

Five in 5: Smart grid modernization



Challenges and opportunities around smart grid modernization

With the energy transition upon us, energy organizations are searching for ways to create smarter, modernized grids. In this edition of Five in 5, Deloitte power and utilities leaders Christian Grant and Jim Thomson share their perspectives on five key questions about smart grid modernization and grid decarbonization.

1

Why are smart grids important?

Christian Grant: The original power system design, which goes back to Thomas Edison's day, had a large central power station that pushes power in a single direction to where it's consumed. That system, referring to the distribution network, was never built to go in two directions. Today we need that two-way capability to maintain grid resiliency, because a home or a big box store can now use distributed energy resources (DERs) to produce power and push that power back to the grid. When we add electric vehicles (EVs), especially medium- and heavy-duty fleets to the mix, now we've got load on the move. The grid needs intelligence. It has to be "smart" in new ways to handle different energy production and consumption flows. This is just the beginning. Wait until utilities start doing distribution planning around localized peak power production and match consumption to supply. This contrasts with what we have always done: planning the distribution system based on peak demand.

Jim Thomson: If Thomas Edison walked into a substation today, he would probably recognize what the equipment does. A lot of our electric grid still uses that same kind of technology, but today's power needs are very different. People are putting solar on their homes, buying electric vehicles and creating a more localized supply. Businesses and consumers are generating power onsite and thinking, "If I've got extra, I should be able to sell that back to the grid." A utility needs the ability to monitor and control that flow from an individual location onto the grid, balance supply and demand mismatches, and make sure it doesn't pull down the local grid around it. This requires a lot of sophisticated controls, hence the term "smart grid."

2

What's the relationship between smart grids, microgrids, distributed energy resources (DERs), and grid modernization?

Christian Grant: The three “Ds”—decarbonization, decentralization, and digitalization—describe the focus of energy grid modernization as well as the relationship among smart grids, microgrids, and Distributed Energy Resources (DERs). With grid decarbonization we are bringing power supply closer to where power is consumed. So rather than having large, centralized power stations, there will be numerous small, decentralized stations providing energy generation, storage, and controllable load at the grid edge — whether that is at a home, a factory, or a business park. A microgrid can be connected to the main grid when desirable or necessary, but if a tree hits a power line, the microgrid can island and use DERs to operate independently. And finally, decentralization requires controls—digitalization—to coordinate how and when a microgrid connects back to or disconnects from the main grid. Also, as two-way power increases and mobile supply and demand from EVs becomes more common, additional sensors and controls will be needed—all requiring more and more sophisticated digital capabilities.

Jim Thomson: As we move toward a decarbonized future, there's a lot that has to be done on the decentralization side to make grid decarbonization a reality and to ensure the safe and reliable delivery of affordable electric power. In an encouraging development, we're seeing communities set up their own microgrids, often times solar-powered, to act as a secondary power source in the event of grid outages. This is a huge change from five or so years ago. If the power went out then, you just waited for the utility company to bring it back online. Today, a community microgrid can almost immediately come online and provide power until the primary grid situation is rectified. As Christian said, this is all part of smart grid modernization: being able to generate and deliver power closer to where it's consumed rather than going through miles and miles of transmission and distribution lines to get to your house.

3

What are the potential challenges in smart grid modernization that organizations might face on their energy transition journey and how can they be addressed?

Christian Grant: Most utilities are already on the journey and they're encountering a host of challenges. Two big ones come to mind: First, how are regulated

utility companies going to make money? They want to decarbonize, decentralize, and digitalize, which requires a lot of capital spend. Unfortunately, that spend drives rates up, and the increase in demand may not be enough to keep rates where they are. How do utilities achieve their goals without the cost of power in this country increasing?

Another challenge is growing competition: Historically, utilities are government-sanctioned monopolies that haven't faced direct competition in their service territories. But that position is changing, and more companies are picking away at their revenue base.

Jim Thomson: There are three points I'd add to Christian's observations. First, utilities are challenged by their existing technical architecture, whether it's for their grid devices out in the field or back-office support. Second, because of their traditional marketplace status, utilities' historical investments in technology and data analytics haven't been enough to get them where they need to be. And third, as utility companies march down the path to digitalization, they're likely to face talent recruitment and retention challenges. Utilities are competing with high-tech companies, financial firms, and others for large numbers of skilled individuals who can design, integrate, and optimize these smart systems.

4

Who are the stakeholders that will need to work together to make smart grid modernization, grid decarbonization, and the energy transition a reality?

Jim Thomson: The easy answer is everybody.

All these decisions should involve:

- Industrial, commercial, and residential customers;
- Regulators;
- Federal, state, and local governments;
- Shareholders who want to make sure the company is moving in a green direction;
- Employees, and
- High-tech companies that may want to partner with utilities in areas where it makes sense.

They're all part of a new, holistic energy ecosystem.

Christian Grant: I agree. You almost have to think of it like economic development, so it gets into an expanded set of stakeholders. There's another consideration: Solution development is an essential enabler of smart grid modernization and grid decarbonization, but many utilities no longer have internal R&D functions. They'll likely need to collaborate with both current suppliers and new partners to advance in certain areas. M&A is

another way to build or expand capabilities. Given the increasing capital needs—especially in inflationary times—a larger balance sheet may be essential to bring the right stakeholders together.

Jim Thomson: When you look beyond regulated utilities, there's a lot of M&A activity happening in the broad power sector, which includes renewable energy companies making devices for the grid, battery and EV charging equipment manufacturers, and other behind-the-meter solution providers. We're seeing private equity firms buying unregulated utilities as well as acquiring multiple solution providers in the renewable energy space and consolidating them into one large entity because when you have scale, you're better positioned to capture more business on the other side of the meter.

5

What should organizations do to prepare for what is to come?

Jim Thomson: As Christian mentioned, many utilities have been on the grid decarbonization and energy transition journey for the past decade. Many were thinking ahead and realizing that coal-fired power generation at some point was

probably going to have to be retired as plants reached the end of their depreciation schedule. Now, everything is being accelerated. Almost all large utilities and many of the medium and small ones have set decarbonization targets, but that's not planting the flag of victory. That's an indication things are just beginning. If you've got a target of 2035 or 2050 for your power generation to be 100% decarbonized, you have to start now to hit those marks. It's not just a time for statements; it's a time for coming up with concrete plans and a road map that can deliver a return and benefits for customers, employees, and shareholders.

Christian Grant: The only thing I would add—and this is difficult for any organization—is to recognize that “what got you here isn't going to get you where you need to go.” Smart grid modernization and decarbonization are going to affect everything from field operations to C-suite decision-making. The aperture for what you're willing to consider—and likely change—needs to be much wider than before.

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The clean energy transition powers on

[2022 Power and utilities industry outlook](#)

New avenues are opening

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