

Powering A New Energy Age, One Smart Grid At A Time

Getting Smart About Our Future



Today's challenges

Utility companies around the globe, faced with an ever intensifying and interconnected set of challenges, are looking for even smarter ways of doing business. More and more, utilities are viewed as being a critical link to solving the challenges we all face related to climate change and the care of our planet's energy resources. Customers, employees, regulators, investors, and other stakeholders are looking in part to utility companies to address these issues and to take actions that produce genuine environmental and financial results.

Smart grid technologies transform the way electricity is generated, transmitted, distributed and managed, adding intelligence throughout the grid to improve system reliability and efficiency, improving management of supply and demand, optimize operations and streamline costs. By using digital sensors, advanced communication networks and analytics, utilities can understand demand in near real-time.

IBM is helping utilities add a layer of digital intelligence to their grids. These smart grids use information to automate, monitor and control the two-way flow of energy—from the source to the plug. Smart grids can also incorporate new sustainable energies such as wind and solar generation, and integrate electric vehicles.

If the U.S. grid were 5% more efficient, the energy savings would equate to permanently eliminating the emissions from 53 million cars.



The Intelligent Utility Network by IBM

The Intelligent Utility Network is IBM's solution for the smart grid. It encompasses a broad set of offerings that address the complete energy value chain, from generation to the consumer's premise. The Intelligent Utility Network fundamentally is an information network that connects together the 'participants' in the energy value chain, at multiple levels. This information network enables the intelligent flow of information, which can be used to transform and optimize the generation, supply and consumption of electricity. The Intelligent Utility Network is the information management component of the smart grid.

The Intelligent Utility Network will enable the transformation of the way power is generated, distributed and used, enabling more intelligence throughout the grid to dramatically reduce outages and faults, improve responsiveness, handle current and future demand, increase efficiency and manage costs. With a smart grid, consumers will be able to interact with a utility in multiple, convenient ways; select customized services and pricing options; and

gain near real-time visibility into their usage and costs. A smart grid also helps consumers actively participate in solving critical energy problems by enabling "smart" homes and energy-conscious choices possible.

IBM's Intelligent Utility Network solution guides a utility in every phase of a smart grid transformation from strategy development, planning and selection through design, implementation, and ongoing operations. The Intelligent Utility Network provides utilities with a solution for:

- **Smart Metering & Beyond**

Enables business transformation through enhanced metering capabilities.

Visioning, strategy, planning and selection, design, build, rollout and operations support for smart metering initiatives, their integration into the utility enterprise and the ensuing capabilities that smart metering enables for both the utility and the consumer.

- **Grid Operations**

Provides enhanced operational and analytical capabilities throughout distribution network operations.

Development, planning, implementation of asset monitoring and energy management systems required for grid operations and their integration into the utility operations environment and enterprise to take advantage of this information for business and operational intelligence.

- **Intelligent Utility Network Security**

Provides tools and methodologies to enhance physical and cyber security characteristics of the smart grid.

Comprehensive cyber security offering covering major aspects of utility security from assessment, strategy, policy, planning and development to managed security operations.

- **Intelligent Utility Network Communications Networks**
Apply methodologies which will optimize communications aspects of the smart grid.

Assessment and development of utility-wide voice and data communications strategy to enable information exchange across all the components of a Smart Grid. Further provide planning, design, implementation and operation of IUN communications networks.

IBM also helps utilities extend distribution capabilities into homes, commercial operations and cars.

- **Electric Vehicles**
Visioning and strategy to support the various business models which may develop around the supply and demand of electricity with electric vehicles. Development of IT infrastructure and standards required to enable the supply and

billing of electricity to electric vehicle mobile customers. Development of demonstrations and pilot projects.

- **Renewable Energy Resources**
Visioning, strategy, development of IT and communications infrastructure required to integrate distributed energy into the utility network and gain observability of the resources in order to better manage electricity supply and demand.

The U.S. could save up to \$70 billion in infrastructure spending over the next 20 years through better management of existing assets.



How Do We Deliver?

The Intelligent Utility Network solution combines strategy, processes and technology to help utilities build a smart grid in line with their vision and objectives. We have experienced subject matter experts and trained Intelligent Utility Network practitioners who can deliver the solution. Based on the experience gained from our various Intelligent Utility Network implementations and demonstration

projects, our solution has harvested engagement models and best practices that can enable a faster implementation.

Through hardware, software and service offerings, IBM provides a rich portfolio of solutions across the energy value chain for power generation optimization, transmission and distribution operations and customer

operations transformation. Many of these offerings are connected through the IBM Solution Architecture for Energy and Utilities Framework (SAFE). This innovative, powerful software platform is uniquely designed to provide network visibility and control, process automation and business collaboration for solutions across the energy and utility value chain.

Building an Intelligent Utility Network

Proven, Tested, Validated Methodology. Validated with top energy and utilities companies, IBM's successful Intelligent Utility Network methodology guides our grid strategy and delivery engagements. Our methodology is customized to confront disruptive technologies, like the smart grid. For instance, our methodology addresses concerns in a heavily regulated environment, and it emphasizes stronger reliance on multiple solution providers in a complex, rapidly changing technology environment.

SAFE Architecture. Supporting the Intelligent Utility Network Solution is the Solution Architecture for Energy and Utilities Framework (SAFE), an innovative, powerful software platform, uniquely designed to provide network visibility and control, process automation and business collaboration for solutions across the energy value chain. SAFE enables data transformation throughout a utility company. Both highly cohesive and loosely coupled applications can work together so that utility companies

can extend their investment in current applications, systems and infrastructure.

The framework brings the capabilities of IBM software to power smarter utility solutions across all areas of a utility, including plant operations, mobile workforce management, asset lifecycle management, smart metering, grid operations and customer care. By integrating and optimizing assets, devices, networks, servers, applications and data across the enterprise, utility companies can drive business agility

IBM is a leader in smart grid transformation around the globe.

Involved in approximately 50 smart grid engagements worldwide

Supporting 7 out of 10 largest automated metering projects globally

Employing more than 3000 energy and utility professionals worldwide

Significantly investing in energy and environment programs toward smart grid transformation



and more 'intelligent' networks. The framework approach will help increase the reuse of assets for each successive project, improving return on investment and speed of implementation.

Smart Grid Maturity Model.

Progressive utility executives know that smart grid transformation is the right thing to do, but many remain unclear about where to begin. The Smart Grid Maturity Model (SGMM) from IBM is a strategic management tool designed to help energy and utility companies benchmark their current smart grid-related initiatives versus the industry. The tool also provide a framework alignment around the long term strategy for a smart grid program. The SGMM creates a clearly articulated journey for smart grid transformation, with defined stages and options, and helps to bridge the gaps between strategy

and execution that might exist. The SGMM can be used in a variety of ways, the most powerful of which is to create a common vision and prioritization of initiatives that provide the greatest opportunity for improvement, innovation and transformation.

In April 2009, IBM and a group of leading utilities—the Global Intelligent Utility Network Coalition—announced that they handed-over stewardship of their Smart Grid Maturity Model to the Carnegie Mellon® Software Engineering Institute (SEI), which assumes primary responsibility for the ongoing governance, growth and evolution of the model. In order to support widespread adoption and use, the SEI will ensure availability of the model and supporting materials and services for the user community; maintain consistency of its application, validity, and results; and analyze

and provide feedback on its use, value and impact for stakeholders. In addition, the World Energy Council (WEC) is now a channel for global dissemination, participation and adoption of the model using its worldwide network of member committees.

Component Business Model.

IBM has developed a Component Business Model (CBM), a tool for smart grid planning and execution, for the entire set of functions performed by utilities, regardless of organizational orientation. The CBM creates a one-page snapshot to allow executives to frame decisions from a common perspective. It can be used to identify relevant areas of strategic importance and map resources allocation to those areas via a CBM "heat map."

China aims to boost usage of renewable energy to 10 percent of total energy consumption by 2010 from 7.5 percent in 2005. Solar power capacity will rise to 300,000 kilowatts from 70,000 kilowatts.

U.S. Power Grid

The power grid is among the top concerns of President Barack Obama, and key to the stimulus program. In a speech to students and faculty at George Mason University on January 8, 2009, the then President-elect explained how the new Administration would “do more to retrofit America for a global economy. That means updating the way we get our electricity by starting to build a new smart grid that will save us money, protect our power sources from blackout or attack, and deliver clean, alternative forms of energy to every corner of our nation.”

Research and Innovation

As a leader in the information technology industry, IBM and its research division realize the importance of delivering innovation to our clients. To aid them in achieving their specific goals, IBM Research has created On Demand Innovation Services, which features a First-of-a-Kind program and the Industry Solutions Lab.

First-of-a-Kind projects are partnerships between IBM and clients that turn promising research into market-ready products. This is a great way to match researchers with target companies

to explore new and innovative technologies for emerging opportunities. Clients have a research team to solve problems that don't have ready solutions. Researchers get immediate client feedback to further enhance their projects.

The Industry Solutions Lab gives IBM clients the chance to discover how leading-edge technologies and innovative solutions can help solve business problems.

IBM energy industry software labs in Austin, Texas, and La Gaude, France, along with demonstration centers built with utilities, such as CenterPoint Energy, USA, and Country Energy, Australia, establish the value of smart grids to the industry and public.

IBM and Smart Grid Demonstration Projects

Together with our global business partners, IBM has helped to create pilot projects that demonstrate the many advantages of smart grid technology.

Pacific Northwest National Lab: Smart Meters Power Down Bills

As part of the U.S. Department of Energy's GridWise Program, the Pacific Northwest National Laboratory (PNNL) project wanted an innovative way to keep the electricity grid healthy in times of stress by better managing electrical demand. IBM helped them implement intelligent devices—including

thermostats, meters and sensors—in consumers' homes that were tied to the PNNL system. This helped to automatically control power consumption based on pricing signals and customer preference. The smart outcomes? Consumers were able to decrease their electricity bills by an average of 10 percent, as the utilities reduced short-term peak loads by 50 percent through better use of existing infrastructure.

***EDISON Project:
Building A Smart Grid for Electric Cars***
The EDISON research consortium is a

Denmark-based collaborative aimed at developing an intelligent infrastructure that will make possible the large-scale adoption of electric vehicles powered by sustainable energy. Within the project, IBM researchers will develop smart technologies that synchronize the charging of the electric vehicles with the availability of wind in the grid. IBM has also contributed a hardware platform to the Technical University of Denmark that will be used for large-scale real-time simulations of the energy system and the impact of electric vehicles.

Thinking Smarter in the Real World

Consider these examples of what Intelligent Utility Network technology and services from IBM can do to save energy, positively impact climate change, and create a more sustainable environment.

Malta: First Smart-Grid Nation

The Mediterranean island nation of Malta is about to become the world's first smart-grid country. The Maltese national electricity and water utilities have selected IBM to design and deliver a nationwide smart grid implementation over the next five years.

The IBM solution will involve replacing 250,000 analog electric meters with smart meters that can monitor electricity usage in real time, identify water leaks and electricity losses, set variable rates, and reward customers who consume less power. Water meters will be integrated into a system that can monitor and manage meter readings and suspensions. By collecting and analyzing the data from thousands of digital sensors embedded throughout the infrastructure, the Maltese government

will be able to make better decisions about usage and begin replacing carbon-intensive fuel oil with sustainable sources of energy.

CenterPoint Energy: Improving Grid Reliability

As a major U.S. energy company, CenterPoint Energy is deploying 2.4 million advanced electric meters in the Houston area to improve operations, give consumers more control over their energy consumption and provide the foundation for retail electric providers to offer new competitive services and

Investing in the creation of smarter grids

products. Working with IBM Global Business Services and IBM Global Technology Services, CenterPoint Energy is deploying an advanced metering solution supported by IBM Tivoli® Netcool®/Impact software. The new system will deliver near-real-time data on energy usage and supports dynamic time-of-use rates and other pricing options. This will encourage energy conservation and new offerings, such as monthly prepaid electric service for the budget-minded.

DONG Energy: Powerful Savings

Increasing marketplace and regulatory demands, along with a need for future infrastructure reinvestment, drove Danish utility company DONG Energy to look for a way to better manage and utilize its electrical distribution network. The solution proved it would be able to reduce minutes of power lost by 25% to 50%, reduce fault search time by one-third, and potentially realize a savings of up to 90%.

To promote the use of smarter energy, IBM is substantially investing in energy and environmental programs and has actively participated in a host of global initiatives, with the goal to lead utility industry organizations to smart grid transformation.

The Global Intelligent Utility Network Coalition is a strategic relationship that IBM formed with a small group of leading utilities from around the globe to shape, accelerate and share in the development of the smart grid. The Coalition's purpose is to collaborate in the market to enable the rapid creation of solutions, the adoption of open industry-based standards and informed policy/regulation that drive the adoption of the smart grid. A key benefit of the Coalition is that it reduces regulatory, financial, market and implementation risk for the industry. The current Global Intelligent Utility Network Coalition member base serves nearly 100 million electric and natural gas consumers.

IBM's Energy and Environment Initiative is an effort to apply technology and services that matter to businesses, governments, people and the planet. This initiative includes Intelligent Transportation Systems to measure and improve transportation usage, Carbon Management to measure and reduce carbon emissions, Energy Efficient Technologies and Services to create and manage efficient information technology (IT) in energy management, and Advanced Water Management to measure and manage water systems usage, as well as the Intelligent Utility Network.

The GridWise® Alliance, formed in 2004, is a public-private partnership working to transform the nation's power supply system by moving the grid into the information age, and IBM serves as a key participant and chairs the Alliance. Its members include utilities, IT companies, equipment vendors, new technology providers and educational institutions.

The GridWise Architecture Council, also formed in 2004, is working to shape the guiding principles, or architecture, of a highly intelligent and interactive electric system—one ripe with decision-making information exchange and market-based opportunities. IBM Research

works closely with this organization and chairs the Council.

The Department of Energy's Electricity Advisory Committee, formed in 2008, provides advice to the U.S. Department of Energy on implementing EFACT 2005

and EISA 2007 and modernizing the nation's electricity delivery system. IBM is a leading participant with extensive experience in advising how digital technology can improve reliability, security and efficiency of the electrical system with a smart grid.

IBM is collaborating with the city of Rotterdam, The Netherlands on the design and testing of a monitoring and forecasting system for smarter water and energy management.



Why IBM

IBM has proven successful around the world in delivering solutions that provide improved reliability and end-to-end network data in near real-time. We bring to the table the integration skills, leading-edge technology, partner ecosystem and business and regulatory expertise required to support every level of a smart grid implementation. We provide planning and business case development from pilot programs to full-scale execution. Our extensive experience can deliver a comprehensive Intelligent Utility Network solution that is manageable and scalable in a secure environment.

For more information

To learn more about how IBM Intelligent Utility Network technology and services can benefit your company, please contact your local IBM representative or visit our

Web site at:

ibm.com/energy

ibm.com/smarterplanet/grid



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