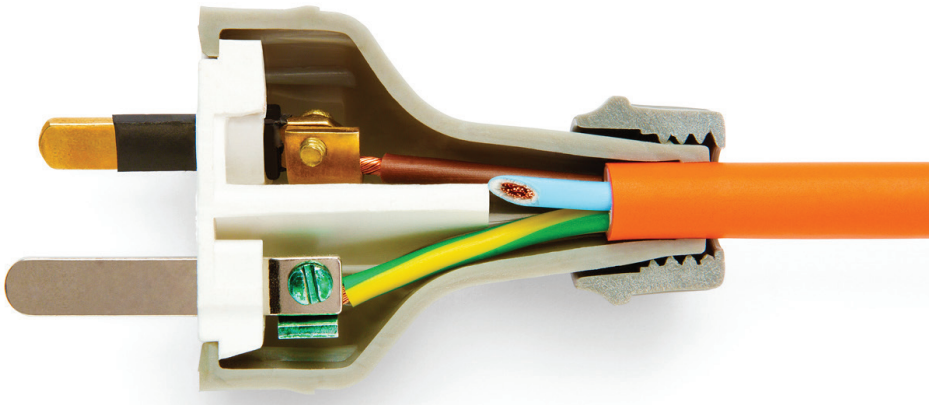
Deloitte.

Analytics in power and utilities
Driving performance through Power Insight℠



Our perspective

Utilities the world over realize that the smart revolution is having a disruptive impact on their fairly stable, mature, and conservative industry. In addition, the volume, diversity, and complexity of data is growing in orders of magnitude. In order to succeed in this increasingly competitive and heavily regulated environment, utilities must address these challenges in a structured and strategic fashion — by building analytical capabilities via systems, processes, and people, and by leveraging an enterprise-wide, scalable approach in doing so.

The rapidly changing utilities landscape

The unprecedented explosion of data from smart meter and smart grid programs, combined with increasingly complex data retention requirements from regulators and a changing competitive landscape, create a "perfect storm" in utilities for information management (IM). Like companies in other industries, transmission and distribution companies face the challenges and opportunities in the age of Big Data. The smart revolution is poised to deliver new levels of visibility into the flow of electricity from generators to consumers and into customer decision making — specifically in regards to energy conservation and consumption. This transformative process coincides with a vast array of external and internal forces that exacerbate the challenges:

- Adaptation to the constantly evolving landscape for energy sources, market fluctuations, and macroeconomic factors.
- Education and motivation of customers, both residential and business, to increase efficiency and reduce consumption rates.
- Response to and management of regulatory agencies' requirements for progress reports and oversight into operational performance, reliability, security, and return on capital.
- Management of the rapid modernization of assets used in the generation, transmission, and distribution of services, be it electricity, gas, or water.
- The integration of historically siloed divisions of the business to understand cross-functional impact of decisions.

- Management of the proliferation of analytical applications within the organization and the potential dilution of the "one source of truth."
- Preparation for the exponential growth in raw data collected by smart devices in the transmission and distribution network, including meters, sensors in substations and transformers, automated reclosers, and switches.

These are but some of the many drivers that place growing pressure on utilities' information management needs. As the amount of data collected climbs into the multiple-terabyte range, utilities require new ways to manage and exploit this data. The development of systems, processes, and capabilities to consolidate, rationalize, cleanse, and analyze the diverse data in the organization begs the need for powerful solutions.

"Electric utilities operate now much as they did a century ago — but the environment in which they operate is changing dramatically"

Lena Hansen & Amory B. Lovins, Rocky Mountain Institute

Many industry leaders are looking to analytics to extract insights from this data and move their businesses toward a future of proactive and agile decision making. The science of analytics identifies patterns in the data, elicits insights from historical data, and predicts the impact of business decisions — both short- and long-term — within and across functional silos. This capability requires a solid information management foundation — including data governance and data quality standards — to succeed.

The smart grid: Overload or opportunity?

Where utilities used to read meters once per month, some have transitioned to capturing meter data every 15 minutes, every hour of every day. The job of sifting through seven years of data to satisfy a regulatory request in a timely manner, and the multi-million-dollar fines for failing to do so, can be daunting.

The dawn of the smart revolution has exponentially compounded the amount of customer, grid, billing, and transformer data that utilities generate. In addition to the installation of smart meters, utilities are also upgrading distribution lines, transformers, and substations, implementing automatic switches and other intelligent electrical devices, which generate data. These data sources in the field are potential sources of fundamental operational insight via near-real time reporting and predictive analytics. Business units are clamoring for access to this wealth of data internally, and require a well-planned and strategic approach to analytics. Implementation of effective analytics strategy requires careful program management, governance, and stewardship, and the selection of analytics toolsets that support business operations efficiently and ubiquitously.

Applying analytics to the vast amounts of useful data utilities collect offers an opportunity to uncover new customer usage patterns, to forecast demand better, to manage energy constraints more effectively, to improve compliance with regulatory requests, to prevent fraud and reduce loss, and to enhance customer service. The ability to measure and analyze data about electricity distribution and consumption in near-real time can unearth previously unavailable information on customers' consumption patterns, preferences, and decisions. With this information, utilities can better segment their customers on the basis of their decisions to conserve or consume electricity. Primary and secondary consumer research through interactive tools and surveys can supplement raw consumption data to enable utilities to better understand their customers and, in turn, educate and motivate them to conserve power.

But there is a fine line between information opportunity and information overload. Companies that fall short in managing and leveraging the deluge of data may find it increasingly difficult to meet the needs of their internal and external customers. They may also fail to satisfy the scrutiny of numerous stakeholders, ranging from consumers to regulators, and increasingly, to shareholders. Precious momentum they may have developed in the funding and deployment of smart assets in the field can be impeded by the inability to finish tasks that require simple but historically unattainable answers buried within terabytes of data. Regulatory agencies' reporting requests have shorter lead times than in the past, and missing their deadlines can lead to costly fines.

"[Smart meter data] requires 200 TB of storage space [annually] when disaster recovery redundancy is factored in …"

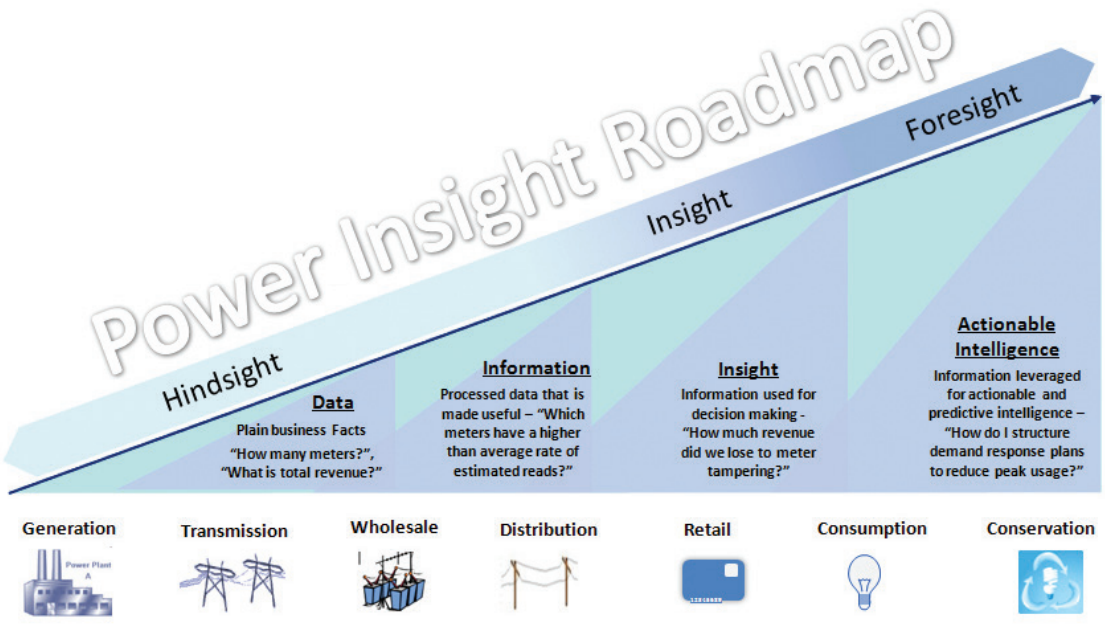
Andres Carvallo, Chief Information Officer, Austin Energy

Adopting a proactive approach to business analytics — even before smart projects are underway — can greatly benefit the organization by readying an infrastructure to house, mine, and analyze the eventual flood of data, channeling it into powerful operational and strategic advantages, some of which are listed below:

Analytics advantages pre-smart implementation:	Analytics advantages post-smart implementation:
• Standardized reporting practices and unified data sources to increase the credibility of internal and external reporting (e.g., to senior management and regulatory agencies, respectively). • Proactive management of customer payment plans to minimize delinquencies. • Quicker and higher quality outage identification, and confirmation of resolution, thereby solving customer issues and improving reliability scores (System Average Interruption Frequency Index, System Average Interruption Duration Index, etc.).	• Greater insight into the electricity consumption patterns of customers, thus improving the quality of the organization's market segmentation. • Reduction of unbilled revenue through the analysis of aggregated interval meter data against billed invoices. • Analytical oversight of time-of-use billing plans — from the utility's and the customers' perspectives (e.g., reduction in peak demand vs. reduction in billed revenue). • Improved forecasting of previously unmetered consumers of electricity — such as street lights and other public facilities — thus reducing the potential for unbilled consumption. • Settlement of supply/demand can become more real time as load data is available and does not need to be de-aggregated from global load profiles. • Asset management (loading of transformers and circuits) is available with Advanced Metering Infrastructure (AMI) below the substation and again improves performance by substituting load profiles with actual consumption.

Analytics in power and utilities: Power Insight roadmap

To meet the complex information demands of the utility industry, new thinking and approaches are required — solutions that not only meet today's needs for performing complex historical analysis and reporting, but also look forward with uncanny precision into what is likely in the future. Utilities must find ways to leverage their storehouses of data to effectively manage energy profiles, reduce peak demand, improve resource utilization, rapidly resolve outages, and improve the customer experience, now and into the future. Traditional approaches to information management aren't enough to cut through the current range and volume of data and arrive at informed decisions. That's where Deloitte's Power Insight comes in.



Power Insight is a methodology using skill sets, technologies, applications, and practices for the continuous, iterative exploration and investigation of past business performance to gain insight and drive business strategy forward. A mix of art and science, Power Insight makes use of statistical and quantitative analysis, explanatory and predictive modeling, fact-based management, and scoring and segmentation to deliver actionable intelligence to the business. Power Insight incorporates information management, advanced analytics, business intelligence, and performance-management capabilities.

By slicing, dicing, and manipulating data in new ways to create scenarios and answer tough questions, analytics can move informed decision making into the future, giving utility companies the ability to move up from asking questions like "How many meters do we have installed?", "How many reads were collected?", and "How many customers do we have?", to more effective questions like: "Why is this happening?", "What if this trend continues?", "What is likely to happen next?", "How do we prepare?", and "What is the desired outcome?" In this way, business analytics identifies events that may impact the business as a whole so that corrective action can be taken at as early as possible.

Where Power Insight addresses business requirements

Utilities that are able to effectively manage and analyze data are likely to be better at addressing their critical business challenges. Here are some functional areas with potential analytic solutions for them:

- **Revenue management** — Analytics can leverage integrated meter reading, meter inventory, and customer billing data to improve revenue management. Proactive adjustment of billing schedules to match chronically delinquent customers' pay cycles could reduce the number of outstanding receivables and collection expenses. Internally, analytics capabilities include business performance management using scorecards and dashboards, and financial performance management through better budgeting, forecasting, and probability analysis. Pre-pay and customer visibility into consumption may allow them to better manage consumption, thereby reducing accounts receivable.
- **Fraud and loss prevention (theft analytics)** — An analytic process to identify suspicious patterns in consumption, billing, and payments can lead to more-targeted investigations for the revenue assurance department. Often resource-constrained, this team is better able to minimize energy theft and fraud when its time is used more effectively. Monitoring usage at premises without accounts limits unbilled revenue. Spikes in usage and comparisons to historical consumption at the premise can identify changes in behaviors and thus activity at the premise.
- **Demand forecasting and load management** — Customer segmentation performed on the basis of interval usage data can lead to more homogenous clustering, and consequently, lower variance between forecasted load and actual usage. Subsequent analysis, along with targeted communication and interaction with customers, can inform, educate, and motivate changes to customer usage patterns. The generation of individual demand forecasts and bottom-up aggregation of load forecasts within each customer segment can be facilitated by such analytic solutions. Such a solution can minimize costly spot-market purchases of power.
- **Asset management** — Analysis of meter flags, as well as maintenance parameters for transformers and other field equipment, can lead to better management of maintenance schedules. Simply put, device maintenance need not be done on a standard schedule, but based on one or more actual device characteristics — such as temperature, voltage, current, or cumulative power transmitted since last maintenance, etc. Intelligent devices that collect and report on such characteristics in near-real time enable maintenance operations to make informed decisions. Extending the life of a transformer by even a few months can lead to greater preparedness for its eventual replacement. These are drivers for quicker outage resolution and an improved customer experience.
- **Outage impact** — A solution to compute and analyze the magnitude and nature of electricity consumption in distribution networks that underlie specific assets in the device hierarchy (e.g., substations, feeders, and transformers). This facilitates analysis of the potential effect of outages both financially and in terms of the customer. When coupled with asset maintenance systems, this kind of a solution may prevent costly outages by proactively assisting the utility in maintaining a device ahead of a disruption, or perhaps even extend its service life.
- **Compliance** — A consistent set of analysis rules and reliable reporting infrastructure can greatly enhance the credibility of utilities' periodic reports to regulatory agencies. The timely submission of reports on customer service, electric reliability, and the impact of smart grid initiatives can support regulatory relations departments.
- **Customer service** — Analytics can improve customer interactions and drive the development of new incentives and pricing plans configured to customer needs. For customer service representatives, having a holistic view of interactions with the customer on the phone as well as intelligent information that may be pertinent to addressing his/her concerns can result in a satisfied rather than a frustrated customer.
- **Sales and marketing** — With highly-targeted customer information and analytics-based interpretation of customer data, utilities can better target customers with more effective sales, marketing, and educational programs.

Utilities that build their capability for analytics by investing in technology, people, and processes can extract significant value. It is possible for financial value to be derived by utilities even before they install their AMI infrastructure. Just leveraging analytics to identify and address inefficiencies in the utility's operations can be very powerful. This would be in addition to qualitative business and technical benefits made possible by bringing previously siloed information together in an enterprise data warehouse with an overarching analytics solution applied. The sensible approach is to get started soon, with a structured approach.

Why Deloitte

Deloitte works with utilities to discern actionable insight from their data assets. Providing technology, knowledge, and service excellence at each stage across the information lifecycle, Deloitte's end-to-end engagement model facilitates information availability is mapped intimately to operational demand. A trusted partner in power and utilities analytics, Deloitte possesses vast smart grid experience across the top ten significant AMI and smart metering programs underway in the U.S., UK, and Canada. Deloitte's unmatched functional competencies — including financial process, reporting, tax, controls, technology, strategy, and talent management — enable the utility industry to tackle its toughest data-related challenges. For example:

- **Smart grid strategy to future-proof investment** — When the director of smart programs for an electric company realized that the business lacked the number and depth of resources required to develop an AMI strategy, they turned to Deloitte's experienced smart grid practitioners for answers. With Deloitte's strategy and vendor evaluations, the business mitigated the crippling expense of trial and error, while enabling the company to better future-proof its overall $400 million smart grid design. With a solid strategy and solutions roadmap, the business is on track to deliver improved operational performance, increase customer retention, and to facilitate a favorable regulatory rate of return.
- **Information technology strategy for an improved operating model** — Looking to better respond to a rapidly changing industry and regulatory environment, technology advances, and the implications of sustainable energy, United Energy Distribution (UED) tasked Deloitte with formulating an information technology (IT) transformation strategy. Deloitte worked with UED to sharpen its focus on customer and to market services, asset and network performance, and IT infrastructure improvements. The strategy mapped a path for UED to be information-rich and gain a deeper understanding of its customers. With Deloitte's knowledge, UED was able to model and analyze the financial implications of two-way billing and capitalize on the introduction of smart grid technologies. The strategy resulted in the standardization of business processes and improved automation among systems. The new infrastructure strategy leveraged investments in AMI systems, reducing downtime and allowing the business to reduce operational risk.

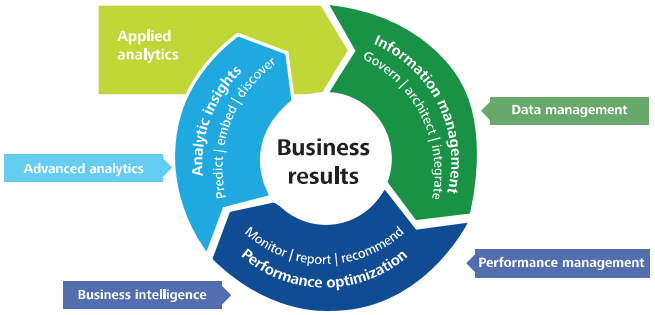
We serve more than 95 percent of Fortune 100 utility companies, using our understanding of complex, two-way data communications and the massive influx of meter data associated with AMI to improve utility companies' ability to fulfill operational requirements and make real-time business decisions.

Deloitte's methodologies offer tested, repeatable, sustainable processes that solve utility companies' business problems. A top consulting company with top-tier talent, Deloitte is ranked No. 1 by Kennedy and Gartner Research and was the recipient of the 2009 Market Leader Award from CRM Magazine and the 2009 Partner of the Year by IBM, Oracle, and SAP's IM Practice.

Deloitte Analytics

Deloitte Analytics helps organizations use data more effectively to inform decision making, pursue business strategy, and enhance performance.

Our Deloitte Analytics offering includes a full range of services, from allowing organizations to look backward to evaluate what happened in the past to executing forward-looking approaches like scenario planning and predictive modeling. Our capabilities range from guidance with fundamentals, such as data management and business intelligence, to activities such as performance management, predictive modeling, asset intelligence, and automation.



We can deliver business analytics services to clients under any of four models:

- Advisory analytics: An advisory analytics engagement delivers focused services that enable our clients to develop an analytics approach to support a specific business strategy or initiative.
- Transformational analytics: In a transformational analytics engagement, which is broader in scope than a typical advisory analytics engagement, we work with clients to design and implement an enterprise solution to enable analytics at their organization.
- Managed analytics: In managed analytics, we provide outsourced analytics services and a platform for analytics that draws on our Deloitte Application Management Services capabilities.
- Subscription analytics: Subscription analytics is a subscription-based analytics service in which we deliver analytical scoring and results to the client on a periodic basis.

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