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## The “Smart Grid”

The United States’ security, economy, and quality of life depend on the availability of a reliable, resilient, and responsive energy infrastructure. However, the nation is increasingly struggling with an outdated electricity transmission and delivery system that was designed and built in the 1960s or, in some cases, earlier. That network of transmission lines, substations, transformers, and distribution systems—known collectively as “the grid”—is now operating at or near capacity, resulting in a systemic vulnerability to technological failures, natural disasters, and sabotage or attack.

In response to those vulnerabilities, the Energy Independence and Security Act of 2007 calls for the construction of an electricity system that provides the nation with abundant, affordable, clean, efficient, and reliable electric power. The key to that system is a modernized electrical grid that integrates advanced technologies to enhance efficiency, security, and reliability. Those advanced technologies, which include two-way communication systems, state-of-the-art control systems, and modernized security systems, will result in a “smart grid” that:

- **Self-heals** by detecting and responding to routine problems and quickly recovering if they occur, minimizing downtime and financial losses;
- **Resists attack** by using security systems built engineered into the grid, not added on after construction;
- **Motivates and involves consumers** in energy-usage decisions by providing real-term visibility into pricing and offering the ability to choose programs and prices that best suit their needs;
- **Provides power quality for the 21<sup>st</sup> Century**, including the elimination of sags, spikes, disturbances, and interruptions—improvements that are crucial to the data centers, computers, electronics, and robotic manufacturing that power an increasing portion of the nation’s economy;
- **Optimizes assets and operates efficiently**, allowing more power to flow through existing systems, eliminating the need for new infrastructure and cutting operations and maintenance costs;
- **Accommodates all generation and storage options** with plug-and-play interconnections to nearly any source of power, including renewable energy sources and emerging storage technologies; and
- **Enables markets** by supporting consistent operations from coast to coast while allowing local and regional innovation.

### State Actions

Several states, in cooperation with the utility companies serving their residents, have initiated or approved grid-modernization programs that are putting in place the foundations of a “smart grid.” For example:

- In March 2008, **Colorado** Governor Bill Ritter announced that Xcel Energy plans to make the City of Boulder the first [Smart Grid City](#) in the country. Under the Smart Grid City plan, the utility will build and deploy a fully integrated system that can monitor all aspects of the power grid and send real-time usage, environmental, and pricing information—as well as analysis of the grid-reliability impacts of consumption decisions—to customers and decision-making systems. Consumers in Boulder who choose to participate in the Smart Grid program will have greater control over their energy usage and, as a result, their energy costs.

As it is deployed over the next several years, Colorado officials expect the Smart Grid City will offer a digitally enhanced, more resilient, and stable energy grid that is less prone to outages, greatly improving power delivery and reliability and optimizing environmental benefits.

- In February 2008, [Austin Energy](#), the 10<sup>th</sup> largest community-owned electric utility in the nation with nearly 400,000 customers in an around Austin, **Texas**, signed an agreement with the energy communications firm Cellnet+Hunt to expand the deployment of Cellnet+Hunt’s two-way advanced metering system to as many as 234,000 residential, commercial, and industrial users. The expanded two-way communications network will also enhance Austin Energy’s ability to deploy smart grid and demand-response strategies, including time-of-use pricing, in-home communications, remote disconnection, load shedding, and distribution automation.
- On the East Coast, [Allegheny Power](#), with approximately 1.6 million customers in **Pennsylvania, West Virginia, Maryland, and Virginia**, is undertaking several Advanced Utility Infrastructure (AUI) projects that will contribute to a modernized electricity grid. The investor-owned utility hopes the AUI projects will lead to an advanced communications and control network that links utility infrastructure with customers’ equipment and appliances, yielding a system that reduces peak power consumption, improves efficiency, and enhances reliability. Allegheny’s AUI projects include:
  - [Modern Grid](#), a Department of Energy (DOE)-sponsored field test for isolating system faults and restoring electricity without manual intervention;
  - West Virginia Circuit, a DOE demonstration project that will evaluate the integration of advanced system monitoring and control to improve the performance and reliability for customers in the Morgantown, West Virginia, area; and
  - Research Ridge, a project that will demonstrate how a network can link the customer’s equipment to the utility’s distribution system to optimize energy consumption at an office park in Morgantown.
- In June 2008, [Dominion Virginia Power](#) announced an [energy conservation plan](#) to meet the future needs of its more than 2 million residential and commercial customers in **Virginia and North Carolina**. A key component of Dominion’s “Powering Virginia” strategy is the installation of smart grid technologies—including advanced meters capable of two-way communications—that will enhance the electric distribution system. The new technologies will allow electricity to be delivered more efficiently and is expected to result in significant energy savings by allowing more precise flow controls.

Dominion plans to invest \$600 million in the system, which will include replacing all its electric meters with Advanced Metering Infrastructure (AMI) and transitioning to additional equipment to monitor and control the electric distribution system. Over the next 15 years, Dominion Power expects the plan to result in more than \$1 billion in customer savings. The company hopes to begin implementing the program in 2009.

**Additional Resources:**

- [Energy Independence and Security Act of 2007, Title XIII](#)
- [DOE Office of Electricity Delivery and Energy Reliability](#)
- [The Modern Grid Strategy \(NETL\)](#)
- [National Association of State Energy Officials](#)