



Perspectives on smart grid from leading solutions providers

In the following article, top managers from leading equipment vendors and solutions providers discuss the future of the smart grid industry. The article draws on interviews with Bob Gilligan, Vice President of Transmission & Distribution for GE; Laura Ipsen, General Manager and Senior Vice President of the Cisco smart grid business unit; Cameron O'Reilly, CEO of Landis+Gyr; and Eric Dresselhuys, Executive Vice President and Co-Founder of Silver Spring Networks.

How are utilities currently deploying smart grid technologies?

Bob (GE)

One utility that has gotten a lot of press (and deservedly so) is Austin Energy. They defined future services together with customers and re-mapped their systems. Doing this let them understand what will be needed to provide the services. Utilities have to shift their paradigm—they're not just here to provide energy to customers. They have to provide energy-related services. As customers implement solar PV at their homes, for example, how does that change the services they need from the utility, and how the grid needs to work and be managed? Think about PHEVs and the fact that there will be a

high concentration in Austin. Think about mobile users and how the utility will need to interact with them.

Laura (Cisco)

Deployment is occurring today in pieces and in pilots. The stimulus funding in the U.S. is creating more appetite for scale across applications. Prior to the stimulus package, there was traction but more in a siloed manner. Now the new focus is on testing integration across applications and scale, as some of these smart grid applications have yet to attain significant size. The stimulus funding will have a positive impact, helping to test possible technologies, current policies, and what works and what doesn't.

The whole logic around dynamic pricing draws from the efficiency of markets

Most technology today is deployed in forms adapted for specific uses. Cisco has seen this story play out before and sees real benefits in converging infrastructure across applications. The good news is that we see utilities beginning to think more strategically and recognizing the need for convergence, but currently they still act quite tactically.

What will accelerate the adoption of smart grid technologies?

Cameron (Landis+Gyr)

The question for me is why has adoption taken so long? You could say that our progress has brought the electricity industry into the 20th century, not the 21st. Most utilities only find out that their customers are using their product when they *don't* call to complain that they have an outage. In most other industries, users get real-time feedback and pricing offers based on usage, which allow them to better manage their consumption and budgets. The industry is very much in the dark ages on this.

Yes, we need standards; yes, we need the PUCs [public utility commissions] to push adoption. However, I think ultimately the killer application that will drive innovation is variable pricing. The ability to save money will drive massive innovation. You can't do dynamic pricing without AMI [advanced metering infrastructure]; you can't do that without remote management for customers. The whole logic around dynamic pricing draws from the efficiency of markets. If

people want to run their air conditioning all day cooling the cat when no one's at home, fine. If you don't have to buy wholesale power at peak times, however, you can save money.

Bob (GE)

For grid applications, utilities need an economic model that makes sense. Utilities have gotten comfortable with advanced metering infrastructure as a solid economic investment. They want to be sure that additional infrastructure investments will be as solid, with at least a 10-year horizon. Extending the communications network with AMI, enabling digitized substations and sensoring, so you can see the status of the network—we should start there. Our econometric models describing returns for grid applications depend on defining a price for carbon and a price or penalty for reliability. And [they show] a need for time-of-use pricing for energy consumers. If we address these three things, I think we have a business case for making the grid smarter. The payback was generally under 4 years—in a utility environment, that's good for a return on capital deployed.

Laura (Cisco)

Regulated mandates help make this market move. Just look at the European Union with its directive related to smart metering deployments. There will need to be new regulations that utilities respond to. Cap and trade is one example that might play

out in the United States. This will create a substantial potential for investment. The GreenTech manufacturing bill in California is another example. It can create a huge export opportunity. President Obama has named CleanTech as a driver of job creation. The government investments that are flowing in are an accelerant for adoption, and contribute to establishing the smart grid reference architecture as a blueprint.

One area that really needs clarification is what I call “gridonomics,” or the intersection of grid policy, technology, and economics. On the policy side, regulation, legislation, and standards play large roles in influencing the industry and will have a significant impact on the smart grid. On the technology side, there has been a great deal of innovation, but it is not yet clear which of these will emerge as winners. And from an economic point of view, the incentives in the electric power industry are distinct from those of other industries and can change depending on geography and ownership structure. The key here is that utilities and other market players will need to make the smart grid case along all three “gridonomics” pillars.

Eric (Silver Spring Networks)

The other factor is risk. In the AMI business, we’re seeing a massive ramp-up. The industry finally sees it has an open, two-way Internet protocol-based network that works. We’re seeing utilities decide that the risk profile is dropping. They believe they have enough bandwidth and overhead that they can hang a thermostat or distribution automation device off the network and it will work. Standards help to lower the risk. If you break apart the functionality and pick each item

based on the standard approach for that task, you end up with a much better solution. In the past, utilities went with a single vendor to minimize risk. They’re finding that picking the best in breed built on a standard platform is actually lower risk. We’ve found that accelerating adoption is not just about selling gear or licensing software, but providing a solution where we de-risk by offering managed service, a managed network operations center, and the like.

What do customers want?

Cameron (Landis+Gyr)

In most markets, more information leads to more efficiency. Many utilities today don’t know who their profitable residential customers are. It’s hard to say if demand is based on what we have today. Did we all say we wanted a word processor or spreadsheets? No. All we can do is look at analogous situations and ask whether people reacted to more information, such as price signals, and whether they benefitted from it.

I think there will be big innovation in home automation, which will not demand much change in consumer behavior, but will see technology doing things seamlessly. A lot of people say that electricity is not price-elastic, but there is a price movement that people will respond to! Without automated technology, however, the market for price elasticity is too small. I don’t see people running around turning lights off or doing laundry at three in the morning, for example. Within 5 years, I do see houses that have this in-home technology. There are business models that might have a third party between the customer and the utility. What we’re doing today, however, is pretty basic stuff—basic switching and automation.

Eric (Silver Spring Networks)

The home and customer-facing applications will be the bigger driver for smart grid over time. In a macro sense, we have to move customers from being rate payers to being participants. My conclusion, from pilots that didn't work, is not that customers don't care—because I think utilities have been limited by technology that couldn't provide what they needed. If retailers can only differentiate on price, that's what you'll get. However, if you look at an example like Oklahoma Gas and Electric, where customers have in-home displays [IHDs], 96 percent customer satisfaction rates, and 15 percent savings on their bill—that's where the market starts to take off. People didn't know they wanted an iPhone, but when they saw it, they knew it was cool. Electricity probably has the highest penetration of any commodity or service in the world—why do we expect everyone to behave in the same way?

What do you see as the next wave of smart grid applications?**Cameron (Landis+Gyr)**

I think you'll see more integration of AMI and DA [distribution automation]. I don't think you'll have people building separate AMI, demand response, and distribution automation networks. You might have two networks—one that is general and one that is mission-critical. I think you'll see AMI players broadening into distribution automation and smart grid, and you'll see us broadening into smart grid, with others coming into the market we're playing in. Some utilities are going with a modular approach, where they buy a meter from one vendor, a network from another and an MDM from a third. In some circumstances, modular may offer more functionality, but there are cost advantages with integration. In general, I don't

think there will be one approach that succeeds. That's why our strategy has been to be prepared with either solution depending on how the market evolves. For example, we have taken very different approaches in working with Oncor and with PG&E.

Eric (Silver Spring Networks)

I'd characterize the next step as being all about the integration of distribution automation, AMI, and distributed generation. How will these things come together? They used to be separate initiatives, but now they need to be managed as one. You'll see the normal market evolution—some big guys will fade away, some newer companies will rise to market leadership. The taxonomy is already starting to blur—product definitions are getting fuzzy and customers look for something that is broader. We'll see broader solution sets, and each player will make up its own mind about the most effective way to get that breadth—either through partnerships, acquisition, or building the functionality themselves.

Laura (Cisco)

Telco service providers went through a period in which their networks started carrying things that looked really different from what happened in the past—voice, video, rich applications. The same thing could happen in the utility world. VoIP has, for example, taken the cost of voice service down significantly. What will happen in the utility world when zero-net energy consumers begin to appear? Will anyone be able to monetize the new models? Certainly Google and Microsoft are making moves in this space. It is still unclear what the revenue model is. We believe that significant innovation will be seen at the top in the application space.



How do you see the market evolving across the united states and around the world?

Cameron (Landis+Gyr)

The smart grid market is not like the iPod market. It's not like one product will get the market going everywhere equally. However, utilities are heavily influenced by each other. European utilities are looking more and more to the U.S. Two years ago, our people in Europe hadn't really heard about smart grid; now smart grid is a global phenomenon. Two years ago, people thought AMI and MDMS [meter data management systems] were only happening in the U.S. Now Europeans want to know what is going on in the U.S. and how that will affect their plans. If 30 to 40 percent of business-case benefits (such as the DSM [demand-side management] benefits) are not delivered, things will be different. If these benefits do arrive, however, you'll see behavior in Europe like what's going on in the U.S.

Bob (GE)

Different geographies have different needs and priorities. Looking at California, I expect them to move rather quickly to a demand response solution that engages consumers and tests

different technologies in the home. In Hawaii, they are paying \$7 billion to import oil. They need high penetration of renewables to reduce their dependence on foreign oil. If you look at American Electric Power, they are concerned about reducing losses and driving efficiency in their network. If you go to Africa and look at Eskom, there is a big mismatch of supply and demand, yet there are huge losses in their delivery system. They want to deal with tampering and inefficiency in their network.

China and India have different needs. We see China implementing a smarter grid with communications-enabled electric meters, but less concerned with communicating into the residence. That hasn't been something they are focused on today—consumption by consumers is relatively small compared to more mature economies. Though systems can leapfrog, what they are trying to solve is different.

Laura (Cisco)

Many economies are facing similar problems. At the highest government levels, we see a real intersection with smart grid and other trends to develop smart connecting communities. There

may even be a leapfrog effect in some economies as they have more of a Greenfield opportunity. Look at Jeju island in South Korea as an example where the notion of smart connecting communities will be tested.

The idea of connected communities can cut across big sectors: energy, healthcare, security. It is not clear how it might unfold but the utility will

clearly need to be proactive here to prevent being disenfranchised. I'm not saying there will be a single converged communications infrastructure across all these industries; but the development of the smart grid may not play out purely from an energy provider point of view. Providing services to consumers and communities to allow them to become more sustainable and interdependent will be important. ○