“Digitization of the electric grid: the enabler of energy efficiency and economic gain”

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Keynote Address
by

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Less than nine months ago, I presented a vision of the smart grid at a Department of Energy workshop in Washington, D.C. Yesterday we began deploying the first of more than two million smart meters over five years across our electric service territory.

After 130 years of little change in the electric industry, the rise of the smart grid within our industry and in the public consciousness has been meteoric. Nine months ago, I, and those active in smart grid, were still trying to convince people of the value of a smart grid. Now, Congress and the President are talking about it. And those active in smart grid are no longer just talking about what a smart grid will do SOMEDAY, but are acting on it today. Because someday is now.

The dialogue has spread so fast that we don't have a common language yet. There's talk of a smart grid, an intelligent grid, Intelli-grid, the Intelligent Utility Network, smart meters, advanced meters. The terms don't have a clear definition. If you ask various people what a smart grid is, you'll get various definitions.

Those of you who attended the reception at our Technology Center Sunday night witnessed the unveiling of our brand of integrated advanced meter and future smart grid technologies as we add Energy InSight^{SM} to the list of smart grid names. The name demonstrates the power of knowledge.

Showing consumers the facts of their energy usage will give them useful insights to save energy and money. From a utility perspective, smart meters and smart grid technology will make the grid more visible and transparent to give us insight into the health of the grid. For both consumers and utilities, knowledge is not just power, it is cleaner, lower cost, more reliable power.

CenterPoint Energy has traveled fast and far along the smart grid road. Four years ago we began by testing BPL for data speeds just to see if it would work. In 2005, we built our Technology Center to test and demonstrate the technology.

A lot of the system components didn't exist when we started down this road. We joined IBM's Intelligent Utility Network Coalition as a charter member as well as the ZigBee Alliance and other infrastructure organizations to help design the concepts of smart grid for the distribution system. We developed relationships with IBM, GE, iTron and others while working with the Public Utility Commission of Texas and stakeholders in the Texas electric market to develop rules for standard deployments of smart meters by Investor Owned Utilities in the state. We selected vendors for smart meters, the communication system, backend systems integration and home area network, or HAN, technologies. Last December, following a pilot deployment of 10,000 smart electric meters, the PUC granted us approval to roll out 2.4 million smart meters across our territory.

This month we begin the installation of that two-way communication system with in-home connectivity.

Beginning this fall, our meters will be able to interact with energy-aware thermostats, air conditioners, washers, dryers, TVs and other ZigBee-enabled appliances to help customers monitor their consumption and operate appliances remotely. In-home energy monitors have already arrived, and while a few years ago there were no ZigBee-compliant thermostats, now every major manufacturer has a ZigBee-certified thermostat. Who knows what other smart home technology is on the horizon?

We do know plug-in hybrid electric vehicles are coming next year, and we do know that the smart grid must integrate the growing portfolio of distributed generation power sources: solar panels, wind turbines, fuel cells, geothermal, battery storage and more.

CenterPoint Energy is joined on the vanguard of smart meter deployments by several other utilities, such as our neighbor to the north, Oncor, Xcel, AEP, Detroit Edison and all three of California's IOUs. More than 28 million smart meters have already been deployed in the U.S., Europe, and Australia.[1]

State regulators have approved these deployments both to improve reliability and to deliver customer benefits.

The National Association of Regulatory Utility Commissions is working with the Federal Energy Regulatory Commission to expedite smart grid implementations. The Department of Energy has also provided leadership as have groups like GridWise and the Electric Power Research Institute.

But there is an interesting situation regarding smart grid that is taking place nationally that, perhaps rightly, is open to criticism. Our industry is moving forward with full deployments of smart grid technology even though there have been no full-scale tests or pilots proving that such programs are cost beneficial or that consumers will respond in large numbers to energy choices and real-time price signals. Excel has their Colorado Springs pilot which is well underway but not conclusive.

The DOE's demonstration project on the Olympic Peninsula of Washington state resulted in a 15 percent reduction in peak load and 10 percent savings on consumers' bills. This trial is generally used as the proof of concept. We're moving so rapidly, some observers may be skeptical that we can change behavior. Will the smart grid change the behavior of customers who are used to being passive participants in energy markets? Who are used to waiting each month for their bill with no real sense of their energy use or spending?

Some consumers who have not participated in such trials are skeptical about the costs of smart meter deployments.

We have to persuade them of the benefits they can reap. Others are eager. We have to meet their expectations.

The skeptics may wonder about the impact of the economic climate on smart grid investment. *SmartGridNews.com*[3] addressed four forces against smart grid investments:

1. higher cost of capital,
2. rising utility rates,
3. slowing growth and a potential drop in demand – while acknowledging that in past recessions electricity demand has not fallen sharply and not nearly as much as has demand for oil, gas and cars, and
4. the "sky-is-falling syndrome" which has infected Wall Street.

Balancing – and perhaps outweighing – these obstacles are incentives to smart grid investment. The federal government has included such incentives in a series of energy bills in recent years:

- the 2005 Energy Policy Act,
- 2007 Energy Independence and Security Act,
- 2008 Energy Improvement and Extension Act,
- and the 2009 American Recovery and Reinvestment Act, signed into law by President Obama two weeks ago.

The latter includes $30 billion in spending for renewable energy initiatives, $20 billion in tax incentives, $4.5 billion in matching funds specifically for smart grid investments, and $3.2 billion in bonds to reduce greenhouse gas emissions.[4]

I believe that efforts in this country to reduce GHG emissions will dovetail into highest use for smart grid. With only four percent of the world's population, the U.S. produces 25 percent of global greenhouse gases.[5]

The generation of electricity contributes 40 percent of carbon dioxide emissions in the U.S., double that of the transportation sector.[6]

As you know, Congress has given a lot of attention to climate change. In the most recent 110th congress, over a dozen bills were introduced or proposed to reduce greenhouse gas emissions in the U.S. More than 10 of these would establish a national cap-and-trade program while others would implement a carbon tax on fossil fuels. A handful of bills would set up a cap-and-trade program for GHG emissions from the electricity sector.

Most of these proposals envision cutting total CO_2 emissions to half of what they would be under business as usual by 2030, from over 8 billion metric tons to around 4 billion metric tons.

Emissions resulting from electric generation would be reduced by about a third to pre-1990 levels (under 2 billion metric tons) even as technology-driven consumer demands continue to rise. During the election campaign, President Obama proposed reducing U.S. GHG emissions by 80 percent in 2050 through a cap-and-trade program.[7]

I believe the goals set forth in these draft bills are impossible to achieve without fundamentally altering residential and commercial electricity consumption patterns.

This is the heart of what I want to talk to you about today. We aren't simply going to build cleaner power plants and continue using electricity the way we've been using it and meet the climate change goals. People have got to fundamentally change the way they use electricity.

I suggest there are two clear ways to change consumer habits. I'll call them "gasoline" and "Internet."

Last summer, we learned that $4 gas will change consumer habits.

We had cheap gasoline for so long, we got complacent. Our driving habits have been established for so long the consumption of gasoline was considered an inelastic commodity: sharp increases in price have not typically resulted in commensurate decreases in usage.

But we reached a tipping point somewhere between $3 and $4 per gallon, at which people altered the way they use (or don't use) automobiles and which automobile they chose to purchase.

Rising prices ultimately change behavior. If a product becomes too expensive, people will stop using it.

Last year, gasoline became so expensive, people began combining errands, carpooling, riding the bus and buying fuel-efficient hybrids to lower their gasoline bills.

This is the road we're on with climate change legislation. Ultimately, the costs of a carbon tax or emission credits will be borne by consumers. John Rowe, CEO of Excelon, predicts a likely carbon tax or cap could raise electricity rates by 10 cents per kilowatt hour[8] – about a 75 percent increase over the average price in Houston today[9], and more than doubling the national average.[10] If the price of carbon-based energy rises high enough, consumers will consume less power.

Price shock is one way to change behavior but at the terrible cost of economic dislocation. People spend money that would have gone for food on gasoline or electricity. Those who can afford to buy hybrids spend money on a car that they could have invested elsewhere. We need to find alternative ways to save energy.

That leads us to our second option, the Internet.

Remember life before the Internet?

Think about it. Has the Internet changed the way people make purchases?

Absolutely.

You don't need to drive around from store to store (burning $4 gas) looking for something. You have a convenient way to shop from your home, or to buy a home, or sell a home. Indeed, a National Association of Realtors report showed 80 percent of consumers use the Internet for real estate information. Twenty-two percent use the Internet to sell their home.[11] People buy cars on eBay auctions; my son-in-law fixes up cars and sells them online.

As markets developed using the Internet, consumer habits changed without economic dislocation but at a slower pace. It takes time for people to learn to trust technology, and it takes a large number of people using the Internet for markets to develop. But the result is positive for all. Because information is so easily accessible, better pricing decisions are made, less time is spent making decisions and more sellers are able to reach larger markets.

Well, the smart grid is the marriage of electricity and the Internet.

Just as the Internet brings enormous information quickly to consumers, the smart grid will bring energy information and ideas to every link of the electricity value chain. The better way to get people to change their energy consumption habits is to develop an Internet-based tool that is convenient and offers lower prices through competition.

So, you have a rapid change in consumption prompted by the sticker shock of a rapid rise in prices, or you have more organic, slower, steadier change by allowing a market to develop around an Internet-based smart grid solution.

My premise today is that digitization of the electric grid is the best way to change electricity consumption habits and reduce demand. I believe that, as the Internet transformed commerce, a smart grid will create economic gain through energy efficiency and market choices.

Today's electric industry suffers from inefficiency. The load factor of all available power generation in the U.S. is about 60 percent. [10] That is, on average, forty percent of our generating capacity sits idle. According to the DOE, ten percent of generation assets run less than 400 hours per year, or 5 percent of the time. [12] These peak plants are expensive to operate, with fuel bought on the volatile spot market, running with poor heat rates.

A smart grid that could re-form consumer habits could reduce peak demand by spreading out energy consumption over off-peak hours and seasons.

Such a reduction in demand delivers three major benefits:

1. The cost to consumers is dramatically lessened because they do not have to pay for on-peak power as the most expensive plants come on.
2. The number of new fossil power plants can be reduced. Smart grid enables systems that can transfer renewable energy sources to peak availability.
3. It enables the ability to have distributed generation such as solar panels that reduce peak summer demand.

A smart grid system can handle such demand changes.

A smart grid can also directly help achieve the goals of climate change legislation. First, the smart grid's "plug-and-play" capability can integrate expanding renewable energy resources. Such cleaner power sources and conservation would reduce harmful emissions. The smart grid can also reduce electrical losses in the transmission and distribution system. The DOE has estimated that a five percent more efficient grid would reduce generation equivalent to the fuel and GHG emissions of 53 million cars.[13] A 2003 EPRI study concluded that full deployment of a smart grid could reduce GHG emissions by 13 to 25 percent, equal to taking 1 to 2 million cars off the road every year. [14]

An EPRI study published last December claims the smart grid could reduce CO_2 emissions by 60 to 211 million metric tons in 2030. [15] A Climate Group study contends that a smart grid could prevent 4 percent of global emissions in 2020. [16] McKinsey reports that studies suggest the cost-effectiveness of GHG reduction via the smart grid is superior to reduction from other technologies that have seized the public consciousness, such as bio-fuels, biomass, and carbon capture. [17]

Now digitizing the grid isn't going to single-handedly solve climate change, nor will it address every factor that might impact energy costs. Energy prices will rise, but the slope of future cost increases will be much more gradual as a result of the smart grid.

So how do you get consumers conditioned to be passive recipients of energy to actively take control of their electricity use to reduce peak demand?

Jeff Lund, VP of Business Development for Echelon sees two stages of energy awareness likely to emerge. [20]

First, the use of in-home displays to monitor electricity price and consumption. New time-of-use pricing schemes would adjust prices based on consumption patterns to encourage shifting consumption to off-peak periods. Xcel's "Smart Grid City" experiment and Google's prototype PowerMeter suggest that many consumers will respond to such information and price signals. One Google employee reduced his power use by 44 percent and cut his bill by 56 percent. [21]

The second stage is creating a new generation of products – smart home devices such as thermostats, washer/dryers, or refrigerators – that can process real-time price signals and consumer preferences and power on or off accordingly. Studies show that peak loads can be reduced up to 50 percent some days by automatically turning off certain appliance functions, such as the heating elements in dryers and water heaters. [22]

Research shows consumers will manage their energy use if the interface with the smart grid is simple, accessible, and convenient. [23] You've got to make it like the Internet, where energy control is transparent to the user.

You can't count on someone choosing every 15 minutes which appliance to turn on or off in response to real-time price signals. You CAN ask consumers to fill out a preference sheet on the Internet indicating what they are willing to turn off and when, then having the system take over to make purchasing decisions for them to optimize their energy consumption and minimize their bill.

You can make it a game. Consumers could go online, and join a team of, say, 50 homes competing against 10 other teams to see who could have the lowest total energy consumption and the greatest energy savings. After three months or so, the team with the lowest consumption gets a prize. But everybody wins with lower bills. Everyone is better off for simply participating.

The higher purpose of the competition would be to train consumers to use energy more efficiently. You've begun to changed people's habits.

This is a simple example of how digitizing the grid with two-way communications with easy Internet interfaces can transform the way we buy, deliver, and use energy.

We certainly can't expect to keep consuming energy the way we do now. We can't just run more and more electricity-consuming appliances. We can't just keep our home as cool as we want and expect magic technology to make clean energy ever more abundantly available on demand.

We can't even meet the projected load growth in this country with renewable energy; much less replace the generation that's in place. As the population grows, and computers and big-screen TVs and other power-hungry digital devices fill bigger homes with more air conditioning, summer peak demand is expected to increase by 20 percent in 10 years and total demand to double by 2050. [24]

The only way to address this issue is to change the demand growth characteristics, which requires changing consumer habits. You can shock people into conservation with higher and higher prices, or you can create a cost-effective energy market driven by information-intensive communications. The surer road to energy efficiency and economic gain is the digitization of the smart grid.

Many factors are aligning to bring the smart grid to life: new technology, public policy and regulations, economic incentives, and growing consumer awareness.

Think about the Internet and the transformative "killer apps" it has enabled: e-mail, e-commerce, Podcasts, YouTube, and social media. What will be the killer app born of the smart grid?

Demand response? Plug-in hybrid electric vehicles? Home area networks?

Things are going to change. How fast and in what direction are ours to decide. Do we pick the gasoline model or the Internet model?

I believe the Internet model is vastly preferable. The construction of smart grid infrastructure nationally is the foundation for a cost effective and sustainable energy future.

Thank you for allowing me to speak this morning. I'll be happy to answer any questions.

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