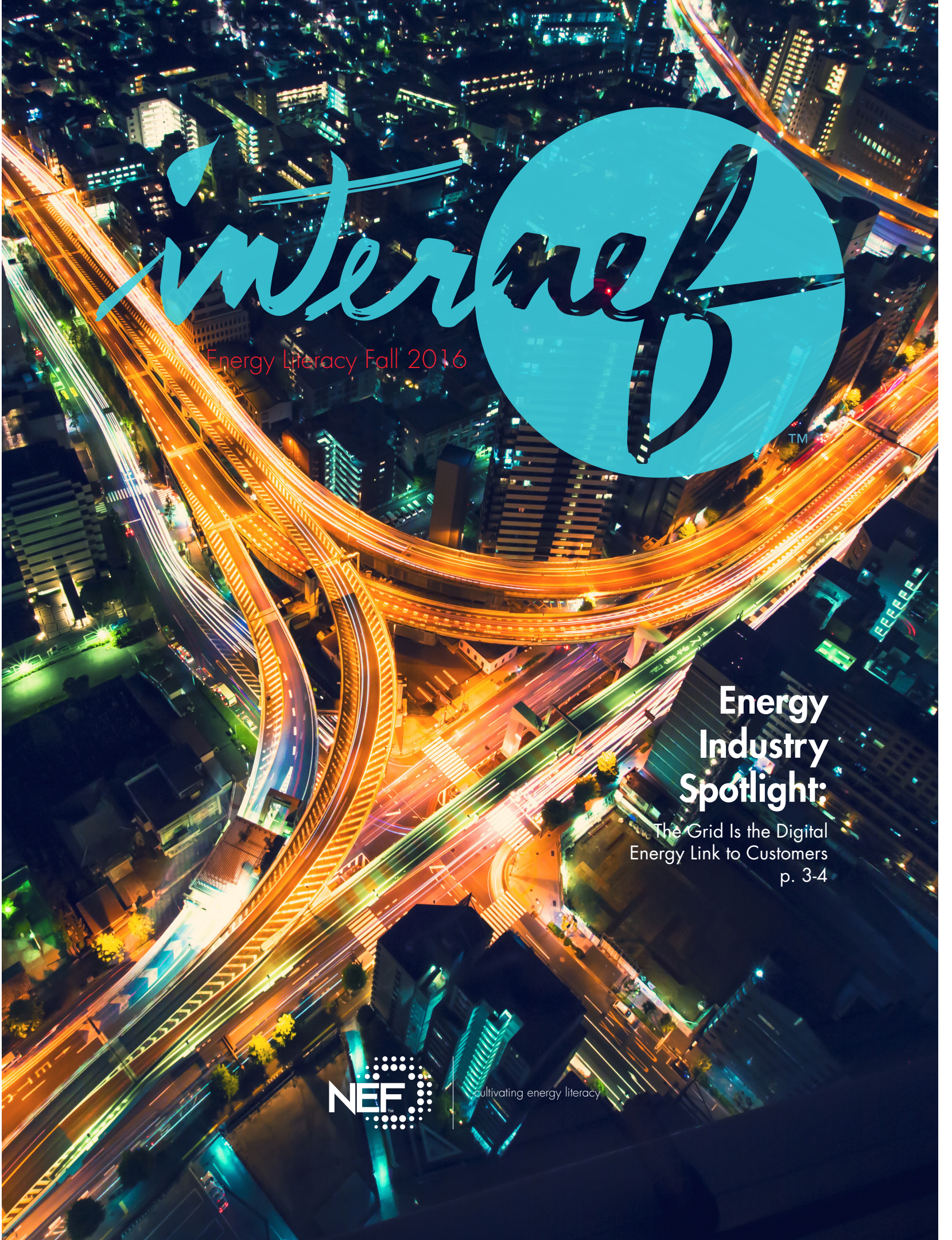
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Energy Literacy Fall 2016
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NEF
cultivating energy literacy

Empowering Educators on Energy Literacy

Mr. J. Everett, a high school teacher from PA, shared the following about the "Load It Up and Monitor the Power" activity:

"It is a favorite lab this year for students. I set up 10 stations of devices with kilowatt meters (plug power meters). The stations feature three types of light bulbs, a microwave, a video game station, a computer, two different mobile phone brands, an electric heater, an electric tea pot and a blow dryer. Students predict their top three items for energy use and phantom load use, then measure energy on and energy off with the meter. For analysis they calculate the cost per day, month and year to run the device. Lastly they compare the results to the predictions. Students are often very surprised that they do not get most of the predictions right. The lab is quite illuminating, especially the lightbulb station."

Find this activity on pages 5 and 6!

Providing teachers with the background, curriculum and resources to educate students on energy concepts is a mission driven goal of the National Energy Foundation (NEF). The foundation has delivered teacher training workshops throughout the United States during its 40 years of service to educators and students. Although specific workshop topics vary, increasing energy literacy is always an objective. Electrical generation, energy efficiency and management, solar, sustainability, alternative transportation fuels, as well as mining and minerals have all been popular workshops offered in past years.

Educators attending workshops enjoy the experience of increasing their own knowledge-base as well as learning how to better teach ideas to students of various ages. They not only receive supplemental science/energy materials, but are also involved in modeling hands-on student activities. All of the activities are correlated to STEM ideals and the Next Generation Science Standards.

One popular NEF activity, "Load It Up and Monitor the Power," educates students on the electrical grid and the amounts of power appliances draw from the grid.

Smart Meter Technology

Smart meters help utilities and customers understand energy consumption through a two-way flow of data. This data allows residents and businesses to make informed decisions on how and when they use energy. Utilities use the data they receive back from customers to provide more affordable and prompt service.

What are smart meters?

A smart meter is a device that records and communicates electric energy consumption in a home or business. These meters capture data in short time intervals and allow for a a two-way communication flow.

What do they look like?

Smart meters look like a traditional meter with a digital display for easy and accurate readings.

How many are there?

Smart meters have been deployed to over 55 million residential customers and 10 million businesses.

How is data accessed?

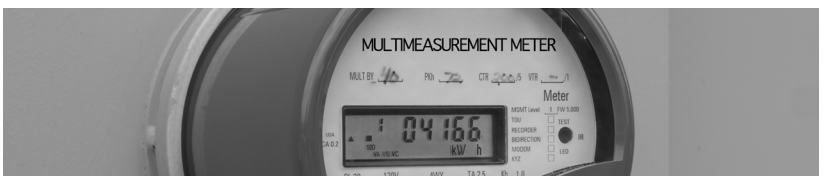
Consumers have access to an online interface to monitor their energy use so they no longer have to wait until the end of the month to know how much they have consumed or how much their bill will be.

Where are they located?

On homes and businesses where analog, mechanical power meters used to be connected.

How do they work with America's electrical grid?

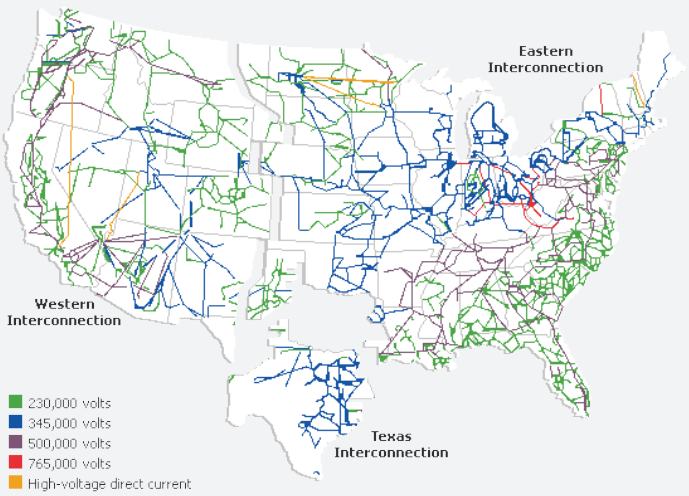
As we move toward a nation-wide digital electric grid, smart meters provide detailed information that leads to better energy management by utilities and customers alike. Communication with the grid helps prevent outages, quickens response time, reduces peak demand and localizes energy management.



America's Power Grid

America's power grid is an amazing feat of engineering. It has reliably delivered electricity to our homes and business for well over 100 years, but what exactly is it? The electric power grid is a network of power plants and transformers interconnected by over 400,000 miles of power lines. The current system in the United States is broken into three smaller grids called interconnections: the Eastern Interconnection, the Western Interconnection and the Texas Interconnection. These smaller grids make delivery of electricity more manageable. The Eastern and Western Interconnections are separated by the Rocky Mountains and the Texas Interconnection is exactly where one would think it might be, covering most of Texas. This massive system is the reason our nation's generated electricity consistently reaches to even the furthest regions of the United States.

Learn more from the experts at the Institute for Electric Innovation on pages 3 and 4.



(Source: *eia.gov/energy_in_brief/article/power_grid.cfm*)

Faces at NEF

"What is your favorite electronic device and why?"

Caleb Oldner, Bookkeeper-
"My XBOX 1 because it does everything I want including video games, Netflix, photos and internet access."

Casey Klosterman, Program Administrator-
"My Fitbit because it helps me stay fit and healthy!"

Emi Christison, Program Administrator-
"My Fitbit is also my favorite device. It's a great tool to help me stay healthy!"

Anastasiya Bobrova, Layout Assistant-
"It would be my cell phone because it has everything that I need – messaging, music, social media and internet."

The Grid Is the Digital Energy Link to Customers

By: Institute for Electric Innovation

Our society and our economy are more dependent than ever on electricity. Indeed, the modern marvels, inventions, and conveniences that have come to define 21st century life—personal computers, flat screen televisions, cell phones, air conditioning, and especially the Internet—are all powered by electricity. Plugging-in is a way of life and electric companies are investing in digital technologies that lay the foundation for smarter homes, ever more resilient cities, cleaner transportation, and greater customer choice.

Like many other industries, electric companies are taking advantage of rapid advancements in technology and the digitization of information to better serve their customers. Indeed, the electric power grid—the largest machine on the planet—is undergoing a massive technology upgrade. An easy way to think of this change is that the physical infrastructure used to deliver electricity—poles, wires, and substations—are being enhanced by a digital layer of sensing and communicating devices, automation controls, and data analytics, transforming the grid from a one-way power delivery system to a dynamic, multi-directional network that delivers electricity and information between customers and the electric company.

Modernizing the grid helps electric companies better monitor the health of the grid, quickly restore electric service when outages occur, integrate distributed energy resources such as solar and storage, and deliver important energy information to customers. In 2015, the electric power industry invested about $47 billion to digitize and harden the energy grid. A portion of this investment supported the continued deployment of digital smart meters, a key building block of a smarter, stronger grid. Through the 65 million smart meters already installed in the U.S., a digital "energy" link has been developed with half of all U.S. households.

Aided by new technologies and grid digitization efforts, the mix of resources used to generate electricity is becoming increasingly cleaner and more distributed. Today, over one million solar installations are connected to the grid. And, in 2015, one-third of all electricity was generated by zero-emissions sources such as wind, solar, nuclear, and hydro. Today, U.S. electric power sector CO_2 emissions are about 20 percent below 2005 levels. We anticipate these trends to continue.

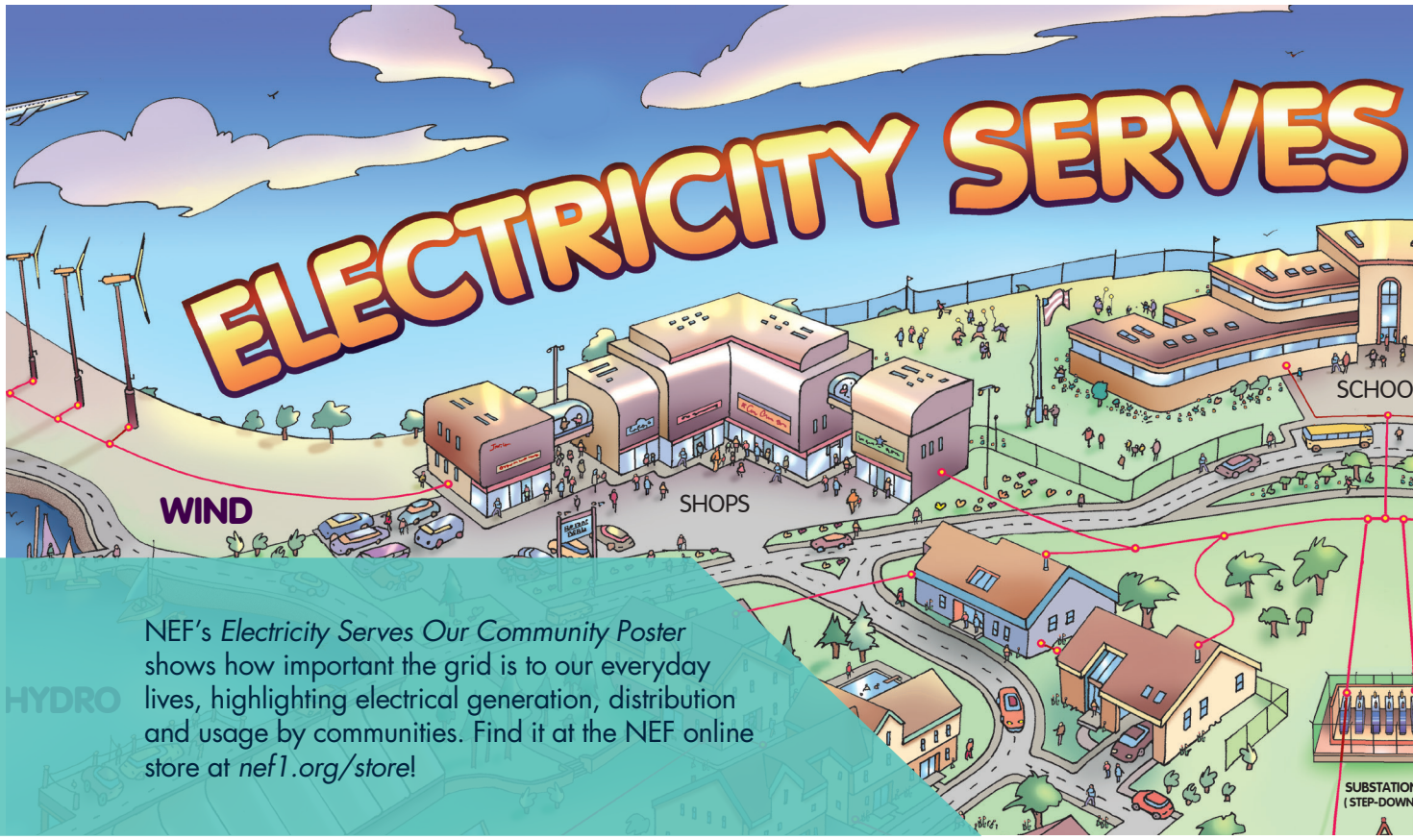
By collaborating and innovating with customers and technology companies, electric companies are building a 21st century digital grid platform to integrate and orchestrate a more complex set of central and distributed energy resources, operate more efficiently, deliver the clean energy that customers want, and provide even more value to customers.

About IEI

The Edison Foundation Institute for Electric Innovation focuses on advancing the adoption and application of new technologies that will strengthen and transform the power grid.

For more information about IEI, visit: *eei.org*.

The Edison Foundation
INSTITUTE for ELECTRIC INNOVATION



NEF's *Electricity Serves Our Community Poster* shows how important the grid is to our everyday lives, highlighting electrical generation, distribution and usage by communities. Find it at the NEF online store at *nef1.org/store*!

Teacher's Corner

Load It Up and Monitor the Power Activity

This activity explores the energy consumption of different electronics and appliances. Plug loads are devices or appliances that draw power through an electric outlet. Managing the plug load of a building helps save electricity and money.

Tip: Unplugging infrequently used electronics can save thousands of dollars on a school's utility bills and makes a difference at home too. Plug load for devices can be measured with a meter such as the Kill A Watt® Edge power monitor or other plug power meter.

Materials needed: Kill A Watt® Edge power monitor or other plug power meter, various electronics and appliances.

The meter can measure many different things but it is the kWh setting that is the most useful for determining electrical costs. To use a meter for plug load simply plug the device you are testing, such as your laptop, into the meter, then plug the meter into the wall. The meter has a timer so that you can see how a device performs over a long period of time. This is especially useful for appliances which cycle on and off, such as refrigerators and air conditioning units. Use the formula below to calculate the energy usage and cost to run various devices.

Appliance	Your typical use in hours per day	x	kWh/ hour from monitor	x	Approx. cost per kWh from utility bill	=	Cost per day	x	Days used per month	=	Cost per month
Example Computer	8	x	0.17	x	0.135	=	$0.1837	x	30	=	$5.51

To determine standby power, follow the same procedure as for plug load, but if the meter reads zero, plug both the device you want to test and another load into a power strip or extension cord, then plug them into the meter. Measure kWh with both loads for an hour. Then remove the standby device and measure again. The difference between the measurements is the standby power your device draws.

Some other examples of electronics to test: cell phone charger, hair dryer, microwave or television.

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Technology has advanced over time to allow us to do more than ever before. From the "brick" cell phones of the 90s to the smart phones of today, we are able to make phone calls but our ability to communicate has improved with text messaging and internet access. We are able to do more with less, yet our electricity demands continue to grow. Fortunately, we have new technology, supported by wise energy behaviors, to help us meet our growing demand with the same supply of energy.

Energy savings can be accomplished by combining wise behaviors with the use of efficient technologies to reduce energy use. When we are energy efficient, we save valuable resources needed to generate energy. Energy-wise behaviors go a long way in saving energy and technology helps bridge the gaps. Here are some ways that behaviors and emerging energy-efficient technologies are complementary:

- Turning off a light when it is not in use is a great way to conserve. However, when light is needed, LED lightbulbs are efficient, using up to 80 percent less energy to produce the same amount of light.
- Adjusting the temperature a few degrees on a standard thermostat with each season change is a great way to save energy. A smart thermostat will automatically adjust and adapt to changes in outside temperature and humidity. Smart thermostats also "learn" the behavior of the household, resulting in an ideal energy output year-round.
- Unplugging electronics when they are not in use is a wise behavior. But an advanced power strip will automatically supply electricity only to outlets that require power. It can also cut power altogether by using measures like motion sensors that detect when a room is empty.

Looking back on how far we have come since those "brick" phones, we can see that technological advances are continuing to accommodate our growing lifestyle needs. These innovative solutions help us get things done easily, quickly and efficiently. As our demand for energy grows, we can use new and efficient technologies, combined with wise behaviors, allowing utilities to meet all our energy needs.