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Power Play: States Address U.S. Electric Grid | OAS Episode 77

Welcome to "Our American States," a podcast of meaningful conversations that tell the story of America's state legislatures, the people in them, the politics that compel them, and the important work of democracy. For the National Conference of State Legislatures, I'm your host, Gene Rose.

We're talking with Glen Andersen, who is the Energy Program director for the National Conference of State Legislatures. He and his colleagues have just written a new report called "Modernizing the Electric Grid—State Role and Policy Options." Glen, welcome to our program.

Glen: Thanks, Gene.

Time Marker (TM): 0:47

Gene: What prompted this report, Glen? What was the impetus behind it?

Glen: Well, really much of the nation's network of electricity generation, transmission distribution, grid is aging and major upgrades are going to be needed to reliably incorporate the new technologies and energy management approaches as well as new market dynamics and shifting consumer preferences that are developing.

Basically, there has been maybe a revolution in technology, some call it digitizing the grid, where many of these new data management and communications technologies are being implemented to help basically make the grid smarter, but provide utilities and consumers with more flexibility and a greater ability to tailor the way energy is both produced and consumed.

TM: 01:43

Gene: So explain to us what is the role of the states regarding regulation of the electrical grid.

Glen: So, the states are responsible for basically distribution grid planning. The distribution grid is … basically there are two components to the grid: There's the transmission component, which directly connects large power sources to the distribution grid; the distribution grid takes this higher voltage power and basically steps it down to a lower voltage for use by residents.

And so there are these two kind of components and, when it comes to federal versus state regulation, states are responsible for the distribution grid and, to be honest, much of the transmission grid as well.

The challenge I would say in what's confronting state legislatures is how the market is changing due to new technologies and due to rapid growth of distributed energy resources. The federal government comes into the wholesale market; the Federal Regulatory Commission does regulate the wholesale market, so when states have a wholesale market, they are under the jurisdiction of FRC as well. But it really varies from state to state.

I know this is getting a little involved and complex, but a number of states have gone through restructuring and a number of states are still in what we call vertically integrated markets. But FRC is basically more involved in these restructured, more competitive markets than they are in vertically integrated markets.

TM: 03:31

Gene: Explain to us what vertically integrated markets are, Glen.

Glen: So basically, a vertically integrated market is one where the utility owns both the transmission and generation and distribution lines, and also manages the billing and basically consumer relations.

Compare that to a restructured market where the utility has basically been forced to some extent, but been made to sell off its generation, so it may or may not own some generation, but in many states it isn't allowed to own generation, and it operates the distribution grid and may also operate the retail sales component, or some states actually have that component as well. So you will have multiple retailers in some states, some restructured states, such as Texas.

TM: 04:27

Gene: And I noticed in the report you even talk about consumers themselves creating their own electricity.

Glen: Yeah. And so that's one of the big changes confronting the grid and confronting those who are managing the grid, and also those that are trying to develop resource plans to modernize … not just modernize the grid, but enable it to also be reliable with these different resources coming online.

So traditionally the grid was basically one-way flow of electricity from generation to transmission and then down to distribution and then out to houses. Now there are both residential homeowners and such, as well as commercial and industrial companies, that own their own generation, such as rooftop solar—they may also own energy storage—and those resources can be used to generate their own electricity, but oftentimes that electricity goes back out onto the grid and may be used elsewhere.

So this means that the flow is multi-directional as opposed to just one-way. Given that there are many more of these generation sources and more actors basically participating in the market, it

does increase complexity of balancing the production of electricity with the consumption of electricity.

And it's important to note that at all times, people who operate the grid could be utilities or system operators, grid operators, and are required to balance what is being consumed exactly with what is produced. So as soon as you flip the switch in your house, there's a slight increase in energy consumption and that has to be potentially taken into account by the grid operator, and they have to increase and adjust generation to exactly meet the amount of consumption.

So this poses a challenge and, especially when a number of homes and businesses own their generation, those grid operators need somewhat advanced technology and abilities to manage both the production and the demand for electricity, and that really is a new approach where this demand management has been enabled by some of these new technologies and more modern grid technologies for basically matching demand with production.

Traditionally it was always the production of electricity was matched to demand as it fluctuated. Now, especially with becoming more reliant on generation sources that may fluctuate or be intermittent, such as wind and solar, there are opportunities for grid operators, utilities and independent demand management companies to actually adjust the amount of consumption by sending either price signals or having control over, for instance, a whole fleet of air conditioners or water heaters. So they can adjust those devices and on a grand scale, across say whole neighborhoods and cities, they can have a really large impact on demand.

So if, for instance, the wind dies down or a generator, for instance, may go offline, be taken offline such as a natural gas plant, there need to be some repairs done on it or, for instance, a power line goes down, making it challenging to get electricity to a certain part of the grid, the signals can be sent out and we can adjust the demand, consumers can have the demand adjusted – they participate in these programs and are actually compensated for them.

Basically, by adjusting the demand, it provides another tool of flexibility and resilience for the electric grid.

TM: 08:38

Gene: OK, let's dive into some of the subjects that are in your report. You talk about the incentives that states use to promote things like solar energy and energy storage. Are those incentives working? What did you find out?

Glen: Yeah. When it comes to incentives for distributed technologies, they vary from state to state. They can be tax incentives; they can be production incentives. One of the largest drivers is called renewable portfolio standard or renewable electricity standard, which basically requires that a certain percentage of the electricity sold by a utility comes from renewable sources.

In some states they also have specific carve-outs for solar and distributed solar. In a number of states, they are required to hit a certain percentage of their generation from rooftop solar, and that has been very effective in those states for driving distributed energy development, so rooftop solar for example.

And there are also a number of states that have now implemented requirements for energy storage, that a certain amount of energy storage be deployed by date.

Gene: We'll be right back with our interview about the nation's electric grid with NCSL's Glen Andersen after this short break.

Music and Gene VO:

At NCSL's Capitol Forum you are the voice of the states. Join us Dec. 10th through the 11th in sunny Phoenix, Ariz., to advocate for states on Capitol Hill and develop the state's agenda. Explore key state/federal issues, hear from experts, and network with your peers from across the country. Visit www.ncsl.org/forum2019 for more information.
TM: 10:32

Gene: We're back with our discussion on NCSL's new report about the electric grid, talking with one of the authors, Glen Andersen. Glen, one major concern about the electric grid is its safety. You talk about that in your report, as well as cybersecurity. Tell us what you've found.

Glen: Yeah. So basically, there are some reliability concerns with the modern grid. The dispatchability of some of the new resources that are coming online may be in question, for instance, more solar and more wind means that there's an increase in intermittent energy resources.

Now there has been a big growth also in natural gas generation, which can very rapidly adjust to fluctuations in wind and solar generation and, as I mentioned, there are some relatively new tools that utilities and grid operators are using to adjust demand.

For instance, as I mentioned, they can reduce and adjust the demand by sending certain price signals or actually controlling, as I mentioned, an individual's or a group of individuals' water heaters or air conditioners to adjust that energy consumption to meet fluctuations in production that might be created.

Nonetheless, there are questions about how far we can move along with these, or how far a grid or state region can go with regards to implanting renewable resources and where those targets start to become challenging.

Now, a number of states have already hit really percentages and there's an expectation… for instance, Hawaii has a 100% renewable requirement by 2045 and they're very concerned about hitting reliability and resilience targets and ensuring that that does not compromise resiliency and reliability. So, they're implementing a number of different technologies such as demand response and lots of energy storage to ensure that reliability is not threatened.

Now one of the biggest concerns I would say is really the digitization of the grid and the fact that the kind of remote control and data gathering that is really part and parcel of a modern grid opens up the opportunity for what I would call some sort of cyberattacks.

We know that there is a lot of attempted cyber interference every day; many utilities are seeing this; and so protecting and ensuring that many of these distributed components that are being controlled by the utility or that consumers have online cannot be leveraged and utilized by

those wishing to cause havoc or do harm, that we are protected from those individuals through different types of approaches, ensuring that equipment has gone through some thorough testing and that there are no problems with the code and, where needed, that there are separate systems operating that cannot be compromised by cyberattacks as well.

Utilities are working on this, the federal government is working hard on cyber issues as well, and those concerns obviously are higher in a more digitized modern grid, but at the same time there are also many opportunities to increase resiliency and increase reliability with these new technologies.

TM: 14:13

Gene: So those new technologies that you've mentioned, there's also a flipside to that—I noticed in your report that you talk about things like electric vehicles and how they affect the grid and other technologies like that. Tell us what you found there.

Glen: Sure. The rapid potential uptake of electric vehicles could create an increase in load that could be fairly significant, and right now we have a very small penetration of electric vehicles, although it's increasing somewhat rapidly. The challenge for utilities is: How do they ensure that this increased demand can be met given the current electric grid? And what are the needs for the distribution grid with regards to upgrading to enable it to adequately supply this additional electricity to different neighborhoods?

For instance, if numerous residents on the same portion of the grid in a neighborhood, multiple residents put in or decide to buy electric vehicles and decide to charge them quite quickly during the middle of the day, that can cause a big challenge for the utility. Seeing this increased demand during a high demand time can put strain on the grid and it also might require an upgrade to different devices on that distribution side, which was not designed perhaps when it was put in to deal with that amount of electricity load.

So, there are intelligent approaches that are being utilized to ensure that electric vehicle owners charge their vehicles at optimum times during the day when there is enough electricity being… or I should say, when there is not as much demand. So, charging in the late evenings, during the night or other times during the day when there is less electricity demand is basically much easier for the grid to absorb that extra demand.

So, there are price signals that can be sent, and this is something that we do discuss in the report, through certain approaches of rate making and rate design, so designing rates that fluctuate during the day based on the demand for electricity.

Normally we pay the same amount no matter what time of day it is that we consume electricity, but this is fairly inefficient because there are definitely times during the day when electricity is very expensive to purchase, and that is averaged by the utility and put into our bill.

But if consumers were actually getting the price signal, let's say electricity instead of being 12 cents per kilowatt hour is actually going to be 35 cents per kilowatt hour during the day, they will adjust the way they consume electricity, and these time varying rates are something that

are being implemented by a number of states such as California, and many, many states actually have pilot projects that are looking at these time-varying rates.

Basically, new technologies such as smart meters allow utilities to meter by time and adjust rates by time, which was not feasible before this modern, smart-meter technology, and that really enables the grid operator to manage this rapid growth or rapid changes on the grid such as residents purchasing electric vehicles and also, perhaps, installing rooftop solar.

So those can cause dramatic fluctuations and changes in the grid, but this price signaling through varying rates can really help manage the way consumers use electricity and better integrate their consumption with the variations that might be seen from generation, or with the various other challenges that might be seen with these rapid changes.

TM: 18:35

Gene: So, Glen, what other findings or research that you did for this report would you like to talk about that we haven't discussed already?

Glen: I would say with these rapid changes that are occurring … some of the big ones I've mentioned: distributed energy resources such as storage and rooftop solar, or distributed solar—they can be larger than rooftop, community solar projects as well—there has been some dramatic change in the way consumers manage and consume electricity; I should say rate payers—their approach to consumption is changing.

So, individuals are more interested in perhaps generating their own electricity. They're concerned about environmental and air quality issues related to energy consumption and basically are much more involved than they were say 20 years ago or 30 years ago in knowing where their electricity comes from and potentially managing and using it themselves.

So these new technologies really enable this flexibility and the one thing that they do challenge … I mentioned there are ways through rate making, for instance, to better reflect the actual prices of electricity, which then helps consumers adjust their consumption, which can help the grid operate more efficiently and at lower cost.

So one of the challenges really with these new technologies and new opportunities, such as I mentioned, demand management or the ability to manage demand, there is a component that legislators are very interested in, and that is the utility business model. If we're trying to modernize our grid for the 21st century, how do we modernize our regulatory regime so that it better reflects this modern grid and takes advantage of different opportunities that arise with grid modernization?

And so some of those I guess you'd call them the utility business model issues that are being addressed or discussed related to performance-based regulation. So one of the big challenges for utilities right now is the fact that grid modernization is quite expensive and so there are a lot of capital expenditures that are going to be needed in the coming years on the distribution grid particularly.

However, utilities are seeing either flat or sometimes decreasing demand for electricity and so their income is not rising as quickly as it used to, and there have been some challenges in addressing that decline in demand at the same time as addressing grid modernization.

Now, there's a possibility that the growth of electric cars could kind of counteract this decline in consumption, which is really driven by new technologies that have enabled increased efficiencies across the board for all of our, I guess, devices in our homes such as refrigerators, air conditioners, televisions, as well have all become more efficient and that means that individuals may not be consuming as much.

For utilities that's somewhat of a challenge since the current business model, which is called the cost-of-service model, compensates utilities based on their capital expenditures, how much capital they own, and how much electricity they sell. So in this new era where policymakers and residents are really interested in addressing environmental concerns, clean energy concerns and, I guess, customer service concerns and there are a lot of residents, as I mentioned, who are interested in controlling and improving their ability to manage their own electricity and produce their own electricity, this older business model doesn't really fit as well.

So a number of states are looking at, and many utilities actually prefer looking at another approach which inflates performance-based regulations. So instead of being merely compensated on how much they build and how much they sell, they could be compensated on meeting performance goals such as energy efficiency goals, reliability goals, grid modernization goals, goals for public safety, customer service, economic development and growth, and others.

So this is a methodology that is being aggressively pursued, for instance, in Hawaii, New York, and also being looked at in California and a number of other states, Minnesota, are looking at new ways, and they're working closely with utilities, so it's about really helping utilities and motivating utilities, also providing them with some solid, I guess one would say, a little more certainty about their future and what they really need to do to be successful and by kind of adjusting the model so that the consumer and policy goals align with utility goals.

Policymakers, utilities and others are finding this could be a much more efficient and more effective approach with the new grid technologies and changes in consumer behavior that are developing.

TM: 24:16

Gene: So, Glen, how can legislators and legislative staff get a copy of this report and do you have other resources available that you'd like them to know about?

Glen: Yes. So the report is posted on our website at ncsl.org. Simply go to the energy policy area and you will be able to access that report. You are welcome also to contact me, and we do have some hard copies and can send those out as well.

In addition to the report we also want to highlight that we have an excellent database where we are tracking state legislation on grid modernization and many other energy related issues such as reliability, nuclear energy, natural gas, renewables, and utility regulation, and this energy database is available and accessible for all legislators and staff as well as the public.

It's updated biweekly and provides an excellent resource for you to get a handle on what's going on across the U.S. in different states legislatively in the energy sector and field.

Gene: We've been talking with Glen Andersen, who is the Energy Program director at the National Conference of State Legislatures and one of the authors of the report "Modernizing the Electric Grid—State Role and Policy Options." Glen, thanks for being a guest on "Our American States."

Glen: Thank you, Gene.

Music and Gene VO:

And that concludes this edition of our podcast. We encourage you to review and rate our episodes on iTunes or Google Play. You may also go to Google Play and iTunes to have these episodes downloaded directly to your mobile device when a new episode is ready. For the National Conference of State Legislatures, this is Gene Rose. Thanks for listening and being a part of "Our American States."