First Person—"Super System" to Coordinate Electricity, Gas, Other Utilities

The Story in Brief

Amy Ericson's executive perspective on the electricity sector is grounded in technological development, the emergence of big data, and the opportunities it presents. She also points to the need for effective collaboration, demonstration programs, and coordination with utilities providing diverse services and products, including water and natural gas.

Editor's Note: When this interview was conducted in 2015, Amy Ericson was U.S. country president of Alstom, a grid/power technology provider and rail transit infrastructure company. After GE acquired Alstom's grid/power business in November 2015, Ericson joined GE's Water & Process Technologies team.

EJ: New technologies are transforming the grid, and no one at this point can project exactly what it will look like in the future. How do you guide and plan your business during such a transformation?

Amy Ericson

Ericson: If you look at the grid now, advances in IT and telecommunications have enabled not only two-way energy flow and more engaged consumers, but also a lot more speed. A lot more data is coming in, and quicker. When we put today's grid in the framework of affordability, sustainability, and reliability, it has put our focus on integrating distributed resources and renewables and hardening the grid.

Demonstration projects are essential. We recently completed a five-year smart grid demonstration project in the Pacific Northwest with the U.S. Department of Energy, Battelle, and several other technology companies, including IBM. It involved 11 utilities and 60,000 metered customers. A main focus was transactive control. In the final report, there were a list of things that were

considered successful, and a list of things that were identified as 'we need to do better'. That naturally points to what they need to work on next. I see a need for more of these demonstrations.

EJ: What role can collaborative R&D play in doing more demonstration projects?

Ericson: There's something very special about the industry we're in. We provide electricity. It's a uniquely public endeavor. That makes collaborative research and public-private partnerships critical. You can say, 'I developed a new toothpaste. Let's try it out on the market.' But you can't do that in the power industry. It's got to be game-ready by the time it's deployed widely. We can't take chances.

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EJ: What types of demonstrations do we need?

Ericson: One is applying advanced IT and software technologies from the transmission to the distribution level. For example, synchrophasors in the transmission system transmit data 100 times faster than they did 10–15 years ago. The associated data analytics provide visibility into the status of the system. With all the demands now being placed on the distribution network, it could benefit immensely from this ability to collect data faster and to have that real-time situational awareness. That's going to require basic research and demonstration.

Energy storage is also important. A lot is happening with batteries, but they're still far from utility-scale, and we don't know the capacity limits for the different types of batteries. There are other, larger utility-scale types of storage—pumped hydro storage and compressed air. I'd like to see EPRI help us answer the basic question: How much energy storage are we going to need to optimize our electric system? It's a great modeling question that EPRI could handle well [*see box at end of article*]. This could help us figure out whether we can optimize the system with batteries, or whether we need the larger utility-scale options.

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EJ: What other critical R&D needs do you see?

Ericson: Electricity is the cornerstone for a lot of other utilities in some places—water, gas, and transportation. These are major services that are required in populations around the world. They need to be coordinated and optimized with electricity. Discussion in the electric industry should not just be about the electric system. It should also be about the systems that electricity supports. It's to our nation's benefit if we begin coordinating across sectors, with the common core being electricity. This is something I would like to see EPRI tackle.

For example, a tremendous amount of electricity is required to pump water. We talk about optimizing the load on the electricity grid. What if you now bring the water systems into that discussion? What is the best time to pump the water? It's a larger optimization equation. It involves the same concepts that deal with traffic congestion. America needs to be the first to do this on a big scale. We're doing a microgrid demonstration at the former Naval Yard in Philadelphia, again with many partners. What's interesting is that both the water and the electric utility of Philadelphia are involved.

All the other systems that are naturally coordinated with electricity can give you a bigger picture to optimize your overall energy system, and that's even more powerful. Big data and analytics can be applied to all of these. If the electric industry is able to achieve better situational awareness—knowing what's wrong instantaneously—with faster data and data analytics, wouldn't the other utilities benefit from them, too?

EJ: There could be one super system that optimizes all the sectors.

Ericson: That's what I'm talking about.

What Is the Optimal Amount of Energy Storage for the Grid? The Answer: Not So Simple

"I've been asked this question a lot over the last decade," said Haresh Kamath, EPRI's program manager for energy storage. "It's a natural question: Storage developers want to know the market size for storage, and utility managers want to estimate how much they will have to pay. However, finding an answer is not trivial."

To begin with, the meaning of *optimal* can change depending on the context, especially in view of the many tradeoffs in grid design. "Deploying a significant amount of storage may allow more renewable penetration on the grid, but may also make the grid significantly more expensive," said Kamath. "The goals have to be identified before we can define what 'optimal' really means."

Even after the goals are decided, it is still possible that there are easier or more cost-effective ways of achieving them than storage. "The choice isn't simply whether we use storage or not," said Kamath. "In some cases, we have to choose a technology from a portfolio of options, and in other cases, we have to choose a combination of technologies. Finding the best answer can be extremely difficult."

These answers can be explored through appropriate modeling. But it takes significant time and effort to build models sophisticated enough to accurately estimate optimal energy storage deployments across the grid, factoring in all possible storage technologies and applications, and ranking them against non-storage solutions to the same problems. Such models have to be updated continuously as new technologies are introduced, and as costs and features of other technologies change.

According to Kamath, other investigators have published storage market size estimates based on tenuous analyses. "Every so often, you will hear someone make a statement estimating the storage market to be worth $3 billion, or $30 billion, or $300 billion," he said. "The variation in the values is a red flag that the studies lack rigor."

In a 2009 analysis, EPRI estimated the overall market size of storage by evaluating its value for various types of projects and calculating how many of those projects are possible in a given service territory at a given cost.

"We have not updated the estimate because we have focused our research on the economics of individual projects, which we believe is more important and immediately actionable than general market projections," said Kamath. EPRI has recently developed models that can analyze project costs and benefits, helping utilities and regulators decide whether to invest in storage. These include the Energy Storage Valuation Tool and its successor, the Storage Value Estimation Tool, expected to be available in late 2016. The former was used in 2013 to inform stakeholders involved with a California Public Utility Commission regulatory proceeding on the cost-effectiveness of storage.

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