

2019 GRID INTEGRATION INSIGHTS



Integrating new technologies involves several skillsets, depending on where the technology is situated on the grid. Engineering, customer relations and strategy oriented utility professionals face different challenges with grid integration.

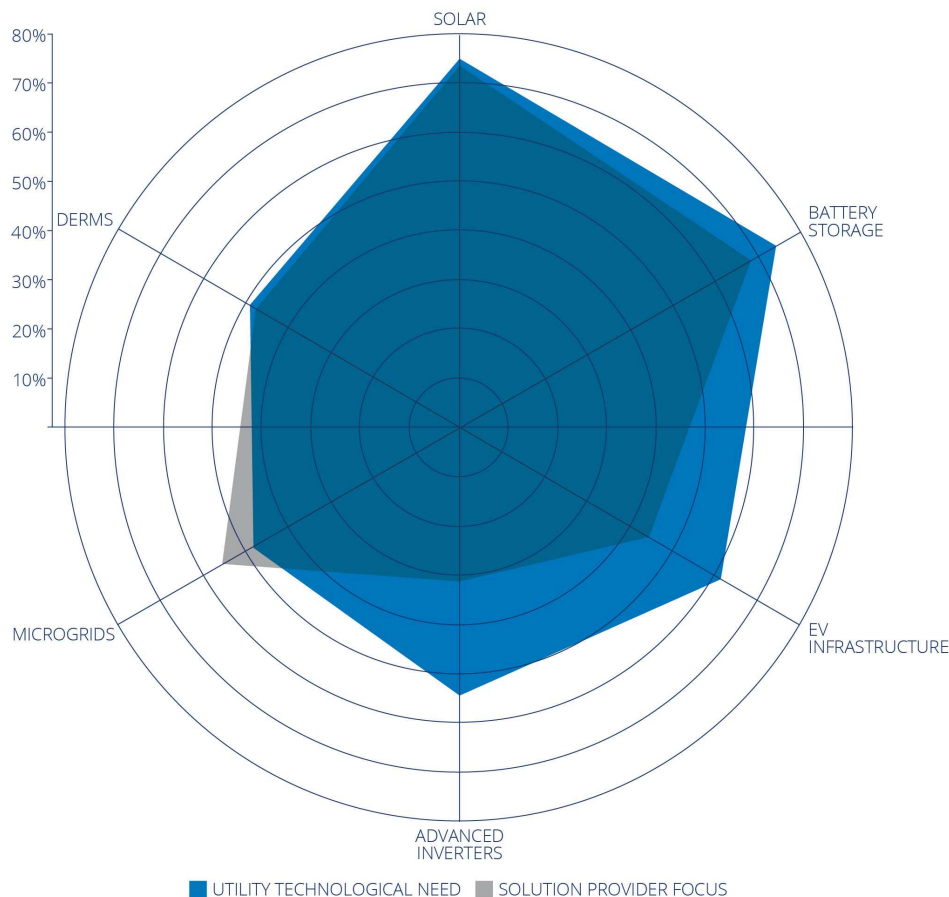
To gain a thorough understanding of these challenges, SEPA surveyed **591 utility professionals** from 193 companies across 38 states. 1,212 solution providers responses were also collected for perspective from the other side of of the grid integration process.

This report synthesizes these responses to answer the following questions:

- What solutions are utilities looking for in 2019?
- Where are there gaps in technology markets?
- What are the largest barriers to grid integration?

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FIGURE 1. TECHNOLOGIES BEING USED/EVALUATED BY UTILITIES COMPARED TO TECHNOLOGIES FOCUSED ON BY SOLUTION PROVIDERS [n=675]

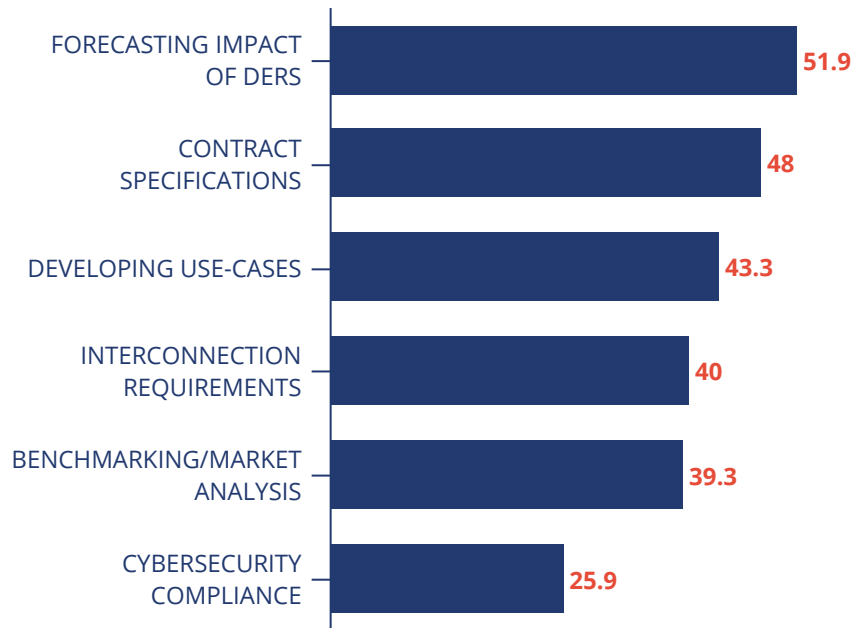


Trends & Opportunities

- **Battery storage is now being used or evaluated by utilities on the same scale as solar.** Batteries allow utilities to smooth power fluctuations from solar and other renewables. Removing barriers to pairing these technologies will open the door for more growth in the battery storage market.
- **There is alignment in our sample on utility need and solution provider focus on solar and distributed energy resource management systems (DERMS).**
- **There are significant gaps in our sample between utility need and solution provider focus in markets for advanced inverters (23.2%) and EV infrastructure (16.8%).**
- **A greater proportion of solution providers are focused on microgrids than utilities in our sample.** Developing use-cases was a significant challenge for utility professionals evaluating microgrids.
- **The majority of utility professionals that are focused on integrating new technologies in the next 6-12 months work at western utilities.** Bipartisan legislative support for renewable energy in California is the main driver behind this trend. There is also regulation around transportation electrification in the majority of western states according to SEPA's Report: [Utilities and Electric Vehicles: Evolving to Unlock Grid Value](#).

FIGURE 2. TOP CHALLENGES ASSOCIATED WITH THE GRID INTEGRATION PROCESS FOR UTILITY PROFESSIONALS BY SELECTED % [n=61]

Pre-Integration

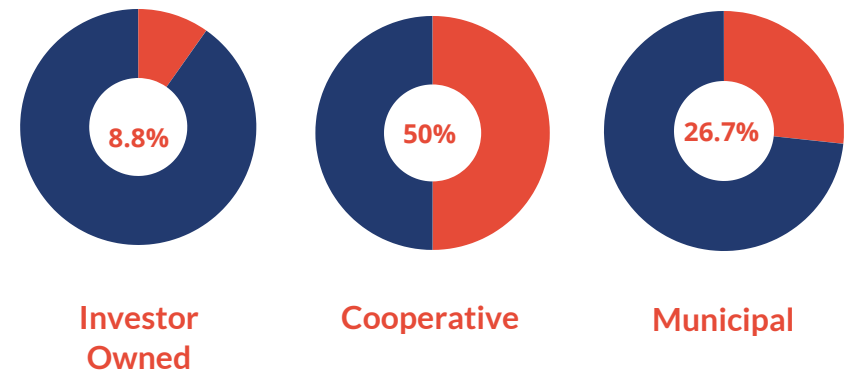


Post Integration



Performance analytics (the largest perceived challenge for integrating new technologies) is a significantly greater challenge for smaller utilities. On-premise data analytic platforms are unsuited for cost sensitive utilities with small IT shops. However, new cloud-based platforms are allowing these utilities to outsource analytics and save money.

FIGURE 3. THE PERCENTAGE OF UTILITY PROFESSIONALS CHALLENGED WITH PERFORMANCE ANALYTICS [n=14].



The other main analytics piece to the grid integration process, forecasting, is the second largest challenge for utility professionals. Forecasting impact of DERs is a key feature of DERMS, which 49.3% of utility professionals reported that their utility is using or evaluating.

Analytics is also major challenge for utilities facing load growth from electric vehicles. Forecasting impact is essential for setting up successful managed charging programs and EV-specific rates - two promising solutions to load growth.

2019 Challenges

- **34.1%** of utility professionals reported that **transportation electrification was an important challenge to their business in the next 6-12 months.**
- **Grid and resource planners are at the forefront of this challenge. 68.4%** reported that they are facing transmission and distribution constraints. What they're worried about is "clustering"-- when a concentration of EV chargers are powered by the same electrical distribution transformer causing damage and outages.
- **Designing rates and managed charging programs are the greatest challenges related to transportation electrification in 2019.** According to SEPA research, **47 EV-specific rates** were active at the end of 2017. These rates are designed to discourage on-peak charging to reduce the impact of clustering.

Managed Charging

Managed charging allows utilities to remotely control vehicle charging by turning it up, down, on or off. Rather than relying on rates to influence customer behavior, utilities are in control. By shifting load, the utilities can more easily minimize system impacts, reduce costs for customers, and enable grid services - among other benefits.

Key factors influencing managed charging opportunities:



Incentive design



Customer participation and responsiveness



Changes to existing policies and regulations



Availability of managed charging capable EV supply equipment



Clarity with the business model for managed charging, including costs and payback for both the utility and the EV driver

The ability of batteries to address renewable power intermittency is well documented. Many additional capabilities of battery storage exist and others are being piloted today. The majority of professionals reported that their utility is using or evaluating battery storage in 2019.

2019 Challenges

- **Regulatory and other barriers to markets are the largest challenge for battery storage providers (72.9%).** The energy storage market remains dependent on state policy, just as the solar energy market was a decade ago. A few states have implemented energy storage mandates and incentive programs. These programs are discussed in detail in SEPA's [2018 Utility Energy Storage Market Snapshot](#).
- **Innovation and new product development was significantly less of a challenge for battery storage providers than other solution providers.**

Trends & Opportunities

Battery storage is being used or evaluated more at larger utilities. The majority of deployments of battery storage are interconnected in California, driven by mandates directed at investor-owned utilities.

FIGURE 4. PERCENTAGE OF UTILITY RESPONDENTS USING OR EVALUATING BATTERY STORAGE [n=156].

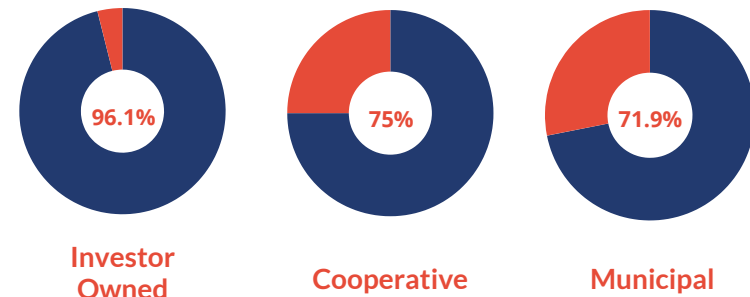


FIGURE 5. THE PERCENTAGE OF UTILITIES USING OR EVALUATING BOTH BATTERY STORAGE AND ANOTHER TECHNOLOGY



SOLAR

80.4%

[n=210]



MICROGRIDS

87.9%

[n=68]



ELECTRIC VEHICLES

89.1%

[n=75]

Utilities rely on customer programs to increase or decrease electricity demand to match their supply. With customer-owned generation increasing in many areas across the U.S., the top challenge for utilities when engaging customers is the customer program recruitment process.

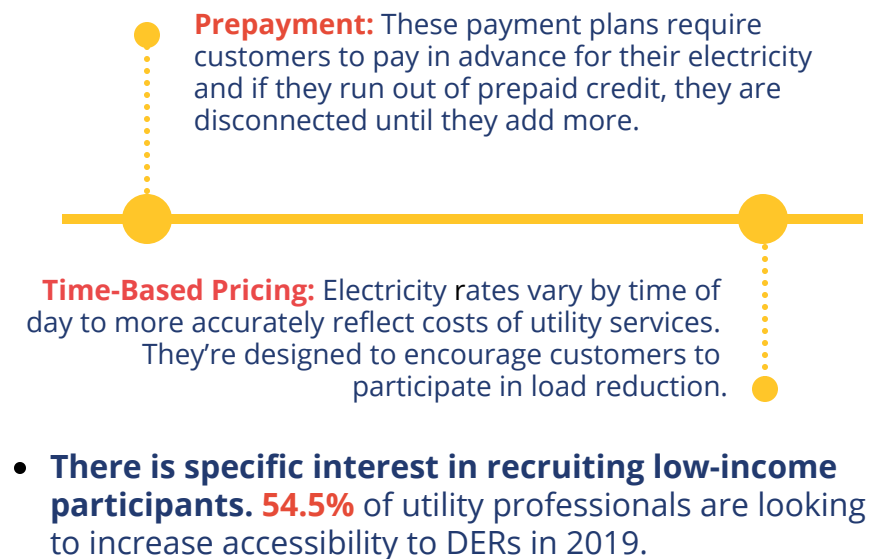
2019 Challenges

- **Increasing customer engagement was significantly more likely to be the primary task of utility professionals in the Midwest than in other regions.**
- **71.4% of utility professionals identified recruiting customer participants to programs as a challenge.** Many utility professionals have to do both the education around technologies along with the program design. Find **effective recruitment strategies from leading U.S. programs** in SEPA's Non-Wires Alternatives report.
- **Recruiting customers to programs is 40% more likely to be a challenge for municipal utilities than IOUs.** Given that recruiting is a resource intensive process, it is an even larger challenge for smaller-staffed municipal utilities.

Trends & Opportunities

- **50% of IOU professionals are exploring alternative pricing packages for customers.** Many utilities are using time-based pricing to incentivize customers to provide demand response. For deeper insight into these programs, see SEPA's **2018 Utility Demand Response Market Snapshot**.

FIGURE 6. TWO SPECTRUMS OF CUSTOMER ENGAGEMENT WITH PRICING PACKAGES

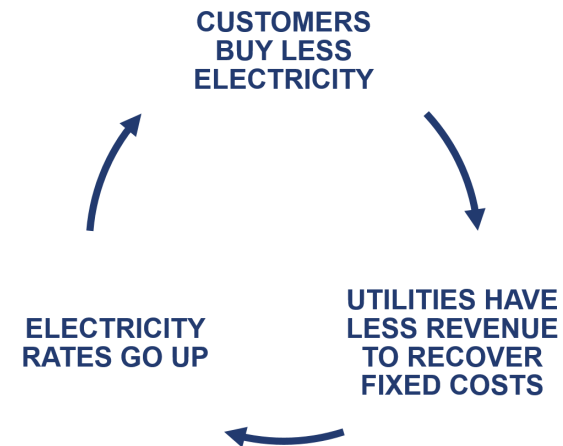


Despite wanting to increase customer participation in load balancing, utilities recognize that customer-owned generation could lead to sub-optimal solutions for the grid and, in some cases, loss of revenue. Developing a sustainable strategy for behind-the-meter technologies is the largest challenge for utility professionals tasked with creating new revenue streams in 2019.

2019 Challenges

- **81.3% of utility professionals tasked with creating new revenue streams in 2019 are challenged with developing behind-the-meter projects.** Based on [SEPA's Solar Market Research](#), utilities are evenly split between incentivizing behind-the-meter solar and having no interest. Customer-owned rooftop solar can reduce the amount of revenue that utilities generate from ratepayers.
- **77.8% of utility professionals trying to create new revenue streams are challenged with allocating fixed costs.** Revenue loss due to customers electing to generate their own power reduces a utility's ability to recover fixed costs. Inability to recover fixed costs can propel a cycle of further customer disintermediation (see Figure 7).
- **Utility professionals focused on creating new revenue streams face the additional challenge of getting approval from regulatory commissions.** New revenue streams often don't have a proven record of providing value to customers and thus have difficulty getting approval as a fixed cost.

FIGURE 7. CYCLE OF CUSTOMER DISINTERMEDIATION



Opportunities

Despite the challenges, there are several ways utilities can derive value from DERs and create sustainable business models:

- **Leveraging behind-the-meter technologies as a grid asset.** Solutions providers aggregate behind-the-meter technologies to create a 'virtual power plant' which utilities can call on like a traditional generation asset. This can reduce the need for investment in traditional generation.
- **Market for Third Party Solutions:** Utilities not only benefit from their vast physical and digital network, but also their network of customers which they can market behind-the-meter products to.

For processes to analyze current challenges and more future electric business models see [SEPA's Understanding and Evaluating Potential Models for the Future Electric Power Utility](#).

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ACKNOWLEDGEMENTS

This was a collaborative project that involved thousands of power industry professionals. I am extremely grateful to those who filled out our survey. The responses have provided invaluable information about the current environment that will be of great benefit to the smart energy community.

Special thanks to SEPA staff for their contributions with the survey design and assembling of this report: Adam Wasserman, Brad Benton, Erika Myers, Christine Stearn, Brenda Chew, Jen Szaro, Nick Esch, Maliya Scott, Janine Fiasconaro, Ian Motley, Lisa Aukward, Holly DeLoache, Jordan Nachbar and Frank Grace.

I would also like to recognize Ryan Edge for his contributions to this research and for being a great mentor and friend.

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