Explore key benefits, challenges, and opportunities

With more energy organizations modernizing grid infrastructure, microgrids and distributed energy resources (DERs) are quickly becoming a popular, cost-effective alternative to traditional transmission and distribution investments. Explore the role and importance of microgrids and DERs in this edition of Five in 5.

What are microgrids and DERs?

Craig Rizzo: For more than a century, our power grid has generated energy centrally and then distributed it through electric transmission and distribution lines to customers at the edge of the grid. We're now seeing a transition to more energy generation, storage, and controllable load at the grid edge, like commercial, industrial, and residential sites. That's reflected in different types of DERs, including traditional diesel- or gas-powered distributed generation like combined heat and power (CHP), renewable energy systems including photovoltaic solar and wind energy, and multiple different forms of energy storage.

Trevor Loose: A microgrid is designed to separate itself from the electric grid and use DERs to operate when an outage is detected on the distribution system. There are two categories of microgrids: The first is a utility-owned microgrid, in which the utility company installs DERs and has a controllable load on a specific portion of its distribution system. When the utility experiences an outage, it can “island” that portion of the distribution system and service it with DERs that either they or third parties own, or a mix of the two. The other type of microgrid is “behind the meter.” It’s owned either by a single customer—like a business park—or a third party that uses DERs and systems to monitor and manage all the resources. This type of microgrid not only needs intelligence to separate itself from the primary grid when it goes down, but also load balance generation and storage to meet energy demands in real time.
What is the importance of microgrids?

Craig Rizzo: A microgrid’s main purpose usually is to improve resiliency. Think about primary grid outages caused by hurricanes, ice storms, or cyberattacks: a microgrid is a small portion of the primary grid that will “island” from the primary grid and use DERs to power all of the loads connected to those DERs while the primary grid is down. So the importance and primary benefit of microgrids is helping critical facilities ride through primary grid outages.

Trevor Loose: Non-utility-owned microgrids are usually created for essential service providers—hospitals, airports, military bases—that need to survive when large grid outages occur. Some of the utility-grade microgrids are initially developed as demonstration projects to support commercial and industrial operations that can’t suffer production loss during an outage. Semiconductor plants are one example of that. With microgrids, it all comes down to the business case.

What potential challenges with microgrids and DERs might organizations face?

Craig Rizzo: The main challenges for utility companies are regulations and cost. There are regulatory restrictions specific to investor-owned utilities, although municipal and cooperative utilities are a little different because they don’t have that level of oversight. These regulations require rate recovery approval, which can make it difficult for a utility to recoup costs for the capital upgrades that are typically needed to integrate a microgrid into the main grid, and to operate and monitor the microgrid and DERs.

Cost is a big issue for both utility-owned/operated and behind-the-meter microgrids. Costs for battery storage—a keystone of DER enablement—are still fairly high. And because these systems are so new, many are customized, which drives costs up. As we see more microgrids and DERs in the future, there will be less customization and costs will continue to come down, which should accelerate the rate of deployment.

Trevor Loose: Beyond dealing with regulatory and cost issues, it’s essential that organizations considering or actively deploying microgrids and DERs maintain project momentum. After Hurricane Sandy and the recent Texas ice storm, everyone wanted a microgrid. Six months to a year later, momentum stalled. To keep the sense of urgency alive, you have to place a value on resiliency and reliability. A microgrid’s ability to prevent, for instance, the potential loss of production time or a revenue stream can help you justify the business case with stakeholders.

Utilities and commercial entities have an innovation imperative to address changing customer product and service preferences supportive of environmental, social, and governance (ESG)/decarbonization goals. For example, with charging stations for electric vehicles, much of the necessary microgrid and DER technology already exists, but regulatory support and business models also need to advance.

Who should be thinking about microgrids and DERs?

Craig Rizzo: This is definitely a C-suite issue. The benefits of microgrids and DERs are reshaping the utilities industry, from grid operations to communication systems to enterprise software applications. They’re also impacting utility and business models. How do you serve customers differently? How do you partner with third-party aggregators to offer microgrid and DER services in front of and behind the meter?

Trevor Loose: Utilities need to take a longer-term, enterprise view of the marketplace, along with the role of microgrids and DERs within that. They all have ESG- and renewables-related portfolio standards to meet. In addition, incumbent utilities risk losing revenue to large consumer and technology companies. These companies often register as a utility in certain regions, with plans to own and operate DERs and sell microgrids to third parties. Some utilities are responding by acquiring renewables capabilities and companies, but they really need to use a holistic approach that encompasses people, processes, and technologies. Change at this level can’t happen without C-level alignment and ongoing support.
How should organizations begin their journey to realizing the benefits of microgrids?

Trevor Loose: We suggest starting with a feasibility study. What are the company’s onsite energy needs? If it operates a fleet of vehicles, how can it use DERs to electrify them? Can it sell stored energy back to the utility’s power grid? Should the company build and operate its own onsite microgrid, or partner with a third-party provider and just purchase the energy? Answering these—and other questions—will help frame a living roadmap that can keep pace with the evolution of the electric grid.

Craig Rizzo: As Trevor mentioned, taking a holistic view is key. So is adopting an innovation mindset. Most utilities have already started down the microgrid/DER development path, but they need to look beyond specific technologies and consider how new product and service offerings will address both their customers’ evolving energy needs and their own strategic growth priorities. The development process may be more involved for commercial entities because energy production and management aren't their core mission. However, most recognize that customer, regulatory, and competitive drivers will require that they operate more sustainably. Microgrids and DERs can help them do this.