MAXIMIZING THE VALUE OF
SMART GRID AND DATA

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It's wise to be skeptical when changes taking place in an industry are described as revolutionary. But the once staid and conservative utility industry has experienced so much change over the past decade, that it's genuinely difficult to find strong enough words to describe the scope and pace of the transformation — a transformation that's arguably only accelerating, thanks to a mix of technological innovation, customer demand, public policy and the ever-increasing importance of data.

A few statistics help illustrate the velocity of change taking place as the power system evolves from a hub and spoke model — large central station power plants generating electricity and transmitting it long distances — into what the Electric Power Research Institute (EPRI) calls the Integrated Grid, which includes increasing amounts of distributed energy resources (DER), such as solar and energy storage, bi-directional power flows, and a wealth of grid-edge technologies.

For example, earlier this year the Solar Energy Industries Association (SEIA) reported that the U.S. now has two million solar photovoltaics (PV) installations, up from one million in 2016. For context, keep in mind that it took 40 years for the U.S. to hit the one million mark and that SEIA projects that the U.S. will reach four million installations by 2023. Battery storage is also on a rapid growth trajectory, thanks in large part to falling prices and increased demand for electric vehicles (EVs). Bloomberg New Energy Finance (BNEF) estimates that the global market for storage will double six times by 2030.

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A DIGITAL TRANSFORMATION

As the electric power system evolves, technologies that provide transparency, improved communication, control, safety, reliability and customer engagement are becoming more important. Everything from smart thermostats to EV chargers to distribution grid sensors are all providing the data needed to improve everything from the operations of the grid to customer satisfaction.

Arguably the most foundational development in the elevated importance of data in the functioning and capabilities of utilities is the **wholehearted embrace of AMI networks.**

A report released at the end of 2017 by The Edison Foundation's Institute for Electric Innovation found that U.S. electric companies had installed 72 million smart meters by the end of 2016, enough to cover over 55 percent of American households. The same report projected that by 2020, investor-owned utilities, electric cooperatives and municipalities would install 90 million smart meters.

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Not surprisingly, the proliferation of smart meters and other grid-edge technologies has resulted in an explosion of data. In fact, according to Boston Consulting Group (BCG), utility customers are now generating as much data on the grid as they do on social media. In so many ways, all of this data about customer energy usage and preference, as well as the functioning of the overall power system, offer many opportunities for utilities that are able to translate this tsunami of data and information from disparate sources into genuine insights and actions that create value.

For example, utilities haven't always placed customer engagement and satisfaction as a top priority. But today there is a big emphasis on personalizing communications and the products and services utilities offer. There are ample reasons why utilities are working hard at reorienting themselves to be more customer-friendly. One is the simple fact that companies like Amazon and Netflix have changed the expectations around how consumers expect to be treated; the ubiquity of personalized suggestions about books and movies that might interest customers has had a big impact on how they expect to be treated by all companies, including their electricity providers.

But the increased emphasis on customer engagement and satisfaction also makes good business sense. Another aspect of having engaged and satisfied customers is meeting their demands, which increasingly includes residential and commercial solar. Evolving the grid so that it remains as resilient and reliable as ever even as more intermittent generation is added requires a larger number of intelligent sensors and devices. That's because utilities need real-time visibility and rich data in order to manage the challenge of increasingly complex power flows and an aging grid.

"Distribution utilities are looking to enhance grid visibility and better coordinate grid operations with **controllable customer resources.**"

KUMI PREMATHILAKE, SENIOR VICE PRESIDENT OF ADVANCED METERING INFRASTRUCTURE AT ACLARA

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"Distribution utilities are looking to enhance grid visibility and better coordinate grid operations with controllable customer resources. Operators are increasingly using data analytics to increase visibility of DERs and customer load forecasting. They need real–time information on critical network connections so they can act upon and provide reliable safe power," said Kumi Premathilake, a Senior Vice President of Advanced Metering Infrastructure at Aclara–part of the Hubbell Power Systems family of brands. Aclara is a St. Louis-based end-to-end smart infrastructure solutions (SIS) company that couples innovative technology with data-driven solutions to predict, plan and respond to system conditions across electric, gas and water distribution systems.

Yet another indication of the opportunities utilities see in developing a more sophisticated capacity to tap data to improve their operations and customer focus can be found in the significant investments being made in the analytics necessary to make sense of large amounts of information. In the recently released 2018 BRIDGE Index Utility Survey which queried more than 20,000 North American utility employees in a wide range of roles, the number of utilities developing their predictive analytics capabilities jumped by 42 percent since 2017.

Consultants with McKinsey have actually come up with an estimate about what the improved use of analytics can do for the financial results of a utility. Their finding: it can improve profitability by as much as 10 percent.

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SMART GRID AND DATA: THE CHALLENGE

The significant investments being made in smart meters, sensors and analytics capabilities are a tangible sign that utilities understand the importance of collecting and understanding data. "The first step in this journey is to have the data in the first place, and in the last couple of years, we're seeing a material shift there," said Thomas Baker, a Partner and Managing Director in Boston Consulting Group's Energy practice. "But, as a whole, even mature utilities are just starting to figure out what to do with the data and how to manage it."

Indeed, while necessary and foundational, the ability to instrument and collect massive amounts of data is only half the challenge. Utilities need the right data management platforms to aggregate data, mine it for insights to manage their distribution network, and serve up those insights through an interface that meets the need of all users, whether they're consumers wanting to understand how to manage their energy use or utility operations personnel seeking to better manage customer loads during peak demand periods.

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One of the biggest challenges of taking raw data and turning it into actionable information is the lack of integrated systems and common platform where data is collected and analyzed for usable, actionable insights. In part, this is the result of utilities selecting a number of individual point solutions that may work just fine on their own but don't benefit from interoperability. "Grid modernization was not centrally planned. As a result, many utilities are playing catch-up with their data analytics solutions and have a lot of different solutions deployed," said Premathilake. "Based on the conversations we've had with customers, utilities are proactively considering a more comprehensive approach to grid modernization and looking for flexible and scalable solutions to enable critical applications such as Distribution Automation."

In some cases, utility personnel who have a data analytics background and grasp the benefits they can reap from harnessing the information being collected will take it upon themselves to explore what's possible. Again, while this approach can yield some tangible benefits, it's not the sort of transformation necessary to achieve the wide-ranging improvements possible.

Achieving that potential requires breaking down data silos within utilities and establishing a level of standardization. "What you see in a lot of utilities is AMI data collected in one system and housed in one place while at the same time other related distribution-level information is housed in a different data architecture and you've got customer information housed in yet another architecture," said Boston Consulting Group's Baker. "Utilities won't be able to

effectively manage and optimize and capture all the value until some of the systems are standardized, until data hygiene is more mature and you'll be able to look at all of the data across a utility."

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THOMAS BAKER, PARTNER AND MANAGING DIRECTOR AT BOSTON CONSULTING GROUP'S ENERGY PRACTICE

One example of what this actually looks like: when a utility leverages traditionally siloed data to simultaneously balance the load on the grid while bolstering customer engagement. "During the day you have peak demand and you want to shave some of that peak so the utility won't have to pay for expensive electricity," said Frank Brooks, Jr., Aclara's Vice President for Software. "If you have a load control module in a larger data platform, you can do cycling of air conditioning and other load management steps to shave peak demand. If you also have a consumer engagement module, it can be used to opt-in customers to the demand response needed to avoid purchasing expensive electricity. This is possible when you use data from the operations side to manage the load, while also providing programs that customers can use to save on their bills."

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THE EMERGENCE OF SOLUTIONS

Last year Aclara released AclaraONE®, which is designed to help utilities fully leverage data to manage an increasingly distributed and smart grid while also improving operational efficiency, reliability and responsiveness. Spanning metering, monitoring, communications and customer engagement, AclaraONE is a single, scalable platform able to grow with the needs of utilities, as their SIS-enabled networks grow, and bring the benefits of data to all.

Of course, how the benefits of improved data visibility, usability and analytics varies depending on the unique circumstances of each utility. At Tideland EMC, an electric cooperative located on the East Coast of North Carolina, the journey towards the improved use of data began in 2012 with the installation of smart meters to better serve its 22,000 members. "Our meters were old and antiquated electrochemical meters," said T.W. Allen, Tideland's Director of Substations and Metering. "By swapping them out, we were able to decrease line losses from 11 percent to 7 percent. We also no longer needed six part-time meter readers or to pay for six vehicles."

Those immediate savings were just the beginning of the benefits for Tideland EMC. Today, Tideland EMC utilizes AclaraONE, which Allen is enthusiastic about because "I can learn anything about our system with a point and a click." For example, one of Allen's main responsibilities is system modeling in order to properly size transformers to meet peak demand. In the past, a big challenge to effective modeling was the fact that data was hard to access and infrequently collected. "You only got meter reading once every 30 days before," he said. "Now I get the real-time peak data instead of a 30-day window. It's a big help to easily get accurate, exact time of peak load for all meters to use for over- and under-sizing, and utilization of our transformers."

For the Missouri-based Platte Clay Electric Cooperative, the move to incorporate digital meters in 2017 corresponded with a change in how billing was done. "The main reason was that we were switching to demand billing at the time and digital meters can calculate the demand themselves and get it in their daily readings," said Ashley Dinwiddie, Staff Engineer at Platte Clay. "With the mechanical meters I had to calculate demand by hand and that was not fun. Sometimes the maximum demand would be calculated with pulse data and there

were times when pulses wouldn't be converted correctly and I'd have to correct those conversions for each week and each month, and find the maximum for every account. Aclara has a maximum demand finder that goes through interval data and does everything automatically."

Besides allowing Dinwiddie to focus her valuable time on more important issues, Platte Clay's use of AclaraONE has delivered benefits in terms of helping the cooperative monitor voltage, which is more important today because the cooperative has interconnected more than 100 solar arrays. Today, voltage readings are taken four times a day for regular customers and seven times a day for solar customers. "It's a lot more sensitive to voltage drop. Before 98 percent of the voltage had to go down before it would register and now we have much better visibility."

AclaraONE has also helped Platte Clay improve its ability to detect outages. "We've gotten at least 30 minutes faster at detecting outages," she said. "A lot of times our members aren't home in the day and we used to send out crews at night after-hours when members got home and told us their power was out. We are hoping to avoid that as much as possible."

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EVOLVING TO MEET INDUSTRY NEEDS

Though the challenges that Tideland EMC and Platte Clay face may be different, the importance of having a single data platform is part of each cooperative's solution. This has been made possible due to the development of AclaraONE, which is the culmination of a years-long effort by Aclara to build a comprehensive and usable solution for utilities to take full advantage of the data they collect. This effort began about five years ago, when Aclara focused its efforts on AMI, power line communications and radio frequency networks (RF).

Since then, Aclara has added a range of products including smart grid sensors and smart meters, and also expanded its AMI solutions including cellular and RF communications for electric, water, and gas utilities. The company also continues to develop its software platform for enhanced data analytics. "At the core of delivering greater automation and real-time control is the ability to communicate among the key assets on the grid. As a result, advanced metering infrastructure is a foundation for understanding what is happening on the grid, real time," said Premathilake. "If you can read a meter on the edge of the distribution grid, you can read any other assets on the grid."
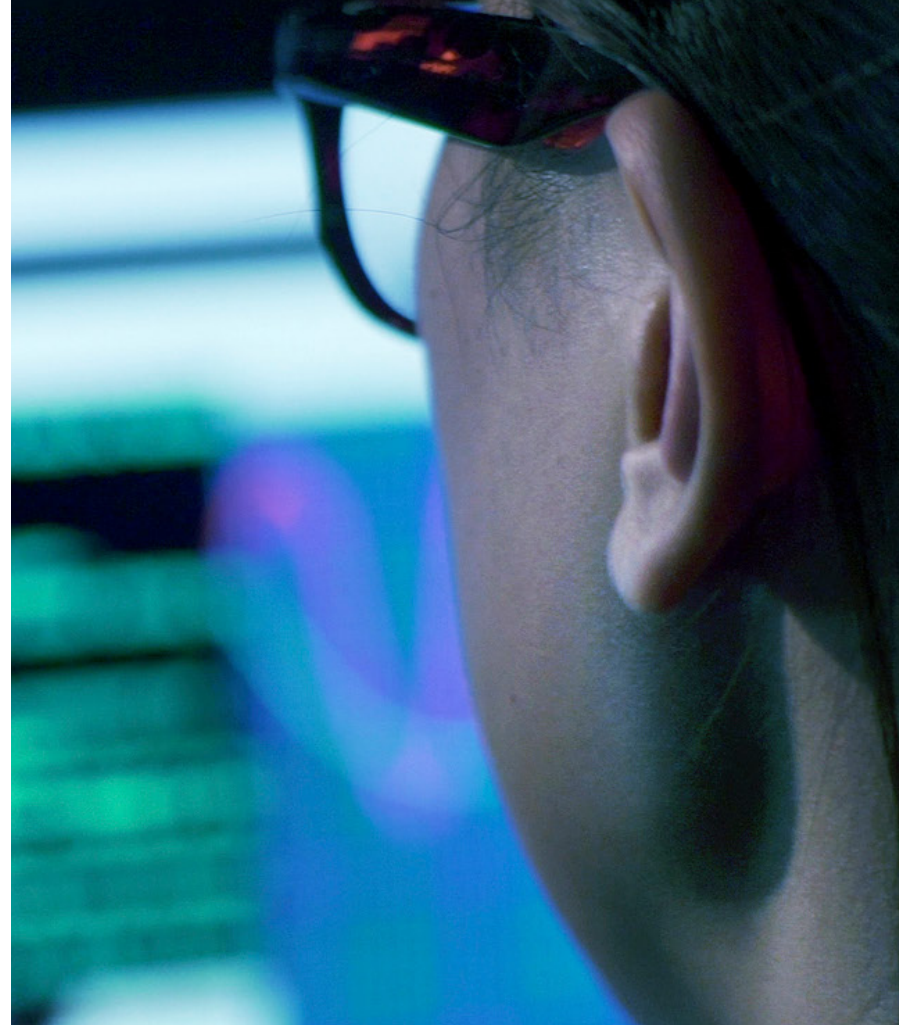
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Taken together, this has translated into AclaraONE becoming a tool for utilities to manage load control and take advantage of distribution automation and medium voltage distribution grid monitoring. AclaraONE can be a single, unified platform for utilities already relying on Aclara systems but also those that have worked with other vendors that have provided digital and legacy analog grid systems.

As the power system continues to evolve and add more sensors and grid-edge technologies, a centralized hub where information can be accessed, analyzed and acted on will become an indispensable tool. "All of the point solutions that provide benefits are a start but there hasn't been a provider that puts all of them together so you can cross pollinate the information," said Aclara's Brooks. "This gives the utilities and their customer the information they need in a simplified way so they can take action on the data they have at their fingertips."

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ABOUT ACLARA

Aclara, now part of the Hubbell Power Systems family of brands, is a world-class supplier of smart infrastructure solutions (SIS) and services to more than 1,000 water, gas, and electric utilities globally. Aclara SIS offerings include smart meters and other field devices, advanced metering infrastructure and software and services that enable utilities to predict and respond to conditions, leverage their distribution networks effectively, and engage with their customers. Aclara was recognizes for its Vision and End-to-End Solution Strategy by Navigant research, won a Frost & Sullivan Global Smart Energy Networks Enabling Technology Leadership Award and was named a finalist in three categories of the Platts Global Energy Awards. Visit us at Aclara.com, follow us on Twitter @AclaraSolutions or subscribe to our blog.

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