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2016 utilities industry trends

Power companies cannot afford to ignore energy storage

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Introduction

Utilities companies can't be blamed for feeling they are under siege. During the past few years, they've battled one "100-year storm" after another, trying to keep their aging infrastructure working during hurricanes, snowstorms, nor'easters, and floods. Although some of these incidents led to blackouts, which tested consumer patience, the increased focus on grid reliability has buoyed confidence in the sector.

However, as utilities continue to grapple with the costs and complexities of maintaining their systems, a host of new, less traditional challenges are taking center stage: rising cybersecurity threats; more demanding consumers; and, with the shift toward distributed generation, an increasing number of innovative competitors and the growing popularity of "behind the meter" (BTM) on-site generation sources, which could impact grid stability.

As an executive decision maker in the electric power industry, you already know about these threats. But you may be overlooking one technology, emerging this year, that can address some of the most troubling issues facing your sector. This technology is known by the umbrella term energy storage. Its offerings range from various types of batteries to pumped hydroelectric systems to underground compressed-air storage. In all cases, energy storage equipment warehouses power and distributes energy at a moment's notice when and where it is most needed. Some energy storage systems — batteries in particular — are installed by consumers for BTM applications. On a larger scale, this technology delivers four potential advantages:

- It can help you integrate a larger amount of intermittent renewable energy into the power grid.
- It buttresses your efforts to meet consumer and regulatory demands for resilience and reliability, cleaner energy options, and enhanced services, such as electric vehicle charging stations.
- It can fill in capacity shortfalls during spikes in usage, allowing you to defer expensive transmission and distribution (T&D) infrastructure upgrades.

Energy storage technology can address some of the most troubling issues facing power companies.

- It provides higher levels of reliability, safety, and security, by improving your control of fluctuating voltage and frequency introduced by intermittent generation.

These potential benefits are rapidly accelerating business for energy storage, a market that is expected to quadruple by 2020, reaching US$6 billion worldwide. The trend is apparent on a global scale; experimentation and implementation are taking place from Australia to Germany to Japan. According to the 2015 PwC Global Power and Utilities Survey, 97 percent of utilities executives from 70 companies in 52 countries expect a medium or high amount of market disruption by 2020 — and nearly half expect the biggest impact to come from energy storage.

Given these projections, competition for a piece of the storage pie is increasingly fierce. Companies entering this business range from industrial conglomerates to modest startups, from General Electric and NEC Energy to Stem and Green Charge Networks.

Investing in this area isn't always easy for utilities, because energy storage is more expensive than some conventional utility management and distribution alternatives. However, the price is rapidly declining, because competitive innovation and scale are reducing design, production, and material costs. For example, a recent report by Lazard forecasts that the cost of lithium–ion batteries — a centerpiece technology in the energy storage sector — will decline an average of 12 percent per year between 2016 and 2020. Moreover, U.S. legislators recently extended the Investment Tax Credit for solar installations, which can also be applied to some forms of energy storage, and many states offer or plan to offer incentives and mandates for solar equipment, energy storage, and various BTM programs. Both of these factors will likely reduce energy storage prices for utilities.

If you are a strategist or leading executive for a utilities company, you should be wary of sitting on the sidelines while storage costs decline. Increasingly, your future will be linked to how well capacity and production are balanced with variable demand, intermittent supply resources, environmental concerns, and even the occasional unanticipated systemic interruption. There are three possible approaches for acquiring energy storage systems: ownership, pay-per-need, and third-party incentives. The state of California alone offers examples of each approach.

Utilities executives should consider three approaches to energy storage: ownership, pay-per-need, and third-party incentives.

Ownership

In January 2014, Southern California's Imperial Irrigation District (IID) launched a request for proposals for energy storage after a local

blackout exposed vulnerabilities in the utility's distribution network. The district selected lithium–ion energy storage equipment that can smooth out supply and demand, support solar integration, and restart gas-generation plants after a full or partial shutdown. Commercial operation is scheduled for the third quarter of 2016; under the funding agreement with state utilities regulators, the typical residential user's bill is expected to increase about $10 per month. "If we didn't have the battery," Bruce Townsend, IID's superintendent for alternative energy, told the *Desert Sun,* "we would need to procure another gas unit, and get it permitted, and burn fossil fuels."

The most significant benefit of ownership is a high level of flexibility in determining where to site the equipment and when to use it to maximize system reliability. This has the added advantage of reducing operational costs because you can avoid running plants at peak capacity and buying wholesale power. In addition, you could potentially earn a return on your capital investment in energy storage systems. The downside to an ownership approach is that it is initially more expensive and must be approved by regulators.

Pay-per-need

The pay-per-need approach, in which you purchase a specific amount of power or capacity from an independent energy storage provider, works best for companies that have predictable needs or that are willing to make assumptions about how much storage will most likely be used, and that have the ability to recover the costs of the energy through rate adjustments. In California, however, regulators are not leaving it up to utilities to decide whether this approach is suitable for them. Instead, to support the growth of energy storage developers, the state's Public Utilities Commission (PUC) has mandated that utilities purchase a predetermined amount of energy storage capacity and that a company other than the utility must own more than half of this capacity.

Southern California Edison (SCE) was the first to announce its pay-per-need agreements, which involve four startup companies and 264 megawatts of energy storage. Among the details of this arrangement, Advanced Microgrid Solutions and Stem will install BTM lithium–ion batteries in a variety of sites to adjust local and grid distribution during peak and off-peak demand periods. To fulfill PUC regulations, San Diego Gas and Electric (SDG&E) and Pacific Gas and Electric (PG&E) are expected to announce similar joint ventures in the immediate future.

Compared with ownership, pay-per-need better aligns the storage cost paid by a utility with value delivered. But it frequently carries a higher level of risk, related to possible interconnection hazards — for example,

distribution grid imbalances — presented by the providers' equipment or where and how that equipment is installed. Since none of the winning bidders in SCE's pay-per-need deal had completed an interconnection study, SCE required providers to take on expenses incurred if the projects fell through.

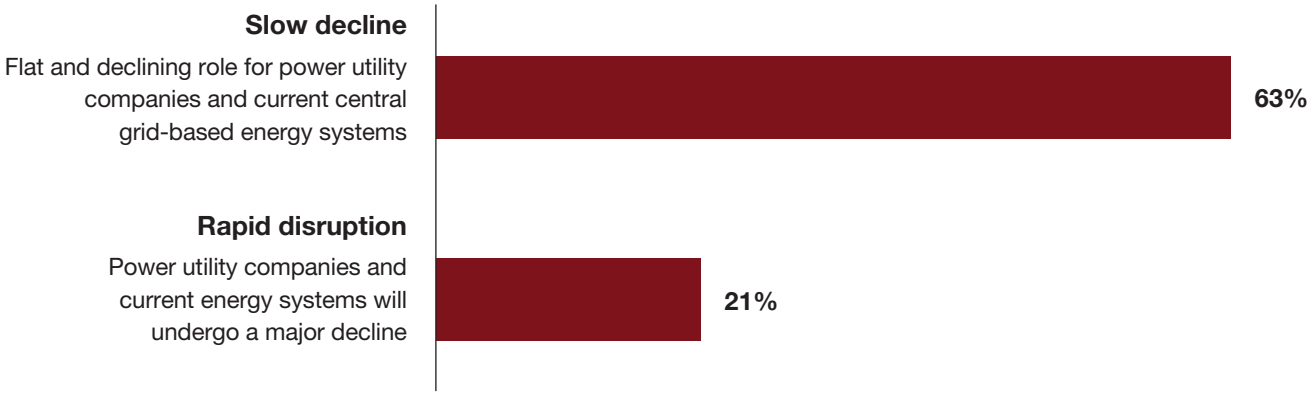
Third-party incentives

SDG&E recently introduced a proposal to encourage residential and small commercial customers to pay for their own BTM energy storage. Under this plan, which is still under consideration by California regulators, SDG&E hopes to reward customers who install BTM batteries with a lower residential energy storage rate. This novel idea was part of a larger proposal to see whether using batteries could help postpone the costs of upgrading local infrastructure, such as grid circuits and transformers.

Incentives are one of the most innovative and cost-effective ways to help drive adoption of energy storage. You can use them to gain buy-in from consumers on a relatively small scale, without requiring them to purchase a major system. However, this represents just a first step in the energy storage realm. Unlike an energy storage ownership strategy, it offers no real financial return. These smaller-scale rebate programs tend to be easier to run through regulatory approval processes, but the pricing structures can be complicated, and it is difficult to get them right.

At a time when most utilities CEOs foresee a flat or declining role for their companies…

Scenario outlook: % of respondents rating "high" or "very high" likelihood



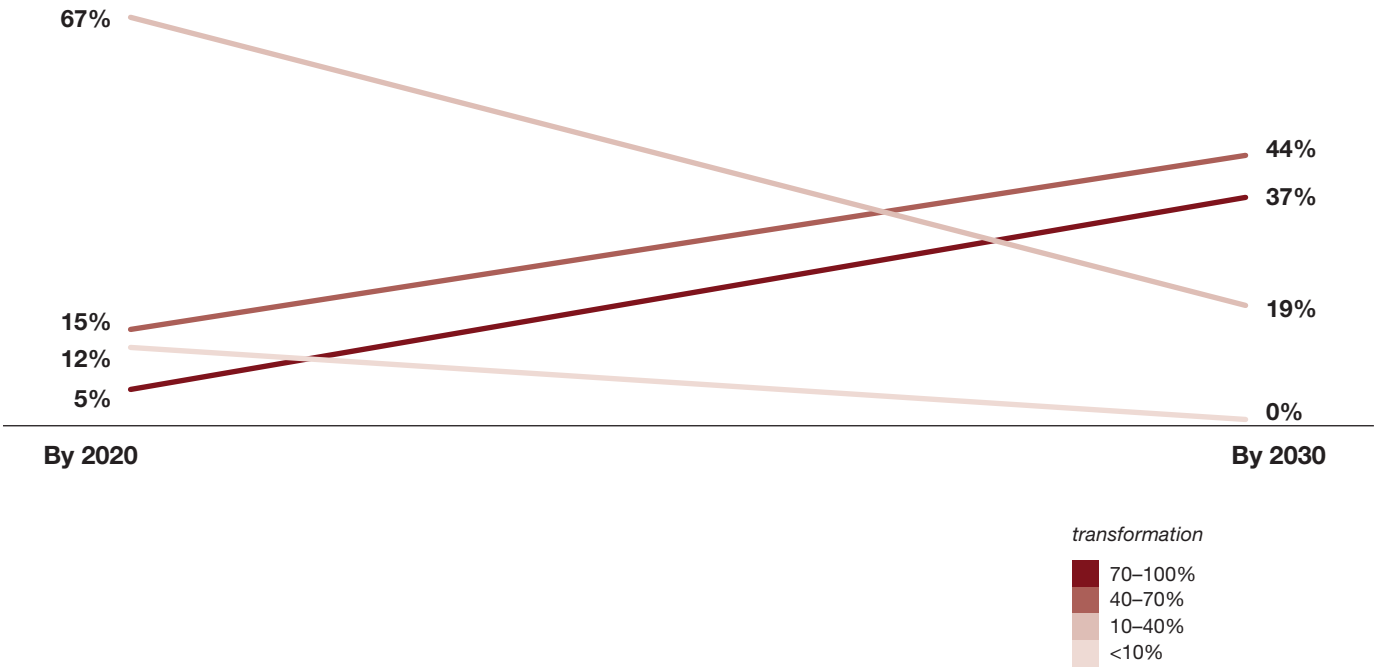
Respondents were asked to rate each scenario separately so totals do not sum to 100%.

Rated on a scale of 1–5 where 1 = no likelihood; 5 = very high likelihood. High/very high = 4/5.

Source: 14th PwC Global Power & Utilities Survey

And anticipate a rapid increase in the pace of energy transformation…

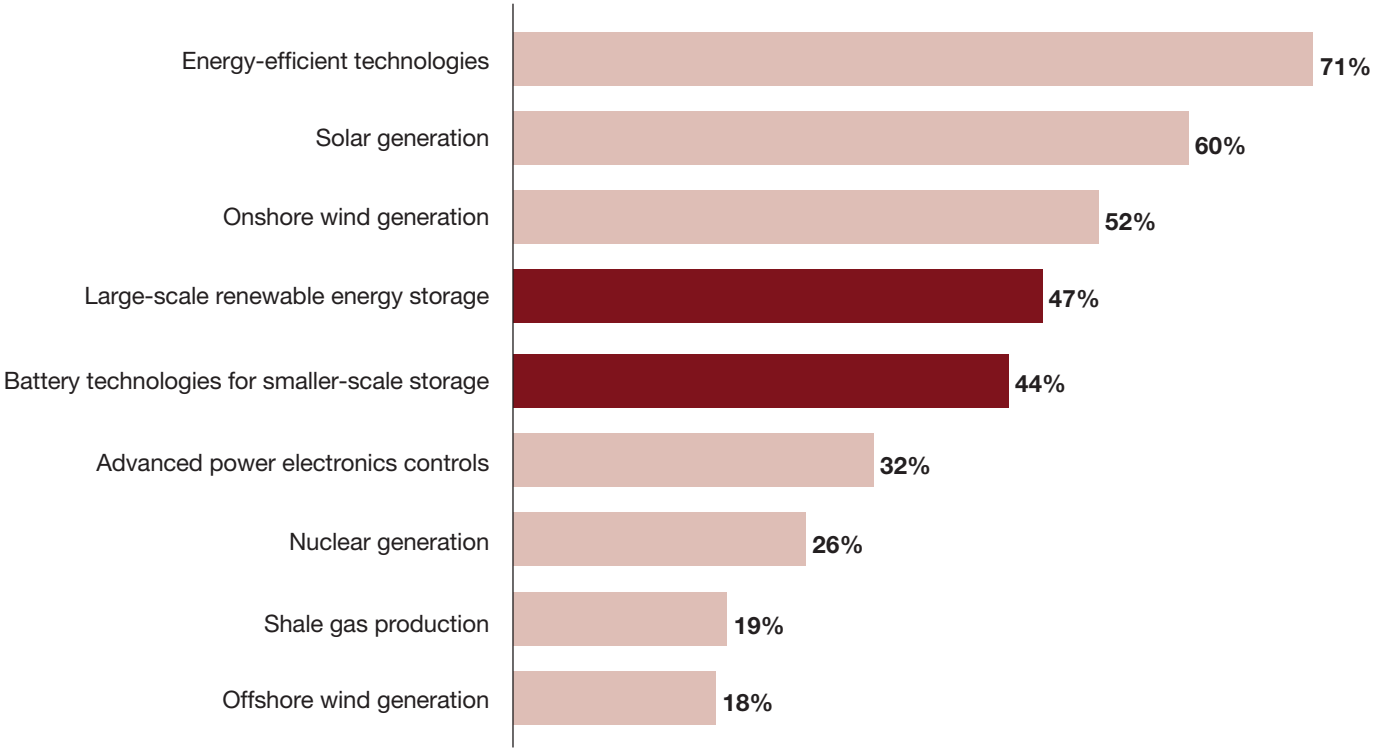
What will be the extent of energy transformation in the “home market” that your company serves?



Source: 14th PwC Global Power & Utilities Survey

Energy storage technologies are expected to play a central role in the power industry.

Which of the following technologies do you expect to have the biggest impact on your "home market" by 2030?



Rated from 1–10, where 1 = no impact, 10 = very high impact. Scores 7–10 reported.

Source: 14th PwC Global Power & Utilities Survey

What's my strategy?

As you navigate the complexities of energy storage this year, you will probably find it affecting every aspect of your business. You must determine which storage applications are most cost-effective for your region, discuss options with regulators and stakeholder groups, and decipher which of the energy storage technologies are most suitable for your customers' specific needs. Ideally, you would undertake this strategic planning in three stages.

1. **Engage your stakeholders.** Move rapidly to discuss plans with internal and external customers, regulators, and special interest groups. Become aware of their expectations and make them part of the solution, and you will avoid hiccups later on. Explain the potential benefits and options of different energy storage approaches and provide financing alternatives. Ask your stakeholders what they hope to gain. Find out if they have concerns. What measures, such as quality of service, reliability, operational efficiency, or safety, matter most to them? How will their needs evolve over the next three to five years?

2. **Assess local storage needs.** Every regional grid is different, and it is critical to determine which technologies best support your needs and goals over the short and long term. You have multiple storage technologies to choose from, each with pros and cons. Key questions: Do you need peak load management? Is your priority reliability, investment deferral, frequency regulation, or capacity support? What are the potential locations for storage (generation, transmission, distribution, or customer-sited) and the benefits of each, given your current operating model?

3. **Determine your business model and procurement approach.** Before making a final commitment on your investment in storage, figure out exactly how you will earn a return on it. Should your business model be ownership, pay-per-need, or merely incentivizing others to invest in energy storage? How do regulators and ratepayers view each option? What broader set of objectives, such as carbon emissions reduction, are you seeking to achieve?

There is no single right answer to these questions, and utilities often find it beneficial to explore multiple options before selecting an approach for deployment. In many cases, it is better to procure energy storage systems using a needs-based approach in which certain general requirements are listed but specific design elements are left up to the storage provider. This gives the provider free rein to combine different technologies — batteries, solar applications, and cogeneration, among others — to best meet your needs. By contrast, technology-specific procurement would tie the provider to delivering a specific type of equipment (for example, all batteries) even if it is not the most viable option.

The most successful electric power utilities will be the ones that can provide relatively economical, safe, and reliable power to customers. The playbook and tools available to you, as an executive in this industry, are extensive. But no matter what else you decide, energy storage will be an essential factor in your strategy this year. It is ready to be scaled, and it is a critical technology for meeting the challenges of an environment that favors the nimble and farsighted.

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