PikeResearch
Cleantech Market Intelligence

Research Report

Smart Grid: Ten Trends to Watch in 2011 and Beyond

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Section 1

SMART GRID TRENDS

1.1 Introduction

During the last few months of this decade, the electric utility industry has experienced a momentous season. The business of electricity generation, transmission, distribution, and consumption has been thrust to the forefront of public discourse – as both a villain and savior – in the fight against climate change and the struggle for energy independence and security, among other global priorities.

The "smart grid," the integration of new embedded computing and communications technologies into the fabric of the power network, is widely seen as the means to adapting our electrical infrastructure to meet these global needs. Basic economic justifications for technical advancements have been enhanced (or distorted) by sweeping regulatory mandates and large national economic stimulus spending plans. The reality of the smart grid is coming into focus, too slowly for some, but at a faster pace than typically seen in this industry. Existing players are transforming, new players are entering, and consumers are awakening.

The months ahead should witness the maturation of the smart grid as all the trials, mandates, and pilots move toward production deployment. There are dozens of trends that bear watching and scrutiny. In the following section, Pike Research focuses on ten such trends that will be most influential in the emerging smart grid sector.

Section 2

TEN SMART GRID TRENDS TO WATCH

2.1 Security Will Become the Top Smart Grid Concern

Grid security has always been an industry concern, though usually one that lingers in the background. The infamous smart meter hacking demonstration at the 2009 Black Hat conference may not have broken any new technical ground among metering vendors, but it did raise cyber security awareness within the smart grid community. However, once metering vendors demonstrated reasonable solutions, the sense of alarm quickly passed.

If anyone in the smart grid community still has a sense of cyber security peace and serenity after the summer of 2010, they need to check their pulse. The Stuxnet worm, discovered in July 2010, awakened the industry to the tangible and very complex threats to the supervisory control and data acquisition (SCADA) systems that run today's "semi-smart" grid and are poised to take a central position in a fully integrated and interconnected "really smart" grid.

Stuxnet is a relatively silent worm that specifically targets and embeds itself into SCADA systems, providing a potential means to wreak havoc. It blasted through many of the axioms that allowed utility managers to sleep at night:

- *"My SCADA system is safe because it is not connected to the Internet"* – Stuxnet apparently entered via USB memory sticks, perhaps distributed at your favorite smart grid conference.
- *"I keep my SCADA Windows Machine updated with the latest security patches and antivirus protection"* – Stuxnet exploited zero-day vulnerabilities in Microsoft Windows and avoided detection by the best protection software. Stuxnet existed for months (years?) before detection. Moreover, many SCADA controllers are not managed as part of the normal enterprise IT network and are NOT kept up to date with almost daily security patches.
- *"At least the threats are limited to my Windows-based management consoles"* – Stuxnet not only infected Windows machines, but also aimed to infect the SCADA Programmable Logic Controllers in the field.

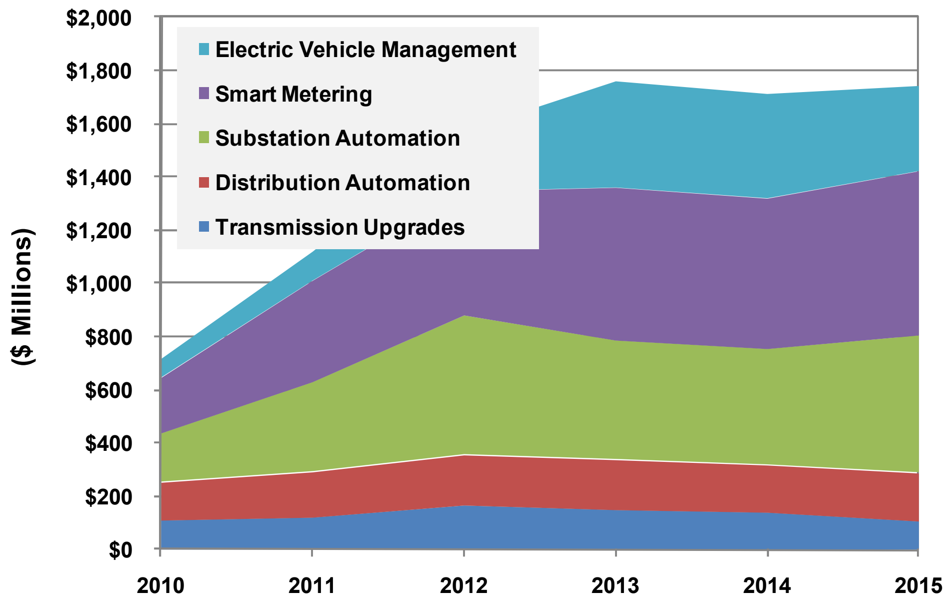
The technical analysis on Stuxnet continues, and it appears to be a very sophisticated attack not aimed at the electrical infrastructure. But if nothing else, the threats security experts have been warning of for years have now moved from theory to reality. Since the industry is taking greater notice, especially regulators and government (including the U.S. Congress), utilities will need to determine what cyber security measures are required – even as standards and regulations are still evolving.

On the standards front, the recently released (September 2010) National Institute of Standards and Technology (NIST) "Guidelines for Smart Grid Cyber Security," at three volumes and 537 pages, is a testament to both the unprecedented industry efforts to establish clear smart grid security guidelines and the incredible complexity and difficulty in doing so. The document has already become a bit of a lightning rod for criticism, which is in itself a productive outcome.

The North American Electric Reliability Corporation (NERC) CIP (Critical Infrastructure Protection) specifications, which have thus far been the closest thing to a general security specification for utilities – much to the chagrin of serious security experts – are being extensively revised. More importantly, utilities that have treated these as a nuisance paperwork exercise – yielding such silliness as almost all assets being declared "non-critical" – will be increasingly pressured to use these imperfect tools to actually assess and correct their vulnerabilities, lest they risk a starring role in the cyber equivalent of the BP gulf oil spill.

Serious investment will be required – even if the actual solutions and standards remain cloudy. Pike Research forecasts that worldwide smart grid cyber security spending will reach over $1.7 billion in 2013, from approximately $700 million in 2010 (see Chart 2.1). Regulators should be primed to welcome and approve such investments, even in the face of an increasingly restive consumer community.

Chart 2.1 Smart Grid Cyber Security Revenue by Application, World Markets: 2010-2015



(Source: Pike Research)

2.2 Distribution Automation Will Rival AMI as the Most Visible Smart Grid Application

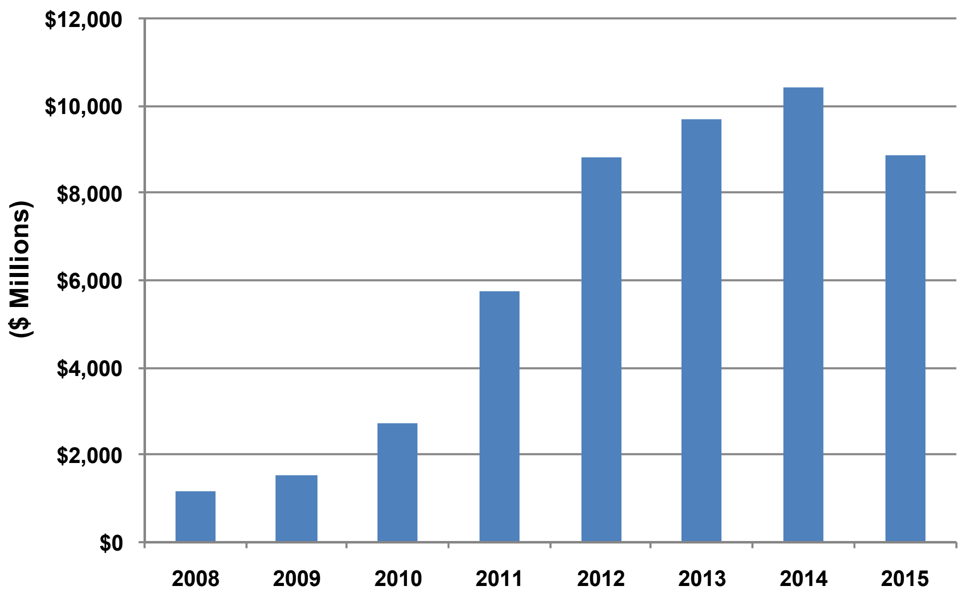
For the small percentage of the general public that might recognize the term, "smart grid" often means "smart meters." While logical for the public at large, this misinterpretation has also been adopted by many in the industry since advanced metering infrastructure (AMI) has captured the most mindshare within the smart grid discussion. Yet, this emphasis is changing as distribution automation (DA), spurred by the threat and opportunity of plug-in electric vehicles (PEVs) and distributed generation (DG), moves from the "toy" stage to the earliest phases of actual commercial adoption.

The technological word association with the term “distribution automation” is likely to evolve as the industry confronts the realities of transforming the distribution network from a one-way to a multi-way power network. Once reserved to simple remote control of field-based switches and sensors (which has never been simple) for the primary aim of increasing reliability, distribution automation technologies are beginning to comprehend the demand response capacity of conservation voltage control (CVR) and the energy management possibilities of dynamic load distribution.

Various demonstration projects and leading production deployments, such as at Progress Energy, will accelerate industry discussion. Duke Energy’s efforts to foster a smarter distribution network by encouraging the development of generalized computing and communications “platforms” deep within the distribution network, as embodied by Echelon’s recently launched ECoS and similar products, are likely to yield new innovations that will address the multi-way distribution system. The final outcomes may not be clear, but more industry conversation will arise even as traditional distribution automation technologies increase their market penetration and integration into a broader smart grid.

Distribution automation projects, whether they target leading-edge applications or traditional reliability improvements, have another important attribute. They have the potential to deliver tangible benefits without requiring intensive consumer engagement or behavior change.

Chart 2.2 Distribution Automation Revenue, World Markets: 2008-2015



(Source: Pike Research)

2.3 The "Bakersfield Effect" Will Continue, but Some Consumers Will Actually LIKE the Smart Grid

Smart grid history will likely remember 2010 as the year of the "Bakersfield Effect." This expression refers to the birthplace of loud consumer pushback on smart meters, which were blamed for dramatically higher electricity bills experienced by Pacific Gas & Electric (PG&E) customers in the summer of 2009. Similar problems reported by Oncor's customers in Texas added fuel to the fire. It has taken months for independent investigations and testing to confirm what industry insiders already knew: there were no major technology issues. However, there was a potentially huge disconnect regarding customer communications, relationships, and expectations.

The Bakersfield Effect is having a larger impact on smart grid development than most imagined. Consider the following:

- For many consumers across the United States, their introduction to the smart grid has come from national news stories chronicling problems in California, whether substantiated or not. For many consumers, this feeds an already well-cultivated antagonism toward their local utility.
- The uproar has spotlighted whether the benefits of smart meters (and the smart grid by association) are big enough, accessible enough, and near enough to warrant the extra costs being passed on to consumers. A white paper published in September 2010 by leading consumer groups (National Association of State Utility Consumer Advocates [NASUCA], the National Consumer Law Center, Public Citizen, Consumers Union, and AARP) best summarizes the concerns. The industry has been surprisingly ill prepared to answer questions, especially from the consumer's perspective.
- Fringe groups, sometimes derisively called the "tin foil hat crowd," are questioning the health effects of RF-based AMI systems. Normally, these claims would be easily dismissed, but the backlash atmosphere has spooked a few municipalities into banning smart meter deployments within their borders.
- Regulators and especially politicians, aware of the ruckus, are responding with a mix of rational questioning and irrational opportunism. Meanwhile, many utilities have responded with a mix of surprise and cluelessness. The Maryland Public Utility Commission's (PUC) initial rejection of Baltimore Gas and Electric's (BGE) smart meter plan, despite a $200 million American Recovery and Reinvestment Act (ARRA) federal stimulus commitment, rocked the industry. A revised plan was ultimately approved, but with significant strings attached.

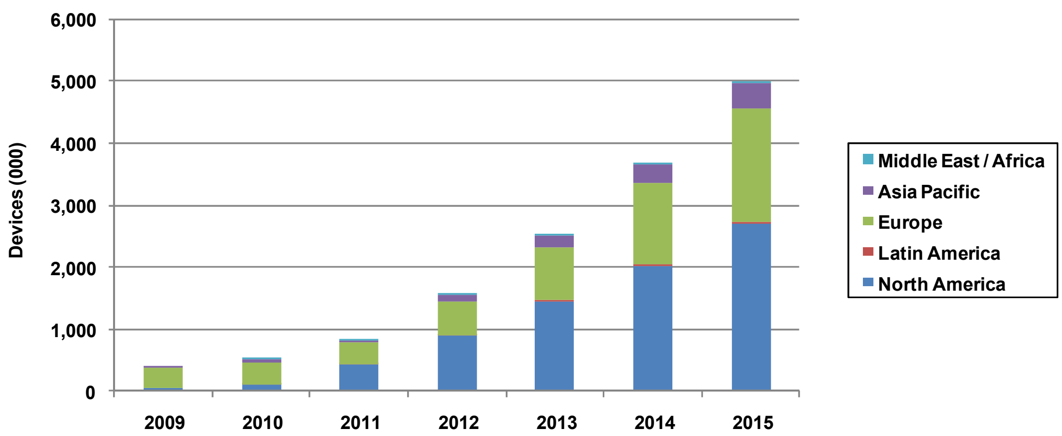
Utilities and their regulators, contemplating their own smart grid programs, are taking long, hard looks at the experiences of PG&E, Oncor, and BGE. Pike Research believes this scrutiny will have both positive and negative effects on current and future smart grid deployments, including the following:

- The industry is placing much greater emphasis on consumer communications, including benefits to be expected, as well as specific logistics around local deployment plans. This should be a positive development toward treating consumers as true customers rather than grid load points.
- Regulators are increasingly requiring specific articulation of consumer benefits within proposed smart grid programs, delivered earlier within the deployment timelines. This may be disruptive in the near term, but should create stronger programs in the long term with better consumer acceptance.

- Some regulators, faced with restive consumer groups, may be increasingly afraid of allowing utilities to expose true time-based electricity costs to consumers, potentially blunting the conservation and peak-shifting benefits sought by smart meter deployments. Such reticence could significantly delay the growth of HAN and other consumer-facing technologies.
- Some of the messaging toward consumers around smart metering and the smart grid in general will go beyond energy efficiency and peak-shifting, which depends on consumer behavior changes, toward other benefits such as PEV support and distributed generation. These applications have clearer, if more futuristic, perceptions among consumers.

Even as the Bakersfield Effect continues to reverberate, consumers in Texas and other leading deployments and large-scale pilots will begin to use the pricing programs and energy management technologies made available through smart metering. Although it probably will not be widely reported in the popular press, many of these consumers will actually like these offerings. Certified in-home devices are just now becoming available in Texas and are viewed as essential customer service tools by energy retailers there. Positive feedback from consumers, combined with quantifiable energy efficiencies by the utilities, should eventually help overcome the more irrational consumer fears related to the smart grid.

Chart 2.3 In-Home Device Shipments by Region, World Markets: 2009-2015



(Source: Pike Research)

2.4 Smart Meter and AMI Focus Will Shift Toward Europe and China

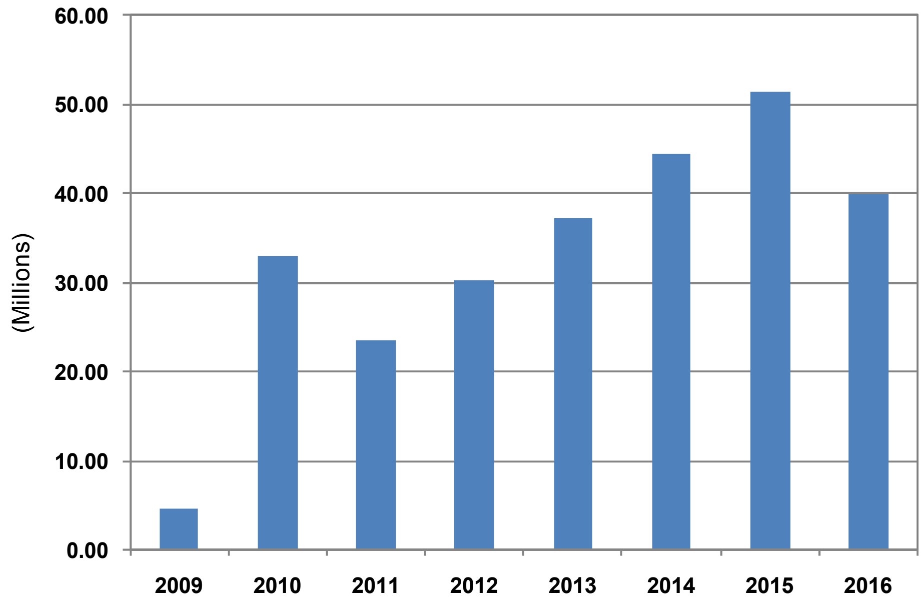
Although Europe got an early start in deploying smart meters, most of the recent attention has been on North America, with Texas, California, and Ontario leading the way. In 2011, attention will begin to shift back toward Europe as major programs in the United Kingdom, France, and Spain, totaling up to 100 million meters in aggregate, move toward deployment.

The U.K. program is notable for the desire to leverage a common communications infrastructure to support multiple retailers (which are responsible for the meters) across different distribution system operators, for both electricity and gas. There is also a stated desire on the part of regulators to mandate the provision of in-home displays for consumers. British Gas has already announced plans for a multi-million meter deployment in partnership with Vodafone using cellular infrastructure to the meters and ZigBee within the homes. Other communications infrastructure vendors are pushing for different to-the-meter mandates, including Arqiva's effort to leverage its nationwide tower network, together with Sensus radio equipment. The regulatory confusion should clear up in 2011, paving the way for broader deployments across the United Kingdom.

French regulators have given their blessing to the "Linky" smart meters being piloted by EDF distribution subsidiary ERDF. Three different pilots of 100,000 meters each, using equipment from Itron, Landis+Gyr, and Iskraemeco, are unique in that they all conform to an ERDF-specified interoperability standard. Thus, these projects have effectively created one of the only multi-vendor interoperable smart meter systems. The opportunity for vendors is large (35 million meters), and the multi-vendor collaboration has spawned the Interoperable Device Interface Specifications (IDIS) industry association that aims to enable a true, open, multi-vendor interoperability option.

As large as these European deployments are, they pale in comparison to China's smart metering deployment plans, which will come into focus in 2011. China's State Grid Corporation has thus far focused on large-scale, high-voltage transmission system buildouts. However, it has also quietly been working on specific smart metering standards (mostly PLC-based), and initial tenders across a number of provincial utilities already total over 40 million meters. Ultimately, plans for over 700 million smart meters across China by 2020 are being discussed, dwarfing the plans of any other region. Whatever the timeline, the vast quantities involved will certainly focus the industry's attention on smart meters. Moreover, with a standards regime seemingly favoring indigenous smart meter manufacturers, Chinese vendors are likely to become even stronger competitors across the globe.

Chart 2.4 Smart Meter Unit Shipments, China: 2009-2016



(Source: Pike Research)

2.5 The "Year of the HAN" Will Not Arrive … Yet

As the first advanced smart meters with built-in home area network (HAN) interfaces were installed 2 to 3 years ago, visions of a robust in-home device market, including displays, thermostats, and smart appliances, took hold. Consumer retailers such as Home Depot and Best Buy would stock their shelves with devices that would connect to the meter, and eager consumers would snap these up save on their electricity costs through time-based rates. All that was required was certification of some HAN standards and a critical mass of installed smart meters.

The first requirement seemed to be set in mid-2008 thanks to the initial certification of the ZigBee Smart Energy Profile (SEP) 1.0, an imperfect but workable HAN device standard. In 2010, the installed base of advanced smart meters reached multiple millions across Texas and California, setting up what home device startup companies hoped would be the "year of the HAN." Alas, this is has not come to pass, nor is it likely to in the near future.

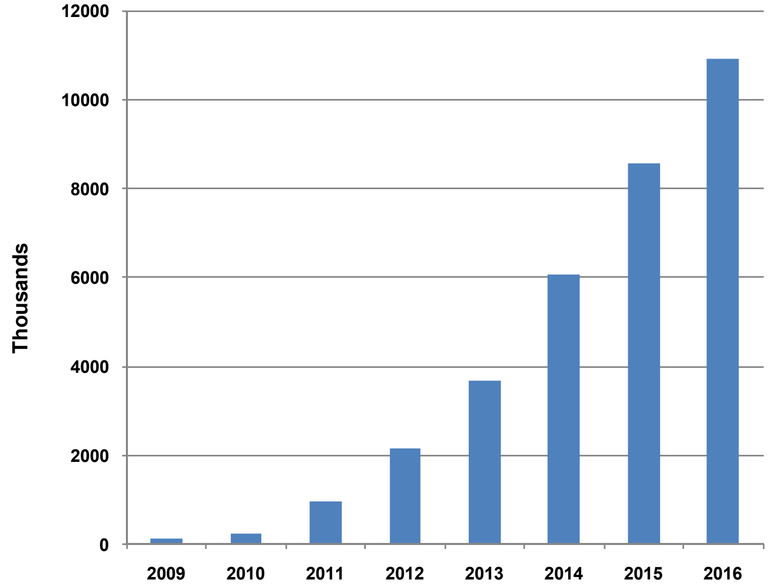
Several factors have combined to delay and perhaps even reroute HAN momentum. First, planned enhancements to the ZigBee Smart Energy Profile grew dramatically when U.S. standards efforts, accelerated by the ARRA stimulus funding, pressured the ZigBee community to adopt the Internet Protocol (IP). End-to-end IP networking is theoretically a good thing, but this effectively tossed out a mature, proven mesh networking standard for something still in development. Thus, at least a year was added to the approval of an updated profile, now expected in the first half of 2011. While deployed smart meters can be remotely updated with new ZigBee firmware, most in-home devices cannot, causing many utilities to wait until the new profile is proven before contemplating large HAN device deployments.

More importantly, the Bakersfield Effect consumer backlash has made utilities cautious about launching programs aimed at "changing consumer behavior," which is what HAN technology-enabled time-based pricing is all about. HAN vendors had hoped that the cycle of utility pilots aimed at proving HAN technology was nearing an end. However, at the behest of regulators, these pilots are being replaced by new pilots aimed at measuring consumer acceptance. Consumer groups are asking whether the relatively complex HAN technology, including individually authenticated secure in-home devices controlled across the utility AMI network, is justified. They are comparing the technology to lightweight price signaling methods, such as those that have been used for years via one-way pagers or other networks. For device makers, it is distressingly late in the game to be asking such fundamental questions.

One bright spot is the deregulated state of Texas, where ZigBee SEP 1.0 devices are finally passing local test certifications. These devices are being made available to consumers through a number of energy retailers that are eager to provide differentiated services. Consumer response to these devices will be a leading indicator of the ultimate success of the original HAN model.

In the meantime, impatient energy management device vendors are adapting to partners and channels that avoid the utility or the need for advanced smart meters. Broadband and wireless telecom companies, home security firms, and traditional home automation vendors are all including home energy management in their solution portfolios, with the potential of supporting time-based pricing and demand response programs as utilities make them available. These different takes on the "HAN" will supplement, and perhaps even supplant, the original vision of utility-managed, AMI-connected HANs. It will take some time to see what choices consumers will make. While 2011 will provide more data, the issue is unlikely to be definitively settled any time soon. Chart 2.5 depicts Pike Research's worldwide forecast for meter-connected HAN devices.

Chart 2.5 Smart Meter-Connected HAN Nodes, World Markets: 2010-2016



(Source: Pike Research)

2.6 The Demand Response Business Transformation Will Accelerate

The curtailment service provider (CSP) business model, as pioneered by leaders such as EnerNOC, has been an interesting and important path toward the more efficient use of grid resources. However, just as personal digital assistants (PDAs) and cell phones are no longer separate devices, Pike Research believes that demand response (DR) will become an application within a company's broader energy management platform or service, transforming today's pure-play CSP market.

Some CSPs, including EnerNOC, are already moving to offer a broader suite of energy management services. Vendors in adjacent markets will target demand response directly or in partnership with local utilities using their own products or via acquisition of smaller high-tech CSPs. Companies in adjacent markets, including building and energy management systems (BEMS/EMS), IT, and communications, are already touching customers who demand energy efficiency products, solutions, and services. These companies can therefore capitalize on existing customer relationships while leveraging the smart grid technology investments being made by utilities (such as AMI).

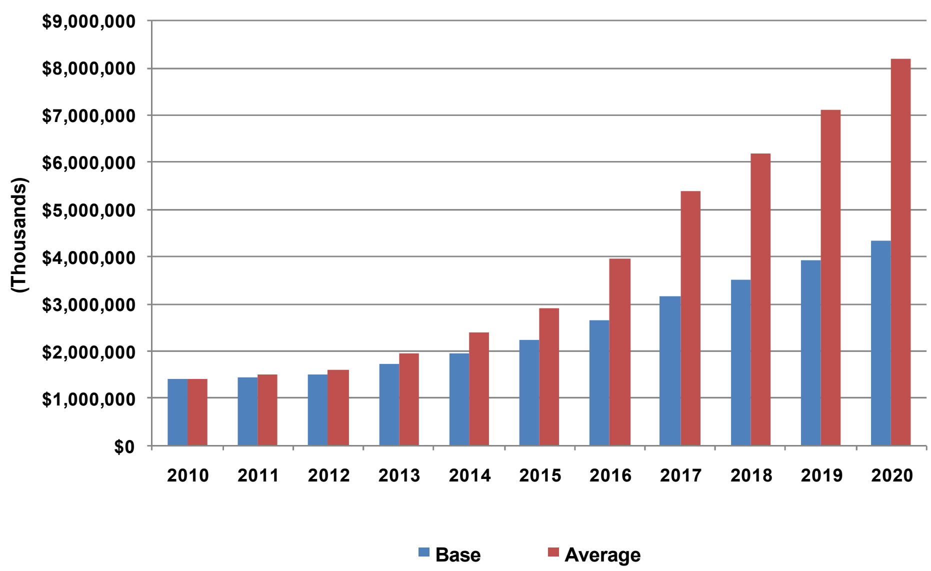
Most influential in spurring this shift from traditional load curtailment and peak load shifting will be the entrance of BEMS, EMS, and IT players that currently do not offer curtailment as a standalone service. BEMS from Johnson Controls, Honeywell, and Siemens will continue to provide the electro-mechanical building optimization services they have historically offered, with a more acute focus on energy management. Additionally, these large OEMs may partner with or acquire specialized energy efficiency technology companies with deep analytical abilities (e.g., Optimum Energy).

The entrance of EMS players that do not currently provide clients with standalone DR will also shake up the industry. Firms like Minneapolis-based Verisae will provide both a software-as-a-service (SaaS) and a software play – thereby increasing visibility to the building (or a portfolio of buildings) and enhancing building optimization. For example, Verisae will provide end users with an EMS (of which DR is a component), asset management, and carbon management – all on the same backbone.

Additionally, the major IT companies, notably Cisco and IBM, are currently analyzing the EMS space. They will significantly disrupt the traditional DR market – providing devices that will be deployed on an open network that is integrated with a BEMS. This will increase the amount of granular energy consumption data and thus expand the opportunity for DR services. The powerful combination of Cisco's EnergyWise switching technology with IBM's Tivoli software enables the management of the consumption of IP-compliant devices on the network. Such integration offers the ability to manage BEMS assets (HVAC, lighting, and security) and provide real-time-pricing (RTP) demand response.

The benefits from this shift should be large, as commercial buildings represent a significant portion of overall electricity consumption, but have yet to fully leverage available technology to manage that consumption. This transition will help market players access this low-hanging fruit provided by demand response.

Chart 2.6 Total Demand Response Market Revenue Forecast, Base and Average Scenarios, United States: 2010-2020



(Source: Pike Research)

2.7 The ARRA Smart Grid "Stimulus" Will Finally Have a Positive Impact

The American Reinvestment and Recovery Act of 2009 included two major components aimed at accelerating smart grid deployment: $3.4 billion for the Smart Grid Investment Grant (SGIG) program and $615 million for smart grid demonstration projects. As might have been expected, the road from idea to implementation has been full of unexpected detours, with many in the industry wondering how much this plan for massive spending actually helped.

In 2008, before the world economy slipped toward "the great recession," various smart grid projects were already underway. In the United States, spurred by the Energy Independence and Security Act (EISA) of 2007 and state regulations, utilities in Texas and California were moving from smart meter pilots toward full deployment, with many other utilities watching closely. Canada, specifically Ontario, was already in full deployment mode. The industry was positioning itself for an unprecedented period of growth. While the uncertainty caused by the financial collapse of late 2008 certainly clouded these growth prospects, concerns were generally limited to how much this might delay planned deployments.

As the U.S. stimulus package took shape at the start of 2009, and numbers as high as $32 billion aimed at the smart grid were being discussed, the industry cheered. However, it also froze. Utilities on the verge of launching or deploying smart grid programs shifted all their energy toward securing a piece of the stimulus pie, preparing to submit proposals by the August deadline and then waiting for the winners to be announced in November. Thus, 2009 was a lost year for most grid vendors. It may be impossible to fully separate the impact of the SGIG freeze from the overall effect of the economic meltdown, but it is safe to say few in the industry felt their business was "stimulated." Yet, all expected to see 2010 make up for the loss as the SGIG money began to flow.

SGIG awards were announced in November 2009; however, the flow of money was held up as the strings attached to the grants were debated and negotiated. Tax questions, "Buy American" restrictions, reporting requirements, asset ownership issues, and security requirements had some grant winners quietly grumbling they might have to turn down their awards due to the associated restrictions. By summer, most of these issues had been resolved, contracts began to be awarded, and vendor selections were announced.

As such, 2011 and 2012 are shaping up to finally realize the acceleration promised by the SGIG program. In addition, those projects that did not win SGIG awards are now stabilizing, and in many cases moving faster, after perhaps experiencing some extra scrutiny from their regulators.

Long term, other related aspects of the stimulus are likely to show even greater positive impact. The acceleration of standards development led by NIST and supported by a technical community animated by the promise of the SGIG money continues to reshape segments of the industry. Moreover, the various demonstration projects that go beyond smart metering should de-risk more advanced smart grid deployments, including renewable generation integration, distribution automation, and microgrids.

Starting in late 2011, Pike Research expects industry discussion to shift from "plans" toward "results," and this transition will finally offer a tangible "stimulus" for the industry.

2.8 The Standards “Horse” Will Begin to Catch the Deployment “Cart”

One rational criticism of worldwide smart grid stimulus efforts has been that deployments are proceeding before good standards have been fully defined. This is especially true of AMI deployments, where smart meters with a divergent range of communications capabilities are being deployed without clarity on all the potential use cases. Others respond that the alternative is “analysis paralysis” and that existing well-defined use cases more than justify the current investments.

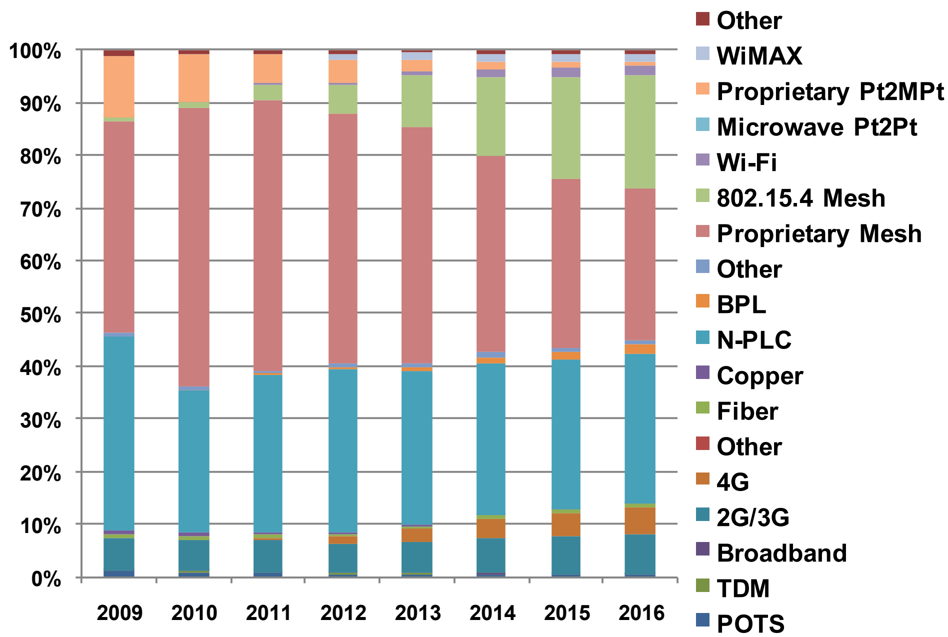
In any case, smart grid standards are beginning to catch up to deployments. There may be too many parallel standards efforts underway around the world, but this still represents a dramatic improvement over the existing vendor-specific application silos. In the United States, NIST’s progress has been impressive, especially compared to the usual pace of standards development, and similar progress can be argued for Europe.

There are many domains that are benefiting from standards acceleration, but perhaps none is more important than the widespread adoption of the Internet Protocol within the grid communications infrastructure. The use of IP may not be the magical panacea that proponents, mostly from the telecom industry, might imply. However, it is the key enabler of an integrated and layered networking infrastructure that will smooth the implementation of the advanced AMI, distribution automation, and substation automation applications at the heart of the smart grid.

The coming year or so will see all the talk about IP adoption show up in real, production-ready smart grid products. Pike Research expects to see Itron’s IP-based upgrade to the OpenWay smart meter system, perhaps enhanced with the “special sauce” implied by its partnership with Cisco. The new-and-improved ZigBee Smart Energy Profile and IP-based stack will be finalized, and perhaps deployed within the millions of meters installed throughout California and elsewhere. IP-based implementations over PLC networks in Europe should also see some deployment action. And perhaps the distributed “platforms” promoted by Echelon, SmartSynch, and Ambient will start hosting third-party applications for enhanced distribution automation functions.

Standards are nice on paper, but are not real until multi-vendor interoperability – or at least cooperation – is deployable in the field. Pike Research anticipates that in 2011, those that have invested in standards will be rewarded and the laggards will be punished.

Chart 2.7 Communications Node Technology Distribution, Units, World Markets: 2009-2016



(Source: Pike Research)

2.9 Data Management Will Be the Next Bottleneck to Smart Grid Benefits

Much has been said about the "data tsunami" faced by utilities deploying AMI systems and other smart grid technologies as they move from monthly meter reads (or as infrequent as annually in parts of Europe) toward readings every 15 minutes (see **Error! Reference source not found.**). The focus has been on handling this vast amount of data, but the challenge of deriving useful information from this mountain of data may prove even more daunting.

The smart grid is driving utility back-end IT systems and applications toward an even more radical transformation than the communications infrastructure. Anyone who has experienced the internal rollout of a new enterprise resource planning (ERP) system knows that far more than just learning new software interfaces is involved. If done correctly, such a rollout requires a substantial reengineering of most business processes, and even of the company structure itself. New smart grid applications will have the same effect within utilities of all sizes and types.

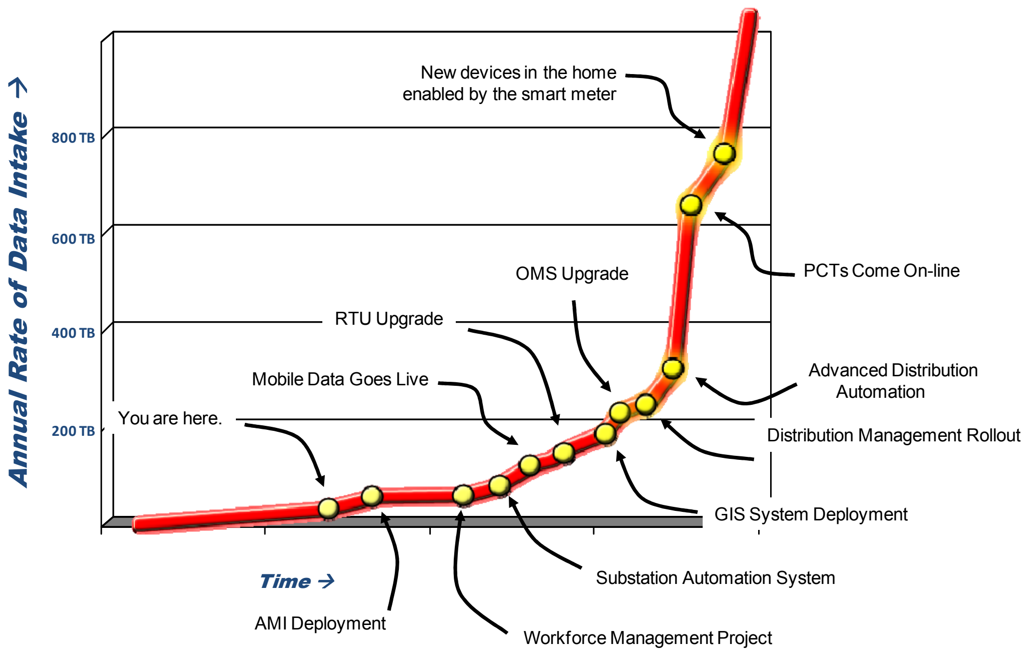
Different utilities find themselves at dramatically different levels of preparedness for this transformation. Many are still patching together home-grown siloed applications, each with their own proprietary interfaces and databases for asset management, workforce management, outage management, meter management, billing, and customer relationships. Others may have already invested in some integrated applications, either through a single vendor or with the assistance of an IT systems integrator using service oriented architecture (SOA) or other standard architectures.

However, few of these may be prepared for the business process changes that are inevitably required when smart metering systems (often “owned” by the customer/billing organization) start spewing real-time data to the outage management systems (“owned” by operations) and provide critical data for distribution network planning (“owned” by engineering. Even more challenging is linking to external third parties.

As a case in point, some of the utilities leading the charge in California are wrestling with the provision of “real-time” metering data to third parties such as Google and Microsoft if customers request, as required by new California regulations. Such provision seems simple given the new AMI systems that are coming online, but ensuring the ability of the back-end systems to gather, process, clean, and distribute the information, modulated by customer permissions, in a timely way (hours) is challenging.

Pike Research anticipates that the ability of utilities that are currently deploying smart grid systems (particularly AMI) to successfully work through these challenges will vary. Most will find these issues to be the next significant bottleneck toward fully exploiting the full potential of the smart grid.

Figure 2.1 Representative Data Intake Rate for Various Smart Grid Milestones



(Source: EPRI)

2.10 Existing Data and Telecom Vendors Will Get Serious About the Smart Grid

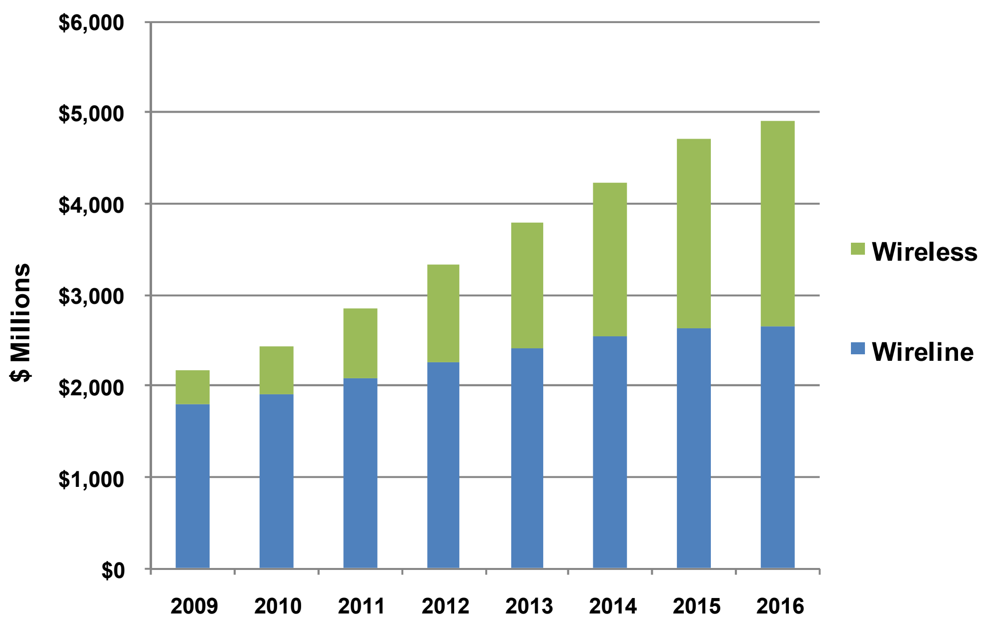
Recent months have witnessed many grand announcements from players outside the traditional utility industry touting the opportunities and high-level strategies surrounding the smart grid. Industry giants, including Cisco, Intel, Verizon, AT&T, Vodafone, and Microsoft, have all launched major smart grid initiatives. A few actual product announcements have followed, but the reality behind these broad visions has remained cloaked in mystery.

In 2011, the rubber should meet the road for these vendors. Telecom services vendors will find out if their revamped pricing and services plans in the United States will be enough to entice utilities to abandon their "build private networks where I can, use public networks where I must" mantra. Vodafone will learn whether its smart meter partnership with British Gas will sway the U.K. regulators to include cellular technology within the envisioned centralized "Data Communications Company" (DCC) for AMI infrastructure. Cisco, while delivering some well-considered products for substations and home-area trials, has yet to demonstrate any game-changing technology, especially for the home, that some utilities hope for and other vendors fear.

Pike Research expects additional partnerships, such as the one announced between Itron and Cisco, to emerge. However, these will be pressured to offer demonstrable results as the overall market matures, standards solidify, and technology and vendor choices are made.

Pike Research forecasts an approaching period of peak smart grid investment. Utility outsiders need to stake out their territory now, or the market window will close.

Chart 2.8 Public Service Provider Revenue, Wireless vs. Wireline, World Markets: 2009-2016



(Source: Pike Research)

Section 3

ADDITIONAL READING

Demand Response

Commercial, Industrial, and Residential Applications for Peak Load Demand Management

http://www.pikeresearch.com/research/demand-response

Home Energy Management

Energy Information Displays: In-Home Display Devices, Web Dashboards, and Mobile Applications

http://www.pikeresearch.com/research/home-energy-management

Smart Grid Cyber Security

Market Issues, Security Best Practices, and Global Forecasts for Smart Metering, Substation Automation, Distribution Automation, Transmission, and Electric Vehicle Management

http://www.pikeresearch.com/research/smart-grid-cyber-security

Smart Grid Networking and Communications

WAN, NAN, and HAN Communications for Substation Automation, Distribution Automation, Smart Meters, and the Smart Energy Home

http://www.pikeresearch.com/research/smart-grid-networking-and-communications

Smart Grid Technologies

Networking and Communications, Energy Management, Grid Automation, and Advanced Metering Infrastructure

http://www.pikeresearch.com/research/smart-grid-technologies

Smart Meters

Smart Electrical Meters, Advanced Metering Infrastructure, and Meter Communications: Market Analysis and Forecasts

http://www.pikeresearch.com/research/smart-meters

Section 4

TABLE OF CONTENTS

Section 5

TABLE OF CHARTS AND FIGURES

Section 6

SOURCES AND METHODOLOGY

Pike Research's industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Pike Research's analysis is primary research gained from phone and in-person interviews with industry leaders, including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Pike Research's analysts and the firm's staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Pike Research's reports. Great care is taken in making sure that all analysis is well supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Pike Research is an independent market research firm whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. The firm is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

NOTES

CAGR refers to compound average annual growth rate, using the formula:

$$CAGR = (\text{End Year Value} \div \text{Start Year Value})^{(1/steps)} - 1.$$

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2010 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

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