INTEGRATED SMART GRID SOLUTIONS

SMART UTILITY®: BRINGING CLARITY TO COMPLEXITY
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Unmatched expertise across the utility enterprise enables Black & Veatch to deliver an integrated technology, infrastructure and IT solution, Smart Utility.® We have all the expertise in-house, readily available for your business needs.

START WITH CLEAR GOALS
The smart grid world is anything but simple. It encompasses multiple utility domains and dozens of specialized service areas that need to interoperate. Successful smart grid programs require a strategic plan and business case to determine implementation objectives.

To optimize the grid for a reliable, safe, efficient tomorrow, Black & Veatch’s Smart Utility solution begins with insightful collaboration with clients — setting clear, impactful goals that establish the foundation for a successful smart grid implementation and then carefully identifying and deploying the best technologies.

UNDERSTAND THE ISSUES
Today, utilities are confronted with economic and regulatory pressures that demand more due diligence and investment foresight than ever before. This requires a partner with broad expertise across all the utility domains — a partner who knows and understands business, regulations and economics, and can apply this knowledge to optimize utility operations.

Black & Veatch has successfully implemented more than 50 smart grid programs across North America. We bring a successful track record of coordinating across organizations, balancing technical and business performance requirements, and optimizing system/asset performance and operational efficiencies. We are your single point of contact for planning, developing, integrating and implementing complex smart grid infrastructure.

INTEGRATE RESOURCES
Black & Veatch assists you throughout the planning, design and implementation processes. Our solution teams include cross-disciplinary experts who ensure systems interoperate as designed and that information is leveraged across the utility enterprise as desired.

As a leader in utility, IT and telecom networks, Black & Veatch is able to plan, design and implement the best solution that focuses on your specific priorities and business model, meeting all of your stakeholder needs. With us, you’ll get an approach tailored to meet your needs and expectations.

THE VALUE OF CLARITY
With Black & Veatch’s integrated Smart Utility solutions, you get improved program execution and accelerated program schedules, which means you benefit from optimized grid performance sooner. And you have greater operational flexibility and peace of mind as the program is implemented.

Black & Veatch’s understanding of how utility systems interoperate translates to improved risk management and operational benefits for you. You’re not stopping and starting, having to adjust support staff along the way. It all adds up to smooth, streamlined implementation.

DELIVER CONFIDENCE
Smart grid programs can require significant capital and involve complex regulatory and consumer implications. Before embarking on such a program, utilities need confidence that a knowledgeable partner will guide and support them from plan to execution. This is Black & Veatch’s forte. Our understanding of system interoperability and program life cycle capabilities translates into improved risk management and operational execution. This adds up to a consistent, smooth, streamlined implementation.
Meeting smart grid challenges requires organizational flexibility and enterprisewide solutions that align all facets of a utility’s operations — from power generation to end-user distribution.

Black & Veatch assists you in meeting these challenges through a wide array of services that include the following areas:

- Policy and Regulatory
- Strategy and Business Case
- Program Management
- Demand Response/Energy Efficiency
- Cyber Security
- Implementation Monitoring
- Reliability and Asset Management
- Systems Integration
- Distributed Resources
- Grid Automation
- Telecommunications Networks
- Data Analytics
POLICY AND REGULATORY

With Black & Veatch expertise, you’ll stay current with regulations, understand their strategic implications and optimize your smart grid strategy.

REGULATORY EXPERTISE

As a regulated industry in most parts of the world, the energy industry is significantly influenced by regulatory requirements and policy inducements requiring action. In the United States, the desire to motivate utilities to modernize their electricity distribution grids has been billed as “the largest single energy grid modernization investment in U.S. history” by President Barack Obama. Other countries are on a similar path and, like the United States, need to manage regulations and financial inducements that play a significant role in directing industry resources and encouraging the activity of both public and investor-owned utilities.

Black & Veatch, due to our global presence and client base, is ideally positioned to deploy a holistic approach that fits with the policies and regulations around the world. We have proven ability to enhance your operations and your customers’ capabilities regardless of the smart grid project, the regulatory environment in your geographic region or the supporting technology. Our understanding of regulatory policy helps you shape your strategies. And Black & Veatch’s local presence helps you manage the reporting requirements and compliance procedures in your specific region.

Regardless of the elements of the smart grid that you elect to pursue, Black & Veatch uses a structured, proven, tailored business case process to generate a financial model for project implementation and maintenance. Our models ensure that the costs and benefits are realistically captured across a wide range of categories, ensuring that business case objectives are attainable in the regulatory environment.

CREDIBLE EXPERTS

Expert witnesses often play key roles in the difficult regulatory environments of public hearings, arbitrations and litigation. These settings can be controversial, requiring careful planning and management. However, the most important criteria affecting a favorable outcome are the quality of the information presented and the credibility of the experts making the presentation. Black & Veatch, one of the world’s most respected engineering, consulting and construction companies, has an extensive history of successfully representing and/or assisting clients in difficult regulatory and legal environments. Our consultants are published, nationally recognized authorities in their areas of specialty and have furnished expert testimony and assistance on behalf of our clients’ interests.
STRATEGY AND BUSINESS CASE
Black & Veatch’s blend of utility expertise, information technology savvy and exceptional project planning helps clients overcome the complexity of smart grid planning.

DIRECTION
The smart grid initiatives under way at many utilities offer the challenge of aligning people, processes and technology across a number of complex and interrelated projects. At the same time, the initiatives demand navigating through a complex regulatory landscape, operating in elaborate regional markets, adhering to constantly evolving cyber security regulations and embracing new technologies at exactly the right time. Black & Veatch’s internationally recognized strategists help you reduce risk by working with you to chart the right course and prioritize the phases of the project based on your needs.

From building a no-nonsense business case, to helping you articulate the benefits to your customers and other stakeholders, Black & Veatch’s extensive experience puts you in control. Our structured and proven business case process generates a financial model for project implementation and maintenance. Based on experience with clients, we’ll bring you improved system and data reliability, and strategic benefits such as improved engagement with your customers.

Our consistent and repeatable performance is in part due to our templates that ensure that the costs and benefits are realistically captured across a wide range of categories. And our pragmatic approach when developing integration architectures for our clients maintains the value of your existing investments in third-party applications, in-house developed applications and custom applications.

The results for you are improved network reliability, operational cost savings and real-time visibility into system performance.
PROGRAM MANAGEMENT
Black & Veatch delivers confidence of program execution and successful results through proven, established program management processes and practices.

APPROACH
Drawing on the company’s global resources and experience in smart grid implementations, Black & Veatch delivers sophisticated and successful program management solutions. We understand, define, plan, implement and integrate every aspect of a client’s program, managing multiple ongoing projects — which may require hundreds or even thousands of separate activities — and the complex integration of interproject dependencies.

Our approach to program management reflects our ability to coordinate and prioritize resources across projects, departments and entities, ensuring that resources are managed with a comprehensive focus. Black & Veatch can also coordinate programs across multiple markets and incorporate impactful change management processes into program execution.

Our professionals bring efficiency, control and accountability to every stage of your program, from initial master planning through authorization, contract implementation, deployment and integration, and ongoing operations support. With experienced program management support from Black & Veatch, you’ll know that the fundamentals of your program are sound and that progress is a measure of time, not chance.
DEMAND RESPONSE/ENERGY EFFICIENCY
Black & Veatch knows how to leverage technology and price responsive rate designs to impact consumption patterns.

PRICING STRUCTURE
There is growing interest in the role electric utilities can play in shaping loads. System reliability concerns and rising energy costs are driving regulators and utilities to manage system demand and reduce overall system costs through various types of demand response and energy efficiency programs.

Black & Veatch uses technology to empower consumers to use energy more efficiently and designs dynamic pricing programs that lead to cost-effective demand response. We understand the link between empowerment and enablement. We understand the link that should exist between wholesale power costs and price signals provided to your customers through utility rates. We understand the critical relationship between the pricing options offered to your customers and the technology they may need to effectively take advantage of those new pricing options. We understand the interdependence between dynamic pricing and standard (default) rates and how a lack of consistency can lead to adverse selection, revenue/margin erosion and harm to your nonparticipating customers. We understand the need to accurately measure the impacts of energy efficiency and demand response programs.

Successful utility rate design and implementation require experience in forecasting participation rates and the reduced consumption and demand response from your participating customers. That’s why Black & Veatch designs programs with a target level of benefits at the outset and an impartial assessment of the benefits that will actually occur upon implementation.
CYBER SECURITY

Black & Veatch tailors industry best practice-driven processes and procedures to secure the smart grid.

PROTECTION

Many of the advances introduced by the information age have been beneficial to the global energy industry. Ironically, though, the risk of disaster seems to lie in the very nature of the convenience and availability of ubiquitous communications and prolific data availability. Today, a single event carries with it the potential for exponential impact. The broad integration of systems and the expansion of distributed communications networks introduce risks that can no longer be managed effectively by physical barriers or constrained access points. Utility industry leaders find themselves increasingly torn between two uncompromising and often disparate objectives — smarter, more data-informed power delivery and escalating requirements to predict, protect against and prevent security breaches.

Cyber attacks are expected to originate from global threats and espionage, market manipulators, disaffected individuals and career hackers. Stringent federal regulations have been adopted in response to these very real risks and to equip electric utilities with the knowledge, tools and standards to prepare for and minimize threats. Understanding, interpreting, implementing and reporting on compliance to these standards can be a significant undertaking.

Black & Veatch offers a methodical, project-based approach to security and compliance. Our cyber security solution is flexible and scalable. Industry best practice-driven processes and procedures are tailored to each client’s specific needs to establish a robust but manageable compliance and risk management posture.

Black & Veatch brings utility and telecommunications industry expertise together with proven technology skills, delivering a project-based approach and proven methodologies that span the full cyber security life cycle.

Whether you are planning your company’s first steps in compliance or considering ways to make your existing program more effective, we have the expertise to ensure the security of your smart grid.
IMPLEMENTATION MONITORING

Utilities need a real-time business intelligence tool to track smart grid project deployments. They need a system to integrate various data sources, extract and display key performance indicators, leverage existing Microsoft and ESRI investments, improve scalability and security, and save resources and costs.

PERFORMANCE

Black & Veatch has developed a geospatially enabled performance monitoring tool that helps you with the initial ramp-up of a smart grid project all the way through to the installation, turn-on and verification of the final meter. ESIntial™ provides preconfigured solutions that enable you to improve management of smart grid implementation tasks, such as field deployment tracking, acceptance testing, network optimization and failover testing. It provides a transparent view of your business by utilizing standard applications that together create a spatially intelligent portal into your organization.

DEPLOYMENT TRACKING

Rolling out a smart meter to every customer is a large and complex affair for any utility. Maintaining an effective view of progress against plan can prove difficult and time-consuming over the course of a project, and communicating that progress to the necessary stakeholders has challenges of its own. Our ESIntial tool provides visualization of project progress on a count and percentage basis, providing the necessary visibility and insight to fix issues quickly before they impact overall project success.

FIELD ACCEPTANCE TESTING

Most smart metering projects include a field acceptance test (FAT) prior to full-scale deployment. The primary goals of the FAT are to 1) verify one or more vendors’ smart meter systems ability to achieve the benefits identified by the business case and 2) meet the functional and performance requirements agreed to in the vendor statement of work. The secondary goal of the FAT is to provide the utility with hands-on experience of a smart meter system. The successful execution of a field test is typically a contract gate for proceeding with mass deployment. Black & Veatch’s ESIntial tool provides you with a source of key measures of technical performance data regarding the selected smart meter technology. It also tests the availability and accessibility of the necessary data within the smart meter technology head-end(s) and validates that the interfacing mechanisms are usable within the utility’s environment and that the data are accurate based upon the evaluation criteria.

NETWORK OPTIMIZATION AND FAILOVER TESTING

It is imperative for the utility to confirm that its smart meter network will continue to operate effectively both during and after deployment. Two critical areas for a utility to focus on include:

- The self-healing network capabilities, which must allow network failover should an advanced metering infrastructure (AMI) network device (access point, repeater) become inoperable. Confirming that these capabilities work correctly is a critical part of the network testing process.
- The proper radio frequency (RF) communications, system failover and system performance, which must maintain operational and contractual performance requirements after the as-built AMI network and smart meters are fully deployed.
RELIABILITY AND ASSET MANAGEMENT
Black & Veatch simultaneously analyzes all facets of a single asset or a portfolio of assets and recommends the right solution based on what you have in place and want to achieve organizationally.

RELIABILITY
Safety, cost and reliability are typically the highest concerns of utilities. Long-term system reliability is driven by effective management of generation, transmission and distribution assets. As assets age, concern for system reliability escalates. Maximizing the performance and use of infrastructure assets at a competitive cost for end users — while ensuring that reliability and quality of service are not compromised — has become increasingly critical to utilities across the country. Black & Veatch’s approach to the integration of smart grid technologies enables the improved examination of system asset utilization, optimization and maintenance to improve reliability, operate more efficiently and optimize assets.

INTEGRATED RELIABILITY AND INFRASTRUCTURE PLANNING
The proliferation of interactive smart grid devices on the power grid requires an integrated approach to system planning to ensure all grid assets operate in a reliable, cost-effective manner. Key decision-making data are often spread across the organization, collected in a number of disparate formats and derived from a variety of external sources. Black & Veatch performs the system analysis needed to optimize reliability in tandem with traditional infrastructure planning.

To determine what system improvements are needed, we conduct system studies to determine the best designs. Our studies take into account utilities’ design philosophies and specific program objectives. Planning efforts also address many other variables, including regulations, community issues, changing technologies, safety and security.

Infrastructure planning encompasses all the prework that is essential to the successful design, execution and operation of a complex project. It requires a multidisciplinary engineering approach considering a project’s entire life cycle. Black & Veatch’s infrastructure planning services seamlessly integrate a project’s technical, business and organizational requirements. It uses advanced processes and tools to drive performance benefits and cost reductions for utilities with a comprehensive asset management approach.

Additionally, ESIntial, Black & Veatch’s geospatial business intelligence tool, provides a nonproprietary environment to aggregate large amounts of data from various systems and different departments for an overall view of your business. ESIntial can help you answer key business questions such as:

- Is my investment in vegetation management paying off with a reduction in tree-related outages?
- Do I really need to upgrade my feeder or will a targeted, demand response marketing campaign reduce enough load to defer investment for another year?
- Which operating headquarters are fastest in turning as-built drawings into outage management system updates when we build out the network, and where are they more efficient?
Black & Veatch provides trusted, experienced professionals to enable your successful smart grid journey. Our in-depth insight and practical know-how help utilities across North America plan, design, integrate and implement a successful and transformative smart grid program.

DESIGN
Black & Veatch believes that systems integration (SI) encompasses two important components: integration, which enables data or systems to work together, and implementation, which uses project management, change management, systems and test engineering, and deployment management to successfully complete the project. Black & Veatch brings these skills to the forefront to help you develop an integrated suite of customer and operational systems and evoke the latest in automation technologies.

Black & Veatch’s utility experts provide complete SI services to complex smart grid projects. We efficiently integrate and implement new program assets (hardware, software and data systems) across a diverse range of utility infrastructures, attributing our success to careful planning and execution of established business and risk mitigation methodologies.

Additionally, Black & Veatch uses established utility business processes and IT architectural modeling to help ensure a superior SI. Our Integrated Business Process ModelingTM scopes and tailors utility best practices to address your unique project needs and business drivers. Our Integrated Delivery ModelTM mitigates risk by embedding high-quality systems and processes that promote on-time, on-budget program delivery.

Complementing our SI background is our real-world experience in advanced metering infrastructure (AMI), meter data management systems (MDMS), demand response, demand management systems (DMS), distributed automation (DA) and other smart grid and utility technologies. The combination of our management, technology and industry background ideally positions Black & Veatch to integrate diverse hardware, software and system assets to establish the foundation for your smart grid success.
Black & Veatch can help utilities navigate renewable distributed energy resources challenges through the entire project life cycle. Net-zero projects, microgrid solutions and distributed renewables integration all present challenges Black & Veatch can help solve.

Renewable distributed energy resources (DER) connected near consumer loads are gaining in popularity. However, they do present a multitude of challenges, one of which is the ability to get financing for deployment. Then, there are policy and regulatory obstacles to overcome, including complicated application procedures with fees/tariffs and rate issues related to load retention. And finally, there are technical hurdles to clear interconnecting DER to the power grid.

Black & Veatch provides a suite of solutions to support utilities to integrate renewable DER in their service territories. Key services include:

- Development of incentive programs and infrastructure, i.e., PowerClerk
- Best practice interconnection studies
- Strategies to reduce the effects of intermittent power on transmission and distribution (T&D), such as energy storage, demand response and flexible spinning resources
- Planning and specification of components such as:
  - T&D infrastructure
  - Protection and relay infrastructure
  - Substation capacitors and other voltage regulation equipment
  - SCADA upgrades
  - Advanced metering infrastructure (AMI)/smart meter infrastructure
  - Renewable energy forecasting service

With Black & Veatch’s expertise and experience, utilities will be able to develop more cost-effective renewable energy faster to meet aggressive renewable energy targets; the grid will benefit from peak load shaving, reduced transmission losses and deferred infrastructure upgrades; and consumers will benefit from prevented blackouts, reduced pollution and job creation.
GRID AUTOMATION
Black & Veatch delivers innovative solutions to enhance the way utilities interact with, manage and control the energy grid.

SOLUTIONS
Automating the grid calls for an integration of grid infrastructure, communications, automation and network technologies. Black & Veatch is unmatched in our ability to deliver all of these major components for a more advanced, intelligent grid operation. Our long history of utility infrastructure implementation, paired with leading communications design and deployment services, provides the specialized expertise needed to design and deploy a state-of-the-art grid automation solution that supports the delivery of safe, reliable and economical power.

From the operations control center to consumer end users, Black & Veatch is transforming the way power is distributed and used. We provide the integration and implementation of technologies, such as supervisory control and data acquisition, communications and intelligent electronic devices (IEDs) that offer the real-time data to monitor and control grid operations.

Our grid automation services include:
- Distribution automation
- Control center operations
- Substation automation and integration
- Distributed and renewable energy resources
- IED integration
- Communication networks

Black & Veatch is leading utilities into the next generation of grid automation by deploying a smarter grid that delivers not only power, but empowering information for optimal grid performance and sustainable operation.
TELECOMMUNICATIONS NETWORKS

Black & Veatch’s Smart Utility network solutions help you create a self-healing environment, minimizing power disruptions, increasing grid efficiency and integrating distributed renewable energy resources.

INTEGRATION

The next generation of smart utilities will be characterized by the network infrastructure being built today. One of the first steps toward realization of the smart grid is establishing an integrated telecommunications network. This is the essential foundation needed to connect devices and systems across the entire utility.

Black & Veatch helps utilities take this first step by guiding them along a clear and focused path, from initial planning stages to network launch, delivering specialized expertise throughout the journey. Our experience with every stage of the telecommunications deployment process has given us the insight to customize network design and deployment plans to specifically address IT and network integration and communication upgrades for smart grid initiatives.

For more than 40 years, Black & Veatch has been supporting utilities with their telecommunication needs, providing up-to-date knowledge of the transport and delivery networks and technologies being implemented today to support tomorrow’s smarter utility. Our full-service offering includes program management, planning, engineering, procurement and construction services to deploy telecommunication solutions including:

- Smart grid communications
- Wireless/microwave/land mobile radio
- Fiber optics/DWDM/SONET
- Transport networks
- Network architecture development
- Utility wireless collocation

As power infrastructure, communications and smart applications converge, Black & Veatch is at the forefront, deploying the foundational technology and communications for the smart grid.

FUTURE-READY NETWORK

Black & Veatch helps utilities transition from the traditional segmented architecture with separate networks for separate business functions to a single, integrated network that supports the entire enterprise. This converged network platform provides the end-to-end IT and communication infrastructure needed to support a seamless operation in which resources are shared and leveraged across the utility, creating a more efficient and reliable system.
DATA ANALYTICS
Black & Veatch can help you analyze the volume of data from smart grid-generated information and apply that knowledge to benefit you and your customers.

INFORMATION INVESTMENT
More than 20 million smart meters were deployed in 2010, and the projections for installed meters are as high as three or more times that in the near future.

The volume, value and immediacy of the monitored data open new doors for utilities that have invested in a smart integrated infrastructure. But how do you take advantage of all that data?

Black & Veatch performs data analytics on the smart grid-generated information, so you will receive immediate feedback on your customer acceptance and use of smart meters, on the effectiveness of demand side programs and the performance of your IEDs. You will benefit from statistics on load reduction and energy savings, allowing you to better articulate customer benefits.

Data analytics increase your ability to remotely troubleshoot network and equipment problems, reducing downtime and enhancing reliability. Black & Veatch’s global analytics platform also facilitates the integration of distributed energy resources, smart appliances and electric vehicles onto the grid. It helps utilities improve their business and asset performance, and integrate knowledge across their entire value chain.
BUILDING A WORLD OF DIFFERENCE®

Black & Veatch is an employee-owned, global leader in building Critical Human Infrastructure™ in Energy, Water, Telecommunications and Government Services. Since 1915, we have helped our clients improve the lives of people in over 100 countries through consulting, engineering, construction, operations and program management. Our revenues in 2011 were US $2.6 billion. Follow us on www.bv.com and in social media.