The AMI Scorecard: Not All Smart Grid Deployments are Created Equal

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SIX LESSONS FOR SMART GRID BUSINESS SUCCESS

By Peter V. Poggi

Which companies will win or lose in the smart grid game? The electric power grid is in the early stage of a sea change, and hype about smart grid is at a high. Investment money is pouring in searching for a “killer app” and profits. Truthfully, nobody knows which business models will survive the Darwinian contest, but companies heeding these six lessons can increase chances of success.

This article makes three predictions. First, investment focusing on improving utilities’ costs and revenues will do better than those targeting customer demand response. Second, organizational transformation will be more important for business success than technological prowess. Third, companies with the ability to leverage international innovation internally and to launch global businesses will be the winners in the smart grid space.

What exactly is the smart grid? There are myriad definitions. This article defines smart grid as “the utilization of sensors, communications or computer technologies to enable greater efficiency in the generation, transmission, distribution and consumption of electricity.” In general, the smart grid’s purpose is to 1) reduce utilities’ costs (losses) and improve return on investment (ROI), and 2) increase service and benefits for consumers.

Many smart grid technology companies target #2 – the consumers and the potential data mine associated with demand response. Some important issues include security, privacy, regulations and standards. However, this article focuses on #1 – on utilities, with the premise that reducing losses and improving ROI will have a more immediate impact, and is thus a shorter path to smart grid business profitability and success. The new system will be built on the shoulders of the old infrastructure, dictating the winners and losers.

DEMAND RESPONSE DREAMING
First, some quick facts about demand response. Thirteen to sixteen million smart meters have been installed in the US, out of a total of 135 million meters, or 10-12%. However, surveys show that most consumers are unaware of potential benefits. They also have doubts. Consumers have filed lawsuits in Texas and California. At September’s Smart Energy International conference in San Jose, CA, a local municipal utility mentioned call-ins from customers complaining about higher pricing from smart metering, despite the fact the utility has yet to install their first smart meter.

Potential household savings from managing peak time usage have been estimated at anywhere from 10% to over 20%, translating into average household savings of about $200 a year. Unfortunately, new smart appliances and home area network (HAN) equipment also costs up to that amount and more, offsetting the first year’s savings.

A key point is that to get an ROI from consumer experiences efficiently, utilities need to get their investment rolled into their base rate. Given the regulatory, consumer education and other challenges, how long will a shift in retail markets take? Five, ten, fifteen years? Can smart grid start-up companies endure a long introductory period? Sure, some utilities gain the benefit of avoiding the cost of building more generating plants, but how strong a driver is “avoided costs”? And what about the utility that does not have integrated generation and buys in its power? To be sure, smart grid allows the management of distributed generation, and new green energy sources, which tend to be distributed, will be an important driver. Prediction #1: In the short and medium term, smart grid companies will be more successful by improving utilities’ costs, revenues and ROI rather than focusing on DR.

UTILITY INVESTMENT AND PERSPECTIVE
The good news is that the US is spending more on the grid. Annual investment in the transmission network is $11 billion, up from $7 billion in 2005 and $2 billion in 1997. The bad news is that 70% of transmission lines are over 25 years old. We see a similar story on the distribution side. Of the over 40 million distribution transformers, about 70% of them are older than 25 years.

Encouragingly, US utility investment in smart grid technologies is now $10 billion annually, and is expected to continue for the next 20 years. Additionally, there is an equal amount of money spent by contractors, building and facility management and industry on smart grid. Total US investment in the smart grid is over $21 billion annually. Looking globally, investment in the rest of the world is approximately three times that of the US level, stimulating much activity from which to learn.

What is the motivation for utilities to implement smart grid? A recent survey by Black & Veatch revealed that the traditional operational goals of “reliability” and “cost” are the drivers of even smart grid projects.

And what did Black & Veatch find as the biggest obstacle hindering smart grid deployments at utilities? By far the biggest issue was “lack of identified benefits”. So one of the key components for driving success at utilities is quantifying the benefits. Where is the “sweet spot” of quantifiable benefits in reliability and cost? Three segments stand out as candidates for the sweet spot: 1) distributed automation, 2) investment protection, and 3) energy losses.

THE SWEET SPOT
According to Greentech Media 77% of North American utilities ranked distributed automation as the top smart grid application. Distribution automation offers the possibility of a self-healing network where intelligent automation reduces the scale and duration of power interruptions. For example S&G Electric Company’s IntelliTeam allows service restoration in the 0-5 second time frame, increasing reliability rates and optimizing power flow control.

Investment protection leverages the return on the existing, massive T&D infrastructure. For example, digital relays have improved protection by allowing localized decisions and high speed response. Monitoring transformers with intelligent sensors is another investment protection example.

Losses can be categorized into three groups: technical loss and two non-technical loss areas, electrical theft and financial non-payment. Together these are a $25-plus billion opportunity in the US. The Edison Institute estimates that 6.1% of total generation (239 million MWh or $20 billion) is lost in the system itself. Electrical theft is estimated at 1.5% in the US, and is as high as over 20% in some
Utilities' product investments reflect these sweet spots. Zpryme Resources breaks down the US's annual $21.4 billion smart grid investment as follows: Smart sensors and devices - 52%, IT hardware and software - 22%, Smart grid integrated communications - 16%, Smart metering hardware and software - 10%.

Lesson 1: To succeed in a “flat world”, companies need to transform their business models to optimize innovation globally.

Thomas Friedman coined the term “flat world” to describe how knowledge and innovation in one part of the world travels very quickly to other parts with today's internet and modern communications. We can learn from the diverse cases where successes have already occurred.

* Italy's utilities are using smart meters for load curtailment to assure customer payment. Regulations prevent cutting the power of a customer who hasn't paid. But with the ability to turn down the current, utilities can incentivize late paying customers by limiting the wattage to three light bulbs. 
* Germany has deployed smart meters widely. They don't have meter readers (who would be unemployed by smart meters), and so there is no resistance from unions. 
* Jamaica Public Service estimates electrical theft at 14%. Their smart grid investment will payback in less than one year. 
* Toronto Hydro won awards for launching a customer education programme before they turned on new billing programmes via smart meters. 
* Burbank Water and Power in California is deploying smart meters to monitor water loss on their system as well as to manage electricity. 

Tips:
* Engage with your peers internationally when developing your smart grid road map. 
* Skype and webcam quality have increased dramatically in the last few years. This technology is inexpensive to install, saves money, and encourages global communications.

Lesson 2: Smart grid successes will impact utilities' costs and revenues directly in a measurable way.

Transmission lines are known to be major energy leakers, but quantifying hard savings can be difficult. That's one reason why lower energy losing trapezoidal wire (TW ACSR) conductors, available for decades, have generally been ignored.

South Korea succeeded in reducing its T&D losses by 40% in 30 years by standardizing voltages and reducing conductor and transformer losses. Their T&D system now has the lowest losses in the world, proving that loss reduction can be achieved if hard savings are quantified.

Tips:
* Utilities make less money when they sell less electricity. 
* A peak at the near-future may be in Cartagena, Colombia. Smart grid is used to combat energy theft and for prepayment plans. 
* Prepayment plans offer an attractive, positive cash-flow business model in the UK. 

Lesson 3: The existing T&D system is balkanized.

The US has 15 transmission voltages running from 23 kV to 765 kV, all sorts of equipment manufactured over the past 50 years, and myriad conductors. Interconnections can be overwhelming in their diversity. As significant, company information systems can be as fragmented. What (and how) are you going to do with all the new data once you get it? 

Tips:
* Companies selling smart grid products need more variations, sizes and flavors than ice cream to conquer T&D territory. Yes, standardize as much as possible, but also recognize that some customization is necessary. 
* A company must have the willingness to modify its products and applications and adopt new procedures. 

Lesson 4: The T&D system is old, as are its people.

Lack of new engineering graduates entering the industry has increased the average tenure. Walk into a T&D department nowadays and you will likely see only gray hair. T&D people have been indoctrinated not to take risks. Their focus has always been on reliability.

Advanced metering infrastructure (AMI) and supervisory control and data acquisition (SCADA) have been around for decades. Silicon Valley did not invent them. T&D folks need to have incentives to help drive innovation. 

Tip:
* Create metrics to measure and reward corporate strategic alignment right down to the individual engineers in each department. This is difficult, but is the best way to drive your strategic results.

Lesson 5: The most difficult part of leveraging global smart grid innovation is not international, it’s internal.

Each utility has its own unique culture. Its people, history, processes and location make it a bubble. At different locations, there may be different siblings of the culture. Introducing new technology can generate conflict between sites and departments. Some communication and cultural barriers already exist, but in addition, people care less if a project is perceived as having less to do with them. This can impact budgets and allocation of resources. Engineering projects become more difficult. 

Tips:
* Strive to get as many department heads at each location to visit an off-site implementation as early in the project as possible. This will help reduce the internal resistance and accelerate the project timetable. 
* Cross-functional teams are highly recommended for alignment. 
* A broader strategy to consider is what Pacific Gas & Electric is doing: centralizing their initiative to minimize interdepartmental friction, but including people from many different departments. 

Lesson 6: Learning from and undertaking a global innovation journey means changes and a global mindset.

Investor John Doerr commented in *Industry Week* magazine: “If you look at today's top companies in clean energy technologies – in wind, solar and advanced batteries – only four out of thirty are American.”

The testing ground of many smart grid products and applications will be outside the US. The successful smart grid businesses will be there too. Companies with global vision and experience who can transform their business model into a global engine are the ones to watch in the smart grid space. 

Tips:
* There will be attacks on egocentric company systems and views. People who have helped create these systems and views may become obstacles and be forced out. 
* Based on historic example, there will be political fallout as your company transforms. The human resources department needs to be involved and ready to assist with change management. 

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