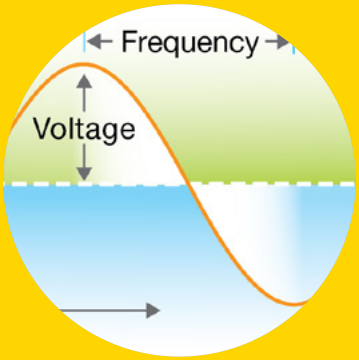
SmartGrid consumer collaborative

listen, educate, collaborate

Consumer Information Kit for the Smart Grid



MYTH NO. 2

Smart meters are a health threat because they communicate using wireless signals.

SmartGrid consumer collaborative

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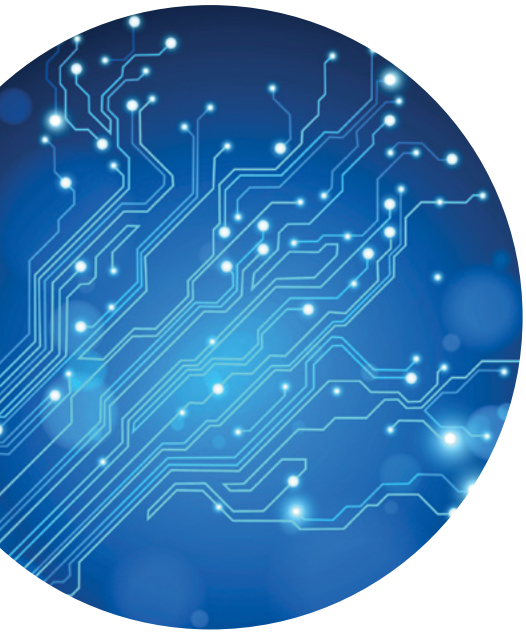
Learn more about these Smart Grid Topics:

These documents are available in our resource library at smartgridcc.org:
http://smartgridcc.org/sgcc-consumer-information-kit-for-the-smart-grid

Smart Grid Benefits You Today…and Tomorrow

Technology has transformed our way of life, but our electric grid — which we trust to keep power flowing to our homes, schools, workplaces, and hospitals — hasn't been modernized to match. Now it can be, with a new investment in our nation's energy infrastructure called smart grid. It combines information technology with power transmission to benefit your home, your community, and your nation. Read on, and you'll agree that there are many reasons why this new plan for the grid deserves to be called *smart*.



Smart grid keeps your lights on.

It overhauls aging equipment.

The current electrical system is decades old and dependent upon equipment that is approaching the end of its usable life. Smart grid updates this infrastructure, ensuring that safety standards continue to be met, that power is delivered consistently, and that the system is managed efficiently.

It equips the grid to meet increasing demand.

As Americans today use more electronic devices than ever, the demand for power continues to grow rapidly. Without smart grid improvements, the old system, already strained to near-capacity, will be unable to meet the challenges of the future.

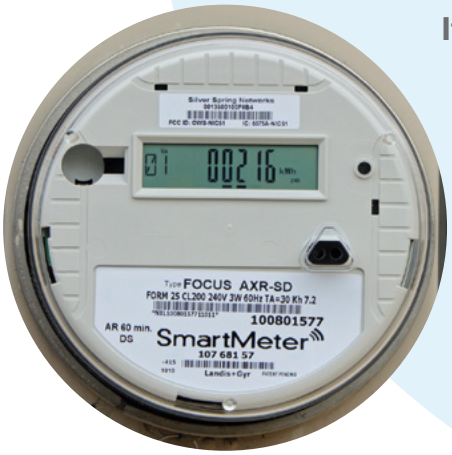
It decreases brownouts, blackouts, and surges.

You don't always know when a brownout or power surge is happening, but they can leave damaged TVs, audio equipment, and computers in their wake. Smart grid applications smooth the flow of power, and when aberrations do occur, they are more quickly and easily dealt with.

Smart grid lowers energy costs.

It gives you control over your power bill.

Smart grid makes it possible to monitor and adjust your energy use through smart meters and home energy management systems that offer 24/7 rate and usage readings. That means no surprises on your electric bill and even better, you can schedule your most energy-intensive tasks for low-demand periods when you pay less. Control of your electric usage is in your hands and dollars stay in your wallet, month after month.



It facilitates real-time troubleshooting.

When something goes wrong in today's electrical system, a utility worker must drive to the location of the problem to collect data before a solution can be devised. Smart grid improvements convert system events into instantly-retrievable digital information, so that problem solving can begin immediately. With such improved efficiency comes reduced producer costs — savings that will be passed on to you.

It reduces expenses to energy producers.

To meet spikes in energy consumption, today's system relies on the building and maintenance of expensive standby plants which sit idle except during rare critical demand periods. Smart grid allows direct communication with end-user equipment to reduce consumption during these peak periods, lowering the need for costly standby power plants.

Smart grid secures America's energy independence.

It facilitates broad-scale electric vehicle charging.

Like many Americans, you may be contemplating replacing your gas guzzler with an efficient electric vehicle. Once you do make the switch, you'll need a reliable, low-cost way to recharge it anytime, anywhere. When you and millions of other owners plug in to charge your electric vehicles, smart grid will be ready to handle the new demand.

It makes renewable power feasible.

Sophisticated smart grid systems are needed in order to strategically manage the diverse and geographically scattered renewable power sources like wind farms, solar plants, and hydro stations. Smart grid will ensure that this energy can be stored safely and distributed where and when it's needed.

It maintains our global competitiveness.

Today, even developing countries are building their energy infrastructure on faster, more modern technologies. Our electric grid once gave us a competitive advantage, but now it's causing us to fall behind. Smart grid safeguards our nation's position at the forefront of the world's transition toward a clean energy future.

Reliability, cost savings, and energy independence are just three of the many benefits of smart grid. These and more make it the energy technology not just for the future, but for today.

Multiple layers of security protect data privacy during transmission.

Data Privacy and Smart Meters

The Smart Grid

Many components of our electricity grid are decades old and wearing out. Utilities across the United States are spending billions of dollars to upgrade and modernize our electrical infrastructure with smarter technology to improve its efficiency, reliability and security well into the 21st century.

A major focus of this upgrade is to ensure that critical and timely data about the transmission of power is available. The smart meter is a key power system component that allows utilities and customers to understand how and when energy is being used. Millions of smart meters have already been installed in homes across the country. They can prevent outages and reduce the length of those that do occur. Smart meters help consumers save energy and money on their electrical bills, which helps the environment by reducing the need for constructing new power plants.

What is a smart meter?

A smart meter is a modern version of the analog meter still used in most U.S. homes. Smart meters allow for the collection of more accurate and detailed electricity usage data and enable the wireless communication of home energy usage. Instead of a meter reader walking on to your property to look at the numbers on a dial, the information is automatically and wirelessly sent to your utility over a secure network.

What data is collected and stored by my smart meter?

No customer-identifying information – such as names and addresses – is stored in the meters or transmitted across the network. Just like analog meters, smart meters collect how much electricity you use. The main difference is that smart meters collect more of that information throughout the day. Some smart meters send utilities a snapshot of customers' energy usage every 15 minutes, while others may collect hourly energy information.

Since smart meters collect and wirelessly transmit much more data about electricity consumption, it is important to have strong privacy protections in place.

Advanced encryption locks the privacy of smart meter data.

How is the information protected?

Protecting customer data is a top priority for utilities. For 100 years, they have advanced strong privacy protection principles. This will not change with the use of smart meters.

Even before smart meters are installed, utilities are required to submit detailed plans to their state regulatory commissions describing how customer data will be protected. Using the same advanced methods as internet banking and ATM machines, digital smart meters encrypt (code) customers' energy usage data to ensure privacy, transmitting it to the utility over a wireless network with multiple layers of security incorporated throughout the system. The performance of security measures are tested and reviewed regularly to guard against unauthorized access to systems.

Moreover, utility companies are working with federal agencies, such as the Department of Homeland Security, the Department of Energy, and the National Institute of Standards and Technology (NIST), to strengthen privacy and security standards to provide even more safeguards for consumer protection.

Who will have access to my information?

Access to information is restricted to authorized utility personnel, who need that data to satisfy a business function, such as improvements in billing and customer service.

The White House, in partnership with utilities, has initiated a program called "Green Button" designed to give consumers access to their own energy usage data. Utilities that participate in the Green Button program will allow consumers to easily access and securely download their own household smart meter data. Additionally, using the Green Button, consumers will be able to choose to share their smart meter data with companies delivering new services such as smart thermostats, remote home control systems and smart appliances.

Green Button Download My Data ®

In conclusion…

The privacy of electricity usage data is protected now and that will not change with the use of smart meters. Electric companies, the federal government, and the suppliers of critical electric grid systems and components are working together to strengthen consumer safeguards, develop a best-in-class data security model and enforce its implementation.

We encourage you to take the time to get to know your electric provider's privacy policy and commitment to keeping client data safe. With that assurance, you will feel free to enjoy the many benefits of a modernized power grid system, including the ability to manage your electricity use and save money, increased reliability of power delivery, and the integration of clean, renewable energy sources to help power our homes in the 21st century.

Myths vs. Facts: The Truth about Smart Meters

Misunderstanding advanced technology can lead to the emergence of urban legends. The case is no different with smart meters, which utilities are rolling out across the country in an effort to bring the benefits of a modernized electric grid to consumers like you.

The following are the most commonly circulated smart meter myths. Our responses, each supported by research, offer the facts — the real deal on smart meters.

MYTH NO. 1

Smart meters are less accurate than analog meters.

TRUTH: Smart meters are rigorously tested for accuracy even before they leave the manufacturing plant.

TRUTH: Some public service commissions require meter manufacturers to supply test results to prove that their smart meters generate on-the-mark measurements. All meter manufacturers must follow performance standards set by the American National Standards Institute.

TRUTH: Prior to installation, utilities repeatedly perform accuracy tests, often side-by-side with analog meters.

Repeated tests confirm that smart meters are accurate, in some cases even more accurate than analog meters.

MYTH NO. 2

Smart meters are a health threat because they communicate using wireless signals.

TRUTH: In-depth review of the scientific literature by the World Health Organization (WHO) revealed that the small amount of radio frequency (RF) energy produced by smart meters is not harmful to human health.

TRUTH: RF emitted by smart meters is well below the limits set by Federal Communications Commission and it is below levels produced by other common household devices like cell phones, baby monitors, satellite TVs, and microwaves. In fact, you would have to be exposed to the RF from a smart meter for 375 years to get a dose equivalent to that of one year of 15-minutes-per-day cell phone use.

No credible evidence shows any threat to human health from RF emissions at or below RF exposure limits developed by the FCC. With over 25,000 articles published on the topic over the last 30 years, scientific knowledge in this area is now more extensive than for most chemicals.

MYTH NO. 3

Smart meters will not keep my data secure.

TRUTH: Just as the banking, credit card and cable industries have provided secure access to your information online, the utility industry is poised to do the same using advanced security and encryption technology to safeguard your data.

TRUTH: Utilities are involved in national consortiums and work with national cyber-security to regularly audit their systems to ensure privacy and security of smart meters.

The privacy of your data is protected now. Utilities work constantly to safeguard it. That will not change with the use of smart meters.

MYTH NO. 4

Smart meters are hazardous, increasing the risk of fire and explosion.

TRUTH: Smart meters must meet safety requirements and standards spelled out in the National Electric Safety Code (NESC).

TRUTH: Public service commissions require independent certification proving that smart meters are safe and show resistance to heat, fire, voltages, surges, and self-heating.

Companies that manufacture smart meters produce certifiably safe and reliable equipment. Nevertheless, smart meters should be installed and uninstalled only by trained professionals exercising standard safety precautions.

MYTH NO. 5

Smart meters are an invasion of privacy.

TRUTH: Smart meters measure how much energy you use, based on time of day, not how you use that energy. Unless you install a home energy management system, smart meters cannot tell whether the energy used is from your oven, air conditioner, or hairdryer.

TRUTH: Utilities adhere to strict policies, following state laws that regulate the use of personal information for business functions like billing and customer service.

Smart meters are a landmark change allowing two-way communication between your utility and you, much like cell phones and banking. Utilities keep your data private and secure, similar to those industries and similar to how it's always been.

MYTH NO. 6

Smart meters do not provide any consumer benefits.

TRUTH: Smart meters measure and transmit your energy usage directly to your utility, eliminating the practice of estimated bills, which means no more surprises on your electric bill.

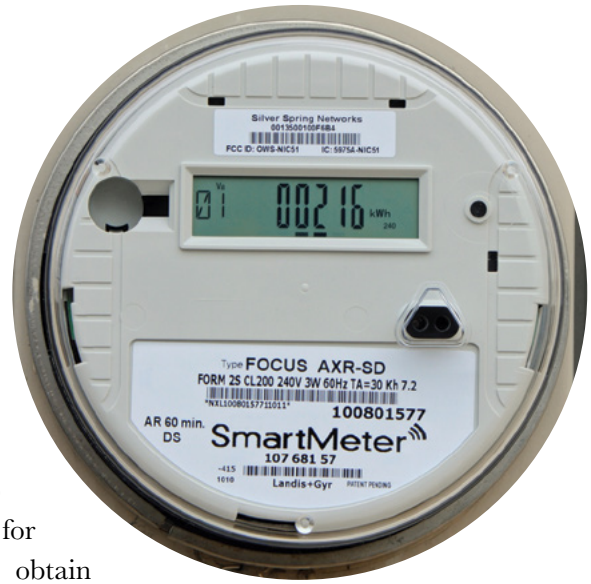
TRUTH: Smart meters provide you with near-real time energy usage information about how much, when and in some cases, at what price, you use energy. Armed with this information, you can take more control over your energy consumption—and your monthly bills.

TRUTH: Working as a part of the smart grid, smart meters improve power outage detection and notification. Smart meters electronically report the location of outages before you ever have to call your utility, making restoration faster and status notification to you much easier.

Greater reliability, faster power restoration, convenience, and control are just a few of the many benefits of smart meters.

Separating myths from reality allows you to take advantage of all the benefits that a smarter, more modernized electric grid offers. It's important to stay informed and learn about the different ways your utility is deploying smart grid and smart meters to improve their electric service. For trusted information about smart grid and smart meters visit the Smart Grid Consumer Collaborative (SGCC) at smartgridcc.org, the US Department of Energy at SmartGrid.gov, or your utility website.

Radio Frequency and Smart Meters



In most regions of the United States, key electric utility infrastructure is now over half a century old. It is no surprise, then, that this infrastructure is in need of major upgrades to keep up with our nation's ever-rising demand for power. One important step that electric utilities are taking to improve their distribution systems is to install smart meters. These devices earn the right to be called "smart" by making it easy for utilities—and consumers like you—to obtain accurate, real-time readings of electricity usage. With smart meter data, utilities can manage power distribution more efficiently to avoid overloading to the grid and the blackouts that follow. Even better, smart meters empower you to make informed, money-saving decisions about how and when you use electricity in your home and business.

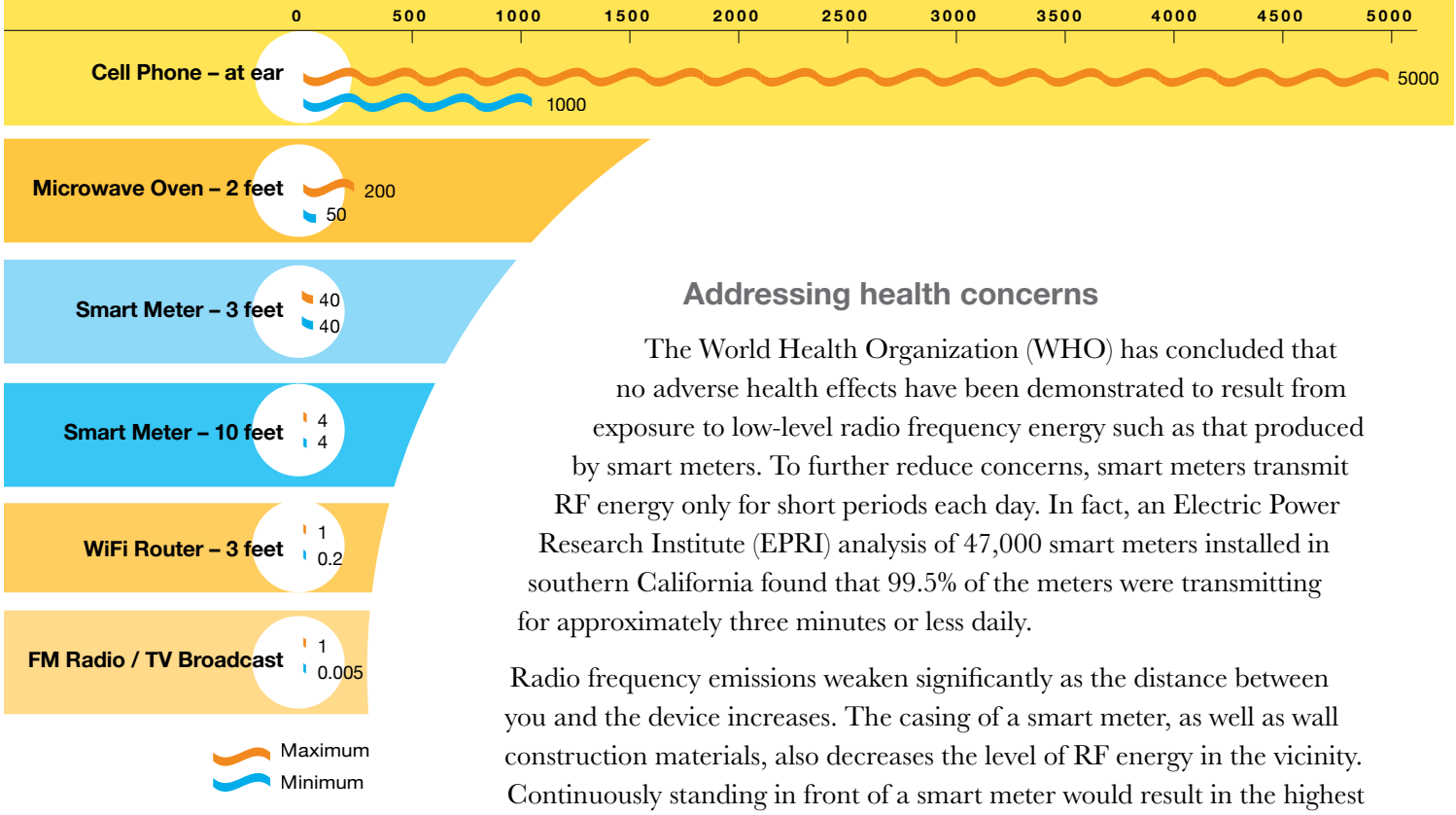
Smart meters, which operate by transmitting and receiving information wirelessly, are a key element in the effort to update and bring electric systems into the 21st century. Nevertheless, some people have expressed concerns about the possibility of negative health effects from the radio frequency (RF) waves that smart meters use to communicate.

What are radio frequency waves?

Radio frequency waves are a form of electromagnetic energy. They move through space at the speed of light and can be man-made or occur naturally. RF waves are used for a variety of purposes, but most importantly, they are employed in telecommunications. Smart meters use low-energy radio frequency waves to transmit information across distances.

Every day, people use and keep nearby to them many devices that utilize radio frequency waves, including microwave ovens and cellular telephones. The Federal Communications Commission (FCC) sets RF limits and requires that all radio communicating devices be tested to ensure that they meet federal standards before they are allowed to transmit within the radio spectrum. Smart meters emit less radio frequency energy than many other commonly-used wireless devices which, like smart meters, are safe and FCC-approved.

Radio Frequency Power Density Levels of Common Devices (in microWatts/cm²)



About this figure: This figure depicts the radio frequency waves emitted by various common wireless devices. Source for starting measurements: Electric Power Research Institute (EPRI), Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model (February 2011). The RF exposure for cellular phones shown in this graph is for comparison purposes only Cellular phones are evaluated for compliance with FCC exposure standards on the basis of specific absorption rate (SAR) and not power density.

Addressing health concerns

The World Health Organization (WHO) has concluded that no adverse health effects have been demonstrated to result from exposure to low-level radio frequency energy such as that produced by smart meters. To further reduce concerns, smart meters transmit RF energy only for short periods each day. In fact, an Electric Power Research Institute (EPRI) analysis of 47,000 smart meters installed in southern California found that 99.5% of the meters were transmitting for approximately three minutes or less daily.

Radio frequency emissions weaken significantly as the distance between you and the device increases. The casing of a smart meter, as well as wall construction materials, also decreases the level of RF energy in the vicinity. Continuously standing in front of a smart meter would result in the highest exposure a person could experience, and even then the exposure would be approximately 70 times less than the FCC limits.

IN CONCLUSION...

Smart meters do not produce any negative health impacts. They emit a low level of radio frequency energy that is both FCC-approved and lower than the level of RF energy emitted by many other devices that are used daily by millions of people. At most, smart meters transmit radio frequency energy for only a few minutes each day, and that energy is reduced further by surrounding materials.

Smart meters are a very important step to improving the delivery of electricity for consumers. They will give you more insight into your energy usage and more control over your energy expenditures. Most importantly, smart meters will help create a more efficient, more reliable, and more sustainable electricity world for generations to come.

How the Smart Grid Keeps Your Power On

(And Gets it Restored Quickly When it Goes Out)

Part of Chattanooga's Smart Grid includes 1,200 "smart switches" that automatically detect and respond intelligently to problems on the grid. In July 2011, a big thunderstorm hit Chattanooga, causing power outages across the city. Thanks to their Smart Grid, 42,000 customers who would have otherwise lost power saw nothing more than a momentary blink of their lights. The 35,000 customers that were affected by longer outages saw their power restored about a day and a half sooner than it would have been prior to the Smart Grid. In total, Chattanooga's Smart Grid helped avoid nearly 970,000 hours of collective customer power interruption.

Even though most of us give little thought to whether the lights will turn on when we flip the switch, on any given day the equivalent of 500,000 people in the U.S. are without power for 2 hours or more. Studies have shown that power outages cost the U.S. economy around $80 billion annually. Impacts to homeowners can range from the inconvenience of losing air conditioning on a hot summer day to adverse health impacts in the case of people who rely on electricity for critical medical equipment.

Why does the power go out?

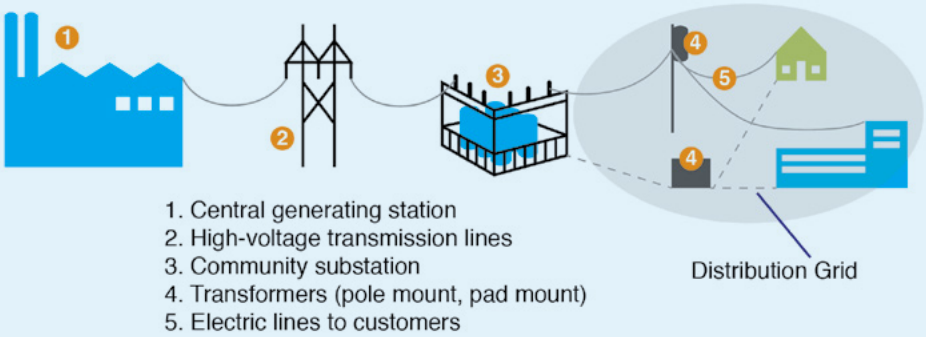
Most outages originate in the distribution grid — the equipment connecting your home to the neighborhood power substation (see graphic). The major cause of outages is due to severe weather like tornadoes, hurricanes, and other natural causes. Some outages are due to equipment failures.

How does the Smart Grid keep the power on?

Most of the traditional distribution grid is built using a "hub-and-spoke" pattern. The Smart Grid can connect the "spokes" to enable multiple distribution paths. When facing an issue like a tree falling on a line, a lightning strike, or a short circuit, Smart Grid technologies collectively called "distribution automation" can sense the problem and automatically reroute power around it. This can mean the difference between a lengthy outage and a momentary one where the only sign something is happening is that lights flicker.

Without a Smart Grid in place, the only way to do this is to send a service crew out to inspect the problem, which of course means that the outage will last at least until they are on-site.

The distribution grid and its role in the electric utility system



Uh-oh, the power is off. How does the Smart Grid help me now?

Chances are, if you have a smart meter and your power goes out, your utility already knows. Many smart meters are able to detect that there is a problem and notify the utility just before power is lost. Before smart meters, the only way utilities knew that customers were without power was when they called. Now, many customers are finding service trucks showing up to restore power before they even call to report an outage!

In addition to letting the utility know of a problem, Smart Grid technology also helps the utility diagnose the problem before sending a service crew to ensure that the crew has the right equipment to fix the problem. Before the Smart Grid, one crew would have to go out, inspect the problem, and radio for another crew to bring the right materials and supplies. This remote diagnosis significantly reduces both the time and cost for restoring power.

Sometimes when power goes out — for example, during a storm with numerous trees down — there are multiple problems on the distribution grid. Before the Smart Grid, multiple outages like this could be difficult to diagnose. After fixing one problem, service crews would sometimes leave an area with multiple outages under the mistaken belief that power was back on for all customers, causing tremendous frustration for customers whose power was not restored.

Now, with smart meters in place, utility crews can "ping" meters within an outage area to make sure that power has been restored for all customers. This facilitates more effective diagnosis and restoration of multiple outages.

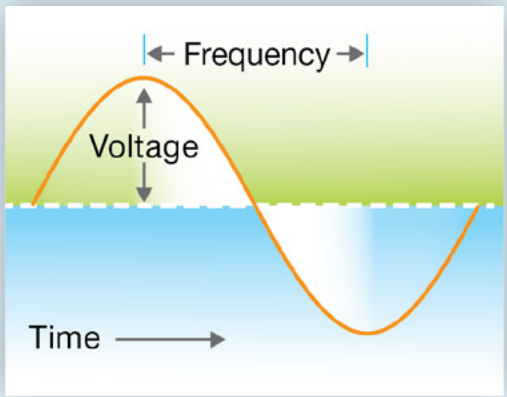
Smart Grid: Where Power is Going

"The vast networks of electrification are the greatest engineering achievement of the 20th century"

— U.S. National Academy of Engineering

We are the daily beneficiaries of the significant infrastructure engineering and investment in the 20th century that built our current power grid. As this infrastructure is becoming less reliable due to age and the demands we are placing on it, it has simultaneously become a critical necessity to our lives and economy. A Smart Grid enables the reliability we have come to expect for the future, integrating diverse generation and storage resources into a smart self-healing grid.

Power Quality



AC power quality factors

What is power quality?

Power quality refers to electricity that consistently meets the agreed-upon specifications for optimal and efficient use in home electronics. In North America, home appliances and electronics are designed to operate within a range of 106 volts to 127 volts of alternating current (AC). However, equipment operates most efficiently in a range of 114-126 volts, which is the standard for delivered voltage in North America.

Utilities also manage a number of other components of power quality, including:

- Frequency, which is set at 60 Hz in North America; and
- Power factor, which measures how much of the electricity delivered is actually useable by customers.

Voltage and power factor, in particular, are very dependent on how many customers are on an electrical line, and how much they are using. For example, if every house in a neighborhood is running their air conditioning, voltage at the last house in the neighborhood circuit could be at—or even below—114 volts. This low voltage condition can cause problems with electric equipment in that house.

Digital equipment relies on a transformer to get the low-voltage direct current needed to operate.

Why is power quality important?

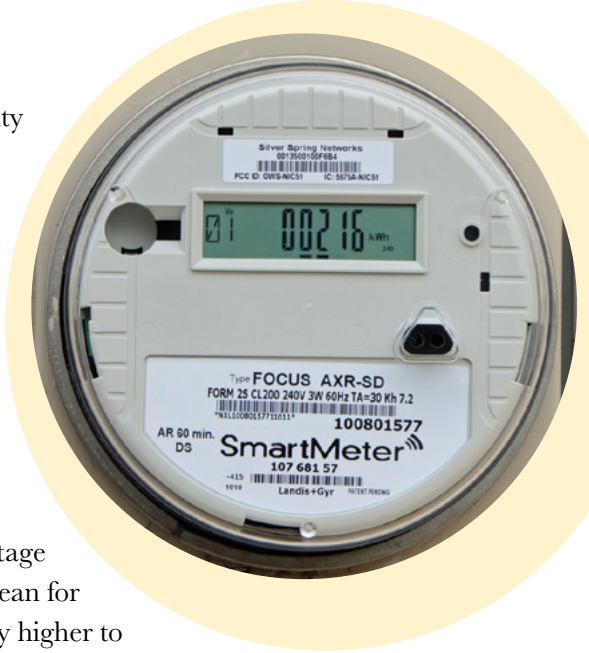
Today's modern and sensitive electronics demand a steady voltage and frequency, a considerable change from electronics in the 1960s. Higher than normal voltage causes electronic equipment to operate inefficiently, and may even cause damage to certain equipment. Low voltage has similar impacts, and may cause equipment to work erratically or not at all, like when you turn on your vacuum and your lights dim momentarily.

This is especially true of digital electronic equipment such as computers and TVs. Digital equipment relies on low-voltage (usually around 5 volts) direct current to operate. In order to get this type of electricity, digital electronics rely on a transformer—either as part of their plug (the typical "wall wart" pictured at left) or built into it like on a desktop computer. If a digital device isn't able to get the right voltage, it simply won't work.

Additionally, research has found that every 1 percent change in voltage has a corresponding 1 percent change in power usage. As a result of these factors, utilities strive to keep the voltage that's delivered to your house within the standard range.

How does the Smart Grid help improve power quality?

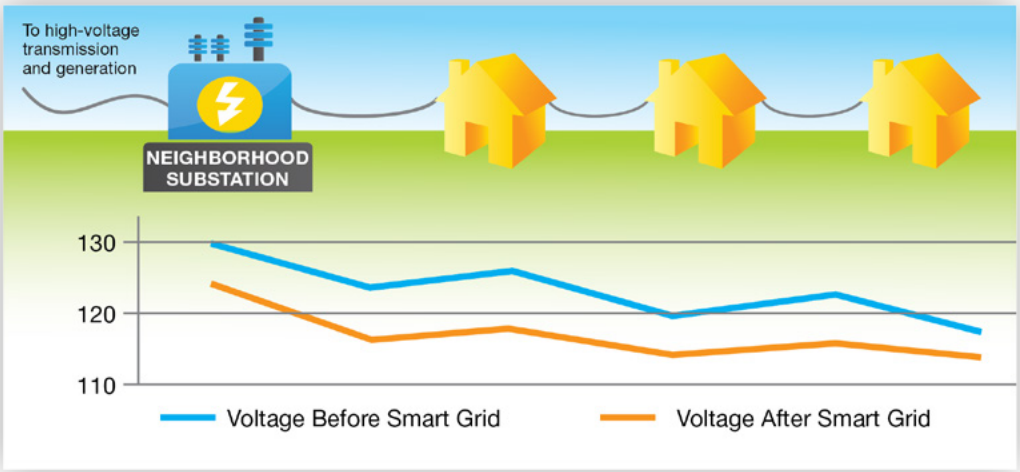
The Smart Grid includes several components that help utilities better deliver quality power to your home: smart meters and technology on the distribution grid that helps manage voltage and power factor.



Smart meters are advanced electric meters that provide both you and your utility with more information about the power delivered to your home. Like other digital devices, they include a transformer to step down voltage for the digital electronics. Also like other digital devices, they are engineered to meet strict FCC requirements to keep from interfering with other electronic or communications equipment.

Smart meters allow your utility to see what the actual voltage delivered to your home is. Before smart meters, utilities would base their equipment settings on voltage readings at an electric substation and engineering estimates of what that would mean for actual voltage at each customer's home. They would often set voltages unnecessarily higher to ensure that the last home on a line didn't receive voltage below 114.

With actual information on voltage, utilities can use Smart Grid technology to optimize the voltage for every customer they serve—settings are based on actual customer voltages rather than engineering estimates, which enables a more efficient and accurate supply of power.



Smart Grid: More Efficient, Higher Quality Power

More information and the ability to manage voltages in real-time allow utilities with Smart Grid technology to operate their electrical grid within tighter tolerances. This provides you with a more reliable and efficient power supply that allows your appliances and other electronic devices to operate at their highest efficiencies and minimizes your cost to run them.

Interested in Smart Meters and Health?

See our fact sheet at www.WhatIsSmartGrid.org/smart-grid-101/fact-sheets/radio-frequency-and-smart-meters.

Learn more about the Smart Grid at www.WhatIsSmartGrid.org.

Become a Smart Power Consumer

How New Pricing Plans Can Save You Money and Help Improve the Environment

Did you know that the cost to generate electric power varies from season to season, day to day or even hour to hour? Today most electric customers are unaware of this because most of us pay one flat rate for each kilowatt-hour of electricity used, regardless of the time of day or actual cost to produce it. This pricing structure increases electricity costs for everyone, since we use a lot of electricity during expensive times of day and don't know it, and utilities simply integrate those high costs into the flat rate we pay.

When and How Power Is Generated Influences Its Cost

"Baseload" power plants are run continually and are tuned to run very cost-effectively, in contrast to "peaker" power plants that ramp up and down to meet higher demand and consequently run less cost-effectively.

New Power Plants and Transmission Lines May Not Be Needed

Peak weekday demand is met with expensive and – relative to baseload power plants – inefficient power plants. By reducing peak demand across the electricity grid, utilities will not have to invest as much money in power generation facilities that are only used a few hours a year. Nor will utilities have to construct as many high-voltage transmission lines and towers to meet peak demand. Avoiding these expensive utility infrastructure costs reduces costs for all electricity consumers.

The Money-Saving Potential of the Smart Grid and Smart Meters

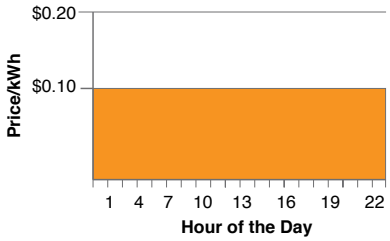
With a smart grid in place, customers may have the option to pay lower electric rates and reduce the pollution associated with their electricity consumption by signing up for a new pricing plan if one is offered by their utility. That's because a non-flat-rate pricing plan will enable you to use electricity when it is less expensive and more efficiently generated. By choosing when and how you use electricity, you can better managing your budget and improve the environment without sacrificing comfort and convenience.

An Illustrative Example:

Many other services we need are priced based on when we use them. Airlines, for example, price their tickets according to demand higher around holidays and peak business travel times. Prices also typically rise as the departure date approaches and available seats decline. If airlines didn't have this pricing flexibility, most airline tickets would cost significantly more.

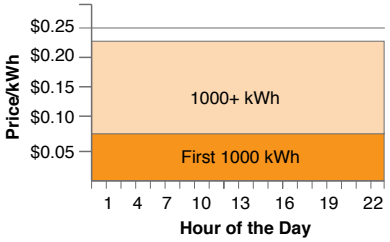
How Electricity Pricing Programs Work

Utilities have used flat rate pricing for more than 100 years. That is beginning to change due to increased stresses on the electrical grid and improved technology that enables greater price transparency for consumers. Customers in some states are being offered new pricing plans that make it possible for them to save money by controlling how much electricity they use during times of peak demand when electricity is more expensive.



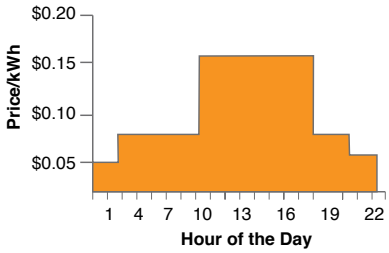
Flat-rate Pricing

This is how most utilities have charged – and many still charge – households for electricity. These flat rates reflect the average cost of electricity. Under this rate structure, customers' only opportunity to save money is to reduce usage.



Tiered Pricing

Under a tiered pricing structure, electricity rates increase as customers' use passes pre-defined thresholds during the billing month. None of the tiered rates reflects what the utility actually pays for electricity; lower tier rates are well below cost and upper tier rates are well above cost. Under this rate structure, customers can save money by conserving electricity, but are deprived of accurate information regarding the actual cost of their electricity consumption.



Time-of-use (TOU) / Variable Pricing

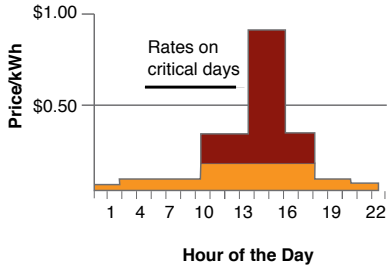
With a TOU/variable pricing structure, prices paid for energy used during specific hours of the day and days of the week are clearly established and provided to consumers in advance. "Peak" pricing is set based on when a utility's peak demand occurs, typically during afternoons and early evenings on hot summer weekdays. "Off-peak" pricing is typically lower per kilowatt-hour than in flat-rate pricing, offering customers an opportunity to save money by shifting their electricity usage from "peak" to "off-peak" times where possible.

The Green Button is a way for customers to access information collected from their smart meter by clicking on a green button on their utility company's website to securely access their household energy data.

Note: not all utilities are participating in this program.

Real-time (or Dynamic) Pricing

Electricity prices in a real-time pricing structure may change hourly (or evenmore frequently, in some cases) based on actual electricity price changes in the wholesale market. Prices are provided to consumers either on a day-ahead or an hour-ahead basis so they can plan accordingly. Customers on this type of rate can use automated tools such as smart thermostats to adjust their electricity use in response to price fluctuations.



Critical Peak Pricing (CPP)

CPP is a premium charge for electricity when it is the most expensive and when the grid is running at maximum capacity, most often on hot summer weekday afternoons. CPP rates can be 4-6 times higher than flat-rate prices. Critical days are declared in advance by utilities, and customers have the opportunity to save money by shifting their electricity use to off-peak periods during those days.

Peak-Time Rebates (PTR)

Some utilities, rather than charging CPP, have taken the approach of providing bill credits to customers who roll back their consumption during critical days. The net effect for customers is the same – a significant opportunity to save money by conserving or shifting their use of electricity.

What the Future Holds – Easier Ways to Stay Comfortable in Your Home

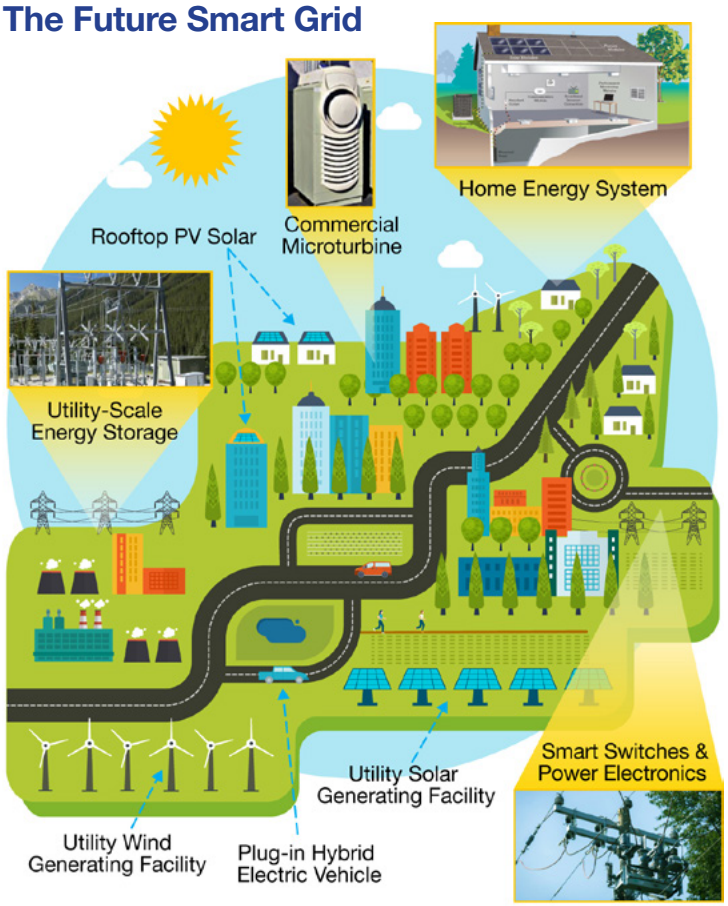
Increasingly, consumers can realize even greater savings when using these different rate plans with tools such as web portals, smartphone apps, in-home energy management displays, and the "Green Button" program that help visualize and control how much energy they use on a near real-time basis. Additionally, automated "set-and-forget" technologies such as smart thermostats and smart appliances can automatically respond to utility price signals and adjust energy consumption the easy way — without any action required from you. The bottom line is that the smart grid will provide you with greater control over how energy is used inyour home.

To take advantage of these tools and reduce both your energycosts and expensive utility infrastructure investment, consider signing up for a variable-rate pricing plan if one is offered to you. For more information about pricing plans check your utility's website and visit the Smart Grid Consumer Collaborative at http://www.smartgridcc.org.

An Electrifying Investment:

What Distributed Generation and Net Metering Mean for You

The Future Smart Grid



The way electricity will be generated and distributed in 10 years will likely be much different than it is today. These changes are made possible by utility investments and government initiatives to modernize the grid, including the American Recovery and Reinvestment Act of 2009. Residential consumers and businesses who generate their own power at or near the point of use, a process known as distributed generation (DG), may be some of the greatest beneficiaries of smart grid technology. DG systems commonly utilize the natural resources available at their location such as the sun or wind. The smart grid helps utilities reliably and efficiently accommodate a greater number of DG system operators than a traditional grid would otherwise be able to handle, thus giving you more choices when it comes to your energy.

We've answered some common questions about DG to help clear up what this means for you:

How does the smart grid help you if you already have or are interested in adding distributed generation?

Although utilities make the delivery of electricity look simple, it's not—the amount of electricity being generated must precisely match the amount of electricity being used at any point in time. The smart grid enables utilities to better manage the variability that goes along with integrating all forms of DG, but particularly renewable forms of DG like solar panels dependent on environmental conditions such as the sun shining. Distributed battery storage presents significant advantages over traditional grid infrastructure, especially when used for the mitigation of the variability of solar and other irregular generation sources. However, battery storage is still expensive and high prices are expected to continue to limit its wide-scale availability.

Why would you want to install a DG system?

Several types of benefits may be available to DG system owners depending on their state's DG regulations. Find your state's incentives and policies through DSIRE.[1] Some benefits may include:

- Lower electric bills
- Reduced carbon footprint
- Reduced exposure to future electricity price increases
- Possible increased property value

[1] Database of State Incentives for Renewables & Efficiency — www.dsireusa.org

What is the smart grid?

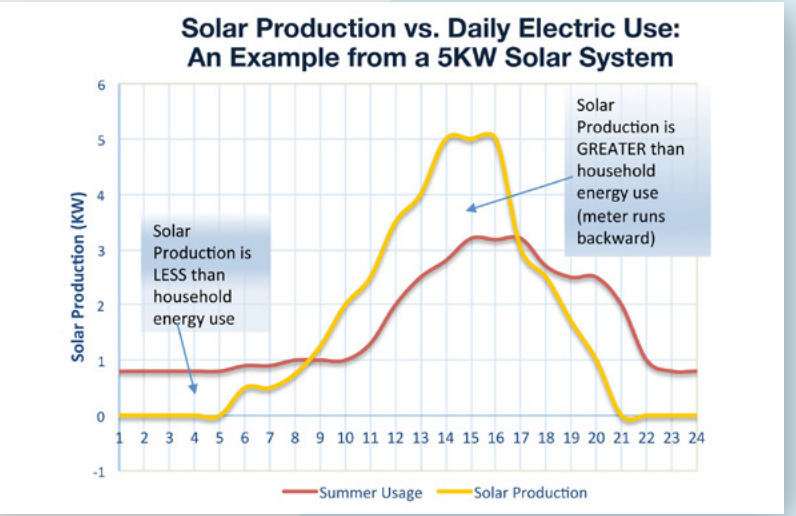
The grid refers to our nation's electric power infrastructure. The smart grid is very similar, only it includes the application of information technology, tools and techniques like smart meters, sensors, real-time communications, software and remote-controlled equipment to improve grid reliability and efficiency.

What are some DG examples?

Solar panels are just one example of DG. Other types include electric vehicle or other batteries, windmills and diesel or natural-gas fueled turbines (the smallest of which are called microturbines).

Can you or any DG owner be independent of your utility?

Almost all DG system owners still depend on their local grid and utility. For example, a solar panel owner uses the grid to transmit electricity that is generated in excess of what he or she needs back to the utility at certain times of the day, and to obtain electricity from the utility at night or on cloudy days. Electric service actually consists of three distinct components: the electricity generation itself, transmission lines, and distribution (grid) services to get it where it needs to go. A DG system can reduce your need for utility-provided electricity, but does not reduce the need for transmission and distribution services.

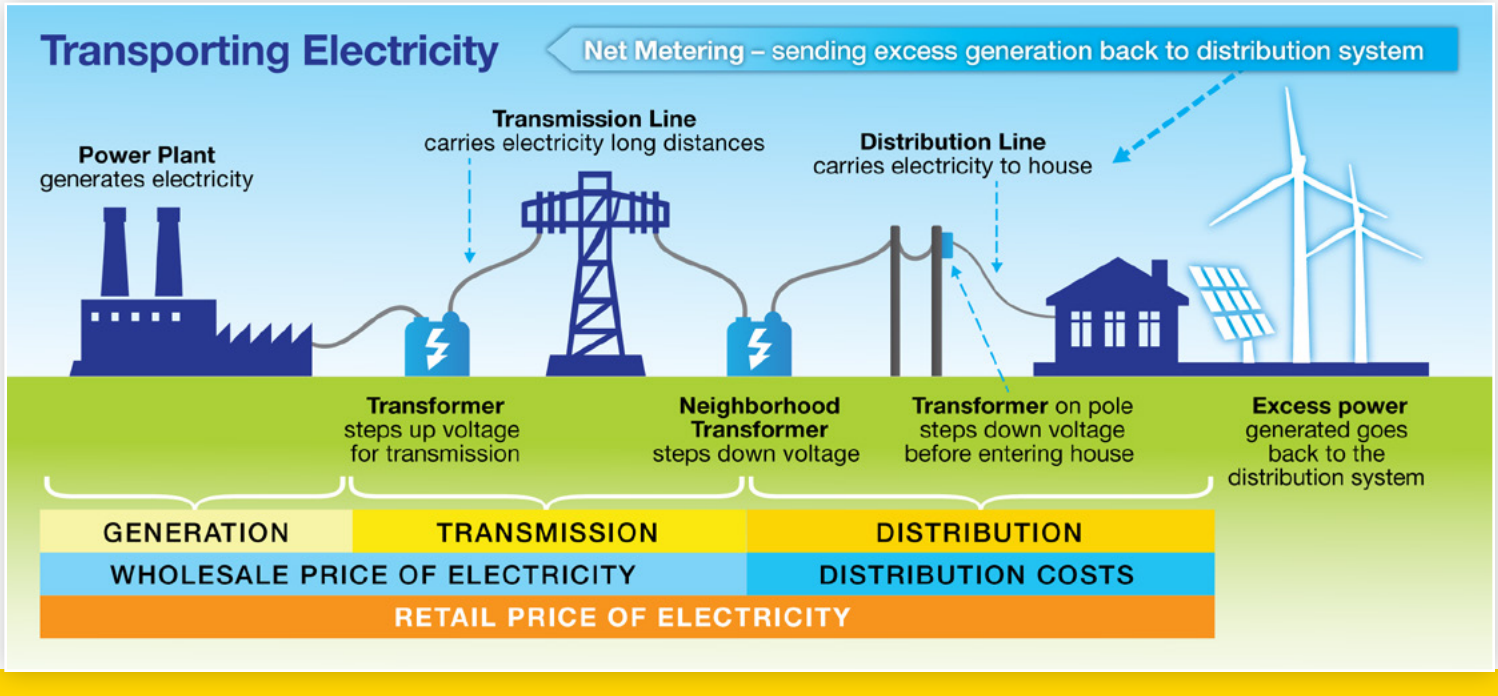


What is net metering?

Net metering refers to the manner in which a utility calculates the quantity and value of electricity produced by a DG system. In the case of solar panels, the owner avoids buying some utility-provided power because the panels are generating a portion of the owner's electricity needs. When the solar output is greater than the immediate needs of the house, the excess is sold back to the utility. Because the panels are generating electricity which is not being used in the house — the electricity meter calculates this as a credit. The details of net metering policies vary by state and utility, and can make a significant impact on the economics of a DG system investment.

What do retail vs. wholesale electricity prices have to do with net metering?

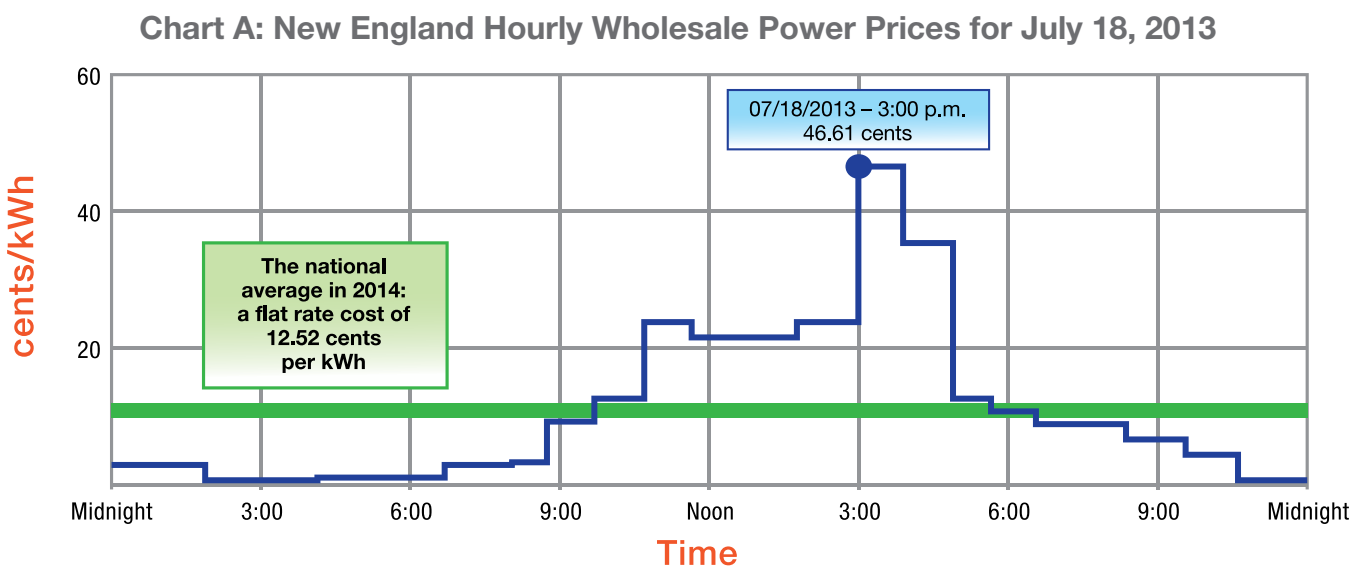
The retail electricity rate is the final rate you pay per unit of electricity and the one that is shown on your bill. It includes both the cost of generating the power and the cost it takes to get it to your home (transmission and distribution). While transmission and distribution costs generally do not change from month to month, generation costs vary depending on market conditions – much like the way we pay for gasoline. Most state net metering rules require utilities to credit consumer-generated electricity at the current retail electricity rate. For example, if you are a DG system owner who uses 10,000 kWh a year, and produces 10,000 kWh a year with a DG system, your electric bill would be $0. You would have paid little or nothing towards the utility's cost of providing the means to receive electricity even though you benefitted from the equipment, and non-DG customers are required to make up the difference. Some utilities may account for transmission and distribution with a single fixed fee or would essentially pass along a rate that balances the utility's cost of delivering services against their savings from your DG system.



How will my DG system affect other consumers?

While DG system owners may appear to be increasing other utility consumers' costs through retail rate net metering, it's important to note that DG systems also deliver several economic benefits to other consumers. We've listed some of these economic benefits in the table below. The value of these benefits vary significantly by geographic location, which is why net metering policies and rates vary. For example, the value of renewable generation is a combination of a DG system's actual generation amount and timing (dictated in large part by regional weather patterns) as well as existing attributes of the local grid (such as the price of avoided generation).

DG BENEFIT	DESCRIPTION
Reduced Energy Costs	Solar panels produce electricity during the day, when the demand for and price of electricity in the wholesale markets is typically highest. If a utility can reduce its purchases of high-priced electricity, all consumers can benefit. These high prices increase the single fixed fee for consumers, reflected in Chart A, which in 2014 was a national average of 12.52 cents per kWh.[2]
Reduced Capacity Costs	The installation of DG systems can help utilities avoid new plant construction and distribution grid upgrades for which all consumers must pay. This benefit is offset to some extent by the intermittent nature of renewable DG. (Solar panels produce almost no electricity on cloudy days, which reduces the capacity value solar panels offer.)
Reduced Exposure to Fossil Fuel Price Variation	Renewable DG makes electricity without fossil fuel, thus reducing all consumers' exposure to future fossil fuel price increases. Most electricity is produced by burning fossil fuels (i.e., coal, oil and natural gas, which are high emitters of CO_2). Fossil fuel prices are volatile due to the nature of international fossil fuel markets and changes in domestic demand and production levels.
Reduced RPS Compliance Costs	In states with Renewable Portfolio Standards (RPS), renewable DG systems can represent a cost-effective way to reach RPS goals. In coming years, as states attempt to comply with the Environmental Protection Agency's new Clean Power Plan rules to cut carbon pollution from existing power plants, the value of this benefit to all electricity consumers is anticipated to grow.
Reduced Distribution Losses	Electricity is 'lost' during distribution to consumers; by being located near where electricity is used, DG avoids transmission and distribution grid losses for which all consumers pay. The International Energy Agency estimates that energy losses in the United States amount to 6% of electricity generated.



The wholesale price of electricity varies throughout every day, though consumers pay a single fixed fee representing the average over time depicted above. Source: *Electricity Prices Soar Past $200 per Megawatt-hour as Heat Wave Hits Eastern United* | The Energy Collective.

[2] Average Price of Electricity to Ultimate Customers from the U.S. Energy Information Administration

Is DG right for you?

For most people, the choice to install a DG system will hinge on several factors:

- **Economic Factors** — how does the cost of the system compare to the savings or revenues from the system? You should understand that even though the sun might be shining, if the distribution grid in your neighborhood goes out, your rooftop PV system may not work.
- **Personal Capabilities** — do you have the financial resources and facility resources (physical space, an appropriate roof, etc.) to purchase and support the DG system you are considering?
- **Environmental Benefits** — most consumer-oriented DG systems (like solar panels) offer global environmental benefits like reduced carbon emissions and air pollution.

You think it might be nice to have solar panels on your roof. What must you consider?

1. **First, determine if you are a good candidate for solar panels through a quick housing checklist.** If you aren't, some utilities offer "community solar", which is the option of subscribing to electricity generated by solar panels located somewhere in your community. Check with your local utility.
2. **Next, determine your costs.** While solar panels involve minor ongoing costs, up-front capital requirements are significant. There are several options to reduce this initial investment:
   - Utility incentives
   - Potential state, local or IRS tax breaks
   - Home loan financing options
   - "No money down" leases (not available in all states)
3. **Evaluate the type of contract structure available to you** – the three main ones are lease, Power Purchase Agreement (PPA) or outright purchase. Each of these options offers varying upfront costs, potential maintenance agreements and ownership of benefits.
4. **Finally, select your installer.** You should get quotes from at least 3 companies. And be sure to ask for (and speak with) references. Your appropriate installation company will go over care and maintenance with you.

Is Solar for Me?	YES	NO
Shading few overhanging trees, shade-free between 10 a.m. – 5 p.m.	✔	✘
Good Roof Condition no repairs needed, still has a good 5 to 7 years	✔	✘
Roof Orientation faces southernly or west	✔	✘

Web-based free solar assessments:

Solar Rating Online: http://solarrating.ca/

Alterra Renewable Energy: http://alterra-wv.com/free-solar-assessment/

EnergyStar Renewable Energy Ready Home Solar Site Assessment Tool: https://www.energystar.gov/index.cfm?c=rerh.assessment

Build it Solar: http://www.builditsolar.com/SiteSurvey/site_survey.htm

PV Watts – National Renewable Energy Laboratory: http://pvwatts.nrel.gov/

Smart Cities: We're All In This Together

What is a "smart city"?

A "smart city" is a city that harnesses digital technology and intelligent design to create a sustainable city. Services like power or public safety are seamless, efficient and provide for a high quality of life for citizens. A smart city does this by collecting data from places like street lights, building sensors and from citizens in their interactions with city services. It would share operational data across city agencies to reduce costs and improve efficiencies. Finally, it would communicate that data to city analysts to make city services more efficient and responsive to citizens' needs. The goal is to improve the quality of life for city residents and streamline city operations.

"Nearly 80% of Americans already live in urban areas."

— U.S. Census Bureau

Creating livable, sustainable cities is a major challenge of the 21st century as an increasing amount of the world's population resides in urban areas. According to the United Nations, currently half of the world's population lives in cities. By 2050, the UN projects, two-thirds of the world's 9.7 billion people will dwell in cities.

Consider the benefits already being realized by various cities pursuing different smart city improvements:

- **Providing universal internet access, saving citizens money.** New York's LinkNYC program is transforming 7,500 former payphones into communication hubs offering free gigabit-speed Wi-Fi for internet access, phone charging and national calls, paid for by advertising.
- **Creating better-paying, skilled jobs by implementing smart technologies.** Chattanooga modernized its grid, reduced power outages and offered its citizens high-speed internet service. A university study showed these improvements created at least 2,800 new jobs, attracted new businesses and provided an $865.3 million boost to the local economy.
- **Streamlining city services for quality of life and economic growth.** San Jose is using air, sound and climate sensors to feed an internet-based platform. It focuses on improvements to public safety, transportation, public health, energy use and economic growth. The city is sharing best practices and lessons learned with other cities.
- **Reducing urban impacts on the environment.** Boston's solar-powered benches enable citizens to charge their cell phones in public. They also provide local environmental data that is used to improve Boston's livability.
- **Improving public transportation to aid efficient mobility and reduce traffic.** Cities are integrating intelligent transportation management software and roadway sensors that monitor freeway conditions and can re-route public transit when necessary. New transportation apps are being developed for trip-planning, navigation and smart parking. Trip-planning apps enable users to find the quickest route to get where they're going on public transit. Navigation apps display real-time traffic and point drivers to less congested routes. Smart parking apps help drivers find open spots, reducing time spent circling downtown blocks.

How does smart grid enable smart cities?

Modernizing our electric grid through smart grid enhancements is an integral first step to enabling smart cities. Making renewables like rooftop solar power more realistic is a game changer for sustainability. Dirty energy produced close to cities contributes to unhealthy air quality. Smart grid enables integration of renewables and allows production of clean energy close to where it is needed.

Smart grid enhancements also allow better integration of new technology like electric vehicles, which, in turn, creates a bevy of possibilities down the road for urban areas. Future possibilities would include city-wide zero-emissions transportation and electric vehicles that act as power storage in case of emergencies.

Lastly, smart grid helps consumers access their energy data. Two-way digital technology makes data more accessible to consumers and city services. This enables utilities to offer new pricing programs that can lead to increased energy efficiency. Additionally, smart grid results in more reliable powerthrough better power outage management. Each of these components serve as building blocks for smarter cities.

Why should I care?

Cities play an important role in economic prosperity, and they offer rich cultural resources and experiences. They attract businesses, create jobs and offer educational, recreational and entertainment opportunities. Their benefits – and their fate – affect not only city residents but everyone in the region, including those who live in suburban, exurban and rural areas.

The trend towards urbanization, however, puts pressure on existing city services and systems. More people mean more complications for public safety and health, transportation, energy and water, among others. Much like electrical grid modernization efforts, decisive action is needed to revitalize our cities and the opportunities they offer.

Cleaner, less polluting cities promote a healthier environment for residents and visitors. More intelligently and efficiently run city services attract new businesses, foster economic development and create jobs. Universal access to high-speed internet-based information and services supports inclusiveness, education and citizen engagement.

In the big picture, healthy, vibrant, prosperous cities contribute to the United States' national competitiveness and economic security. Simply put, smart cities mean progress and progress means a better future.

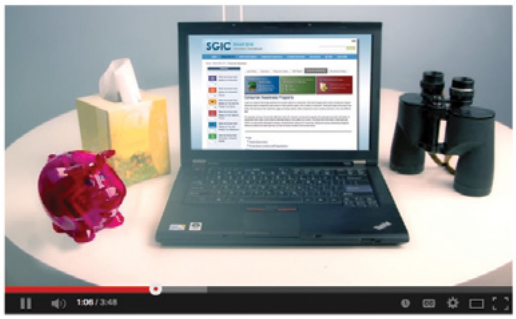
To learn more, you can find these supporting organizations:

Smart Cities Council

IEEE Smart Cities Initiative

Separating the Facts from the Fiction about Smart Meters

Is fact greater than fiction? When it comes to understanding the world around us, most of us would say yes. In this video, the Smart Grid Consumer Collaborative reveals the truth about advanced electrical meters, or "smart meters," dispelling misinformed claims which allege that that these devices infringe on personal privacy, are harmful to human health, and in summary, may just be the Fourth Horseman of the Apocalypse!



Outside of books and movies, there's no reason that fiction should reign over fact. Watch the quick video, get the facts about smart meters from credible sources, and make the decision for yourself.

To watch this video and other SGCC videos visit: http://www.youtube.com/watch?v=Nij-_gAMj-4

For more information visit our website at www.WhatIsSmartGrid.org

Smart Grid: Where Power is Going

SmartGrid consumer collaborative

listen, educate, collaborate

Working for a consumer-friendly, consumer-safe smart grid

SGCC's mission is to serve as a trusted source of information for industry stakeholders seeking a broad understanding of consumers' views about grid modernization, electricity delivery, and energy usage, and for consumers seeking an understanding of the value and experience of a modern grid.

Join @ www.smartgridcc.org.