


Smart grid solutions
To support your business objectives



Rational software

A woman with dark hair, wearing a dark blazer over a white collared shirt, is shown in profile from the chest up, looking out of a large window. The view outside the window is a bright, slightly blurred cityscape. The overall lighting is soft and natural, suggesting daytime. The image is the background for the main text area.

Innovative solutions for developing smart grids.

Simple techniques for managing complex projects



Global climate change.

The crisis in the financial markets.

Issues of national security.

These topics are driving imperatives for energy and utilities organizations to transform themselves to improve environmental responsibility, drive economic competitiveness and help protect national security. One solution that is generating a lot of interest is the smart grid. A smart grid cleanly integrates an electric grid, a communications network, and the software and hardware required to monitor, control and manage the generation, transmission, distribution, storage and consumption of energy. Using such a grid, utilities can transform the way power is sourced, distributed and consumed.

Smart grids use sensors, smart meters, digital controls and analytic tools to automatically monitor and control energy flow, allowing consumers to manage energy usage right down to the individual networked appliance. Using information about their consumption in combination with automated energy management tools, consumers can proactively manage their energy use and choose sources of power. Smart grids can also enable energy companies to instantly detect a power outage, pinpoint the exact location and cause, re-route power and inform consumers about when power will be restored. Smart grids also allow energy and utilities companies to better understand power demand in near real time, so they can improve delivery and dynamically incorporate energy from different sources. These capabilities support greater use of newer, more-sustainable energy sources—such as wind and solar power, sometimes referred to as “energy on the edge”—and can help meet rapidly growing energy demands around the world.

Smart grids can help energy companies cope with a number of business pains, including:

- ➔ Inefficient outage management processes that lead to revenue loss, decreased customer satisfaction and potential regulatory fines.
- ➔ Inefficient work practices and loss of skills and expertise.
- ➔ Rising operating costs and suboptimal returns on assets.
- ➔ Lack of real-time, accurate asset data.
- ➔ New regulatory and jurisdictional demands and lack of business controls.
- ➔ Public safety concerns and communications challenges.
- ➔ Customer churn driven by demands for better service.



Challenges in implementing a smart grid and entry points to help you get started

So what's stopping your organization from exploring smart grid technology? Rolling out a smart grid can be a long, evolutionary undertaking that creates a host of new challenges. Smart grids can add more devices to your infrastructure, as well as more software, requirements, components and vendors. A smart grid is essentially a horizontal system of systems, requiring robust and structured systems engineering processes. The key to unlocking the benefits of smart grids lies in efficiently connecting information, processes and applications across the entire value chain of the grid.

There are five challenges and corresponding entry points that have emerged as energy and utilities companies have begun to build smart grids. These entry points span the business and technical aspects of a grid's value chain, including energy generation and new sources of energy, device and meter management, power distribution and back-office applications. It's critical to identify how your organization can get started on this transformational journey.

IBM Rational® software solutions can help energy companies on their smart grid journey. IBM provides software and assets as well as best practices and processes to support you from the planning and strategy phases all the way through to design and implementation.



BENEFITS FOR PROVIDERS AND CONSUMERS

A smart grid can deliver a number of benefits for utilities companies, including:

- Reduced operating costs and fewer truck rolls.
- Improved outage management.
- Reduced energy theft.
- Lower procurement costs.
- Improved distribution load management and planning.
- More-accurate historical load and usage data.
- Improved asset management and maintenance.
- Support for market-price-responsive tariff requirements.
- Greater visibility into regulatory compliance via automated tracking and documentation.

Smart grids can also benefit consumers by delivering:

- Faster outage notification and reduced restoration times.
- More-accurate usage information.
- Energy-efficiency and demand-response programs.
- In-home displays, portals and real-time customer service.
- Remote service turn-on and shutoff, along with smart appliance management.



Challenge: Establishing the vision, developing the roadmap and making the business case for additional funding to build a smart grid

Solution: Develop a business case that aligns business with IT

Stakeholders from IT and lines of business must come together and collaborate on a holistic strategy—combining business and IT objectives—to transform the current infrastructure into a smart grid. IBM solutions for enterprise architecture, such as IBM Rational System Architect® software, can help you develop a comprehensive roadmap of the changes you need to make. Enterprise architecture is critical for impact and change analysis, enabling your stakeholders to examine various what-if scenarios and plan an incremental rollout that minimizes disruption to operations.

Many utilities organizations are turning to government grants or fiscal stimulus to support their smart grid initiatives, and therefore need to provide proof of return on investment (ROI) so elected officials and community stakeholders can see that the funds are delivering benefits to the community. Portfolio management solutions from IBM Rational and IBM Cognos® software work in concert with enterprise architecture and planning solutions, which can help you maintain business and IT alignment throughout the development and deployment of a smart grid. These solutions can also help you make investment and portfolio decisions, and manage and measure project milestones.


Challenge: Coping with labor-intensive processes and the rising costs of managing metering devices off the grid

Solution: Create a plan for containing device and meter management costs

In the late 1990s, many utilities and energy companies invested in smart meters and other advanced metering solutions. However, many organizations found that it was highly labor intensive and costly to maintain multiple device types and architectures. In fact, one study showed that high meter costs of US\$12–US\$30 led to many companies breaking even on their investments after as long as three years.

By reducing the number of device types, driving standardization and embracing newer over-the-air meter provisioning, you can increase consistency, improve control of the devices and gain insight into actual performance and power usage. Portfolio management offerings from IBM can help your IT leaders rationalize selections across device architectures. IBM Rational solutions for architecture design and construction support model-driven development in real-time or embedded systems, helping systems engineers with architectural standardization and abstraction of complex designs. The projected result is cost reduction through improved productivity, quality and communication throughout the development and delivery lifecycle.





Challenge: Managing the increased intellectual capital, knowledge base and complexity arising from the proliferation of new energy sources

Solution: Embrace a flexible, asset-based approach to development

The proliferation of new energy sources, such as nuclear, wind, solar and other forms of renewable energy, has increased the complexity of managing a smart grid solution. Expertise on these new energy sources can be isolated and difficult to integrate. There is also a risk of losing valuable intellectual property, knowledge and skills as employees in industries such as nuclear energy leave the energy industry entirely. To create a smart grid, you need a single, interdisciplinary view of the best and most economical power sources available along with knowledge of processes and best practices.

Traditional systems development methods are designed to create a “point solution,” or a solution that addresses a specific and static set of requirements. These methods result in systems that are sluggish in response to dynamic conditions and changing requirements, expensive to maintain over extended periods of time and prone to system failure. The advent of new energy sources as well as new procurement models from various partners and subcontractors require energy and utilities companies to develop a more flexible asset-based approach.

IBM Rational requirements management solutions can help you standardize terminology and document service-level agreements (SLAs) between the various entities of a utility value chain. Using a repository, such as IBM Rational Asset Manager software, allows you to capture tacit knowledge and best practices about the diverse set of energy sources, reducing risk and helping to ensure that proven and tested software components are deployed to manage the smart grid. Additionally, IBM Rational software architecture technology leverages the Unified Modeling Language (UML) and Systems Modeling Language (SysML) to help you capture the Common Information Model (CIM) for energy and utilities. This capability greatly enhances the traceability of requirements, testing and change management, making it easier to support the dynamic nature of a smart grid.



Challenge: Losing power due to inaccurate information and a lack of real-time feedback from the demand and response systems

Solution: Improve access to accurate information and real-time feedback

A key issue with core energy transmission and demand and response systems is the lack of real-time feedback. Isolated processes, applications and infrastructures throughout the various service lines can hinder visibility, making it difficult to analyze performance and cost. This can lead to unnecessary power transmission and increase downstream costs. To improve visibility and communication, you need a more holistic approach to model and predict energy transmission performance. Asset-based development is an important part of the IBM service-oriented architecture (SOA) vision for utilities companies. The goal of asset-based development is to automate the collection, classification and application of software assets, making it easier for organizations to leverage expertise in the form of software patterns, templates, reusable components and Web services. There are three components to asset-based development: asset production, asset management and asset consumption. By adopting an asset-based development approach, you can implement reuse programs that leverage scarce technical skills and drive business expertise into the solutions under development.

Model-driven architecture (MDA) is a structured approach to designing and developing complex systems. The power of MDA lies in the power of abstractions. MDA relies on a collaboration-based approach across multiple viewpoints to create an architecture that can not only meet requirements, but can also be highly resilient in the face of inevitable change. IBM Rational solutions that support UML and SysML can cut across disciplines and model the desired control system performance along with possible flaws and the remediation they'll require. Plus, these solutions can help you capture key performance indicators (KPIs) such as desired thresholds, financial usage and instrumentation to ultimately improve the reliability and predictability between transmission services and demand and response systems—while helping lower risk and maintain service levels.

Challenge: Keeping up with increasing demands on IT departments as new business models continue to change the industry

Solution: Improve customer satisfaction with higher quality front- and back-office applications

Consumers today are empowered with information and demanding better service along with accurate billing and real-time information about their power usage. And industry stakeholders are looking for greater accountability from energy and utilities organizations. Mergers and acquisitions, new energy trading schemes, and regulations such as carbon cap regulations are creating additional opportunities to rethink existing methodologies and develop new applications. IT teams need to revamp and deploy new applications both in the front office and back office to deliver superior service and take advantage of new business model innovations. By developing a smart grid, you can ultimately help empower the consumer.

Application lifecycle management solutions from IBM can help. Based on the IBM Jazz™ technology platform for collaborative software delivery, these solutions are exceptionally attuned to global and distributed teams. The Jazz platform is an extensible framework that helps dynamically integrate and synchronize people, processes and assets associated with software development projects. Therefore, these Jazz platform-based offerings help stakeholders more easily collaborate on tasks such as requirements gathering from stakeholders, change management, security enhancements and compliance management throughout the lifecycle, testing and deployment—boosting productivity and helping to save time. Features such as process guidance and automation help your teams stay on task, while real-time insight and status reports help teams make more-informed decisions and continuously measure progress against desired program objectives. Results can include faster time to market, reduced costs and greater customer satisfaction.



IBM solutions for connecting, validating and protecting your smart grid

Regardless of where you start, every system or system of systems undergoes change. There will always be changes in standards, changes in ownership and changes in technology. That's why it's critical to make sure that these changes are tracked, communicated and coordinated so everyone stays on the same page. For example, standards for devices and communications are constantly changing. So you need to be able to identify these changes, assess their impact, coordinate the software and hardware modifications required, and then ensure that proper tests and validations are performed. IBM Rational enterprise architecture offerings can help you manage change and identify how new business objectives and requirements will impact your existing applications, data, technology components and processes. Modeling and development tools from IBM can help you realize these changes and take advantage of reusable services to improve cost efficiency.

A comprehensive and holistic approach to quality can help reduce the risk of outages and system downtime and help you address government and regulatory standards for performance. Quality management solutions from IBM deliver a full range of testing and quality assurance capabilities from unit, functional and performance testing, to test automation and management best practices, enabling you to manage quality control for a single device or an entire network.

Every organization's Web presence is under attack and security breaches can be expensive and damaging for you and your customers. Plus, consumers are increasingly concerned with keeping their information private. When dealing with a smart grid, these challenges are compounded by the need to make every device in the grid addressable. Imagine the havoc that could be caused by intruders taking control of an entire substation or generating plant. IBM has decades of experience along with marketplace-leading products that can help you analyze your grid, probe for weaknesses both inside and outside, and help you guard against damaging break-ins.





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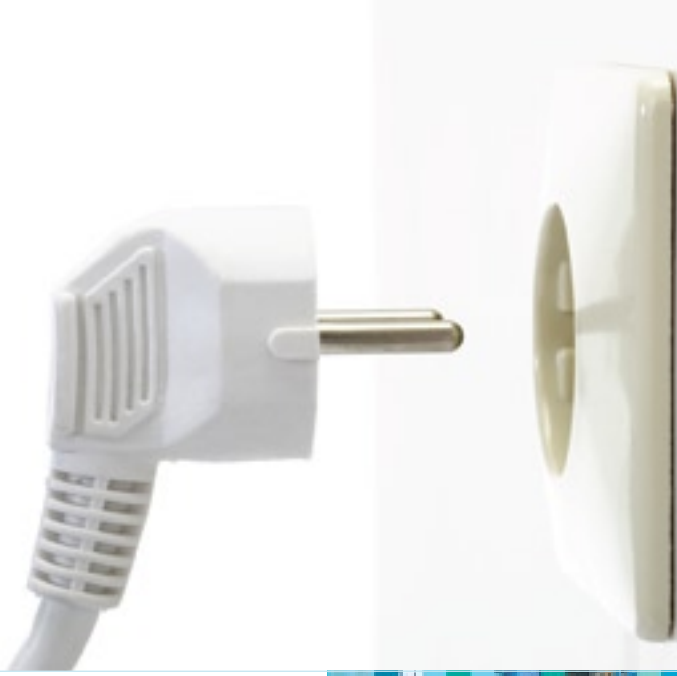
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Why IBM?

IBM has deep, practical experience helping organizations in the energy and utilities industry evolve to meet the challenges of the future. IBM can help define the business imperatives and explore the technologies that can result in increased competitive advantage. The IBM solutions for smart grids are designed by IBM professionals who have applied their business, industry and technological expertise to create energy solutions that drive real business value. And IBM continues to invest in the industry to gain a deeper understanding of its complexities.

Plus, IBM has a global presence that means you have access to resources around the world via a single local source. Let IBM help your company realize short-term ROI as you build a smart grid solution that can help meet tomorrow's energy challenges.

For more information

To learn more about IBM Rational solutions for smart grids, contact your IBM representative or visit:

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