How the Right Enterprise Software Can Prepare Utilities for a Renewable Grid

IFS | UTILITY DIVE

Custom content for IFS by studioID

This past summer, a sweltering heat wave in California put such a strain on the state's power grid that it threatened power shortages and blackouts as residents sought refuge inside and cranked their air conditioners for relief. On Sept. 6, statewide demand reached a record-setting 52,061 megawatts, and the California Independent System Operator, the state's electrical grid controller, raised its Energy Emergency Alert level from 2 to 3, the level at which power outages become a legitimate risk.

Just days before, state officials issued a Flex Alert, sending mobile text alerts to residents asking them to take steps to conserve energy between the hours of 4 and 9 p.m., hours when the grid is most taxed. In a plea for collective action, reiterated by Democratic Gov. Gavin Newsom, who said in a video message that "the risk for outages is real and it's immediate," the alerts urged residents to set their air conditioning to 78 degrees Fahrenheit or higher, turn off lights and avoid using large appliances.

The mobilization strategy worked, but it laid bare the challenges utility companies face in responding to consumer energy demand as the climate warms, distributed renewable energy sources come to make up a greater share of the power supply (22% of the energy mix by year's end), and electrification at large – in cars, HVAC and lighting systems, cellular and broadband technologies – changes the balance of the power grid.

"It was successful," said Seth Frader-Thompson, president of the software company EnergyHub. "But you can't send out emergency alerts very often. If they had done this 30 times over the course of the summer, you would get a crying-wolf situation."

To avoid such high-drama scenarios, said Hariharan Krishnamurthy, vice president and U.S. utility lead at the Texas-based consulting and IT services firm Capgemini Americas, state grid operators and utility companies will need to rethink their digital strategies.

"There is significant transformation that's taking place with the awareness of climate change and net-zero objectives," Krishnamurthy said. "[Digitization] is a major focus area for the utilities in three distinct value chain pieces: supply, demand, and transportation and distribution (T&D)."

42%

EV registrations were up 42% from 2020 to 2021

Decentralization and Decarbonization:

The Paragons of 21st-Century Energy Models

The traditional model of power generation in the U.S. and other industrialized nations, in which power travels from its source at a coal-fired, nuclear or natural gas facility to residential or business consumers, often over great distances, is giving way to a more localized micro-grid approach fed by renewable energy. Policy changes – such as the nation's $1 trillion infrastructure bill signed into law in August, which includes $73 billion to update the electricity grid – along with the published net-zero pledges of many utility companies and consumers' growing adoption of photovoltaic solar panels, smart-home technologies and electric and hybrid cars (EV registrations, for instance, were up 42% from 2020 to 2021) are signals that this transition is already well underway.

To remain competitive in a new era of decentralization and decarbonization, Krishnamurthy said, utility companies will need to bring together engineering and enterprise platforms (IT) to integrate business functions and drive intelligent decisions. Distributed energy resource management system, or DERMS, will need to be integrated with enterprise platforms to track and monitor power from power plants and transmission lines and from aggregated networks of customers who are using API-enabled sensors, microgrids and "behind-the-meter" batteries to manage electricity generation from edge devices.

As the energy infrastructure map changes and work crews and technicians spread across vast geographies, enterprise asset management (EAM) systems will be called upon to integrate with GIS systems.

New solar grids, bidirectional EV chargers, and wind farms will mean energy will be coming from new places. Predictive asset management solutions will become increasingly important to support asset life-cycle management. How will new renewable assets be engineered and built? How will they be procured and commissioned? How will they be operated, maintained, and phased out? These are questions top-performing EAM systems are uniquely suited to answer by providing a line of sight across the asset map.

Utilities' historical business models, whereby companies own and operate core infrastructure assets and energy across the grid, is unlikely to change, Frader-Thompson said. In the years ahead, utilities will still operate control centers that run on on-premise enterprise software. It will make sense for these companies to buy billing and customer information management software and invest in systems that manage the physical components of the grid. But whereas today that software doesn't necessarily go beyond the grid edge, nor interact with much of the technology that sits outside a utility's sphere of control, the future will look different.

> "Today's systems don't go 'behind the meter. They don't go into your home or into your business. They're not going to talk to your car, your smart thermostat, your battery." The future is integrated and hybrid. It is "more automated, less blunt and will require finer-grained tools constantly in operation behind the scenes."
>
> Seth Frader-Thompson
> President of EnergyHub

Situational Awareness at the Edge and Beyond

So what will enterprise tech stacks of the future look like?

For utility companies, experts say, the concept of the digital twin – a software replica of the real-time conditions of physical and human assets – is going to become increasingly important. To draw situational awareness from disparate systems, utilities will need fluid software packages with composable architectures that can integrate new technologies.

There is a dawning awareness that utility companies will no longer be able to service their customers' energy demands exclusively through fixed assets like peaker plants. In the U.S., we are using almost twice as much electricity as in 1980. Investors are closely watching utilities to ensure they are well positioned to perform well financially in the face of increasing energy use and climate risks. A key capability moving forward, many experts believe, will be the ability to accurately model the utility business in all its aspects, from market prices to regional energy use, from customer habits to infrastructure needs, from extreme weather events to workforce utilization. This means being seamlessly connected to data wherever it lives, whether a rooftop solar cell or hydro-electric plant.

A particular challenge will be accurately modeling renewable energy supply and demand. According to the Energy Information Administration, the installed amount of PV is expected to triple by 2030. Much of this new infrastructure will be consumer-owned. To draw on it when needed, utility companies will need to enlist customers in incentivized net metering programs. User-friendly customer platforms that funnel up to more centralized control software, via APIs, are likely to become part of a shared effort to balance the energy equation.

Customer engagement strategies and communication toolkits will be crucial to educate customers – not only on the revenue they can earn from participating in demand-response programs, but the meaningful impact their energy contributions will have on grid resiliency.

The so-called duck curve, a chart first published by the California Independent System Operator in 2013, maps the difference in electricity demand and the amount of available solar energy throughout the day. Delivering electricity safely, reliably, efficiently will rely more and more on customer's storage devices, particularly during peak demand hours and severe weather events. At the same time, utilities will need predictive asset management applications that can track consumer generation patterns and predict where, when, and how solar power is being produced. Electricity generated when the sun is shining and solar power is most available is not when electricity demand peaks in the evening, but forecasting tools can help smooth out these differences.

Regulatory agencies in states such as New York, California, Hawaii are already implementing changes to grid market structures. As more states shift from flat-rate pricing models to two-way transactive models, companies will need enterprise software packages with the agility to respond. Platforms that ensure transparency, choice, and ease of use are likely to be the most eagerly adopted by customers.

Distributed Enterprise Resource Management Systems

One view of what a more fully integrated enterprise tech stack might look like can be found in models being developed by Linux Foundation Energy (www.lfenergy.org), a nonprofit technology consortium bringing together tech companies such as Google and Microsoft with energy companies such as Shell and General Electric to jointly develop software and hardware solutions for all parts of the energy industry, from generation and transmission to distribution and metering.

Executive Director Shuli Goodman said the emergence of cloud computing roughly 15 years ago led to the development of microservices – loosely coupled sensor systems or applications that can perform automated functions, be actively iterated upon and be built on open application program interfaces (APIs), which enable data to pass from one system to another through lightweight communication protocols.

Funding from the American Recovery and Reinvestment Act of 2009 was instrumental in the initial adoption of smart grid technologies and Internet of Things platforms, but utilities, until very recently, have lagged behind other industries, such as telecommunications, in representing and monitoring these technologies in their enterprise architecture.

For decades, well-resourced utilities have invested in so-called SCADA (supervisory control and data acquisition (SCADA) systems and advanced metering infrastructure (AMI) technologies, which establish complex, treelike control architectures to map computers, networked data communications and graphical user interfaces. Today, utility companies have begun to leverage this data not only for outage response and load balancing, but for asset performance monitoring and customer insights.

Those farthest along the digital transformation curve are using embedded artificial intelligence and machine learning to analyze these disparate information streams and form actionable insights, for instance, forecasting weather-related shortages and outages, monitoring the supply fluctuations of distributed loads, and drawing on virtual power plants (VPPs) when the grid is strained.

Now when heat waves, such as the recent ones in California, occur, they are treated as emergencies. Instead, they should be handled automatically and invisibly by drawing on the DERs of customers who opt in to remotely operated programs that pay them in advance for their energy contributions. That way "utilities can press a button and fire off the equivalent of a peaker plant" in times of need, Frader-Thompson said. Behind the scenes, distributed energy resource management systems "send control signals to devices to generate thermostat changes and pull energy from photovoltaic roofs and car batteries, for example."

Utility companies such as Rhode Island-based National Grid, Baltimore Gas and Electric, and Salt River Project in Phoenix already have such demand response programs in place, targeting VPPs in moments of peak demand or in neighborhoods where power networks are known to be overburdened.

More broadly, **enterprise tech stacks of the future, powered by artificial intelligence, will need the discernment and level of automation to replicate human decision making.** Operating in the cloud and built with composable architectures, they will need to monitor and analyze dozens, perhaps hundreds, of microservices. Most important, they will need to be dynamic, allowing utilities to change their underlying tech stacks in a way that builds over time.

You're Ready for Digital Transformation. Where Do You Begin?

OK, you're ready to embark on digital transformation.
But where do you start?

To begin, executives and utility managers need to think about the procurement of assets, the financial controls to guide infrastructure spending and the mechanisms that will determine how these assets (e.g., substations, transmission poles, pipelines) will be serviced across their life cycles. This requires robust, cradle-to-grave software tools for enterprise resource management and project coordination.

What assets do you need and where should you deploy them? What workers and equipment will be needed, and for how long? When will assets need to be repaired, upgraded or phased out? How can they be refurbished or recycled to reduce waste and optimize their value?

By helping professionals answer these questions, predictive software tools can serve many benefits like:

- Improving operational efficiency by "just-in-time" inventory planning, permit requests, capital outlays and hiring directives
- Enhancing workers' safety by situational awareness of equipment needs, power surges and severe weather.
- Extending asset life cycles through automated maintenance scheduling.
- Minimizing worker drive times and fuel costs through distributed mobility and dispatch solutions.
- Supporting better decision-making through real-time data insights from field locations.

How the Right Vendor Can Support Digital Transformation

Selecting the right software vendor will ensure the best results for your digital transformation journey. Here are several factors experts say are key to consider.

1. Net metering programs, such as those in California, Arizona, Oregon and Rhode Island, allow people to give back to the grid for financial benefit. Software packages need the ability to aggregate small amounts of energy from independent providers, dispatch and optimize control of VPPs during demand peaks and run impact assessments.

2. Distributed energy resources will mean new customers, new services and new market opportunities. Best-in-class vendors should offer user-friendly customer support interfaces that streamline new customer enrollment and provide equitable and intuitive compensation mechanisms.

3. ERP platforms will need to be interoperable with GIS platforms to represent infrastructure assets spread across vast geographies. Electric fleets will require new substations and feeders, as well as behind-the-meter infrastructure, to monitor usage. These assets need to be faithfully represented, both spatially and temporally, in cloud-based desktop and mobile applications.

4. Enterprise solutions should be expansive enough to cover multiple business functions: workforce management, asset management, accounting, energy acquisition and control, vendor management and data metering.

5. Edge and distributed intelligence, microservices and central support services (data collection, automation, AI/ML) will need to be tracked on the grid and built into composable software systems that can be adapted over time.

6. Software packages will need the predictive power to forecast weather-related shortages and outages and the real-time responsiveness to inventory damage to infrastructure assets from wildfires and hurricanes and quantify their effects on customers' power service.

7. Engineering teams, grid operators, and data science and analytics teams used to operate in silos. As these groups come together to plan strategic road maps and technology solutions in agile, they will need ERMs with real-time visibility and graphic user interfaces that can be understood by all parties.

8. Grid operators are used to operating their own resource data and being in complete control of it. Now, working with thousands or millions of customer-owned devices, they need to be more comfortable with collaboration and, to some degree, uncertainty. Companies will need the online messaging tools, both live and automated, to forge strategic partnerships between customer organizations and vendors.

Learn more about how our enterprise software solutions can help your business today at ifs.com.

IFS develops and delivers cloud enterprise software for companies around the world who manufacture and distribute goods, build and maintain assets, and manage service-focused operations. Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers – at the Moment of Service™. The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector. Our global team of 5,000 employees every day live our values of agility, trustworthiness and collaboration in how we support thousands of customers. Learn more about how our enterprise software solutions can help your business today at ifs.com.

studio / ID

BY INDUSTRY DIVE

studioID is Industry Dive's global content studio offering brands an ROI rich tool kit: Deep industry expertise, first-party audience insights, an editorial approach to brand storytelling, and targeted distribution capabilities. Our trusted in-house content marketers help brands power insights-fueled content programs that nurture prospects and customers from discovery through to purchase, connecting brand to demand.

LEARN MORE