

Harvesting the Benefits of the Smart Grid with Data Analytics

These are truly exciting times to be in the utility industry and to participate in one of the most important transformational initiatives of our time – the Smart Grid. Acting as a catalyst, stimulus funding has created a frenzy of activity with new Smart Grid demonstration projects being announced almost on a daily basis. Given all the activity around clean energy, communication technologies, smart meters, and electric vehicles, it is imperative to understand that the goal is to optimize this vast and pervasive network.

Optimizing the Grid will be accomplished with intelligent software applications that will “predict, shape, and optimize” the digital network. When applied to vast amounts of grid sensor data (from existing sensors and new streams from smart meters, electrical vehicles, etc.), the science of data analysis and analytics will extract prediction rules, which when embedded in distributed, decision support or real time data engines will help shape electric consumption and optimize the grid. The combination of interdisciplinary and cross industry knowledge along with “The Science of Better” to develop highly intelligent, comprehensive, secure and integrated analytic based applications is the key to achieving long-term success of the Smart Grid.

Analytics based solutions have long been vital for advances and increased profitability in many industries such as travel, retail, telecommunication, etc. Techniques such as data mining, pattern recognition, consumer choice behavior modeling, and optimization form fundamental blocks in market segmentation, targeted marketing, price optimization, supply chain management, management reporting, and various other applications. Such approaches have been dormant in utilities mostly due to the regulated environment and lack of fundamental detailed data streams. In e-commerce, mining click streams for online advertising and cross selling has long been a sweet spot for companies such as Amazon.com. Along similar lines - smart sensors, including smart meters, will provide “powerstreams” that can be mined for customer relationship management (CRM), targeted energy efficiency programs, load forecasting and dynamic pricing. Segmentation of customers based on customer consumption patterns and other demographic data can be used to offer customized dynamic pricing schemes enabled by smart meters, and tailored energy efficiency initiatives to promote conservation, enable load shifting and other Smart Grid goals.

Analytics based applications for the Smart Grid can enable business improvement across the industry value chain. These benefits are well documented and include superior customer service, operational efficiency, optimized delivery of power, smart energy procurement, demand response and dynamic pricing to name a few. Specific examples include predictive analytics to predict equipment failure and outages, to application of pattern recognition technology to detect revenue leakage and theft, to optimization techniques for Volt/VAR control and to applying data mining to improve utility decision making in building new power plants to meet demand and reduce congestion. On the distributed generation side, as more and more intermittent renewable power sources such as wind farms and solar plants come online, their management will become substantially more challenging. At the same time, it will provide new opportunities to optimize the power cost and carbon footprint relationship. Back and forth switching among various generation sources along with distributed energy resources (including electricity storage capabilities) offer tremendous prospects for data driven decision-making powered by state-of-the-art analytics.

Market participants are engaged in a tremendous amount of technology, process and business model innovation and are developing analytics enabled killer applications like advanced demand response,

home area networks (HANs), virtual generation, and vehicle-to-grid. These applications will create the platform for the next generation of innovators that will interface with these platform and data providers to create novel “sensing and perceiving” Machine to Machine (M2M) applications. Examples of these cross industry applications leveraging Smart Grid data will include enhanced security and home automation systems based on novel power line based location-sensing technologies.

Peter Drucker said “The best way to predict the future is to create it”. Creating the Smart Grid will require a solid foundation of analytics along with continued diligence towards paving the way for meaningful data analysis. As new paradigms for the industry business model, interoperability standards and privacy laws emerge, the restructured, customer-focused utilities of the future will become data driven and more Google-like.