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Introduction
For decades utilities have used data analysis to glean insights from historical data. Traditionally, that information was based on small sets of data or was manually entered into databases. Over the past few years, utilities have strived to implement Advanced Meter Infrastructure (“AMI”) and Meter Data Management (“MDM”). Capital investment to deploy smart-meter technology at utility meter points is high, so it has taken time for utilities to build out smart grid infrastructure. As new smart grid systems have grown in prominence, utilities now deal with a confluence of vast amounts of data that can be used for more sophisticated and detailed analysis than was previously available. All of this new data presents a significant challenge for utilities as they now look for ways to use the data rather than simply store it. Meter data analytics allow utilities to bring everything together to deliver actionable insights across the entire enterprise.

Utility Meters and the Evolution of Smart Meters
As energy consumption continues to outstrip current grid capacity, utilities and municipalities across the U.S. are increasingly focused on incorporating new smart grid technology to improve the performance of their existing infrastructure. Smart meters and the supporting AMI network represent the backbone of the smart grid infrastructure and will enable utilities to cost-effectively measure, monitor and supply their consumer networks while balancing supply side constraints caused by peak demand. Smart meters provide consumers with valuable information, such as the cost of their usage based on time-of-day and demand levels transforming consumer energy use behavior to mitigate potential supply shortages, increase grid efficiency and promote energy cost reductions through off-peak usage. Recent industry trends, including increasing energy demand, rising costs, and environmental and regulatory pressures, have compelled utilities to employ smart meter technology to offset these trends and enhance demand response and load control.

As early as the mid-20th century, utilities began deploying non-digital, electromechanical induction meters to residential and commercial customers. Today,
many utilities continue to use electromechanical meters, which feature a series of dials used to measure energy consumption. Many of these meters are still in the field today, although a growing portion has been replaced with smart meters.

Initially introduced in the 1990s, Automatic Meter Reading (“AMR”) meters are essentially electromechanical meters, but allow for the wireless collection of consumption, diagnostic and status information through local reading devices, such as drive-by and handheld systems. AMR still requires utilities to incur significant data collection and meter reading costs and does not permit two-way, interactive communication. As a result, utilities and rate payers lack the ability to coordinate usage and adjust to peaks and troughs in energy demand, thus ignoring the need for more efficient energy use.

AMI technology was initially introduced in the mid 2000s and is rapidly displacing AMR technology due to its drastic cost advantages and revolutionary functionality in utility management and pricing. AMI enables two-way communication between the utility company and the rate payer, which many experts predict will lead to a full-scale upgrade of all existing meters. AMI meters have an imbedded computer, which has the ability to track, store and communicate energy usage, as well as provide time-of-use (“TOU”) pricing, TOU programming compatibility, and an advanced power outage solution system.

There are a number of smart meter companies that continue to develop AMR and AMI technology for deployment in head-end systems. The largest players in that segment of the market are Itron, Landi+Gyr, Sensus, Elster and Silver Spring Networks. Collectively, they develop products that include electricity, gas and water meters, data collection and communication systems, including AMR and AMI, meter data management and related software applications.
**Smart Grid Implementation**

A smart grid delivers electricity from utilities to rate payers using digital technology with two-way communications to control devices and maximize the efficient use of energy. The U.S. penetration of advanced meters increased from 8.7% in 2009 to 13.4% in 2011, or 9.7 million meters, as reported by a U.S. Energy Information Administration sample. Industry experts estimate that utilities continue to deploy advanced meters at a rate of more than 10 million meters per year. If current trends continue the market for advanced electrical meters is expected to be 100% penetrated by 2020. Large deployments of advanced water and gas meters are also expected as the cost per meter point continues to decline with less expensive technology and more robust, sophisticated meters.

![Projected Advanced Meter Penetration](image)

As of September 2011, 27 million smart meters had been installed. The Institute for Electric Efficiency estimates that approximately 65 million smart meters will be deployed by 2015, representing 54% of U.S. households.

**Data Proliferation**

IDC, a technology research firm, estimates that data is growing at 50% a year, or more than doubling every two years. As utilities implement smart grid systems they immediately experience a deluge of grid data generated by a vast array of sensors and devices. Utilities that successfully implement analytical tools will be able to transform volumes of raw data into useful, comprehensible information that drives critical business decisions.

**Energy Efficiency**

The American Recovery and Reinvestment Act (“ARRA”) provides for approximately $18 billion in government expenditures that are specifically designated to improve energy efficiency infrastructure in the U.S. Projects include funding for an improved energy grid that focuses investment in renewable technologies, repairs to public structures, and research and instrumentation for science facilities. Analytics
within a smart grid environment help utilities enhance environmental performance and compliance by enabling more effective tracking of power supply and demand, and by incorporating renewable energy sources into the grid.

**Utility Analytics and the Evolution of Meter Data Analytics**

Analytics are technologies, services and processes that enable utilities to transform data into actionable insights through collecting, managing, cleaning and storing data; extracting and analyzing data; reporting and analyzing results; and making decisions and taking action.

Utility analytics can be divided into five key areas:

- **Hardware**
  Servers, storage and networking equipment that support analytics applications.

- **Software**
  Grid analytics are applications that enable utilities to ensure better planning, design, construction, operation and maintenance of utility transmission and distribution networks. Grid analytics includes transformer management, grid optimization, outage management, system modeling, power quality optimization, advanced distribution management, real-time network operations and predictive asset maintenance.

  Customer analytics are applications that enable utilities to analyze data to better serve the utility and its customers. They include meter data analytics and meter data management systems, credit and collections, call center optimization, fraud detection, customer segmentation, pricing optimization, revenue protection and demand response programs.

  Other analytics include applications that enable utilities to analyze complex data to improve planning and operations in areas such as generation, energy trading, portfolio optimization and shared services.

- **Services**
  Consulting, outsourcing, systems integration and other services associated with planning, implementation and operation of analytics applications.

- **Processes**
  Understanding how changes in utility processes (like new regulatory requirements) create a need for analytics and how analytics will change utility processes.

- **People**
  Validation by a community of experts is required to ensure the analytics are trusted by
different users operating in different parts of an organization. For example, outage analytics need to be validated by power system engineers before they are put to use by distribution systems operators or call center operative or posted in near-real time on a public website.

It is also important that the analytics are presented in the correct way for effectively supporting improved processes and better decision making among the people consuming the analytics.

Visualization techniques that offer information in the right format to the right people are critical, considering that the same information needs to be presented in multiple ways to meet the requirements of different end users.

The chart below summarizes some of the business applications and actionable insights that can be gained from utility analytics.

**Benefits of Meter Data Analytics**

Analytics within the utility sector can be thought of in three distinct periods of time. In the pre-1990s, data storage and analysis were done through ad-hoc spreadsheets. Business users focused on trying to understand what happened historically. From the 1990s to the mid 2000s, data warehouses and query capabilities were enhanced. Business intelligence became more prevalent and there was a shift in focus from understanding what happened to why it happened. The rise of dashboards and alerting capabilities allowed business users to rely on consistent metrics and statistical methods to measure past performance and guide future planning. From the mid 2000s until today, the market has employed more sophisticated predictive modeling capabilities and automated decision-making to extend user focus beyond “what happened and why” to predicting “what will happen next and how do we prepare for and adapt to those predictions”.

The chart below illustrates the evolution of utility analytics.

The Evolution of Utility Analytics

"North American utility analytics spending is projected to grow approximately 29% per year from $552 million in 2011 to nearly $2 billion in 2016."

Industry Growth

North American utility analytics spending is projected to grow approximately 29% per year from $552 million in 2011 to nearly $2 billion in 2016. Currently, approximately 57% of utilities have undertaken an analytics initiative, and another 17% of utilities plan to undertake an initiative in the next twelve months. Roughly 46% of these near-term analytics projects are in excess of $1 million.
 “…over 70% of utilities are currently either in the process of undertaking an analytics initiative or plan to undertake an initiative within the next 12 months.”

In addition, over 70% of utilities are currently either in the process of undertaking an analytics initiative or plan to undertake an initiative within the next 12 months.

### Utility Analytics Initiatives

Source: UAI, “2012 Annual Market Outlook & Forecast”

In 2011, 29% of analytics spending was on hardware, 38% on software and 33% on services. Between 2011 and 2016, analytics software spending is expected to increase 39% per year on average, compared with 19% for hardware and 23% for services.
The chart below illustrates the breakdown of analytics spending by type of analytics.

Analytics Spending by Type of Analytics

Between 2011 and 2016, annual growth rates for grid and customer analytics are expected to average 33% and 32%, respectively. Other analytics will grow at approximately 18% per year.

Growth Drivers

Utility Company Spending

Investor-owned utility companies account for 54% of North American analytics spending in 2011, compared with 46% for publicly-owned utility companies. Between 2011 and 2016, publicly-owned utility company spending is projected to increase at a slightly faster rate than investor-owned utilities, increasing about 30% and 20% per year, respectively.

Analytics Spending by Type of Utility

Source: UAI, “2012 Annual Market Outlook & Forecast”
Large utilities account for approximately 86% of 2011 analytics spending, with medium utilities accounting for 12%, and small utilities comprising the remaining 2% of spending. Between 2011 and 2016, small utilities spending is projected to grow 60% per year on average compared with 35% for medium utilities and 27% for large utilities.

**Performance Improvement and Customer Service**

The use of sophisticated analytics within a smart grid program can help utilities improve customer relationships through more regular and targeted demand response programs. Those programs boost customer loyalty and minimize wasted marketing spend. The use of analytics also helps to achieve greater network reliability and resilience through real-time, automated updates about grid/equipment status and operations. Faults and outages can be isolated and addressed more quickly and effectively. This increased responsiveness also helps to build enhanced and durable customer relationships.

**Regulation**

Three federal bills have provided financial subsidies and incentives earmarked for investment in smart grid projects across the United States:


The aggregate funds allocated by these three bills provides for more than $3.6 billion in smart grid funding, which has already impacted the market by accelerating the implementation of contracted AMI projects. Through the Smart Grid Investment Grant program (“SGIG”) provided for under ARRA, approximately 7.2 million advanced meters have been installed using Recovery Act funding as of
September 28, 2011. In total, 15.5 million advanced meters are expected to be installed under SGIG.

Additionally, a number of states, including Colorado, Kentucky and New Jersey, have implemented legislative and regulatory mandates that address smart grid and advanced metering issues. For example, New Jersey’s draft Energy Master Plan issued in June 2011 calls for the expansion of advanced metering and dynamic pricing, the reduction of peak demand, and the assessment of smart grid demonstration projects.

**Grid Analytics**

Grid analytics is a sub-segment of data analytics. Grid analytics enables utilities to ensure better planning, design, construction, operation and maintenance of utility transmission and distribution networks. Grid analytics can be segmented into two general areas, asset optimization and grid optimization. Asset optimization refers to analytics that assist with optimizing the performance and reliability of grid assets and includes transformer management, substation management, and overall transmission and distribution asset management. Grid optimization analytics assist with optimizing the operation of the grid to minimize power losses and maximize efficiency and quality. This area includes outage management, system modeling, power quality optimization, advance distribution management and analytics for real-time applications.

Utilities have taken on different methods to optimize their grid operation and assets for years. On the grid optimization side, utilities have used SCADA systems, distribution automation and energy management systems, but those systems focused more on control. The first significant deployments of distribution SCADA began in the late 1980s and early 1990s when companies could deliver economical SCADA systems on low-cost hardware architectures. These systems helped utilities control the grid in near real-time, but they weren’t meant to store large amounts of information for analysis purposes, and still relied on human operator interface to make decisions.

For asset optimization, utilities have operated asset management systems for a long time. However, these systems primarily operated as information repositories for assets. These systems maintained a record of individual assets for data points such as acquisition cost, original service life, remaining useful life, physical condition, and repair and maintenance activities. Maintenance practices primarily focused on time-based maintenance, or performing maintenance on assets at regular intervals.

However, many utilities realized that assets rarely fail in a statistically predictable fashion. Utilities then started moving toward condition-based maintenance, or monitoring an asset to determine its current condition. This task is difficult, though, without connections between asset management systems and the real-time data available through control and monitoring systems, such as SCADA and energy management systems.
Today’s grid analytics applications build upon grid control and asset management foundations by increasing automation in decision-making, improving connections among data sources and offering better predictive capabilities. Engineering and operations are considered to be the most important business areas for grid analytics, with information technology coming in as a close third, which shows the importance of the interaction between operation and information technologies as grid analytics moves forward. In addition, utilities continue to focus more on data management than analytic applications, with an emphasis on data characteristics, such as the capability to bring together data from across the company and accessibility to near-time data. The ability to bring together data from across the company tops the list of important grid analytics characteristics.

Utilities continue to face challenges as they move forward with grid analytics initiatives. Approximately 36% of utility companies in a UAI survey sample group indicate budget availability as a key challenge to implementing or advancing grid analytics. Other utilities lack the necessary skills and staff to effectively implement analytics platforms, a challenge that tends to impact small utilities and public utilities more than larger, investor-owned utilities.

Many grid analytics projects are still in their infancy, but will experience significant increases in spending in the near-term. Currently, approximately 47% of all utilities have a grid analytics project under way or in the planning stages.
Of the utilities involved with analytics, about 54% of those companies are in the process of implementing the projects, with another 32% percent of those companies reporting that their projects are more than 50% complete. About 41% of the utilities have plans to start a grid analytics project, with 67% of those planning to start in the next 12 months. Between 2011 and 2016, experts predict that North American grid analytics spending, a subset of overall MDA and utility analytics spending, will grow by 33% per year from $215 million in 2011 to $902 million in 2016.

“Outage management and distribution automation advances will play a significant role in the growth of the grid optimization area in the near-term.”

The UAI expects to see an increased focus on grid optimization, which will account for the majority of the growth in this space, as well as continued growth for asset optimization areas. Outage management and distribution automation advances will play a significant role in the growth of the grid optimization area in the near-term.
Data Proliferation

Prior to the implementation of a smart meter, utilities would conduct one meter read a month per meter. With the new smart meters that capture data in 15-minute intervals, utilities will collect more than 3,000 meter readings a month for each meter. This translates to terabytes of data being collected and stored at the customer level. By creating a fabric on top of the existing infrastructure to establish a common operating platform, utilities can perform noninvasive, real-time data analysis to address their operational, energy delivery, customer care and security challenges.

Key Triggers to Data Growth

With the deployment of smart meters and AMI, providers have to process massive meter event and interval read numbers as well as access and backhaul communication feeds, tariff and demand management information, and service order and asset management systems. Power providers are concurrently dealing with mandates for renewable energy sources, deregulation, increasing load, demand response, plug-in electric vehicles and charging infrastructure, and aging infrastructure efficiency, all of which result in the need to understand even more data.

One breakthrough in dealing with data growth and the increased complexity of data is in a more logical approach to data warehousing. Using column-store database management systems, Map Reduce-based systems like Hadoop and in-memory databases, data can be loaded temporarily into part of the system for analysis then into another for different analysis or storage. Another leap forward is in situational intelligence, the use of multidimensional spatial maps to combine visualizations of structured and unstructured data from different underlying domains in a way that users can see and understand a situation at a glance.

Source: ELP, “Addressing the Big Data Concern in the Utilities Sector”
Utility Billing and Collections

Historically, meter data has been collected by utilities for presentation to customers and creation of utility bills. The meter data is, in this sense, supporting transactions. However, greater value exists in leveraging this data to improve the collections process through predictive analysis. Each year, utilities write-off millions of dollars in bad debt caused by customers who fail to pay their electricity bills. Utilities face significant pressure from shareholders and regulators to minimize those losses, while continuing to provide utility services to those customers who are not likely to pay. In addition, utilities want to maximize their return on investment in newly implemented smart meters. Lastly, given the economic downturn, public utility commissions are demanding that the utilities demonstrate more reasonable care in their disconnect notification efforts. The core technology foundation for collection optimization includes data mining; algorithms; sampling, exploration, modification, modeling and assessment; and robust reporting. Utilities already possess tremendous amounts of data that can be used to create their own advanced, customized bill payment plans for the purpose of optimizing their collection rates. The benefits resulting from improved collections are quantifiable and often significant, including lowered day sales outstanding, improved top-line revenue, improved credit ratings, optimized allowances for bad debt, and increased accuracy of forecasting for accounts receivable.

Industry Participants

A summary of some of the key industry participants is listed below.

Oracle

With its acquisition of DataRaker in December 2012, Oracle has established itself as the leader in the MDA industry. DataRaker provides a SaaS solution to utilities and is the only pure-play MDA provider in the industry. DataRaker offers an analytic platform that transforms energy data into targeted results for utility companies and customers. The company’s analytic platform validates, combines and stores key data elements from meter readings from various disparate systems, customer and meter attributes from the Customer Information System and other utility systems, and third-party data from non-utility sources. DataRaker’s services include meter operations and billing support; design, implementation, and evaluation support for demand response and energy efficiency programs, load research and forecasting, and call center support.

Detectent

Detectent provides customer intelligence solutions to municipal utilities. The company’s solutions include accurate billing that helps utilities to identify cases of inaccurate billing to minimize re-billing, and energy efficiency, which helps utilities meet energy efficiency targets by enabling the utility to target and reach the right customers with the right programs. Detectent’s solutions also comprise energy theft analytical tools and services that continually monitor the information of various
customers to help utilities manage the identification, inspection and tracking of energy theft cases, as well as deter theft in the future.

**Ecologic Analytics**

Ecologic Analytics was acquired by Landis + Gyr in January 2012. Ecologic provides meter data management system (MDMS) solutions for utilities. It offers Ecologic MDMS software that continuously validates meter reads every day for utilities, and transforms the data collected from smart meter endpoints into information for decision making across the utility. The company’s Ecologic MDMS solution includes Network Performance Monitor that tracks endpoint performance by seeking out irregular consumption, alerts, alarms and other abnormal activity, and generates the necessary events, service orders or other user-defined actions.

**Silver Spring Networks**

Silver Spring provides a networking platform and solution that enable utilities to transform the power grid infrastructure into the smart grid. The company received investments from EMC (2011) and Hitachi (2012). Silver Spring offers various solutions consisting of advanced metering, which allows utilities to automate various manual processes and enhance operational efficiencies, offer flexible pricing programs to consumers, and enhance customer service with faster outage detection and restoration. Silver Spring offers distribution automation that provides utilities with real-time visibility into the health of the grid, enabling better management and control of power distribution assets to enhance grid reliability, as well as demand-side management, which enables utilities to offer consumers a range of programs and incentives to use energy efficiently and reduce usage at times of peak demand.

**eMeter**

eMeter was acquired by Siemens in December 2011. eMeter provides software that enables utilities to realize the benefits of smart grid. The company offers eMeter Applications which turns meter data into usable information for business units and customers, eMeter Energy Engage, a consumer energy solution that provides consumers visibility regarding energy usage, cost, carbon footprint and eMeter Interval Billing, which provides meter data management and processing services to support various forms of consumer behavior-modifying rates and tariffs.

**Ventyx/Obvient**

Obvient Strategies was acquired in January 2011 by Ventyx, a subsidiary of ABB Ltd. Obvient offers software and services for industries and utilities with geographically dispersed assets. The company’s business intelligence software collects, analyzes and reports critical real-time as well as periodic information. This supports decision making and helps users to optimize operations. As well as helping to manage complex operations, the solutions also reduce operating costs and improve asset reliability. Obvient’s prepackaged product solutions enable companies to monitor and manage
their distributed assets more effectively, on a real-time and event-driven basis.

Teradata

Teradata provides analytic data solutions worldwide. The company offers various data warehousing solutions that comprise software, hardware and related business consulting and support services. The company’s solutions integrate an organization’s departmental and enterprise-wide data about customers, financials, operations, and others into a single enterprise-wide data warehouse. In addition, the company offers Teradata Analytic Applications and Tools comprising data mining, master data management, integrated marketing management, enterprise risk management, finance and performance management, demand and supply chain management, and profitability analytics to solve business problems.

With four notable acquisitions completed over the past eighteen months, M&A has played a major role in defining the competitive landscape in the MDA sector. We expect this to continue as other companies providing services to the utility sector seek to add an MDA solution to their current offerings.

Conclusion

The challenges of “big data” will continue to increase with the proliferation of AMI meter deployments. The large amounts of data from those meters will continue to present a significant challenge for utilities as they now look for ways to use the data rather than simply store it. Meter data analytics provides the solution that allows utilities to further unlock efficiencies and create data insights that maximize value across the entire enterprise.
VRA Partners, LLC

VRA Partners is an independent investment banking firm that focuses on providing merger and acquisition advisory services to leading middle-market companies and private equity groups located throughout the U.S. VRA Partners also assists companies with raising capital for growth, acquisitions, recapitalization, going-private and management buy-out transactions, as well as provides fairness opinions, valuations and strategic advisory services. The professionals of VRA Partners have completed more than 500 transactions with aggregate transaction value in excess of $35 billion across a broad range of industries.

The founders of VRA Partners have over 100 years of collective investment banking experience and come from a variety of backgrounds, bringing to the firm a diverse set of industry experiences and observations that benefit our clients. Notwithstanding our past experience, every transaction and company is different, and VRA Partners approaches each assignment as such, allocating the time and resources to ensure that we are informed about the dynamics of each client’s business and industry. Our transaction experience and our commitment to fully understand the opportunities facing each client allow us to effectively articulate to the marketplace how and why that client is unique. Importantly, we maintain the philosophy of treating our client’s objectives and interests as if they were our own.

VRA Partners maintains expertise in the energy products and services sector. We focus on companies that provide products, services and technology that support improvement of the utility infrastructure and building efficiency.

For more information about our expertise in the energy products and services sector, please contact:

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