



# Smart Grid: An Introduction

It's likely many utility consumers in Ohio have heard the term "smart grid" in news reports about upgrading the nation's aging electric transmission system, commonly referred to as the electric grid. But understanding exactly what smart grid is and what it can do is a completely different matter. In this fact sheet, the Office of the Ohio Consumers' Counsel will give you a basic overview of what the smart grid is, what it can do and what a smarter electric grid means for you.



## What is the smart grid?

A smart grid is not a single upgrade to the electric transmission and distribution systems but a complete overhaul with 21st century infrastructure, metering and communications technologies. Smart grid technologies take advantage of many advancements used today, including geographical information systems and wireless communication. Each part of the smart grid brings its own system and societal benefits with the goal of improving how electricity is delivered and used.

The smart grid includes four main components: advanced metering infrastructure, advanced distribution operations, advanced transmission operations and advanced asset management. With these technology improvements, the electrical needs of Ohioans can be met with greater efficiency and reliability and will allow more widespread use of renewable energy to help offset carbon emissions. Of these four, the advanced metering infrastructure will most directly include consumers.

The **advanced metering infrastructure** will enable direct two-way communication between a utility and the customer that will provide a variety of information, such as real-time pricing and usage information over certain time periods. The advanced meters will enable customers to respond to real-time electricity

prices and allow better management, monitoring and control of energy use in their homes.

Another common term associated with advanced metering is smart meters. These meters allow for pricing tied to the real-time price and customers' electric use, but also has the capability of net metering. This lets customers sell electricity back to the utility for a payment, provided they are generating their own power, for example, by using a rooftop solar installation.

## Why is a smarter grid needed?

Many experts predict electricity demand will increase 26 percent over 2007 levels by 2030. The electric grid we use today – built in the early 20th century – will not be able to handle the electricity needs of the future. The infrastructure to deliver electricity is already fragmented, overtaxed and outdated, in part because many utilities have failed to upgrade their systems. Without improvements, electrical brownouts and blackouts could become common occurrences.

The grid of yesteryear was designed with one thing in mind – keeping the lights on. Today, the electronics age is requiring much more electricity for everyday conveniences – high-definition televisions, computers and video game systems all use electricity at levels unheard of in the first half of the 20th century. There's a laundry list of items Americans have become

## **Other elements of a smart grid**

### **Advanced distribution operations**

An improved distribution system with automated devices designed to increase the efficiency and reliability of electricity and its delivery to consumers. These technologies will give the distribution system self-healing abilities, speed up restoration efforts and improve the process of connecting and disconnecting customers. Utilities will have more precise information about where failures and problems occur and take the steps to avoid unnecessary outages.

### **Advanced transmission operations**

Links large regional operations that transmit electricity from power plants to local distribution operations that send electricity to consumers' homes. Upgrades will reduce congestion on the lines that can lead to brownouts and blackouts and allow for the integration of renewable energy power sources with traditional sources.

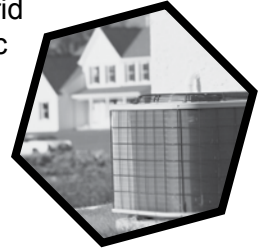
### **Advanced asset management**

Helps utilities acquire more data about their operations of the electric grid in real-time to focus on preventing outages, minimizing the impact of outages on consumers and improving electric usage forecasts with more timely and accurate information. By combining new advanced asset management with other smart grid improvements, utilities can reduce the costs associated with operations and maintenance and improve customer service.

aware of and concerned with when it comes to electricity; affordability, reliability, security, environmental impact and progress are just a few of the areas where grid updates will be needed to meet the demands of tomorrow.

## **What benefits will consumers see with a smarter grid?**

As more consumers seek lower electric costs, improved electric reliability, environmental sustainability and control over their energy consumption decisions, the smart grid will be able to help deliver those benefits. Electric utilities will receive operational savings that, in some cases, can make up more than half of the smart meter investment. These are significant and are comprised of meter reading cost savings, call center savings and outage management savings.



Advanced meters also will help facilitate utilities and competitive suppliers to offer many voluntary rate options that customers can choose to lower their electric costs. The meters will be able to tell consumers how energy is used, what it costs them and what kind of impact that usage has on the environment. Consumers will be able to make adjustments manually or set preferences that will tell the utility to automatically make changes based on those settings. In the near future, consumers will be able to remotely communicate with appliances, thermostats and electronics that can encourage energy-efficient decisions that will save money.



The interactivity allowed with the smart grid also will allow consumers to make decisions on when they use energy to save money. By making the choice to use electricity during times of the day when others are not, consumers can take advantage of cheaper energy. This will help consumers save money and will provide a benefit to all by reducing the need to operate more expensive power plants during peak times.

Consumers also will benefit from increased reliability through a smarter grid. Because a smart grid has the ability to self-heal, momentary outages may occur less frequently and outages related to powerful storms can be significantly reduced. The OCC will be vigilant in its review of each utility's smart grid proposal so that when all the benefits of the smart grid are tallied, they should exceed the costs of implementation.

## **What makes a smart grid so much "smarter"?**

Imagine using a personal computer from the 1980s while everyone else is using the latest in computing technology. The speed, ease

of use, price, storage capabilities and software available in today's computers put the early models to shame. The thought of using a 1980s-era computer to accomplish tasks when superior technology is available does not make sense. To a degree, this is what the electric grid is like today.

By using the information technologies available to us today, the smart grid will keep us up to date with the world around us. Incorporating these technologies will help create an electrical grid that will be able to heal itself in the event of an outage or other event that may disrupt the normal flow of electricity. With self-healing capabilities, the grid will be allowed to automatically reroute electricity to reduce outages, isolate the damaged areas and notify utilities exactly where repairs need to be made.

With these technologies incorporated into an upgraded grid, electric utilities will have an easier time adapting to changes and utilizing future technologies as they become available. The quicker new technology can be applied to the electric grid, the sooner it will help improve efficiency and keep consumers' electricity costs at reasonable levels.

Care will have to be exercised when developing these systems to prevent breaches of customer information. Moreover, security protocols are under development to prevent hacking or other attacks on the new systems.

## How will a smart grid affect your electric bills?

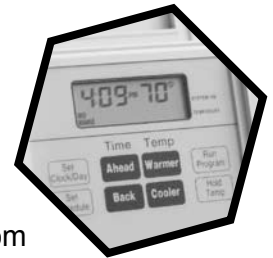
When the smart grid becomes a part of our everyday lives, control of how consumers use electricity will be at their fingertips. Up-to-the-minute price signals will be sent to smart meters allowing consumers to decide when it is best for them to use a dishwasher, clothes dryer or other items that require electricity.



With a smart grid that is more efficient and has

the ability to heal itself when problems arise, savings may be realized on consumers' bills. These savings come in the form of reduced maintenance costs, opportunities to control individual costs and increased energy efficiency.

However, improvements to the electric grid will require an investment before it can provide consumers observable benefits. Experts have estimated a smart grid from start to finish could cost about \$1 billion for a city of 1 million people. At the urging of the Ohio Consumers' Counsel, electric utilities were instructed by the Public Utilities Commission of Ohio to apply for federal stimulus money to pay for half of their smart grid projects. American Electric Power, Duke Energy and FirstEnergy each were awarded grant dollars that will help offset smart grid upgrades.



The impact of building a smart grid could bring significant contributions to the U.S. economy. According to the Galvin Electricity Initiative – a campaign to perfect the power system – a smart grid would reduce costs to the U.S. economy related to power outages and other power quality issues by \$49 billion per year. “Smart grids would also reduce the need for massive infrastructure investments by between \$46 billion and \$117 billion over the next 20 years,” the campaign says. Galvin also says widespread development of smart grid technology could add \$5 billion to \$7 billion per year to the economy by 2015 and \$15 billion to \$20 billion per year by 2020.

## When will a smart grid show up in Ohio?

Parts of the smart grid are already showing up in Ohio. Duke Energy Ohio has already installed more than 40,000 smart meters in the Cincinnati area and American Electric Power has scheduled a 100,000 customer pilot program for smart meters in the near future. Each of the electric utilities has submitted plans to the Public Utilities Commission of Ohio for its plan for smart grid deployment.

**For additional information from the Office of the Ohio Consumers' Counsel:**

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