Making Good on the Promise of Smart Grid: Information Management Is Critical

WHITE PAPER

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IDC ENERGY INSIGHTS OPINION

At no time in recent history has the utility industry experienced so much change. A number of forces in the new energy economy are coming together to drive utilities to adopt new ways of doing business. Concerns about the economy, climate change, and energy security have driven utilities, regulators, shareholders, credit rating agencies, and customers to examine strategies for the future, such as renewable energy, energy efficiency, energy storage, and demand response. Not only are there new demands, but the introduction of new technology is also changing the business. The electric grid is increasingly dependent on information and information technology (IT). To achieve expected business benefits, utilities will need to have a comprehensive information management strategy to meet their objectives in the future, based on these observations:

- Utility management is challenged to address declining revenues and aging workforce. Shareholders, regulators, and other funding sources require utilities investing in smart grid to deliver on the business case.

- The convergence between information technology and control systems provides opportunities for greater reliability and more efficient management, but it also presents security challenges.

- Smart grid funding is dedicated to investment in smart meters, advanced metering infrastructure (AMI), telecommunications, and services for smart grid, but the utility CIO must also make investments in the underlying IT infrastructure to manage data and information.

- There are five "must-have" capabilities for utilities going forward: grid security and privacy of information, data quality and network performance assurance, efficient data management and archiving, ease of access to data and business analytics, and disaster recovery.

IN THIS WHITE PAPER

In this white paper, IDC Energy Insights explores how information management can help utilities cope with major business and regulatory challenges. The paper begins with a review of the business and regulatory environment for utilities, discusses drivers for investment in new technologies, and explores the impact of smart grid investments on information management.

SITUATION OVERVIEW

Business and Regulatory Conditions

At no time in recent history has the utility industry experienced so much change. A number of forces in the new energy economy are coming together to drive utilities to adopt new ways of doing business. Concerns about the economy, climate change, and energy security have driven utilities, regulators, shareholders, credit rating agencies, and customers to examine strategies for the future, such as renewable energy, energy efficiency, energy storage, and demand response. Not only are there new demands, but the introduction of new technology is also changing the business. Advances in distribution automation and synchrophasor technology are now available.

Utilities are adopting smart metering or AMI and delivering personal energy management applications to their customers. Smart appliances, distributed energy resources, and electric vehicles are on the horizon.

Business Conditions

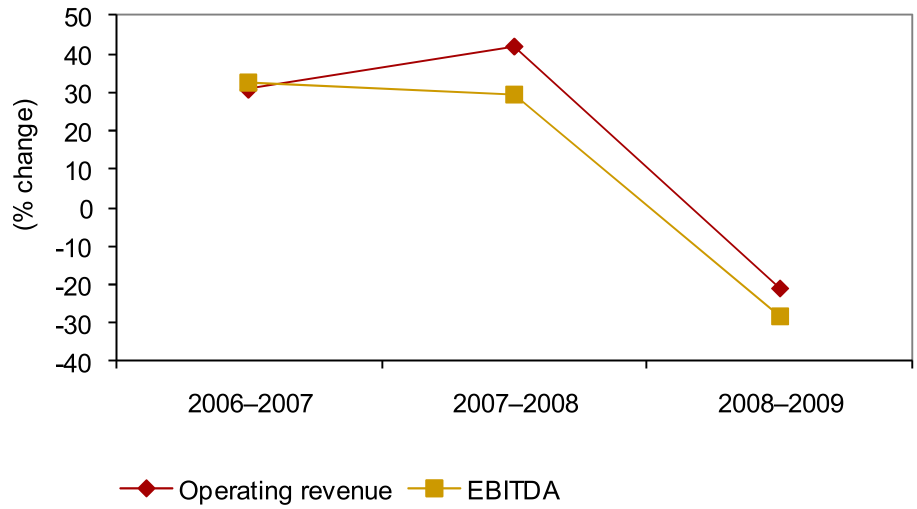
Industry Health Is Slowly Recovering

The utility industry is still feeling the effects of the latest recession. Utility stocks have recovered, but they have not been restored to 2007 levels. While utility stocks led the S&P 500 index throughout the downturn, they are on par with the index as the recovery begins. Energy consumption was down in 2009 due to the recession — impacting utility company revenues. Revenue losses were due to reduced consumption, mainly for commercial and industrial customers. At the same time, utilities are experiencing increased bad debt. For some utilities, losses have been mitigated with rate increases, but for others, there has been little relief.

Utility profits were down considerably from 2008 to 2009, driven largely by the decline in revenues (see Figure 1). For many utilities, the response in 2009 was to delay capital investments and reduce operating expenses, in some cases reducing staff.

FIGURE 1

Index of Utility Revenues and EBITDA



Source: SNL Energy Index, 2010

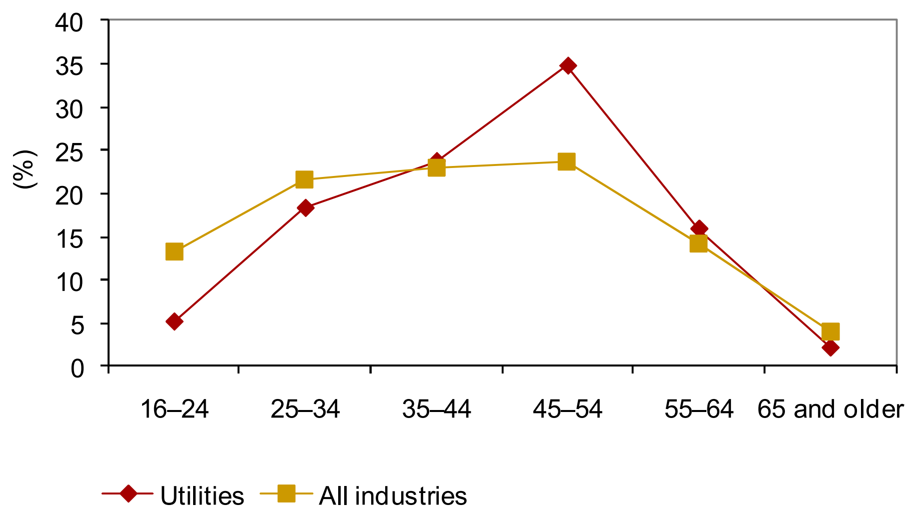
Despite the financial crisis, there is new construction activity for utilities. According to SNL Energy, for 2009, there was currently $51 billion of construction work in progress (WIP) at 870 utilities with an estimated $982 billion worth of construction of generation capacity — both traditional and renewable. Construction provides an opportunity for utilities to add "smarts" to the physical infrastructure that is being built.

Aging Workforce and Infrastructure Remain a Challenge

It is not a secret that the utility workforce is aging. According to the U.S. Bureau of Labor Statistics, citing the 2008 *Current Population Survey,* 34.7% of utilities employees are between the ages of 45 and 54, within a 10-year range of retiring. This compares with 23.8% of employees in all industries in that same age range. On the other end of the age range, only 5.2% of the utility workforce is 24 or younger, compared with 13.2% in other industries (see Figure 2). Almost half of utility workers are technical: 4.9% of utility workers are engineers; 26.1% are in installation, maintenance, and repair; and 14.4% are in production operations.

FIGURE 2

Age Range of Utility Employees



Source: U.S. Bureau of Labor Statistics, *Current Population Survey*, 2008

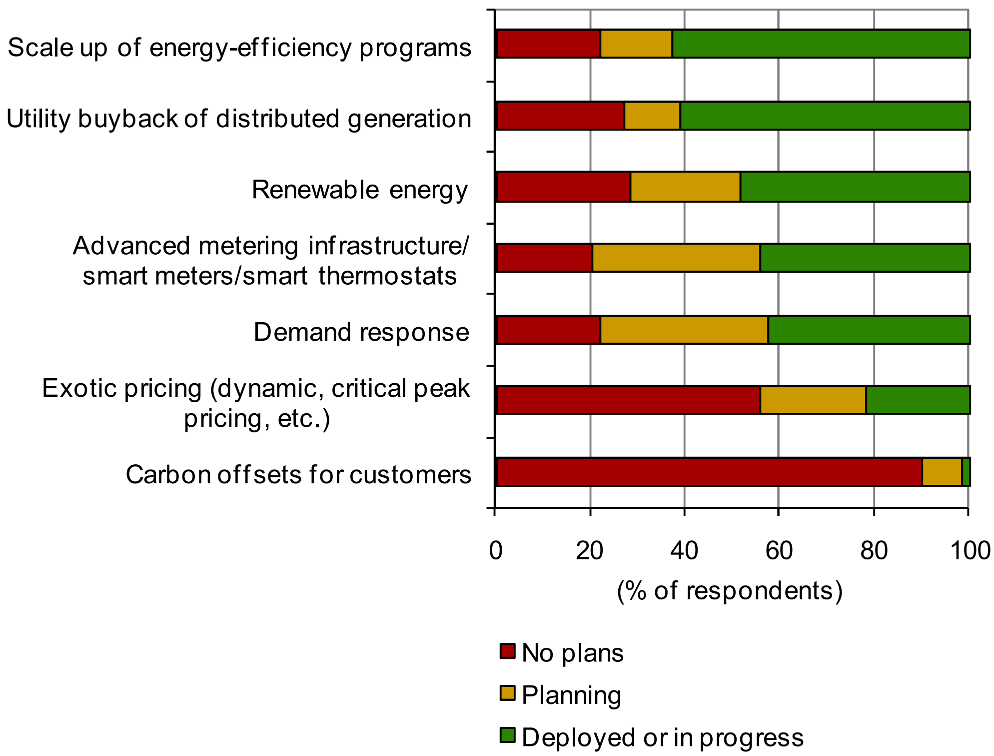
At the same time, physical infrastructure is aging or inadequate for the demands of the industry. Circuit breakers, transformers, and cable are reaching the end of their useful life, especially where this equipment has been pushed beyond capacity in high-demand areas. According to a North American Electric Reliability Corporation (NERC) survey conducted in 2007, 65% of utility respondents believed that there was a high likelihood of a reliability risk due to the aging infrastructure and limited new construction, with 53% assigning it at a high severity level. With the capital constraints of the recession, the utility industry is only now embarking on infrastructure investments.

The New Energy Economy Offers New Opportunities

Many energy and utility companies are offering their customers new products and services, as well as new pricing options for electricity, gas, or water. Many utilities have been offering energy efficiency programs to their customers for many years. However, there are incentives in place now that are driving utilities to scale up program participation. In areas of capacity constraints, utilities are also offering their customers rebates or incentives if they participate in demand response programs or respond to demand response events. On the renewable energy front, utilities are offering several options. Customers may purchase a renewable energy product, buy carbon offsets, or receive a break in rates if they have their own renewable distributed energy (see Figure 3).

FIGURE 3

New Products and Services at Utilities



n = 56

Source: IDC Energy Insights, June 2010

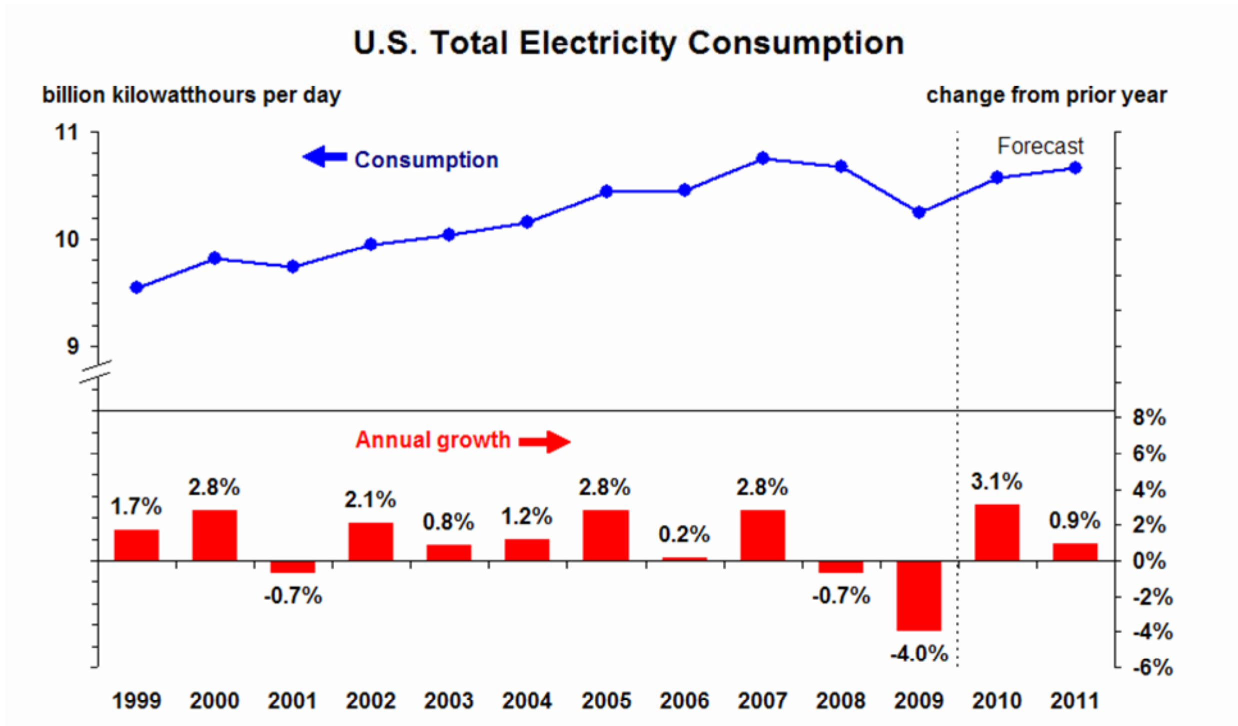
Smart metering and AMI provide the infrastructure for offering new pricing options. For example, the smart meter acts as a gateway to deliver a signal to smart thermostats or data to in-home displays via a home area network (HAN), thus enabling time-based pricing (dynamic pricing, time of use, critical peak pricing). IDC Energy Insights envisions that utilities eventually will provide incentives to customers to purchase their own smart appliances — appliances that will respond automatically to price signals.

Utility Industry Is Seen as a Road to Economic Recovery

The industry is starting to show signs of health. Energy consumption is starting to rise for the mass market and commercial and industrial sectors. Recent announcements of several large mergers and acquisitions — such as the acquisitions of E.ON US by PPL Corporation, Allegheny Energy by FirstEnergy, and three gas companies by UIL Holdings — are encouraging. The U.S. Energy Information Administration (EIA) is optimistic about the recovery, with electricity consumption forecast to grow in 2010 and 2011 (see Figure 4).

FIGURE 4

Electricity Consumption Forecast



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, June 2010

The recession has heightened interest in the energy industry as a source of domestic jobs in clean energy and the smart grid. The American Recovery and Reinvestment Act (ARRA) of 2009 included $11 billion for smart grid technologies, transmission system expansion and upgrades, and other investments to modernize and enhance the electric transmission infrastructure to improve energy efficiency and reliability. In addition, the federal government has committed to loan guarantees for nuclear power. A significant portion of the federal funding — approximately $4.6 billion — was designated for smart grid projects.

Despite the business environment, the outlook is a bit brighter for utilities, as the economy recovers and utilities are seen as a vehicle for economic growth and stability. However, there are also some regulatory challenges to be faced.

Regulatory Conditions

Carbon Will Come at a Cost

Legislation related to energy policy is lagging at the federal level but leading at the state level. States are continuing to play a significant role in energy policy. Twenty-nine states plus the District of Columbia now have renewable portfolio standard (RPS) mandates, and six more have RPS goals in place. Nineteen states have energy efficiency resource standards (EERS), and another three have pending EERS. While these initiatives do not put a direct cost on carbon, there is an indirect effect.

Climate change and energy legislation in the United States has been stalled. The Energy Independence and Security Act of 2007 encouraged states to provide a means to offer customers the choice of time-based billing with the implication that smart metering would be required for support. Now, there is much speculation about the shape of energy and climate bills, including whether they will include provisions mandating smart grid investments and some type of cost of carbon, although it seems clear that at least for 2010, cap and trade will no longer be a part of the bill.

Whether or not a climate change bill passes the Congress this year, emissions will come at a cost. Companies operating power generation are facing increased regulation and enforcement by the EPA. Most immediate is the transport rule of the Clean Air Act, which will impact sulfur dioxide and nitrogen oxide emissions that cross state lines. A new greenhouse gas (GHG) reporting rule requires utilities to develop a plan for monitoring emissions, calibrate monitoring equipment, and submit an annual GHG report by 2011.

Enforcement actions are also being stepped up, with some companies agreeing to settlements. Indicative of the magnitude of enforcement action, one utility will spend approximately $85 million to add emissions controls at a power plant and pay a $1.75 million civil penalty along with $6.25 million on environmental mitigation projects.

Reliability Is a High Priority

The focus of reliability is shifting from standard setting to enforcement of requirements. The blackout of 2003 initiated an intense effort on the part of the industry to ensure reliability. Customer satisfaction is highly correlated with reliability, and utilities are often penalized in their rate requests based on poor reliability performance. For example, in New York, state utilities have reliability performance mechanisms in place as part of their rate plans. Recently, one utility was looking at a $2.3 million earnings reduction for not meeting customer satisfaction standards. At the same time, utilities are beginning to see enforcement of reliability standards. According to SNL Energy, as of July 2010, mandatory reliability standard fines proposed by FERC total $30,584,650.

Privacy Emerges as an Issue

The smart grid has also put focus on another element of security — privacy of information. With the proliferation of energy management offerings, consumers are concerned that their consumption data collected through the utilities' meters will be shared with third parties. Even though regulations already exist on the sharing of customer data, several states are examining strengthening these regulations.

Privacy of customer data extends to competition as well. When deregulation first appeared in the 1990s, vertically organized utilities were required to keep customer consumption data collected by their distribution subsidiaries separate from their competitive retail subsidiaries. That requirement was reinforced by FERC 717, which was established in 2008.

Critical Infrastructure Protection Extends to Smart Grid

Ever since September 11, critical infrastructure protection (CIP) has risen on the list of priorities for utilities. CIP security means protection of the information as well as the physical infrastructure. In 2008, the Federal Energy Regulatory Commission (FERC) issued eight cyber-security standards (including critical cyber-asset identification, security management controls, electronic security perimeters, systems security management, incident reporting and response planning, and recovery plans for critical cyber-assets) and tasked NERC with monitoring the development and implementation of cyber-security standards by the National Institute of Standards and Technology (NIST).

Now NIST is focused on developing regulations for cyber-security of the smart grid. With the installation of smart meters, one concern, among others, is that there are now additional entry points — and potential vulnerability — for access to customer data. For example, hourly customer usage data in the wrong hands could be used to determine if a particular premise is occupied or unoccupied and invite unauthorized intrusion.

Management Challenges

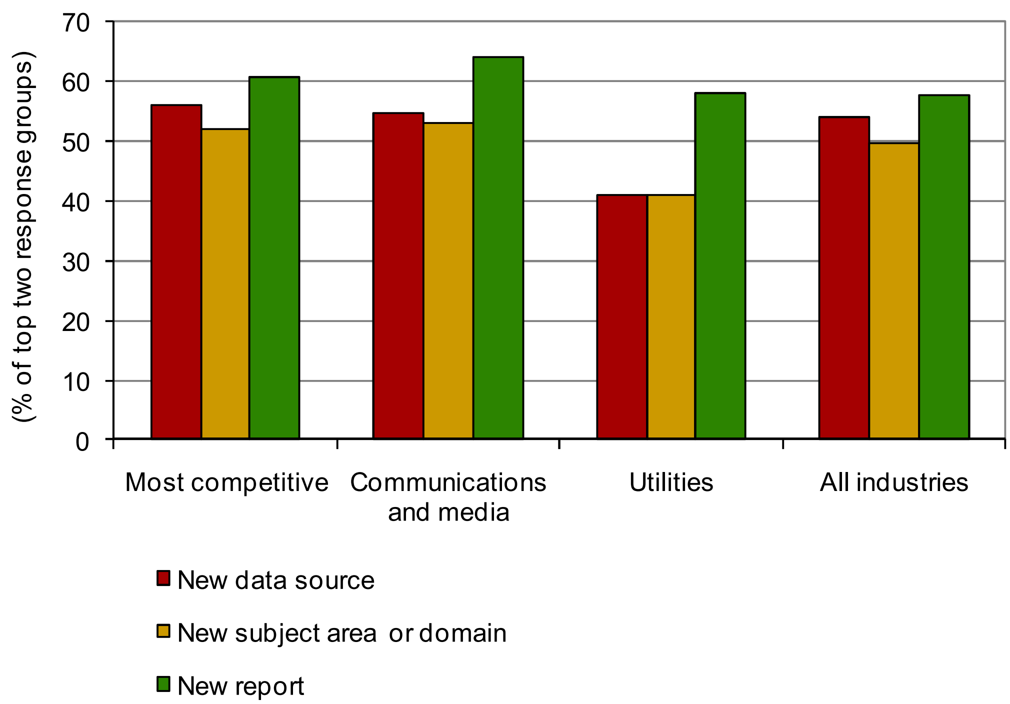
Addressing Decline in Revenues

Although the decline in utility revenues is being addressed somewhat with economic recovery, utility companies are facing a future where revenues are expected to decline with the introduction of conservation and energy efficiency. Utilities are attempting to address this dilemma at the state regulatory level through revenue decoupling. At its most basic, decoupling separates the charge for energy delivery from the amount of energy supplied so that the utility that delivers energy is not incented to sell more. Decoupling provides a way for utilities to promote energy efficiency while still being able to profit. Others are considering offering new products and services as part of their strategy to address declining revenues. However, utility management is finding that it lacks access to the data that it needs to support strategic decision making that will lower risk and put it in the most favorable position with its shareholders relative to other industries. Utilities are below average compared with other industries in the ability to meet end-user expectations for business intelligence, particularly when new data sources or new subject matter is added (see Figure 5).

FIGURE 5

Responding to the Need for Intelligence

Q. On average, do you agree that the speed of your IT department's response to each of the following end-user business intelligence–related requests meets end-user expectations?



Source: *Improving Organizational Decision Making Through Pervasive Business Intelligence* (IDC white paper #214958)

Making the Business Case for Smart Grid

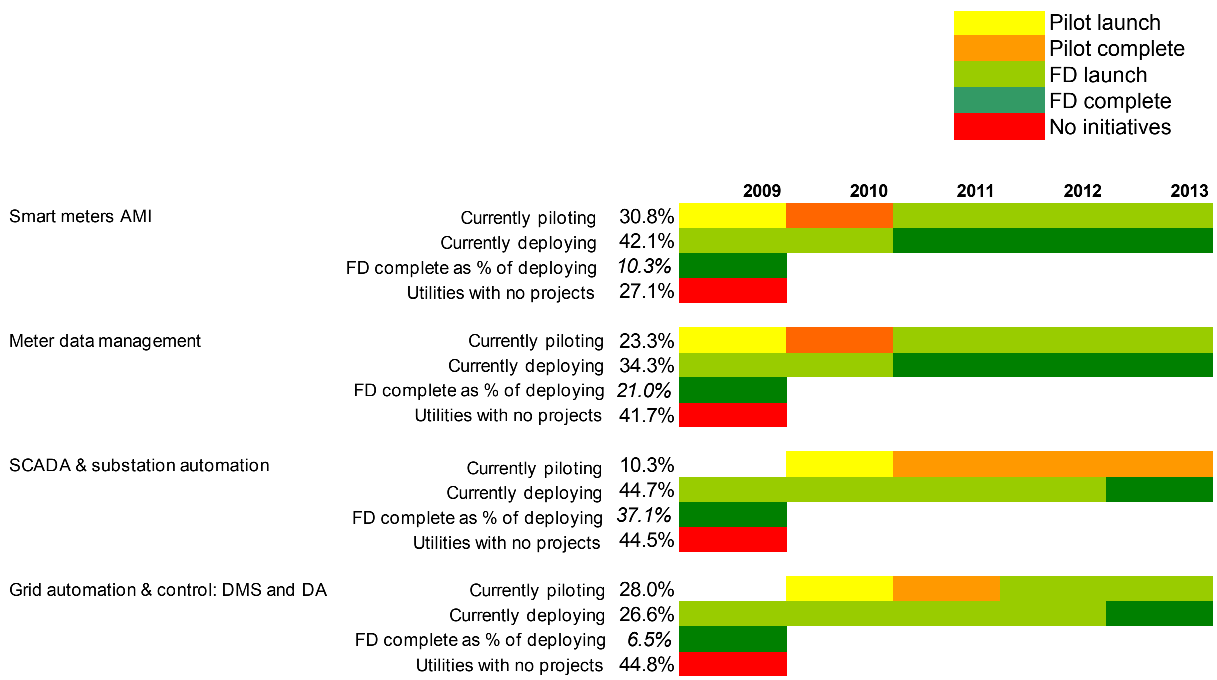
Smart grid is proposed as a way to address reliability, aging workforce, new products and services, and climate change. There are probably as many definitions of the smart grid as there are utilities. Whether called smart or intelligent, intelligent grid is an electric transmission and distribution (T&D) network that uses information and communications technology (ICT) to predict and adjust to network changes autonomously.

Intelligent grid more efficiently integrates operational and revenue-generating business processes (e.g., generation and trading). At the same time, it allows utilities to connect with end users and the premise-based assets that allow for improved management of electric usage, distributed generation, and customer experience.

Smart grid is not just smart metering and advanced metering infrastructure. Smart grid investments also include investments in distribution automation, line sensors, and synchrophasors (see Figure 6). The top 80 electric utilities have committed to making at least $6.2 billion in smart grid investments, with plans currently in place for deploying smart meters to 45% of their electric customers.

FIGURE 6

Planned Investments in the Smart Grid



Source: IDC Energy Insights, 2009

Those utilities making significant investments in the smart grid are now in the process of discovering whether these projects will achieve the return on investment (ROI) established in the original business case. Those utilities receiving federal ARRA funds are further challenged by the three-year timeline for implementation. Depending on the utility, there will be different hard benefits that can be demonstrated:

- **Reduced revenue leakage.** Revenue leakage is related to smart meter capabilities for remote connect/disconnect, theft and tamper detection, and analysis of meter and billing data to detect unbilled accounts. These are hard benefits.
- **Increased operational efficiency.** Operational efficiency attributed to smart meters comes from reduced truck rolls related to high bill complaints and the ability to perform remote connect and disconnect. Smart meters provide access to interval data (usually at 10- to 15-minute intervals) that may be collected as much as several times a day. Sensors on the grid are also capable of delivering more granular data from various points on the grid (substations, feeders, etc.) than previously available to the utility. "Smart meter data" combined with "smart grid data" is used to pinpoint outages in order to more efficiently and quickly address faults. Increased operational efficiency directly hits the bottom line. These are hard benefits.
- **Avoided capital investment.** For some utilities, the business case is based on achieving demand response. Two-way communication via the smart meter facilitates delivery of demand response event notification to the customer, and interval data is used to facilitate verification of the response. The theory is that with reductions in peak load, the utility will avoid the cost of investing in peaking power generation supply and/or capacity.

Of course, there are soft benefits from the installation of smart grid as well. For smart grid investments, the benefits often cited are improved reliability (System Average Interruption Duration Index [SAIDI], System Average Interruption Frequency Index [SAIFI], Customer Average Interruption Duration Index [CAIDI], and Customer Average Interruption Frequency Index [CAIFI]) and fewer customer complaints. For smart metering, the benefits are also related to customer satisfaction — given the customer's greater ability to control costs and/or help the environment.

Convergence of Operational and Information Technology

The past 10 years have seen the proliferation of much smarter devices on the grid — operational technology (OT). Devices that support real-time operations — programmable logic controllers (PLCs), distributed computing systems (DCS), intelligent electronic devices (IEDs), smart remote terminal units (RTUs), intelligent sensing devices, and supervisory control and data acquisition (SCADA) systems — are incorporating computing in the field and two-way communications between these IP-addressable devices for distributed or centralized control. The convergence of ICT and OT is posing issues for management, particularly for grid automation:

- How to maintain security of control system data while allowing for automated decision making

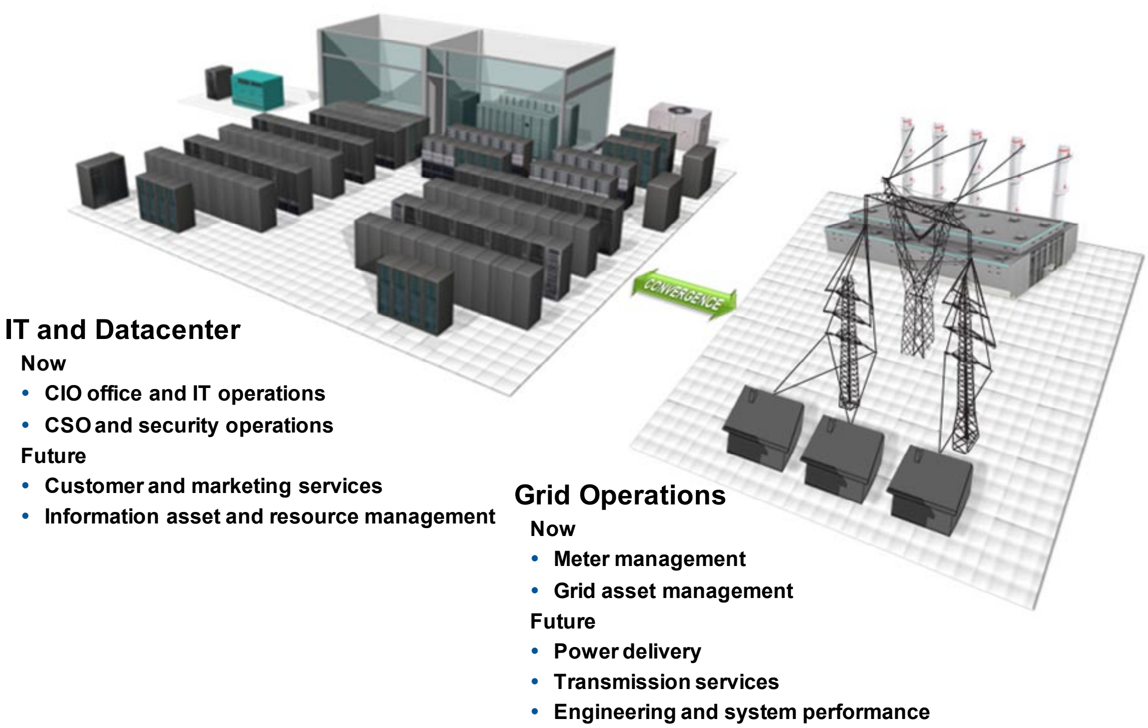
- How to manage the organization now that systems are coming together
- How to leverage existing IT investments on the operational side
- How to gain greater efficiencies across IT and OT

At this point, most utilities have seen an increase in cooperative efforts between engineering — owners of the operational technology — and IT — owners of information and communications technology. Utilities have not yet crafted a formal organizational structure to handle ownership of OT and IT. At this point, "convergence" is taking place today for select sets of data (e.g., meter signals fed to outage management). Convergence is also occuring from a data security perspective to ensure CIP compliance and adherence to applicable privacy laws. To a lesser extent, utilities are also seeing convergence when it comes to grid asset management. In other cases, data convergence between OT and IT is still future oriented, unfolding, and less transparent, especially for transmission (e.g., synchrophasor sensor/apps, renewables), engineering/system performance, and marketing (see Figure 7).

Utilities have not yet crafted a formal organizational structure to handle ownership of OT and IT.

FIGURE 7

Convergence Between IT and OT



Source: IDC Energy Insights, 2010

IT Challenges

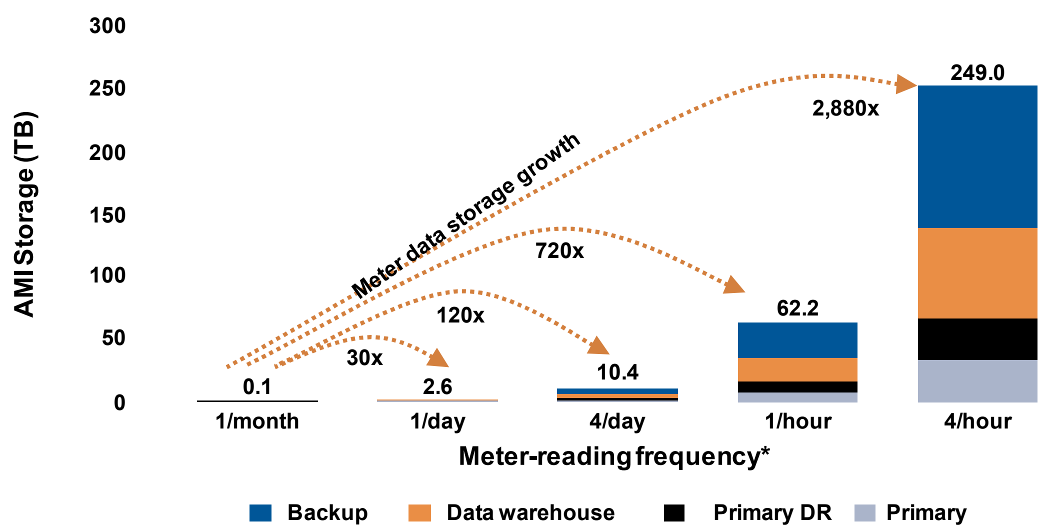
The IT organization is in a perfect position to help guide the utility on its new path. IT can bring to bear expertise in the areas of data management, data security, and network event management (root cause analysis) as the communication layer (IP or otherwise) is deployed across the grid.

Managing Information for Optimal Return on Investment

With the implementation of a smart grid comes an exponential increase in data. Figure 8 presents an example of storage requirements for residential interval data at various levels, which represents only a portion of data being generated. Also to be considered are storage requirements for grid sensor data. Data and information are essential to day-to-day operations and long-term planning. Without them, there will be little chance that utilities can achieve the business case of their investments in smart grid. The reason is that utilities will need to establish baselines for each of the elements of the business case and measure progress against those baselines to meet ROI or regulatory requirements.

FIGURE 8

Example of Storage Requirements for AMI



*Based on 1M residential subscribers
DR: Disaster Recovery
Backup includes weekly, monthly, and quarterly fulls and daily incrementals

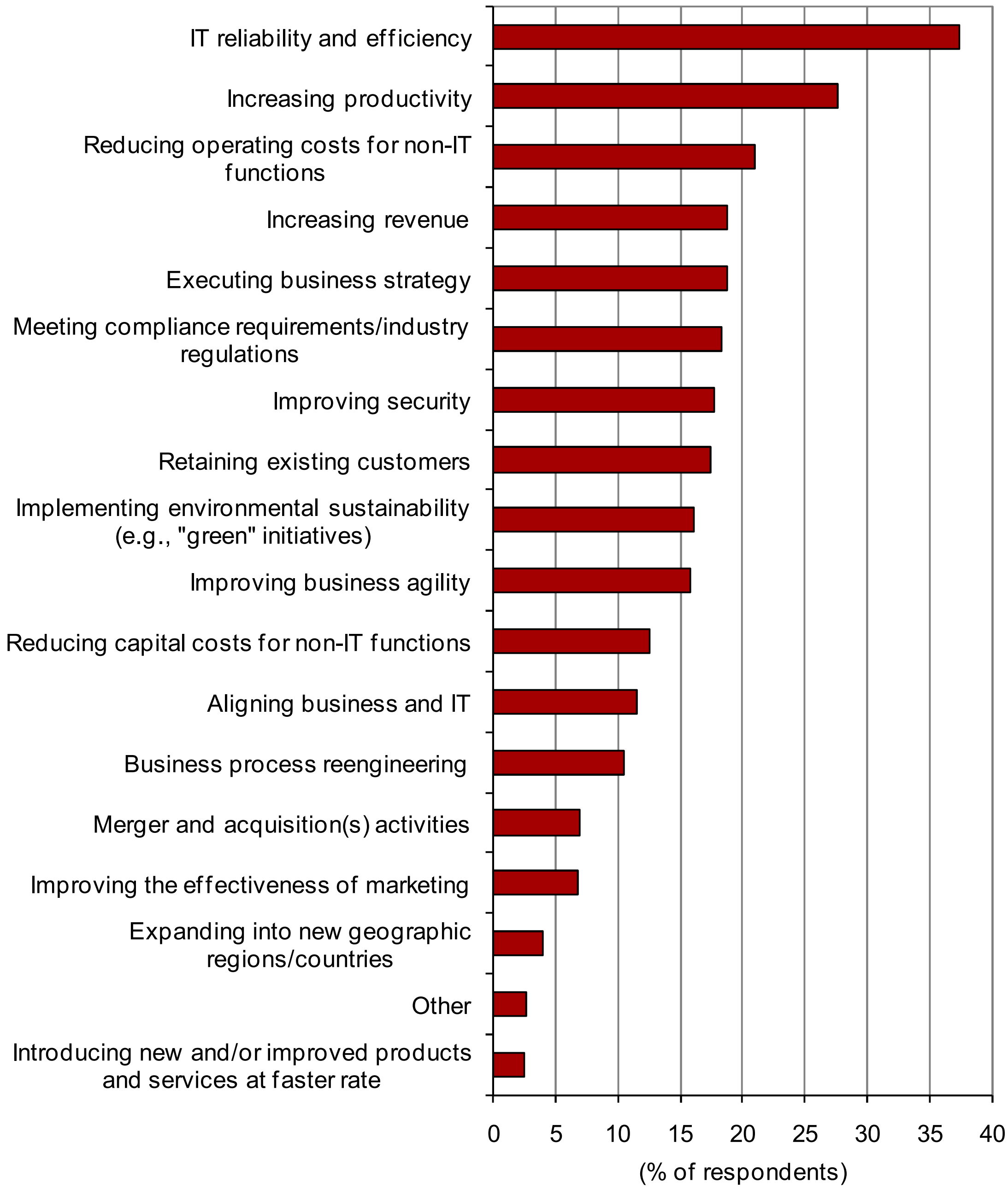
Source: EMC, 2010

Utilities are already making investments in information management a priority. From an application perspective, meter data management (MDM) and security are top priorities for software investments. IT reliability and efficiency and increasing productivity are priorities for 2010 (see Figure 9).

FIGURE 9

Utility Priorities for Investment, 2010

Q. Over the next 12 months, which of the following initiatives will be significant in driving IT investments at your organization?



n = 113

Base = respondents whose knowledge covers software and utilities

Notes:

Managed by IDC's Quantitative Research Group

Data is weighted by employment by industry and business size.

Source: IDC's *2010 Vertical Group Survey*, January 2010

The general challenge for IT is to make the right trade-offs in investment in IT infrastructure. Smart grid funding is dedicated to investment in smart meters, AMI, telecommunications, and services for smart grid, but the utility CIO must also make investments in the underlying IT infrastructure to manage data and information. This investment is necessary to extract value for strategic objectives such as better capital planning and development of new products and services or operational objectives such as early identification of potential grid failures and identification of revenue leakage. Table 1 displays just a few of the challenges related to managing data and information for utilities.

TABLE 1

Challenges for the Utility CIO

Managing T&D Grid Data	Managing Meter Data
Determining the balance between centralized or distributed (device) computing	Achieving acceptable levels of production for billing and customer presentment
Optimizing performance and utilization of storage specific to the workload	Optimizing performance and utilization of storage specific to the workload
Integrating old and new communication infrastructure to support secure data communications	Protecting privacy of customer data
Minimizing network traffic with high device data production given new devices that produce high data volumes	Retaining and archiving billing data to meet regulatory requirements and satisfy business continuity
Managing data, alerting about data irregularities, and resolving inconsistencies	Managing data, alerting about data irregularities, and resolving inconsistencies
Establishing consistent data synchronization, data models, and protocols	Establishing consistent data synchronization, data models, and protocols
Securing the smart grid telecommunications network from incursion by hackers	Securing the AMI network from incursion by hackers
Making the right data available for operations and analytics	Making the right data available for production (billing and customer presentment) and analytics

Source: IDC Energy Insights, 2010

The key for the CIO is to be able to invest in technology that manages grid and smart meter data most efficiently. The ideal is having a platform that can service both.

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What Utilities Will Need from IT

IDC Energy Insights has identified five "must-haves" in information infrastructure as utilities incorporate new technologies, whether grid-facing or customer-facing:

1. Security of the Grid and Privacy Protection

With concerns about privacy and the security of grid operations, utilities must have a comprehensive data security plan that meets or exceeds FERC/NERC compliance. Standard cyber-security components such as encryption, key and certificate management, firewalls, and user access and identification are absolutely critical elements of a security strategy to protect against unauthorized access to data and control systems. For smart metering, key and certificate management should be scalable to numbers of smart meters and other AMI devices. Ideally, encryption is embedded in the meter itself.

CIP depends on utilization of information and communications technology. Video surveillance and other monitoring equipment provide digital data and, when paired with analytics, speed detection of anomalies that could signal potential security breaches. However, this data needs to be monitored and managed. To ensure compliance with requirements, utilities need to take a dynamic approach to identifying sensitive or vulnerable sources of data across the grid. Information and telecommunications are constantly evolving, requiring constant vigilance for security breaches through methods such as attack simulation and intrusion testing and detection. In the event that an incident occurs, utilities will also need to be able to investigate and document the event, as well as derive lessons to further strengthen security protocols. Finally, the utility needs to be able to meet regulatory reporting requirements for security and privacy as established by FERC/NERC or state and local authorities.

2. Data Quality and Network Performance Assurance

Utilities need to have a system in place to monitor and manage data quality and network performance, particularly in the case of smart metering, where meter data is used to create billing determinants or where lack of data can signal a power outage. For example, a group of meters could report as unresponsive due to a power outage, meter failure, collector problem, or downed network.

Automated alerting to major data anomalies is preferred. Analytics can help to highlight the priority areas amid potentially numerous alarms. Quality control engineers should have visibility into the AMI network as well as access to data and analytic tools to understand the sequence of events and to perform root cause analysis of incidents or anomalies. That analysis becomes more valuable if it is also made in the context of service and business impact, typically provided by business analytics.

At the same time, logging of incident handling will be a foundation for continuous improvement and compliance reporting. The most advanced systems have automated this process to streamline operations and reduce costs.

The system will also need to act as a manager of managers. Utilities are often handling multiple meter types, network service providers, and datacenter providers. The best approach brings together heterogeneous network events across information technology and operational technology. The ideal is to have the ability to manage network performance from one screen.

3. Efficient Data Management and Archiving

With more data available than ever before, utilities need a way to manage and store that data efficiently. Utility IT departments are practiced in managing transactional data used in enterprise and industry-specific applications, such as work and asset management and customer care and billing. What is different with the new sources of data is that transactional data is being quickly outpaced by "real-time" or time series data as OT and IT converge. Data collected from IEDs on the grid is also time series in nature. Meter reading intervals can be as short as 15 minutes, with collection periods being as little as four hours. This has implications for storage — storage needs will grow. In addition, utilities looking at server virtualization will also need to reevaluate their portfolio of storage.

Many utilities archive meter data for seven years for accounting purposes, although the common practice for meter data service providers and MDM providers is to retain this data for three years. For example, the California Public Utilities Commission and the Illinois Commerce Commission have set a standard of 13 months of online data retention and three years of archived data retention for meter data service providers. A review of a recent request for proposals from the Sacramento Municipal Utility District (SMUD) calls for MDM vendors to store 36 months of billing data or possibly more. This is interesting because the practice in the past has been to make at least one year of data quickly and easily available and archive the rest.

While it is still unclear how retention and archiving requirements will emerge across the country — many states are considering these as part of smart grid deployment plans — it is clear in today's climate that regulators will mandate retention requirements on behalf of customers. It makes sense as well for utilities to be able to maintain an audit trail. What does not make sense, given the volumes of data, is to keep much of it in production systems such as MDM, as this slows production. Best practice is to implement storage tiering so that data is accessible based on its business value. For example, older data should be archived to SATA disks or a separate archive tier, and data needed for next month's bill should reside on high-performance flash drives on the production system.

4. Ease of Access to Data and Business Analytics

Business analytics will get utilities to the point where they can make use of the additional data being collected to support their business initiatives and business cases. If utilities are to meet the business case for their investment, it is important that data from multiple sources and types — internal and external, time series, and transactional — be accessible and easily retrieved for analysis. For example, analysis of customer consumption data, billing data, and payment history can help a utility to fit payment options to the customer, thereby decreasing uncollectibles. Business analytics can aid in the design of demand response programs by providing the utility with an understanding of the customer's elasticity of demand, based on analysis of past behavior and future demands. With the introduction of dynamic pricing, this type of analysis will need to be performed not just for program design but weekly or even daily to ensure that customers will respond to the price signal.

Operational intelligence — analytics applied to data for the purpose of improved decision making and planning — can be applied to data and information, but only if the analytic applications can access that data quickly and easily, with little or no time spent by utility personnel in assembling the data for analysis. For example, the ability to quickly perform a root cause analysis of an outage and identify the source makes more efficient use of the labor force and can shorten the duration of the outage.

5. Disaster Recovery

As utilities are most often close to dealing with disasters such as hurricanes and other weather events, disaster recovery is not a new concept. Many utilities have robust data loss prevention and disaster recovery plans and systems. For example, during Hurricane Katrina, Entergy was fully up and running with its backup systems in another location within hours. NERC Critical Infrastructure Protection Standards for Cyber-Security (NERC CIP-009) is meant to guarantee that disaster recovery plans are put in place. However, many disaster recovery systems may not be optimized to operate at the lowest possible cost. Utilities are well aware of bandwidth issues associated with movement of data from the field and meters to more centralized locations. A system that will minimize bandwidth needs as the data flows out to backup and recovery systems can help to lower networking costs. Methods such as compression and deduplication of records can aid in reducing need for bandwidth while increasing speed of backup and recovery with minimal data loss.

FUTURE OUTLOOK

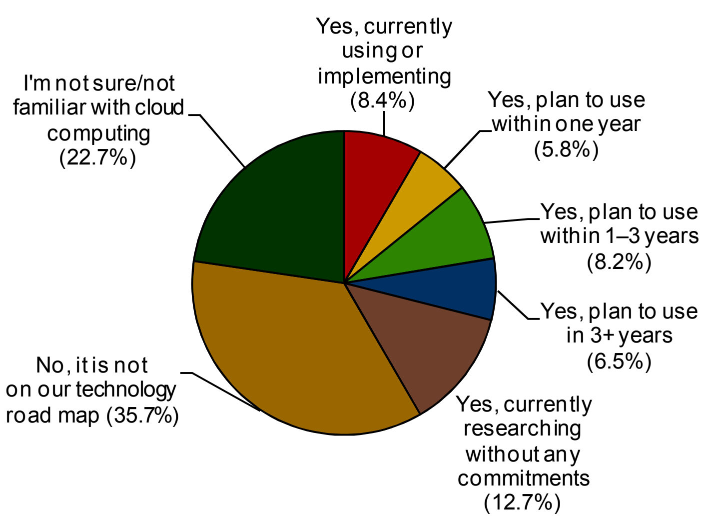
Utilities are just in the beginning of substantial changes to their business and underlying technology. Although the spotlight initially has been on large-scale smart metering implementations, utilities have also made investments in increasing the intelligence of the grid itself. IDC Energy Insights expects that this investment will continue as utilities put together a comprehensive transmission and distribution automation strategy. This strategy will encompass intelligent electronic devices, remote terminal units, distribution management combined with outage management, and greater penetration of substation automation. With more data being collected at the device and equipment level, the challenge of managing the data will only increase.

Utilities are already leveraging server virtualization technology for core enterprise applications, and now they are beginning to weigh how cloud computing can act as a strategic lever in dealing with the coming data deluge. In fact, in a recent IDC survey, 14.2% of utilities indicated that they are already using cloud or plan to use it within the next year (see Figure 10). The blending of OT and IT will only accelerate this data growth and the exploration of more efficient technology infrastructure.

FIGURE 10

Utilities Begin to Go into the Cloud

Q. Is cloud computing currently on your organization's technology road map?



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In the long term, the power system is expected to increase in complexity. That complexity is already coming as utilities experiment with new technologies, such as plug-in electric hybrid vehicles, smart appliances connected to home area networks, the integration of customer-owned distributed energy, energy storage, and distributed renewables such as rooftop solar and wind. These new technologies and programs are all fueled by extracting maximum value from, and the efficient management of, the volumes of new data with best-of-breed information technology. There is potential for many business models, although whatever the business model, the data and information management requirements will increase, along with the data and information. High-speed analytics, such as dispatch optimization, will play a greater role in providing the utility with a virtual power plant (VPP), the ability to enable demand response to offset variable generation like wind and solar.

CONCLUSIONS

The utility today is as much a processor of information as it is a processor of fuel to generate electricity. Data and information can help utilities manage their generation, transmission, and distribution operations more efficiently. It is important not to lose sight of the fact that the data itself needs to be managed for peak efficiency.

- Develop a data and information management strategy for the enterprise that can be adapted to future requirements for increased scale, new mandates for archiving, and constantly evolving security conditions.

- Become involved in development of NIST standards, privacy standards, and NERC CIP, and develop a strategy and road map for security and compliance.

- Assess your company's overall information management infrastructure. Decide early on how quickly your system needs to respond to requirements for scale, speed, and accessibility. Some situations may call for low latency, while others will not have the same requirements for speed. Not all data needs to be available for real-time operations. For example, the system need not be responsive in seconds when it comes to data used for billing transactions. On the other hand, the system must be able to support efficient extraction of data for production so that this process is completed in hours, not days.

- Determine what existing assets can be leveraged across multiple domains and what needs to be added to support current and future requirements.

- Examine how you can use OT and IT together to achieve greater reliability and operational efficiency. For example, AMI and meter status integration into outage management systems (OMS) improves customer outage restoration performance metrics. Many areas are developing, including distribution optimization for improved energy efficiency and power quality and wide area situational awareness for greater reliability in the transmission grid.

ABOUT EMC

EMC Corporation is the world's leading developer and provider of information infrastructure technology and solutions that enable organizations of all sizes to transform the way they compete and create value from their information. EMC has served Investor Owned Utilities, Municipalities, and Cooperatives for over 25 years with solutions that address their information management challenges. More information about EMC's products and services can be found at www.EMC.com/smartgrid.

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