RELIABLE AND SUSTAINABLE POWER GRIDS

MAY 2017

MEMBER NEWSLETTER

GO15 Newsletter Special Edition: Cooperation with ICER

On April 28, 2017 industry experts invited jointly by GO15 and the International Confederation of Energy Regulators (ICER) gathered in Arlington, VA. The event was hosted by the National Association of Regulatory Utility Commissioners (NARUC), currently chairing ICER. The goal of gathering together is to share both "sides" of the challenges associated with the integration of Distributed Energy Resources (DER) in the power grids; from the GO15 members' perspectives, sharing our experiences with how renewable and embedded resources are changing the way we do operate; and from the regulators perspective, how government can facilitate the integration of renewables generation reliably.

We thank all our members who attended the meeting, namely CAISO, ONS, PJM, and TEPCO. This summary of events is provided to GO15 members so that we all may learn from the conference. What follows is a synthesis of comments and conclusions drawn from the consensus discussion. The GO15 review is partitioned by panel, as each group discussed a particular aspect of the challenges we all face today.

Integration of Distributed Energy Resources

Session Chair: Lorenzo Kristov, California Independent System Operator (CAISO), USA
Panel: Larisa Dobriansky, General Microgrids, USA
Marcelo Prais, Operador Nacional do Sistema Elétrico (ONS), Brazil
Scott Baker, PJM Interconnection, USA
Anda Ray, Electric Power Research Institute (EPRI), USA

Discussion Highlights

To most of the press and the public at large, a Distributed Energy Resource (DER) simply means rooftop solar and maybe some wind power. This limited understanding leads to misconceptions - at least in its current state – as rooftop solar requires the least amount of interaction from the grid operator. It is important that as an industry we educate the public that DER process is much more than "hooking up

generation to the grid." Operational impacts are critical to consider both for transmission and distribution voltage levels, such as complex feeder analyses for capacities, grounding, and so on.
The industry must also communicate that complexity of DER may be on either side of the meter and that some technologies, for example storage solutions, are not just energy solutions; capacity and reserve and other essential services are at least as important features to consider. One might argue that educating the public about DER is more important than the technology at present.

In terms of DER valuation, studies show that the return on a DER investment varies based on the network configuration, i.e. radial networks as in Europe's low voltage grids and those seen in California and mesh networks as in Europe's medium to high voltage grids and those seen frequently in New York. Of course, location/climate plays an important role. For example, Brazil has already seen large growth in wind which has caused issues with grid balancing. On rainy days which often have low wind speeds, there is an expected reduction in bulk-power wind generation – but also an unexpected increase in load, which has been attributed to embedded wind generation impacting the net load numbers. This "double hit" is stressing existing generation. Additionally, low hydro levels resulting from several years of below-average rainfall has removed a natural balancing resource from the mix. A clear lesson is that market and regulatory reform is urgently needed both in regions experiences like Brazil already experiencing challenges, but also where problems have yet to arise.

Other regions are looking at uncovering these "invisible" resources, not just to understand their negative impacts but also to use them as reliability tools. For example, PJM identified some local generation not in the market and was able to dispatch then generation in lieu of load shedding. Using these resources improves the service levels of the grid, and it is imperative not only to discover that these resources exist, but also to document their electrical connectivity and response capabilities. Here too, market reform is necessary: an increased value on resiliency could bring these resources into the market to make response more seamless and would compensate the resources using proper market incentives.

Key Messages

DER adoption is clearly "bottom-up" resource, meaning that customers are seeking out technologies that are economically viable, and are implementing them regardless of the larger impacts. Given this, it is important to acknowledge a few realities:

- Incentives have long-term, and sometimes unforeseen, effects
- Mistakes are to be expected, so flexibility should be "baked in" to the plan
- Progress will likely be fast that the utilities are expecting movement to appear
- Interconnection requests will increase, perhaps current processing capabilities
- Smart meter information bandwidth will become an issue
- Retail rates need to be examined

Market Regionalization – Development of Grid Interconnection

Participants

Session Chair: Ken Quesnelle, Ontario Energy Board, Canada
Panel: Keith Casey, California Independent System Operator (CAISO), USA
Alberto Pototschnig, Agency for the Cooperation of Energy Regulators (ACER)
Marcelino Madrigal, Comisión Reguladora de Energía (CRE), Mexico
Fernando Hernandez, Comisión Nacional de los Mercados y la Competencia (CNMC), Spain

Discussion Highlights

The industry is going through a revolution at the distribution level; this revolution requires thoughtful change both behind-the-meter and at the grid level. Furthermore, changes may be necessary at the transmission levels as well, in particular at the T-D interface.

For example, in California, the penetration of embedded solar resources has led to a massive change to the overall load shape in the State ("duck" curve). California is now experiencing on a regular basis, a large reduction of the apparent load during peak solar hours leading to fast ramping of conventional resources at both sides of the window. California has very aggressive goals to address these changes – the California ISO has recently opened its market to neighboring areas without markets to diversify the portfolio of resources in the market.

In the past there was some desire to expand markets in this part of the United States, but previous attempts failed? Why is the change working now? Hydro resources outside the current markets can cover the changes based on Solar penetration in California, when in the past the value of these resources was not nearly as large. Continued expansion – both in scale and scope – of the California electricity markets is expected to continue and will require the market operator to change its governance from a State-based organization reporting to the California Public Utilities Commission to a multi-State organization reporting to the additional States PUC as well as to the Federal Energy Regulatory Agency (FERC).

Just south of California, cross-border trading is increasing in Mexico. Here the model involves multiple fuels as well as multiple regions. Based on today's economics, Mexico is purchasing natural gas from the United States on its northern border, converting that fuel into electricity, and selling that product south to buyers in Guatemala.

Similar trends can be seen in Europe. For example, the algorithms used to clear the day-ahead markets in Europe have been harmonized so that the market design is shared over currently nineteen jurisdictions. Cross-border markets in Europe lead to new infrastructure needs, needs that have cross-border impacts. A given country may need to improve infrastructure and may only see a benefit in part of the investment or potentially even need to make an improvement for the good of the whole market with little benefit to itself. The answer is a new model for valuing benefit and allocating costs in Europe and now projects are defined and nominated every two years using a new, standard model called the

Project of Common Interest (PCI). With this process in hand, groups can focus in on the barriers – for example ACER reports that more than a third of all PCIs are delayed because of permitting.

Key Messages

The expansion of markets, or at the very least, grid operation coordination among regions, is becoming more evident as a requirement of the future of the grid.

- The value of markets is expanding
- The need for cross-border agreements is becoming more relevant
- There is in increase in the coupling of different energy markets, such as gas and electricity
- Common process and a unified focus on common barriers is essential

Data Management – Facilitating the Transition with Digital Technologies

Participants

Session Chair: Alain Steven, GO15
Panel: Anne Doennem, Norwegian Water Resources and Energy (NVE) Directorate, Norway
Edward Arlitt, Ontario's Independent Electricity System Operator (IESO), Canada
Phillip Shepard, National Grid, UK
Douglas Thomas, Ontario's Independent Electricity System Operator (IESO), Canada

Discussion Highlights & Interesting Anecdotes

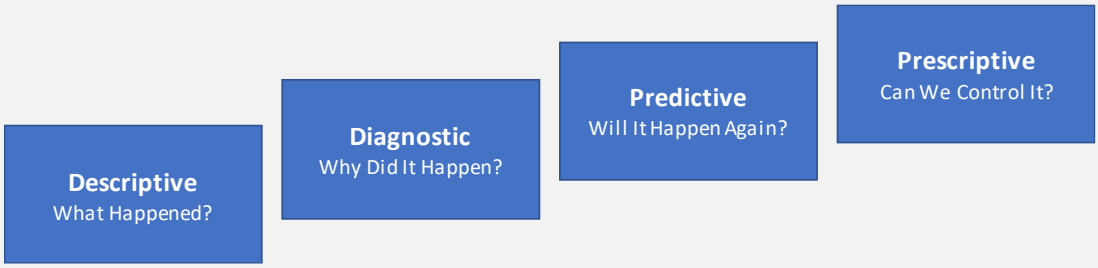
Integrating new resources to the grid and connecting grids across regions leads to a natural need for new supporting technologies. The concept of a "data hub" is gaining support to, at least initially, store and distribute smart metering information. Having a single source for this information in a common format is critical. The process too needs to be formalized, with the suppliers managing the customer data, distribution operator submitting metering data, and an independent party managing all of the data and the connections. Such a system and process should ultimately lower barriers to entry for new players and technologies, as well as reduce errors with the establishment of the principle of the "single truth" for each datum.

In addition to facilitating day-to-day operations, central hubs for data can also give us new insights into our current practices and current pitfalls. For example, the ISO/RTO Council has investigated where renewables are being deployed and finds a high correlation with the presence of markets in North America. However, there are places on the North American Continent which are more logical to deploy such resources and hence, incentives might not be optimally aligned with benefits.

Storing, reviewing, and analyzing data is one function of a data hub. Access to and appropriate use of dynamic data is also key. Access to more data should help enable a future distribution management system (DMS) to better do its job. Additionally, new entrants to the markets – in other words "non-utility players" will want access to these data and the industry needs a good process to balance information privacy with reliable and cost-effective operations.

Turning to resources on the grid, there are common themes across the globe of mostly-embedded solar and wind split generally evenly between transmission and solar, which lead to several operational challenges such as voltage stability and high ramp requirements. The solution means more data and many more counterparties from whom to collect data. Here too, the data hub concept is a solution.

As an industry, different parties are at different stages in the evolution of effective data usage. We can visualize this as:



Key Messages

- Our industry should look to other industries to see how data analytics can be a benefit, e.g. how have data helped oil drillers find the best spots to build wells?
- We should temper these stories with the additional requirements which constrain the electricity industry: security and physics.
- Historically, the entire load of data management has been put on the transmission and distribution operators; in the future, this will be allocated to many parties
- Data privacy is a great concern; so a method to grant and track consent needs to be present in all processes.

Additional Reading

The following materials are available in the GO15 Library:

- California's "More Than Smart" effort: morethansmart.org
- EPRI's "The Integrated Grid: A Cost-Benefit Analysis" published in February 2015.
- The European Commission's Network Codes: ec.europa.eu/energy/node/194

Join The Conversation on Bitrix!

Feedback on the new collaboration tool, Bitrix24, has been generally positive from the members who have logged in. If you have yet to experiment with members.go15.org, please send a request to support@go15.org with a request for an account. Feel free to invite anyone in your organization who you would like to have access to our official documents and who may wish to contribute to the conversation.

GO15 Calendar of Events

September 24	Committee Chairs	**Melbourne** Australia	AEMO AUSTRALIAN ENERGY MARKET OPERATOR
September 25 – 26	**Governing Board**		
October 22	Committee Chairs	**Brussels** Belgium	elia group Powering a world in progress
October 23 – 24	**Steering Board**		
October 25	**GO15/APEx Forum**	**Brussels** Belgium	APEx Association of Power Exchanges