

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Reliability Technical Conference	Docket Nos.	AD16-15-000
California Independent System Operator Corporation		ER16-1085-000
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TESTIMONY OF CHANTAL HENDRZAK
ON BEHALF OF PJM INTERCONNECTION, L.L.C.

On behalf of PJM Interconnection, L.L.C. (“PJM”) I am pleased to present these Comments on Emerging Issues (Panel II) and the specific questions posed by the Commission for the June 1 Reliability Technical Conference.

My name is Chantal Hendrzak. I serve as Executive Director of Market Evolution for PJM. My areas of accountability include developing and implementing PJM’s strategic plan for market development, emerging technology adoption and overseeing market performance analysis. Specifically, these responsibilities include ensuring the ongoing development and reliable integration of resources such as demand response, renewables, energy storage, and adoption of other industry innovations and emerging initiatives. I have served in various capacities at PJM since 2002.

The Commission’s questions for this panel focus on the reliability impacts of distributed energy resources, renewables, reliability considerations for microgrids as well as questions concerning grid planning taking into consideration the possible loss of natural gas production facilities and pipelines. I will provide some observations on each topic.

Before doing so, I would note that PJM’s work with the natural gas pipeline industry has led to a level of gas-electric coordination in this region far beyond what we have experienced in the past. Our appreciation goes to the Commission for Order 787¹ as well as its continued focus on this issue. In addition, the natural gas pipeline industry, as well as many local distribution companies (“LDCs”), have worked with us to increase our level of communication and coordination both on an operations level as well as a planning level. Finally, we appreciate the support of the US Department of Energy, which funded the Eastern Interconnection Planning Collaborative Gas Infrastructure study—a first of its kind analysis of gas pipeline infrastructure needed to serve electric generation in a very large portion of the Eastern Interconnection covering the footprints of PJM, the Mid-Continent ISO, the Ontario Electric System Operator, the Tennessee Valley Authority, the New York ISO and the New England ISO.²

I address the Commission’s questions topically below:

¹ <http://www.ferc.gov/CalendarFiles/20131115164637-RM13-17-000.pdf>.

² The EIPC study is posted at www.eipconline.org.

I. DISTRIBUTED ENERGY RESOURCES.

Potential Reliability Issues from the Proliferation of Distributed Energy Resources

Although the reliability impacts of any one distributed energy resource is quite small, as the industry moves further in this direction, it is incumbent on all of us to look forward to consider the best way to integrate these resources in a manner which enhances rather than degrades total system reliability. PJM has been working with a number of such providers and outlines here some of the steps that we, and hopefully the rest of the industry, are contemplating moving forward.

The proliferation of distributed energy resources carry with it some reliability impacts:

- Most notably, for the bulk electric system, experience is demonstrating the growing need for the electric distribution company as well as the RTO to have sufficient information on where Distributed Energy Resources (DER) are located and how they operate;

The events associated with the voltage disturbance in the Washington D.C. area on April 7, 2015³ underscores the enhanced need for visibility, communication and voluntary dispatchability of distributed resources. During the event, much load was automatically transferred from grid power to behind the meter back up generation units. Unfortunately, the real-time operation of these units was largely invisible to PJM and Pepco at the very time both entities were trying to assess and prioritize system restoration.

Also, during the hot weather experienced during September 2013, for two days in a row, PJM was forced to shed a limited amount of load in the Penelec zone in order to maintain system reliability with in the zone. On the third day, although system conditions were the same, the operation of behind the meter generation prevented a third day of local load shed.

Knowing the location and quantity of available distributed energy resources as well as having the ability to communicate with these resources will become more critical over time as part of grid operations. For these reasons, enhancing visibility of DER resources is an issue of growing importance to the entire industry;

- Depending on circumstances, local overvoltage on the distribution system is possible at those locations where there is a significant amount of distributed generation on a feeder not otherwise designed to accommodate that generation. Although this is largely a distribution system reliability issue, to the extent that voltage issues migrate “up the chain”, these local

³ https://www.rfirst.org/Documents/Joint_Report_on_D.C._Event.pdf.

overvoltage issues can impact various substations and ultimately the transmission grid itself;

- As DER proliferates, the need for dynamic behavior that supports grid stability increases. For inverter-based DER like solar and storage, this takes the form of standards for smart inverter functions. Some of these functions (such as local voltage support) are most relevant to distribution system reliability, while others (such as frequency support) are relevant to regional transmission system reliability. PJM has established, with FERC approval, requirements for “enhanced inverter” capabilities for inverter-based Interconnection Customers coming through the PJM interconnection queue. However, much of the DER in the PJM footprint is subject to state-jurisdictional interconnection and does not come through the PJM queue. Most U.S. states use the IEEE 1547 standard for their interconnection requirements. Currently, IEEE is engaged in a process to update the 1547 standard such that advanced grid support functions can be provided by DERs. Coordination of these requirements and standards would be a valuable activity, especially across the various jurisdictions to which they would apply.
- Also, as much of the new distributed energy resources are rooftop solar facilities, over time, further consideration will need to be given to address variability from cloud cover, ramping capability of the solar facilities, improving forecasting capabilities and the need for enhanced communication between grid operators and solar facilities, at least in the aggregate. In short, the industry will need to develop better tools to address these emerging reliability issues but will need to do so in a manner which does not create an uneconomic barrier to entry of these resources.

What Can System Operators Do To Leverage Reliability Benefits of Distributed Energy Resources?

Along these lines, the Commission asks how system operators can leverage the potential reliability benefits associated with the increase in distributed energy resources. PJM proposes the following thoughts for the Commission’s consideration:

- Enabling Markets to Enhance Visibility and Voluntary Dispatchability of Distributed Energy Resources – PJM believes that there is a greater potential for enhancing visibility and dispatchability of distributed energy resources in a manner which does not create barriers to entry or otherwise trigger jurisdictional challenges. The Supreme Court has affirmed that loads at the distribution level can participate in RTO wholesale markets as demand response. The Commission has created an “opt out” for states that do not wish to see their customers so participating. Along these same lines, we believe that FERC, the states and the RTOs could develop a “model tariff” that would allow behind the meter resources to participate in the wholesale markets as generation

resources in return for their providing the level of visibility and dispatchability that is so important to both distribution and transmission grid reliability. This needs to be a cooperative effort – one that respects jurisdictional lines. One way to effectuate this cooperative effort, would be for interested states, FERC, the RTO and stakeholders to develop a consistent model tariff at the state level that would also meet the reliability needs of the RTO/ISO while also providing the means for distributed energy resources to be able to voluntarily participate in the RTO energy and ancillary service markets and enjoying the valuation of those resources that the markets provide;

- Operations Reforms to Improve Visibility of Distributed Energy Resources – On an operational level, we have taken steps to operationalize behind the meter generation that appears to us as demand response resources. Specifically, we have made changes to enable subzonal dispatch of demand response and increase the operational flexibility of the resources by implementing a 30-minute notification time default;
- The Role of Aggregation of Distributed Energy Resources – Aggregation is important for handling large numbers of smaller distributed energy resources. We do not need every kW to be telemetered to the RTO but aggregation at the P-node (wholesale energy pricing location or pricing node) level would allow for a level of communication, modeling and transparency that would enhance both system operations and planning. The aggregated information needs to include the quantity, types of resources, and operating characteristics of aggregated distributed energy resources in order to enhance the overall reliability benefits of these resources. PJM's demand response program serves as an effective model for this type of aggregation.

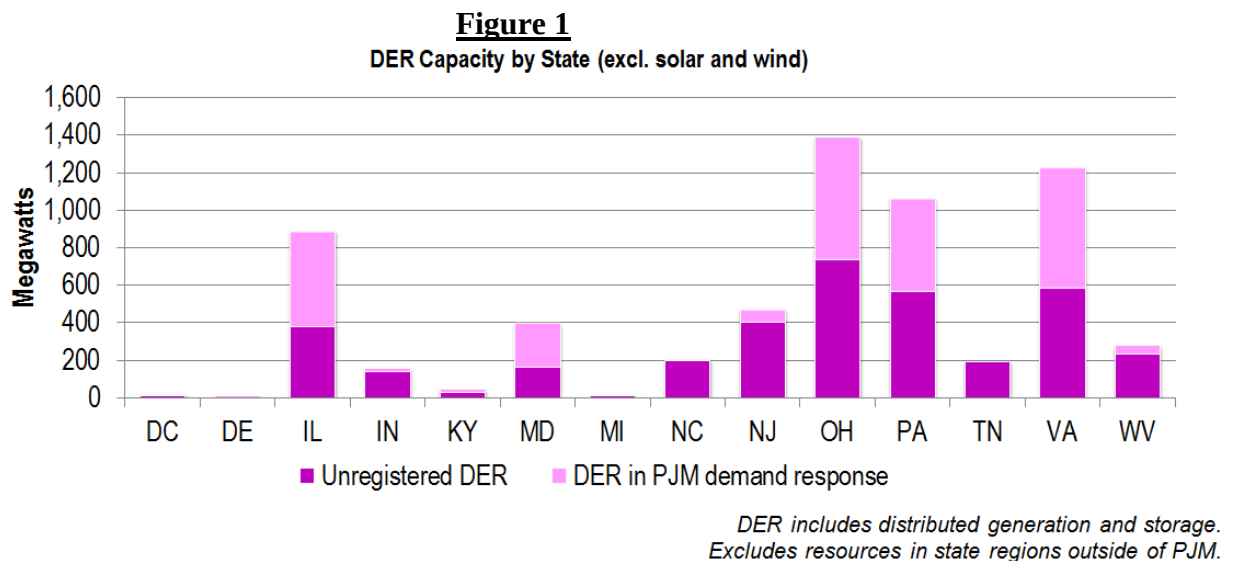
It is relevant to mention some of PJM's recent initiatives with respect to distributed energy resources.

- We have recently enhanced ⁴ our load forecasting methodology to account for forecasted deployment of behind the meter solar generation in PJM's Long-Term Load Forecast. This has implications on capacity procurements through the Reliability Pricing Model as well as transmission planning;
- As an interim step to getting information directly and more automatically from distributed energy resources, we have worked with our members and U.S. Energy Information Administration data to document (**Figure 1**) many of the distributed resources that do not participate the wholesale

⁴ Change to PJM's Load Forecasting Methodology now includes distributed solar generation - <http://www.pjm.com/~media/planning/res-adeq/load-forecast/solar-forecast-presentation.ashx>.

markets. Unit specific information, such as location, size, and contact information, for those resources PJM is able to identify, is currently made available to PJM dispatchers for consideration during emergency conditions;

- There is an active stakeholder discussion, Special Markets and Reliability Committee – Distributed Energy Resources, to review Generation Resource Rules, Queue Processes and other considerations for distributed resources seeking to interconnect into PJM and participate in the energy, ancillary services, and capacity markets.



II. MICROGRIDS.

Much of my response related to distributed energy resources applies with even greater emphasis to microgrids. We have seen development of some very promising microgrids in our region including at Princeton University and the Philadelphia Navy Yard as well as in the City of Chicago. Many of the visibility and dispatchability issues that I raised above are even more important for microgrids. But given their larger scale, the economics of placing appropriate telemetering is more favorable, especially when balanced against the value that microgrids can realize from selling their excess generation or demand response capability into the wholesale markets.

Microgrids are often established to improve the resiliency of the load they serve. They are designed to operate in an islanded state, which is disconnected from the grid. When microgrids operate in an islanded mode, the load that was previously being supplied by the grid are supplied by resources within the microgrid. To PJM, this looks simply like a drop in load in the area. In order to ensure a more sophisticated view of what is actually occurring, relay coordination, telemetering and enhanced visibility into

how the microgrid will behave under what conditions are important issues for system operators and microgrids owners / operators to work on collectively.

We do not believe that this area is ripe for a NERC standard at this point. Moreover, given jurisdictional issues, such a standard may only complicate matters. Rather, continued work and encouragement by this Commission and state Commissions on developing a harmonious tariff that bridges federal and state jurisdiction is a goal worth working toward in the near future.

III. PLANNING FOR PIPELINE INFRASTRUCTURE.

PJM has seen a massive changeover of the fleet as a result of low natural gas prices and EPA's implementation of the Mercury and Air Toxic Standards⁵ rule. Our recent Reliability Pricing Model Base Residual Auction results only underscore the increased dependency of the PJM region on natural gas resources.

PJM has not been idly sitting by during this transition. Rather, with the Commission's support, we have implemented the Capacity Performance product as a means to ensure, among other things, that units are "firming up" their fuel supplies in return for a unit's receiving capacity payments. This firming up has come in various forms, such as: direct interconnection to one or more pipelines; firm transportation contracts, and installation of back up oil supplies.

From a planning perspective, PJM led the DOE-funded EIPC study, referenced previously, which provided a helpful baseline inventory of the present and future availability of gas pipeline infrastructure to serve future electric generation needs. In the PJM region, the study largely concluded that the existing infrastructure was strong but did point out specific geographic areas within the footprint where pipeline enhancements are needed. And many of these enhancements are presently being proposed through various pipeline applications pending before this Commission. We have built on the EIPC analysis by including pipeline contingencies in our ongoing Regional Transmission Expansion Plan (RTEP) development. We have also included pipeline contingency sensitivities into our seasonal operational studies.

From an operations viewpoint, we have put together a team that performs a daily operational risk assessment for all natural gas fired generating units within the PJM footprint based on interstate pipeline and LDC conditions, during the winter period and other times of system stress. This information is shared with the PJM dispatchers for awareness and operational planning purposes. We have also begun to coordinate electric and gas system outages where possible to minimize the impact to reliability. PJM has also changed the timing of our day-ahead energy market, as well as shortened the time to announce results, in order to better coordinate with natural gas nomination schedules.

From a policy perspective, we signed a Memorandum of Understanding with the pipelines that have enabled us to engage in a strategic dialogue as to future flexible products and services that could be offered to meet future reliability needs. Those

⁵ <https://www3.epa.gov/mats/>.

discussions are ongoing. We have also begun discussions with LDCs to exchange information regarding gas-fired generation located behind a city gate.

Although this entire area is one that may be appropriate for continued high level NERC assessments, our experience from both the larger EIPC analysis and our own day to day work underscores that this issue is very locational in nature. For these reasons, we do not believe that a particular NERC standard is needed at this time. Rather, we think, at least for the PJM region, establishing the flexibility and reliability required from a unit serving as a capacity resource, along with appropriate compensation for the risk of substantial penalties associated with not meeting those requirements when called upon, has developed a better approach.

On all of these issues, PJM looks forward to working with the Commission and serving as a resource as the Commission considers “next steps” identified from this emerging issues panel.