



INTEGRATING INTERMITTENT RESOURCES: CHALLENGES AND OPPORTUNITIES

Things are changing for utilities, especially as a result of the growing integration of distributed generation, also known as “intermittent resources.” At a surface level, the first pass is going to be the change in the way utilities need to look at their distribution grids. In the past, it was about looking at it from a design and operation perspective. The energy flowed from the substation out to the end user.

These days, with the growth of distributed resources, with people installing their own generating units, such as rooftop and community solar, utilities are faced with the reality of looking at power flows in multiple directions. In addition, over time, these flows are going to become increasingly difficult to predict.

As a result of these changes, it requires a change in the ways that utilities look at protecting their distribution networks. For example, the way they set their protection coordination schemes and tracking all of this will become exponentially more complex.

In August 2017, the U.S. Department of Energy released a report titled, “Voices of Experience: Integrating Intermittent Resources. What Utilities are Learning.” The information in the report was created with input from a working group of experts from over 100 electric utilities in the U.S., large and small, and representing all geographic regions of the country.

The key takeaway from the working group’s research and professional experience is that utilities need to be preparing their systems “for a growing penetration of customer-sited generation.” Utilities must begin to:

- test and adopt new technologies designed to provide better visibility and control;
- collect and interpret the increasing amounts of data needed to plan, forecast, and model their future systems;

- focus on their customers, listening and responding like never before; and

- streamline their processes in order to enable faster interconnections with more transparency.

How many utilities will this trend effect? According to the report, even those utilities with very little customer-sited generation currently will need to recognize that these resources will become a growing part of their generation mix going forward, whether because of state policies, growing customer interest, or both.

The report goes into depth on three steps that utilities need to take in order to begin to prepare for this trend, plus six “key insights and takeaways.”

Preparation

1 - Expect exponential growth. Penetration growth rates may follow more of an exponential, viral growth rate rather than a steady, straight line. Field research shows that, even if a utility’s growth rate is slow now, it could quickly become inundated with interconnection requests.

2 - Capture your load profiles. High penetration of intermittent resources, such as customer-sited rooftop solar, can have a significant impact on load shapes. Utilities will need detailed data about their systems and customer energy usage in order to develop models and perform hosting capacity studies that will allow them to integrate higher penetration of intermittent resources.

3 - Develop your tools. Grids are now dynamic and require integrated models that enable operators to look beyond one section at a time. This requires a model of the utility’s primary system that includes equipment characteristics, such as phasing line impedance, generator characteristics, the location of distributed resources on the system, and even inverter information.



Key Insights and Takeaways

- 1 - Customer engagement has new import. Customers interested in intermittent resources require and expect a new level of information and engagement from their utilities.
- 2 - Engineers and others are working on the challenges. It is important to understand how the design and operation of the grid is changing, and then develop staff capabilities, tools and processes in order to operate safely and reliably in this new environment.
- 3 - Policy and societal preferences are ahead of technology. Penetration rates are often catalyzed by policies that are designed to support renewable energy goals. It is important to understand and accept the nascent nature of some of the technology.
- 4 - Visibility, predictability and control are key. As intermittent resource penetration grows, utilities need the ability to see, control and predict the output from these distributed resources, and the aggregate behavior at the distribution circuit level becomes even more important.
- 5 - Each situation is unique. It is important for utilities to remember that each distribution system is unique, built to the needs of customers in that region. As such, there are unique implications for the integration of intermittent resources. In addition, different regulatory environments may require different approaches to this integration.

6 - Collaboration is essential. Planning for the future requires a holistic view, one in which the utility must not only understand its own resources and plans, but those of its customers, regulators, and developers in its service territory.

Benefits

While it is obvious that there are a lot of challenges ahead as a result of the need to integrate intermittent resources, and even as complicated as the system is becoming, Finley Engineering believes that the benefits will outweigh the challenges. One benefit is that utilities will be able to have the sources of generation closer to the loads, which is the most efficient way to serve those loads, rather than generating power miles away and having to find ways to transport it to the end users. Cutting down the length of the transport is, overall, just a more efficient process. As a result, system operators and owners may be able to put off expensive infrastructure additions by utilizing distributed resources.

Finley Engineering's Perspective

One thing Finley Engineering brings to the table is that we are constantly staying abreast of these leading technology trends. In addition, we bring a very broad perspective, looking at trends and issues from all angles, and providing clients with a number of ways to think about operating their systems in the future and incorporating all of this new technology. For example, in recent months, we worked with a number of entities helping them integrate utility-scale solar into their systems.



About the Author:

Phil Carroll, Vice President of the Energy Group for Finley Engineering, has been involved in the electric utility industry for the past 31 years. Managing multi-million dollar projects around the country, Carroll has been responsible for the design of distribution and transmission lines, material specifications, contract administration, final acceptance, and close-outs. He is also a registered Professional Engineer in several states.

For more information, you can contact Phil at p.carroll@FinleyUSA.com.