak heating season yet. We have this concept called over-generation, and who would have thought, right, that at 4 pm on a Tuesday afternoon that you'd have more power than you knew what to do with. That's been a big incentive for California to find ways to move power out to the rest of the interconnection and then bring it back in at night when it's needed and the solar resources aren't generating. That opportunity with Mexico exists as well. The northern part of Baja, California, Baja Norte, is integrated in with San Diego and synchronizes with the western interconnection and is generally considered to be part of the west. Those transactions already occur pretty regularly and pretty seamlessly.

Q: Let's turn to something that I'd like to hear you discuss or explain; it's the risk-based compliance monitoring and enforcement program. What is it? What is it enabling you to do?

A: One of the-- when mandatory reliability standards were put in place starting in 2007, I think that's when the first suite became enforceable. I think most observers would say that NERC and the regional entities wanted to implement that model in the worst possible way, and we managed to do that. We took kind of a one-size-fits-all approach, check the box, and everything was equally important. Obviously, everything isn't equally important. If you're familiar with our standards, there are a range of requirements in them. If you think about the different kinds of entities out there, you know, a violation in one entity might be severe because of where they are, but in another entity, it might be interesting and should be logged, but does it really place the entire interconnection at risk? One of the things that we realized, I don't know, 5-6 years ago was that were spending kind of an equivalent amount of time on everything. (1) It wasn't efficient; (2) it certainly wasn't effective, and (3) it was driving everybody nuts. We started the process, I want to say, back in 2014, 2015 which was about the time that I joined WECC as the CEO of trying to be much more thoughtful about making sure that we're not treating every entity the same, that we're paying extra attention to those that pose significant risks to reliability and aren't as harsh or intolerant with those entities that really don't have that same kind of impact. We created a risk-based

model that really had two major components to it. One was to really understand the inherent risk that an entity presented to reliability for the interconnection, and then also therefore kind of what are the really important standards and criteria that needed to be reviewed with them? Second, to really understand the compliance history, obviously, we have an entity that every time they're audited and reviewed, right, you never find anything, right, because they are very, very well-run versus one that every time you walk in the door you find ten violations. You want to spend more time on the second than you do the first. It was really a process of making sure that we were focusing on the big, not overly distracted by the small. We put in place a process called self-logging for those entities that are very good and very diligent at finding and rooting out mitigating violations that they do that and inform us later. We created the notion of a compliance exception which is something that is considered a violation. We just ask the entity to mitigate it and move on. We don't take it through a really draconian or inflexible enforcement process. We save our enforcement powder for those things that, those violations that really create substantial risk, really reflect a bad management practice that needs a symbolic correction if you will, and again, we make sure that we're focusing on the big stuff and not distracted by the little. That's the whole point of the risk-based approach. We've given the regional entities that perform most of the audits lots of flexibility to tailor the oversight program that they have or their oversight plan for each entity that they're responsible for based on those factors.

Q: Lastly, I'd like to turn quickly to the electromagnetic pulse task force and update on the work they're doing and where it stands.

A: Yeah, unfortunately, I am not incredibly up-to-speed on that task force. I will have to back off on that one.

Q: Okay, all right. Well, we will save that for a future discussion then.

A: Yeah, that's good.

Q: Let's sum up really on where you think you find the grid today and where you think most of the work needs to be done in terms of reliability and accommodating all these new resources that are coming on that we talked about at the top in terms of renewables, more distributed assets, more digitalization. What do you think the low-hanging fruit would be and what are some of the bigger reaches that need to be attempted?

A: Well, I think the big opportunity that's in front of us is to-- we can take it one of two ways of thinking about this. The grid continues to evolve, and we will just evolve our models and so forth to deal with it. The other one, which I'm an advocate for, is to step back and say we are really in the middle of, or in the early

days of creating grid 3.0 that's a decentralized, distributed, decarbonized, and digitized grid. It's developing in front of our eyes. Most of our work takes models that were designed and developed with the notion of large central station generation, grid 2.0, through an integrated system being delivered to customers. We modify and we tweak them and we torture them to deal with the system as it evolves. One of the things that I'd like to see us do is to really step back and think through, okay, how should we model the system? How do we get better probabilistic analytics in to how we think about load, how we think about resource availability? Have we updated? Updating the value of a lost electron, that's a very important planning construct. The value of electricity has only gone up over the last 10 years. The other, I think, dimension here that's really important is to design cyber security into the grid. Right now, it's kind of bolted on top because the grid wasn't designed in large part with cyber security as a risk that people were worried about. We have a real opportunity here to really integrate kind of how the grid is planned, how it's operated, and how it's secured as we go through this reinvention process. That's one of the things that we're trying to get our teams focused on at NERC, you know, to work with the ecosystem, if you will of players that can help make that vision a reality to really kind of step back and do this smartly as opposed to continuing to do it the way we've done, making modifications to the new reality, if you will.

Q: Great.

A: I think that's a huge opportunity for us.

Q: Thanks, Jim. Thanks for listening to Grid Talk. Thanks to our guest, Jim Robb of NERC for sharing his insights about changes in the grid and the power supply system North America. Please send us feedback or questions 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 to the podcast series, visit SmartGrid.gov.