



The Smart Grid: What it is and Why it Matters

Using energy more efficiently is one of the most discussed topics in the energy arena today. Ensuring a reliable flow of power to residential areas and businesses is a challenge, especially as the demand for energy grows at a constant pace.

In this issue brief Advance Mississippi discusses the new technologies of the smart grid, which are designed to improve energy efficiency and make energy distribution and generation more efficient, cost effective, and secure.

What is the smart grid?

According to Mississippi-based industry leader and Advance Mississippi member SmartSynch, the smart grid is “the sum of services, devices, and software necessary to add a layer of intelligence onto today’s 20th-century electricity grid such that every point on that grid can talk to every other point and decisions are made by devices or human beings to fully optimize the process by which electricity is generated and delivered to customers.”¹ The smart grid also allows consumer interaction with the grid by providing real-time information about their electricity use, the peaks of this use, and the cost of the energy used.² Smart grid technologies can also potentially reduce electricity costs, increase reliability, and give increased accountability to consumers. Additionally, smart grid technologies can also play an important role as intermittent renewable energy sources and plug-in hybrid electric vehicles (PHEVs) become more widespread.

The U.S. Department of Energy chart below depicts several applications of smart grid technologies at various stages.

¹ SmartSynch: “Smart Grid Infrastructure” - <http://bit.ly/cCyzGY>

² SmartGrid.Gov: “Benefits of Smart Grid” - <http://bit.ly/aA9J98>



Source: U.S. Department of Energy ³

The U.S. Department of Energy defines the smart grid as having seven specific characteristics: ⁴

- Self healing from power disturbance events
- Enabling active participation by consumers in demand response
- Operating resiliently against physical and cyber attack
- Providing power quality for 21st century needs
- Accommodating all generation and storage options
- Enabling new products, services, and markets
- Optimizing assets and operating efficiently

Federal Energy Regulatory Commission (FERC) Chairman Tom Wellinghoff defined the smart grid as, “providing customers the opportunity to communicate with and participate in the electric system in ways that can control their cost.”⁵

Gridwise Alliance, a coalition of businesses and organizations from across the nation that provides a forum for discussion and advancement of the smart grid, says the smart grid will “improve overall operation efficiency. [...] Utility operators will be able to easily identify, diagnose, and correct problems, and will even have the ability to anticipate problems before they happen.”⁶

One of the most important features of the smart grid is that is designed to help ensure reliability. In the United States, interruptions in electric service cost around \$150 billion each year. Alone, the 2003

³ US Department of Energy: Smart Grid diagram - <http://bit.ly/7dQPC2>

⁴ US Department of Energy, Office of Electricity Delivery and Energy Reliability: “Smart Grid” - <http://bit.ly/9MVkC>

⁵ Federal Energy Regulatory Commission: “Smart grid heavy hitters series” - <http://bit.ly/cZajoG>

⁶ Gridwise Alliance: “A Smart Grid: What is a Smart Grid?” - <http://bit.ly/bAi1w2>



blackout that occurred in the Northeast caused an economic loss of \$6 billion.⁷ Gridwise Alliance notes that the smart grid will have the ability to compensate for power disruptions by automatically sending power from other sources into the grid.⁸

Central to the smart grid is the smart meter, a next generation utility meter that simultaneously communicates with the utility company and the ratepayer. The smart meter allows utilities to track energy consumption in real time and more accurately manage energy needs.

Meeting Demand

Ensuring the optimal amount of energy supply capacity at any given time can be a challenge. To ensure reliability, electric providers are required to maintain a minimum capacity reserve as a buffer against power plant outages, extreme weather events, and other unexpected occurrences. In the sweltering summer days that are commonplace in the South, when electricity demand spikes with the use of air conditioners, grid operators must activate generation plants known as peakers. These plants only run to ensure that the demand is met, and they are generally older plants that are inefficient and expensive to operate. These plants also produce more carbon emissions than a typical power plant. By integrating smart grid technology, utilities may be able to reduce the need for peaker plants by having greater access to real time usage information.⁹

Advances in smart grid technology can also provide customers with choices about how much they pay for electricity in states or regions that have adopted "Time of Use" electricity pricing, which sets different prices based on the time of day or night when the electricity is used. During the busiest hours of the day, when peak electricity demand is reached, electricity would be more expensive. During the rest of the day (off-peak), the price of electricity would be lower. This would encourage customers to manage their costs by shifting electricity use from the peak to the off-peak. For example, a customer could run the dishwasher or charge an electric vehicle during off-peak times to save money.

Smart grid in practice

Smart grid technology has already been put to the test in some locations. Austin Energy, an electric utility in Texas, has used smart grid technology to reduce their peak load by more than 660 megawatts (enough electricity to power around 500,000 average U.S. homes). Austin Energy is also utilizing the technology to improve reliability, and with the goal of making the company's grid able to "heal" itself in the event of a mechanical failure by sensing problems and rerouting power.¹⁰

In the city of Boulder, Colo., Xcel Energy and several other companies have invested \$100 million dollars in a city-wide smart grid project, integrating smart meters, two-way wireless thermostats and other technologies into qualifying homes. However, the cost of the program has rapidly outpaced the original estimates.¹¹

Smart grid technologies and renewable energy sources

⁷ US Department of Energy: "The Smart Grid: An Introduction" - <http://bit.ly/ViTV>

⁸ Gridwise Alliance: "A Smart Grid: Reliability" - <http://bit.ly/97impv>

⁹ Ibid.

¹⁰ IBM: "Austin Energy - Leading the way to the smart grid" - <http://bit.ly/bbYXEL>

¹¹ Denver Post: "Xcel's smart grid a "learning lab" for dos and don'ts" - <http://bit.ly/brsfrO>



With the national and global push toward the use of renewable energy sources such as wind, solar and biomass, the integration of energy storage systems will become increasingly important. Because many of these energy sources are intermittent (solar, wind, tidal), and cannot provide energy around the clock or at peak hours when it is most needed, energy storage technologies can make it possible for grid operators to dispatch this stored electricity as necessary. While there is progress in the development and use of energy storage technology, it is not common in the U.S. today.

Smart grid technology in Mississippi

Mississippi is home to a globally recognized leader in smart grid technology. Jackson-based SmartSynch, a member of Advance Mississippi, manufactures smart meters, software, and other components of the smart grid infrastructure. The company has won several awards for their innovations in smart grid technology and was named a top ten smart grid “Company to Watch.” The company’s GridRouter™ was recognized as the #5 High Technology Concept in the World for 2009 by Green Tech Media.¹²

SmartSynch CEO Stephen Johnston said: “SmartSynch has been serving the smart grid industry for more than 10 years. We even coined the term *smart meter* before it became a household name. Only in the last couple of years, however, – thanks largely to a heightened emphasis on energy conservation and environmental awareness – have we seen our industry explode into the national spotlight. Our company, led by Mississippi-educated people, is at the center of the effort to solve the energy crisis through high technology that provides both cost saving and conservation benefits to utilities and their customers. It’s a great feeling to see our technology used globally. It’s very important to us at SmartSynch to make a difference from right here in our backyard.”

Several institutions in Mississippi are currently utilizing smart meters to become more energy efficient. In August 2009, the State of Mississippi awarded a \$3.75 million grant to SmartSynch “to help manage energy consumption and cost at public facilities around the state.”¹³ The University of Mississippi also partnered with SmartSynch to make the university’s campus more energy efficient.

Smart grid advancements in the United States

The federal government has provided funds to speed up the implementation of smart grid infrastructure across the country. The American Reinvestment and Recovery Act (ARRA) contained \$3.4 billion for the implementation smart grid technologies, which will be matched by private funds creating an investment of more than \$8 billion.¹⁴ The U.S. Department of Energy recently announced that more than two million smart meters have been installed nationwide, due in part to funding from the ARRA. U.S. Secretary of Energy Steven Chu said, “As a result of an unprecedented investment from the Recovery Act, smart

¹² SmartSynch: “Mississippi company’s new GridRouter product named world’s #5 Green Technology Concept for 2009 by industry experts” - <http://bit.ly/aoUhyc>

¹³ Mississippi Development Authority: “SmartSynch awarded State Energy Program grant” - <http://bit.ly/9CFvyv>

¹⁴ US Department of Energy: “President Obama announces \$3.4 billion investment to spur transition to smart energy grid” - <http://bit.ly/U0BCD>



meters are being installed [...] across the country to create a more reliable, modern electrical grid and give consumers the ability to monitor and control their energy use.”¹⁵

In September of 2010, Under Secretary of Energy Kristina Johnson announced the formation of Global Smart Grid Federation to “promote best practices to help accelerate the deployment of smart grid around the world.”¹⁶

Conclusion

The Electric Power Research Institute (EPRI) has stated that utilizing smart grid technology could decrease energy use in the United States by more than 4 percent by 2030.¹⁷ This would save money for utilities and ratepayers and potentially lower greenhouse gas emissions. The new technologies of the smart grid will continue to be applied to improve energy efficiency, and present new opportunities for the State of Mississippi and the nation.

Additional Resources

U.S. Department of Energy – *Smart Grid: An Introduction*
<http://www.oe.energy.gov/1165.htm>

U.S. Department of Energy –Smart Grid Resource
www.SmartGrid.Gov

U.S. Department of Energy – Office of Electricity Delivery and Energy Reliability
<http://www.oe.energy.gov/smartgrid.htm>

SmartSynch
www.SmartSynch.com

Advance Mississippi's mission is to advocate for sensible energy policy that will fuel economic opportunity in Mississippi, and educate policy makers, business and community leaders, and the general public about superior energy policies that will foster economic growth. For more information, visit www.advancemississippi.com.

¹⁵ *The Hill*: “Energy Dept. says nationwide ‘smart meter’ army hits 2 million” - <http://bit.ly/dAND1v>

¹⁶ *Power*: “Smart grid offers something for everyone” - <http://bit.ly/9gN7wX>

¹⁷ US Department of Energy: “President Obama announces \$3.4 billion investment to spur transition to smart energy grid” - <http://bit.ly/U0BCD>