

## DER Growth Heightens Need for Increased T&D Collaboration and Focus on Bulk Power System Reliability

### Key Findings

- The increased adoption of distributed energy resources (DERs) is driving change in the industry and causing some G&Ts to evaluate their traditional way of doing business with their members.
- Recent NRECA surveys have given insight into how G&Ts currently perceive the current and potential levels of DER.
- NERC is monitoring the advancement of DERs and considering changes to standards related to these resources.
- G&Ts and their distribution cooperatives may wish to consider the impact DERs could have on their service areas and plan collaboratively how best to prepare.

### What has changed?

The increased adoption of distributed energy resources (DERs) is driving change and prompting some generation and transmission (G&T) and distribution cooperatives to evaluate new services, operating practices and programs within the electric cooperative business model. As a result, several G&Ts are investigating and analyzing their system data to determine the potential impacts of DERs. Several NRECA DER-related surveys show that certain G&Ts are also initiating new and increased communication and coordination activities with their distribution members.

The rise in DER deployment — including G&T development and participation in DER projects — can add complexity to G&T resource and transmission planning. According to the first two NRECA surveys, G&Ts were aware that levels of solar penetration levels were rising, but many G&Ts thought that DER levels were not yet high enough to have a noticeable impact on power supply costs or operation of the electrical system. Preparing for the potential impacts of high DER penetration *before it occurs* is advantageous, as is the participation of distribution cooperatives in the planning process with their G&Ts.

This DER growth has not escaped the attention of the North American Electric Reliability Corporation. (NERC). In recent years, NERC has intensified its focus on the role of DER as power supply sources and their potential impact on the reliability of the North American bulk power system, by modifying standards, creating new reliability guidelines, and even proposing new standards that address the potential reliability risks of DER growth. NERC may also be considering changes to its Compliance Registry Criteria, which could expose many cooperatives to new NERC compliance and the associated reporting requirements. Early

efforts by cooperatives to manage DER growth issues could help prepare for these potential changes and maybe avoid the need for overly restrictive new standards from NERC as the situation evolves.

## What is the impact on cooperatives?

The impact of DER growth on both G&Ts and distribution cooperatives is quite pervasive, affecting many areas of business operations, including business and system planning processes, system operations procedures, communications and security issues, rates and pricing policies, and contracting and member relations issues. For this reason, heightened communications practices along with coordinated, collaborative planning by G&Ts and their member cooperatives is essential.

In addition to the effect on power supply planning, DER integration will have an impact on transmission and distribution (T&D) system planning, including delivery point and substation planning. As DER penetration levels increase, T&D system operations practices and criteria will also have to account for the presence and operations of DERs. This will include the coordination of protective equipment and maintaining/managing adequate voltage and equipment loading levels, and other systems that are affected by the presence of DERs. This is particularly true when the level of DER generation output in a given area, such as on a distribution substation or individual feeder, starts to approach or even exceed the amount of load present for that area, allowing for the potential actual transfer of power from the distribution system back onto the transmission system. This development would represent a fundamental change to the historic T&D operating paradigm.

As DER capacity has grown year-over-year, NERC has updated its reliability guidelines to provide clear recommendations and guidance for establishing effective data collection and modeling requirements on aggregate DERs for the purposes of reliability studies.

Earlier this year, NERC issued a special report, [\*Pandemic Preparedness and Operational Assessment\*](#). It noted that the pandemic introduces a certain degree of uncertainty that is without precedent. If pandemic restrictions persist through the summer, it said, system operators will have to manage such challenges as potential generation unavailability, uncertainties in demand, the increased impact of DERs on load profiles, distribution reverse power flows, higher than usual operating voltages, and minimum demands at all-time lows.

## What do cooperatives need to know or do about it?

Open, transparent and collaborative planning between the G&T and its members on how DERs can fit into the current organizational business structure and operating objectives is essential to creating “wins” across the G&T/distribution co-op/member-consumer spectrum.

If the operational value of DER is established independently by each member cooperative rather than at the overall G&T level, potential inefficient operations, uneconomic decisions and cost shifting could occur among members. Last year, NRECA issued a report — [\*Distributed Energy Resources: Trends and Impacts on G&Ts and Their Member Cooperatives\*](#) — in which it noted that for many G&Ts, it may be premature to tell how the value of DER approaches ultimately will be used. However, it is an issue that most G&Ts and their member cooperatives will face soon on some level.

For planning purposes, cooperatives will need to know how much DER is present or will be added to the system, the voltage level (transmission vs. distribution) at which the DERs will be added, and the anticipated

rate of penetration on the system. With the split jurisdiction related to the interconnection processes between transmission and distribution in most areas, it is difficult to know what the total DER penetration and impacts picture will be without substantial information sharing and coordination on all sides.

As such, planning efforts should ensure that an adequate supply of resources and transmission capacity will be available to meet electrical demand on a real-time basis — and in the future, that also recognizes the variability of renewable DER output at different times and in many different situations. There are many challenges in this area, including anticipating a range of DER types, sizes and participation levels, along with managing effects of the significant and well-known variability in DER output and operating performance. This brings tremendous difficulty and additional risk that makes defining and identifying the best resource portfolio difficult. Contributing factors include:

- **Rate Design Shift:** NRECA’s DER surveys have indicated a shift from a belief that current cost-of-service-based rate design philosophies and integration standards were still valid to finding that underlying rates structures are a significant key risk indicator.
- **Aligning Rate Structures:** Understanding the pricing elements of a G&T’s wholesale rate structure can help the member cooperatives consider whether and how to align retail prices to the member-consumer with G&T pricing.
- **Metering:** G&Ts are encouraged to develop a standard metering package for use with DER systems. Close coordination between the G&T and distribution cooperatives is required when larger DER projects are to be interconnected at the distribution level.
- **Adapting to NERC Requirements:** Staying familiar with NERC’s evolving reliability requirements is important for distribution cooperatives to be able to effectively adapt their operating systems and practices in coordination with their G&Ts to achieve the most reliable and economic outcome for all.
- **Staying Ahead and Involved:** Early efforts can help mitigate the need for new NERC requirements and allow cooperatives to provide support for any changes that may occur if NERC does increase its purview.

### *Impacts of DER*

For more than 80 years, the traditional G&T-distribution cooperative paradigm has been successful at effectively managing the operations and reliability of cooperative power systems. As DER growth and integration on the distribution system increases, it can affect the types and levels of power supply needs for the whole power system and can alter the power flows and operations coordination at the transmission-distribution interface. While the effect of increasing DER integration on the distribution network has been studied and analyzed extensively, the same is not true when it comes to the bulk power system. The impact of DERs on the bulk power system reliability is an issue for NERC. It examines the potential reliability risks for increased levels of DER penetration, and discusses and develops mitigation approaches, which can include new standards and/or operating guidelines.

At lower penetration levels, the impact of DERs may not be significant on the bulk power system or the transmission-distribution interface. However, as DER penetration levels increase, issues related to

transmission line loading, grid voltage, protective device coordination and operations, and system frequency during normal and disturbed operations may be a concern.

### ***G&T-member cooperative coordination***

The impact of DER on a G&T's power supply costs and rates is driven by factors related to the technology, characteristics and ownership of the DER, along with the G&T's situation regarding load profile and resource needs, according to an NRECA report — [\*Distributed Energy Resources: Trends and Impacts on G&Ts and Their Member Cooperatives\*](#) — issued last year.

Understanding the pricing elements of a G&T's wholesale rate structure can help the member cooperatives consider whether and how to align retail prices to the member-consumer with G&T pricing that also addresses the impacts of increased DERs on the T&D systems.

It is increasingly important that G&Ts and their members have open dialogue and understanding of the interaction of: 1) wholesale and retail rates, and 2) the impact of DER technologies on wholesale rates. Also, it is important for G&Ts and their members to work through the challenges and changes of these DER-related issues together.

### ***G&T interconnection with member co-ops***

G&Ts typically are responsible for and manage several key technical-related areas when larger DER systems are to be interconnected to the distribution cooperative system, including:

- Metering, if the G&T is purchasing the output of the DER,
- Communications channel to get metering data back to the G&T and on to the RTO/ISO when required,
- Guidance and coordination among member cooperative systems related to interconnection standards and procedures, and
- Assistance fielding questions from prospective developers.

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If a G&T is purchasing the output from a DER facility interconnected with one of its member distribution systems, a separate meter owned by the G&T that measures the energy being purchased will be needed.

Typically, retail metering requirements are defined by the distribution cooperative for small residential systems and net-metered systems. The G&T specifies the metering requirements for DER facilities that require a wholesale power purchase agreement (PPA) between the G&T and the DER owner (typically based on DER facilities that are greater than a certain size, or aggregate installed DER capacity exceeding a pre-determined “self-provide” threshold in an all-requirements contract or that are not being net metered).

## *DER resource planning*

For planning purposes, all utilities need to know how much DER will be added to their systems, the voltage level (transmission vs. distribution) at which the resources will be added, and the anticipated rate of growth and penetration. It can be difficult for all relevant parties to know the total DER penetration picture in any given area, because of the split jurisdiction related to the interconnection processes between transmission and distribution systems.

Planning efforts should ensure that an adequate supply of resources and adequate transmission capacity will be available to meet electrical demand on a real-time basis for multiple system conditions. Most G&Ts likely will need to adapt resource and transmission system planning practices (including impacts on delivery point planning) to account for DER growth. Within this context, key issues include impact on peak loads and load shapes, balancing supply and demand in multiple time frames, changing operating practices and allocation of costs associated with DER operations, and the need for backing up intermittent DER.

One consideration to manage these challenges and enhance collaboration between G&Ts and distribution co-ops is the concept of utilizing [Integrated Distribution Resource Planning \(IDRP\)](#). This type of planning process assesses the current distribution system for a set of expected future scenarios that include variations in power supply, DER penetration, load growth, and other changes, and forecasts their impact on the operations of the distribution grid. NRECA is currently studying IDRP and working to educate its members through advisories, member outreach and partnering with other organizations to raise awareness about IDRP in conference sessions and NRECA events, while helping co-ops leverage existing resources (data analytics and modeling tools, standards, and reports) to create their own IDRP.

In addition to the effect on resource planning, DER growth will impact T&D system planning and operations, including delivery point and substation planning, as penetration levels increase. System planning practices and the operating criteria used, such as for managing voltage and equipment loading levels, coordination of protective devices, and so on, are affected by the presence of DER, particularly when the generation output in an area starts to approach or even exceed the amount of load present on a feeder, substation or even total distribution system basis. These evolving new practices should consider existing NERC requirements while staying abreast of the ongoing reliability activities to account for DER growth.

## **Conclusion**

In recent years, NERC has intensified its focus on DERs, by proposing modifications to standards that include data sharing and modeling requirements to address the potential reliability risks of DERs, even though NERC's jurisdiction lies with the reliability of the bulk power system predominantly at voltages above 100 kV.

Given NERC's heightened attention to the impacts of DERs on bulk power system reliability, it is advantageous for G&Ts and their members to closely collaborate and engage collectively in open, transparent and strategic planning. Key considerations include: how DER can fit into the current organizational structure and business planning objectives, keeping power supply costs down for all, and maintaining or improving reliability. This collaborative effort helps create "wins" across the G&T/distribution co-op/member consumer spectrum.

## Additional Resources

- NRECA Report: [\*Distributed Energy Resources: Trends and Impacts on G&Ts and Their Member Cooperatives\*](#)
- NERC Special Report: [\*Pandemic Preparedness and Operational Assessment: Spring 2020\*](#)
- [NRECA Information on IEEE 1547 Standard for DER Interconnections](#)

## Contacts for Questions

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