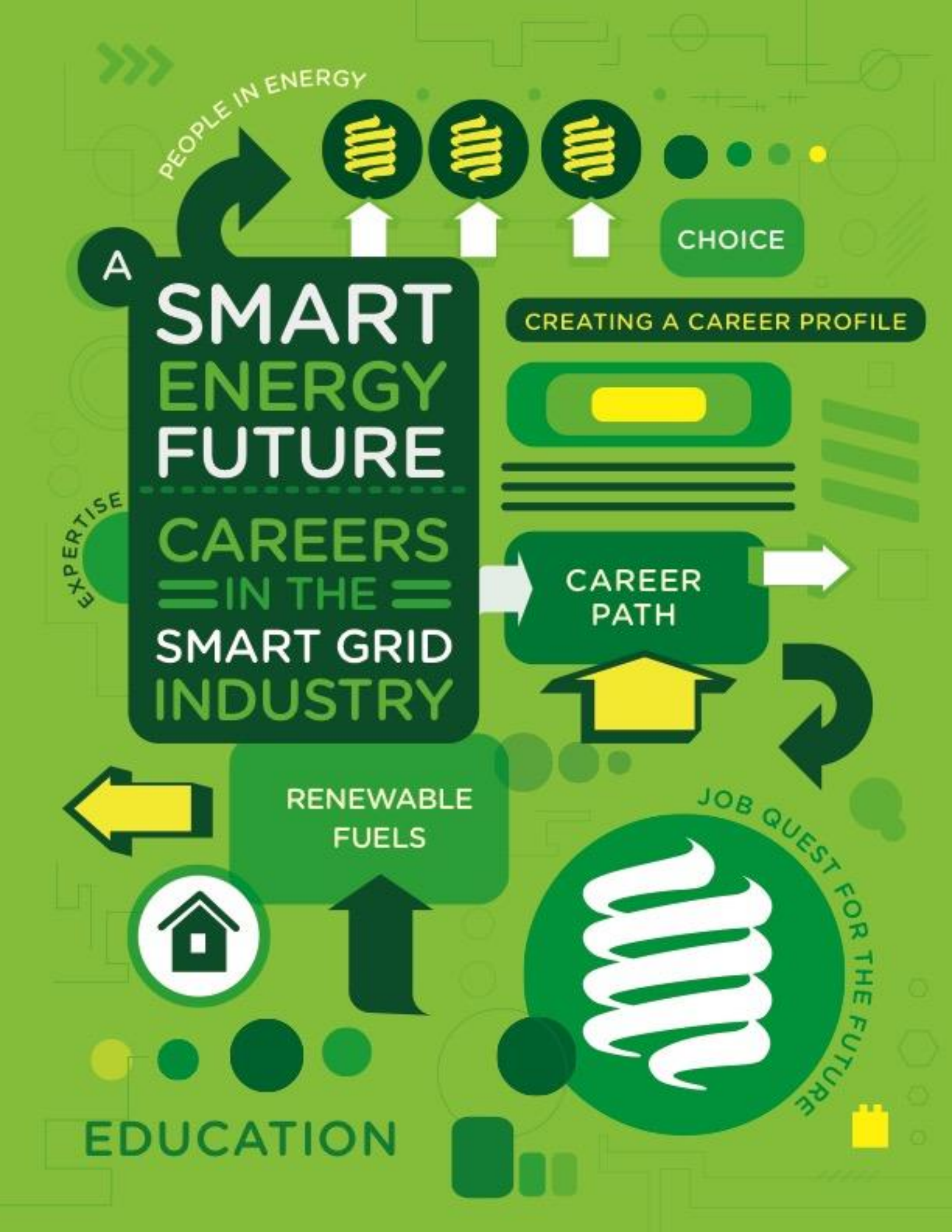
PEOPLE IN ENERGY
A
SMART ENERGY FUTURE
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CHOICE
CREATING A CAREER PROFILE
EXPERTISE
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EDUCATION

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A Smart Energy Future

Unit 2: Careers in the Smart Grid Industry

Acknowledgments

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Unit 2 Overview: Careers in the Smart Grid Industry

Teacher's Note: Introducing the Smart Grid

The curriculum is designed to be done in sequence, with Unit 2: Careers in the Smart Grid Industry following Unit 1: Benefits of a Smart Grid. The units, however, may also be used independently.

If Unit 2 represents students' first encounter with the smart grid and smart grid technologies, you will probably wish to have them complete Unit 1: Lesson 2: What Is a Smart Grid? to give them the necessary background to proceed with Unit 2 activities. You could also give students Unit 1, **Handout 7: What Makes an Electrical Grid Smart?** and have groups read and answer the questions for each section and report back to the class.

The energy industry currently employs millions of people with a vast variety of skills, from coal miners to electricians to administrative workers to the people who install and repair the power lines. Many of these jobs have not changed substantially in years. The advent of smart grid technologies, however, offers the opportunity for an employment explosion in jobs that cannot be shipped overseas but must be created right here and now on the ground. The people who are prepared to fill these jobs will help the United States reap the benefits of a way of using energy that is better for consumers and healthier for the planet.

Many may believe that a job at a utility company revolves around power plants and power lines. But there are many more opportunities and skills needed than those of engineers and equipment operators. A utility company is like a sophisticated high-tech organization comprised of financial analysts, IT technicians, transmission line workers, account managers, customer service representatives and many more roles.

Employees in the utility and energy industries take pride in making sure customers have affordable and reliable gas and electric service for their homes and businesses. They enable us to do the following:

- Become more energy independent
- Use more renewable energy sources to reduce carbon dioxide emissions and create more sustainable supplies
- Utilize two-way communication to maximize the efficient use of existing power sources
- Exercise consumer choices about energy use
- Reduce energy costs

In this unit, students will research existing jobs in the energy industry and explore ways they will be affected and enhanced by smart grid technologies. For their unit project, students will create a career profile for a print or online energy career guide. The career profiles will include information about career preparation, responsibilities and actual work scenarios. Sharing their career profiles will allow students to educate their peers about these promising opportunities.

Framing Questions:

- What skills are needed to create and maintain the smart grid?
- What careers related to the smart grid currently exist or may be available in the future?
- How might you prepare for these careers?

Unit 2 Calendar

Day 1	Day 2	Day 3	Day 4	Day 5
Lesson 1: Quest for Future Careers *Students brainstorm how changes in energy distribution may be changing careers in the energy industry. They then go on the Smart Grid Career Web Quest on specified sites to find out more about such careers.*	Lesson 2: People in Energy *Students prepare for and attend a presentation by an energy professional or watch a video of the presentation. They analyze several videos about careers in the smart grid industry, and then write a journal entry about a smart grid career they would like to profile.*	Lesson 2: Continued	Lesson 3: Creating a Career Profile *Students research the career they chose in Lesson 2, identify several bibliographic sources, and then conduct interviews in person, by phone, or by e-mail with people who do similar work in the energy industry. Students create career profiles for the class* Energy Career Guide*.*	Lesson 3: Continued

Advance Preparation

For Lesson 1:

- Ensure that you have access to computers where students can work together in pairs.
- Prepare a list of job and career search websites that students can use for their Career Web Quest on Handout 4. See *Resources* for a list of suggestions.

For Lesson 2:

- Invite a professional or professionals from the energy industry to your classroom. Ask them to describe their jobs and what preparation they required, and follow their presentation with an informal question and answer session. If possible, find someone who already works with smart grid technologies. Otherwise, ask the professional(s) in advance to be prepared to field questions about the smart grid and how it may change their current job(s) or workplace(s). You may be able to use parent or colleague contacts to find willing participants.

Teacher's Note: Possible Guest Professionals

• Technician for a local electric utility

- Software developer
- Environmental expert
- Electrical engineer
- Customer relations/service professional
- Marketing specialist for a utility
- Electrician
- Reporter for an energy publication or an energy section of a newspaper or website

- Collect some background information from each invited guest and prepare a short biography for students to read in preparation.
- In advance of the visit, provide students with the background information about your guest(s). Then have each student write one or two questions to ask in the question and answer session. Students can draw on what they learned during their Career Web Quest (Lesson 1) to formulate questions.
- So that all students can experience the presentation(s), you may wish to arrange to videotape the guest visit and show the video to other classes. Have all classes write questions in advance and be sure to have professionals field questions from all of the classes.
- Contact utilities and energy companies to ask if they have available videos of employees talking about their work or would be willing to make them for you.
- Compile a library of online videos and other resources to either augment or provide an alternative to a classroom visit. See *Resources* for some suggestions.

For Lesson 3:

- Determine the format students will use to create their profiles. You might choose web postings (text, graphics and/or video) or print formats. You may want to contact your school's guidance office to discuss the ways in which they distribute information about careers and select the format for the profiles accordingly. For example, if your guidance office has a website or newsletter, students might develop profiles to fit those formats. Part of the project might be to have a school counselor meet with the class before students begin writing in order to discuss what format and design would be most useful for the school. The session could be a productive give-and-take conversation, with students offering ideas in response to the counselor's needs.
- Compile print sources and a list of online sources for students to use in their research. See *Resources* for suggestions.

Teacher's Note: Using Career Videos

As an alternative to having students interview smart grid professionals, you may wish to have them look at the video library you have compiled. They will be able to gather information and use quotations from the videos to enhance their career profiles.

Lesson 1: Quest for Future Careers

Length: One 50-minute period

Students brainstorm how changes in energy distribution may be changing careers in the energy industry. They then go on the Smart Grid Career Web Quest on specified sites to find out more about such careers.

Learning Objectives

In this lesson, students will:

- Learn about the unit project of writing a career profile
- Identify careers in the energy industry, past and present
- Research smart grid careers

Materials

- **Handout 1: Unit Overview**
- **Handout 2: Unit Vocabulary**
- **Handout 3: Journal Entries**
- **Handout 4: Smart Grid Career Web Quest**

Procedure

1. **Ask students to imagine what it must have been like before every house had electrical energy. How did people live? How was it different from their lives today?**

   Students should recognize that people did not use electrical appliances and did not have electric lighting.

2. **Ask students to think about how the first system for distributing power must have changed the types of careers people could have. What types of workers do they think were needed to install this first electrical distribution system? What did these people do?**

   Possible answers:

   - Scientists developed new electrical inventions and systems for distributing power.
   - Engineers determined how best to build the system.
   - Construction workers built towers and generating plants.
   - Safety personnel helped ensure that people were not hurt by the distribution system.
   - Salespeople helped get customers for the new system.

3. **Introduce the unit.**

   Explain to students that, just as when the first electrical grid was introduced, new careers will be created and existing jobs in the energy industry will change substantially with the introduction of smart grid technologies.

In this unit, they will develop profiles of smart grid jobs, which they can compile into a class *Energy Career Guide* for use by the school's guidance office or inclusion on a school website.

Students will explore existing jobs in the energy industry, research ways that jobs may change and create a profile of a job in the smart grid industry that might appeal to them.

Distribute **Handout 1: Unit Overview**. Have students read the handout, review Unit 2 glossary, and answer any questions they may have.

4. **Have students write journal entries about how the smart grid will affect their lives or their careers.**

   Tell students that the smart grid industry is on the cutting edge of research and development. This means there is a lot of room for innovation and invention. Have students use what they have learned about the smart grid, and what they already know about jobs in the energy industry, to write a journal entry about an imagined job. Distribute **Handout 3: Journal Entries.**

> **Journal 1**
>
> The smart grid is on the cutting edge of the energy industry. New smart grid technologies are being created and implemented on a daily basis. Now it's time for you to use your imagination. Given what you've learned so far about the smart grid, consider the question:
>
> How will the smart grid change your life or your future career?
>
> Write a journal entry in which you imagine how life or work will change after the smart grid is ready to go. Choose an aspect of life, like getting up in the morning, or something you might do differently at work because of the smart grid and describe it. The possibilities are endless!

   Allow class time for students to write. After students finish writing, call on volunteers to share their ideas with the class.

5. **Have students go on the Career Web Quest.**

   To acquaint students with actual jobs in the smart grid industry, have them carry out the Career Web Quest. Distribute **Handout 4: Smart Grid Career Web Quest** and provide a list of job search sites that students can use as resources. Have students read over the handout, and answer any questions they may have. Then pair up students and have them carry out the Smart Grid Career Web Quest.

   When students have completed their quest, discuss their findings and create a list of smart grid careers. Ask students the following questions:

   - How are smart grid careers similar and how are they different from existing careers in the energy industry?

- Which smart grid careers most appealed to you?

Tell students to make a list of the three smart grid careers that sounded most interesting to them. These may give them some ideas of the career about which they would like to write their profile.

Note: See *Resources* for suggestions. You may wish to have students perform the Career Web Quest as homework or during other resource time. If you have them complete Handout 4 during class time, you may need to allow an additional class session for Lesson 1.

Handout 1: Unit Overview

Introduction

The smart grid will provide energy consumers with more choices and save them money, make our electricity more reliable and efficient and help the environment by conserving energy and reducing greenhouse gases. But another huge benefit of the smart grid revolution is the creation of many new jobs! Careers in the smart grid industry are tremendously varied and will involve a range of skill levels.

Some of these careers are not completely new. Instead, they are existing careers that will include new responsibilities, require additional skills and may offer new paths for career growth. For example, service representatives at utilities will still provide advice and information to customers, but with smart grid technologies, they will be able to offer more options and help customers tailor their energy services to individual needs.

The industry, however, is also creating new careers specific to smart grid technologies, such as engineers to develop in-home meters and technicians to install them, architects and building engineers to design and build plug-in garages and parking lots for plug-in hybrid electric vehicles (PHEVs), and utility monitors to sample voltage and current on newly installed power lines.

For your unit project, you will lead the way in exploring these new careers and capabilities by developing career profiles for students such as yourselves who are interested in entering this exciting new field!

As you work on the project, here are some of the questions you'll explore:

- What skills are needed to create and maintain the smart grid?
- What careers currently exist or may be available in the future?
- How might you prepare for these careers?

What You Will Do in This Unit

Here are some of the activities you will do in this unit:

- Use the web to identify and learn about smart grid careers
- View videos of people in the energy industry talking about their work
- Envision and write about a career of interest to you
- Conduct an interview with an industry professional
- Create a career profile for an Energy Career Guide

Handout 2: Unit Vocabulary

Refer to the words and definitions below as you carry out the activities in the unit.

***Electrical grid*:** System through which energy is produced and distributed in a region.

***National power grid*:** Networks of electrical distribution in the United States. In the continental United States, there are three main grids: Western Connection, Eastern Connection, and Texas Interconnection. Alaska and Hawaii have separate grids.

***Nonrenewable energy*:** Power source that is harvested for one-time use, primarily from fossil fuels such as oil, coal and natural gas.

Peak demand: The highest electrical demand within a particular period of time. Daily electric peaks on weekdays occur in late afternoon and early evening. Annual peaks occur on hot summer days.

Plug-in hybrid electric vehicles (PHEVs): Cars and trucks whose engines use a combination of gasoline and electrical power to maximize fuel efficiency. To recharge the electrical battery, these vehicles are designed to plug into a socket in a manner similar to an electrical appliance.

***Renewable energy*:** Power sources harvested from sources that constantly replenish themselves, including hydropower, solar, wind and geothermal.

***Smart grid*:** A comprehensive set of technologies and devices working together in homes, businesses and throughout the electrical distribution system. Collectively, smart grid technologies are like a nervous system through which all of the parts of the electrical grid communicate and interact. The smart grid has been compared to an Internet for energy. Some features of the smart grid include:

1. Using two-way communication to monitor energy use
2. Shifting use from peak to off-peak periods through the use of dynamic pricing
3. Two-way energy distribution where users may generate some of their own energy (e.g., with solar panels, wind generators or plug-in electric vehicles)
4. Use of distributed generation to take advantage of a wide variety of energy sources, including using renewable energy sources during periods of availability
5. Updating infrastructure, including rebuilding and renovating aging power plants and distribution cables and lines to use more efficient technologies, as well as creating state-of-the-art energy distribution systems

Smart meter: A device installed in a home to monitor household energy use and provide information on the amount and cost of energy use throughout the day. Smart meters are designed to allow users to adjust their energy use to save energy and money. The information that is recorded is communicated at least daily back to the utility for monitoring and billing purposes.

***Utility**:* Company engaged in producing and distributing electrical power for the public.

Handout 3: Journal Entries

Journal 1

The smart grid is on the cutting edge of the energy industry. New smart grid technologies are being created and implemented on a daily basis. Now it's time for you to use your imagination. Given what you've learned so far about the smart grid, consider this question:

- How will the smart grid change your life or your future career?

Write a journal entry in which you imagine how life or work will change after the smart grid is ready to go. Choose an aspect of life, like getting up in the morning, or something you might do differently at work because of the smart grid and describe it. The possibilities are endless!

Journal 2

Now you've had a chance to explore some smart grid careers. You've conducted a Career Web Quest, listened to professionals, watched videos and brainstormed with your classmates.

Choose a smart grid career about which you would like to write your profile. Choose something that you could imagine wanting to do yourself. Explain why the career appeals to you, what you believe it will entail and how you think it will contribute to creating, implementing or sustaining the smart grid or a specific smart grid technology.

Write down your thoughts and anything you've already learned, but don't do further research for the journal entry yet. You'll have time to research your career in Lesson 3.

Handout 4: Smart Grid Career Web Quest

What smart grid careers are there? What do you need to know to be able to work in the smart grid field? With your partner, explore the career websites provided by your teacher and find out as much information as you can about a job that is being advertised. Write down the titles of two jobs and a brief description of the requirements that the employer has identified for the people who will fill those jobs.

Job Title 1: _____

Educational requirements (what degrees in what fields are expected):

Technical experience:

Brief description:

Job Title 2: _____

Educational requirements (what degrees in what fields are expected):

Technical experience:

Brief description:

Lesson 2: People in Energy

Length: Two 50-minute periods (or one 50-minute period and work at home)

Students prepare for and host an energy professional in their classroom. They analyze several videos about careers in the smart grid industry, and then write a journal entry about a smart grid career they would like to profile.

Learning Objectives

In this lesson, students will:

- Learn about energy careers through a discussion with an energy industry professional
- Learn about careers in the smart grid industry by watching videos
- Determine what smart grid career to research
- Conduct an interview with someone who works in the energy or smart grid field

Materials

- **Handout 5: Smart Grid Career Videos**
- Student copies of **Handout 3: Journal Entries**

Procedure

1. **Prepare students to host an energy industry professional in the classroom (see Advance Preparation, page 5).**

2. **Facilitate a visit from the energy industry professional.**

   Ask students to take careful notes so that they will be able to summarize the information they have learned. Follow up with a question and answer session.

   Note: If you have more than one class using this lesson, you may wish to arrange to videotape the presentation, including the question and answer session, to show in multiple classrooms. Even if only one class is using the lesson, you may wish to tape the session for a career library.

3. **Discuss the visit.**

   After the guest leaves, discuss where the career described fits into the smart grid industry, and how that career might change as a result of full implementation of the smart grid. Have students use their research from the Career Web Quest to draw conclusions about these current and future careers.

4. **Have students watch smart grid career videos in pairs.**

   To supplement students' Career Web Quest research and what they learned from the visit by the energy professional, provide a library or list of videos about careers in the smart grid industry. Distribute **Handout 5: Smart Grid Career Videos** and have students pair up to watch at least three videos and then answer the handout questions for each video.

   Allow class time for students to watch the videos and fill out Handout 5.

5. **Discuss student responses to Handout 5 as a class.**

   Hold a class discussion to talk about students' reactions to the videos and what they learned about smart grid jobs. Add any new smart grid jobs to the list you started in Lesson 1.

6. **Have students write journal entries about the careers they would like to profile.**

   Have students refer to **Handout 3: Journal Entries** and respond to Journal 2.

> **Journal 2**
>
> Now you've had a chance to explore some smart grid careers. You've conducted the Career Web Quest, listened to professionals, watched videos and brainstormed with your classmates.
>
> Choose a smart grid career about which you would like to write your profile. Choose something that you could imagine wanting to do yourself. Explain why the career appeals to you, what you believe it will entail and how you think it will contribute to creating, implementing or sustaining the smart grid or a specific smart grid technology. Write down your thoughts and anything you've already learned, but don't do further research for the journal entry. You'll have time to research your career in Lesson 3.

   Encourage students to share their journal entries with the class. You may want to make a list and see how many categories and types of jobs are covered.

   Tell students that in Lesson 3, they will have a chance to research and create a profile on their chosen career for inclusion in the *Energy Career Guide* or posting on the school website.

Handout 5: Smart Grid Career Videos

With your partner, choose at least three videos from the list or library provided by your teacher. For each video, answer the set of questions below:

Video 1

- What is the main point of the video? Summarize it in a sentence.

- What career or careers does the video introduce?

- Describe each of the careers in as much detail as you can.

Video 2

- What is the main point of the video? Summarize it in a sentence.

- What career or careers does the video introduce?

- Describe each of the careers in as much detail as you can.

Video 3

- What is the main point of the video? Summarize it in a sentence.

- What career or careers does the video introduce?

- Describe each of the careers in as much detail as you can.

Lesson 3: Creating a Career Profile

Length: Two 50-minute periods

Students research the career they chose in Lesson 2, identify several bibliographic sources, and then conduct interviews in person, by phone, or by email with people who do similar work in the energy industry. Students create career profiles for the class *Energy Career Guide*.

7earning Objectives

In this lesson, students will:

- Prepare a bibliography of source materials for their research
- Conduct an interview with someone who performs a job similar to the one he or she has chosen (optional)
- Carry out research on their smart grid career
- Write and revise their career profile

Materials

- **Handout 6: Creating Your Career Profile**
- **Handout 7: Career Profile Review Checklist**
- **Handout 8: Tips for Interviewing**

Procedure

1. **Introduce creating the career profile.**

   Tell students that in this lesson they will draw on everything they have learned in the unit to create career profiles for the career they chose at the end of Lesson 2. The audience for their profiles is high school students and graduates making decisions about course selection and postsecondary education, internships, or other career preparations. Decide in advance or with students in class on the format for their career profiles (see Advance Preparation on, page 5).

2. **Discuss career profile content.**

   Brainstorm with students the kinds of things they would want to know about a job if they were interested in applying for it. Begin your discussion by asking questions such as the following:

   - What would you like to know about your job's responsibilities?
   - What would you like to know about how to get the job?
   - What would you like to know about where you would be working and your working conditions?
   - What other questions might you have?

Make a list of all of the questions students come up with so they can refer to them while they prepare their profiles. Title the list "What Is Your Job Like?" and post it in a prominent place in the classroom.

Teacher's Note: What Is Your Job Like?

- What is a typical workday like?
- Whom would I be working with? (e.g., colleagues in a company, customers, the public)
- What hours would I be working?
- What skills would I need to have?
- What kind of education or preparation would I need?
- Would I be working in an office or be outdoors or on the road much of the time?
- Is there an element of excitement or danger to my work?
- Is my work predictable, or would it change from day to day?
- What would be the most interesting thing I would do?
- What would be the most difficult thing I might have to do?
- What tasks might be routine or even boring?
- How much does my job pay at the entry level?
- What opportunities are there for advancement?

3. Prepare students to research their profile.

Distribute **Handout 6: Creating Your Career Profile** and **Handout 7: Career Profile Review Checklist**. Explain that their work will be assessed using the information on Handout 7. Have students read the handouts, and answer any questions they may have.

Explain to students that the majority of information on smart grid jobs will be found online—job search and career sites can be very helpful in finding specific jobs and identifying needed skill sets. You may also wish to have students contact government and trade organizations or companies that use or create smart grid technologies.

Give students the list of sites you have prepared.

4. Provide class time and support for students to carry out their research.

Assist students as necessary in doing their research. Have students do research online, in the school library and/or in the community. Have students check in with you when they have listed their bibliographic sources.

5. **Support students in finding appropriate professionals to interview.**

   Work with students to identify professional interview subjects from your advance preparation for Lesson 2. If there are no interview subjects available in a career close to the one students have chosen, point them toward videos on the web where people speak about specific jobs.

> **Teacher's Note: Student Safety**
>
> Students should never meet an interviewee in person unless this interviewee has been fully vetted by you.

   If students will be conducting interviews, distribute **Handout 8: Tips for Interviewing.** Go over the handout with them. If time or access is limited, you may wish to encourage students to conduct interviews by phone or email.

> **Teacher's Note: Preparing Students to Interview a Professional**
>
> If students don't have experience interviewing adults, make sure they understand how to interact with their interview subjects in appropriately professional ways. Before students conduct their interviews, you may want to have selected students role-play an interview for the class and critique it.

6. **Based on their research, have students create outlines for their profiles.**

   After students complete their outlines, review them before students finish developing their career profiles.

7. **Provide class time for students to develop their outlines and write their profiles.**

   Encourage students to develop their profiles to fit the format you have chosen.

> **Teacher's Note: New and Future Smart Grid Jobs**
>
> Because so much about the smart grid is new, there may not be as much information as students would hope on certain types of smart grid careers. Be prepared to assist students in finding what is relevant in existing careers and helping them be creative in augmenting their profiles with the tasks and responsibilities smart grid technologies might add.

8. **Assign students a partner for peer review of their profiles. Have them review using the Handout 7: Career Profile Review Checklist.**

   Peer review partners should use Handout 7 to help them assess the profiles.

   They should also consider the following questions:

   - How could I make the profile clearer or more informative?
   - How could I make the profile more interesting?

9. Have students revise their profiles.

Provide class time for students to revise their profiles using the feedback from their peer review.

10. Have students share profiles with the class.

Provide class time and space for students to share their profiles with one another before making them available to the entire school through the guide or website.

11. Assess the unit.

Have students turn in their career profiles for you to evaluate.

Conduct a discussion about the unit using the following questions:

- What are some of the ways existing careers in the energy industry will change with the implementation of the smart grid?
- What are some jobs that are entirely new with the introduction of the smart grid?
- What was the most interesting thing you learned about the job you researched for your career profile?
- What was the most interesting thing you learned from someone else's career profile?
- What did you learn about the process of researching careers?

Handout 6: Creating Your Career Profile

Now that you have chosen a smart grid career that interests you, use the steps below to research and create your career profile.

1. Identify source materials.

Smart grid technologies are a current field so most of the sources you will find for careers will be on the web. You must identify *at least* three sources. Use the list of sources provided by your teacher as well as some of the following tips to conduct your research.

Using Websites

Here are a few steps to the successful use of websites:

1. Search focus: Have you chosen the best key words?
    - Keep keyword choices focused and specific.
    - Use + signs to link keywords rather than typing in long phrases, which will limit your results.
2. Accuracy and authority: Have you checked the information source?
    - What is the URL? (For example, *.edu* is the site of an academic institution; *.org* is a nonprofit other than an academic institution; *.gov* is a government-sponsored site; *.com* is a business or personal site)
    - What are the author's credentials?
    - Is contact information provided?
3. Appropriateness: Who is the audience for the site?
    - Is the material targeted for young children, high school or college students or specialists in the field?
    - Does the page contain any advertising?
    - How detailed is the information?
4. Currency: When was the site last checked or updated?
    - Is there a date on the site?
    - Are there broken links?

Write the title, author(s), date, publisher and city of publication (or web address) for each source, and briefly describe the value of the source to your research.

1.

2.

3.

When you have compiled your sources, check in with your teacher.

2. Conduct your research.

Use the questions you generated at the beginning of the lesson as guideposts in your research. See how many of them you can answer by using the sources you've compiled.

3. Gather information from professionals in your chosen career.

Part of researching your career choice is finding out what people actually do in their jobs. The best way to conduct this phase of research is to perform interviews.

If you will be conducting interviews as part of your research project, refer to **Handout 8: Tips on Interviewing** to prepare for and conduct your interviews.

Alternatively, you may use online videos of people talking about their careers. Use your web search skills or work with your teacher to find appropriate videos. Then take notes on the important information and look for quotations you may be able to use to enhance your profiles. If you do use quotations, remember to quote your source exactly and give the full name of the person you are quoting.

4. Create an outline

Now you have the information you need to put together a profile of a promising career in the smart grid industry. What would be the most important thing for you to know if you were considering this job? Think about getting your reader's attention by beginning with one of the most interesting things you might do in your chosen job. Use the questions from the list "What Is Your Job Like?" and outline the order of information that would most appeal to you as a job seeker. Use the list of job search websites provided by your teacher for the Career Web Quest in Lesson 1 to reference actual job postings.

5. Write your profile.

Using your outline, write a career profile that does the following:

- Summarizes the responsibilities and tasks associated with your chosen career
- Identifies the skills and preparation needed to perform jobs in this career

Prepare your profiles according to the format your teacher has provided.

Handout 7: Career Profile Review Checklist

Use this assessment to help you develop your career profile. Make sure to include all the requirements. Your teacher will use this assessment to evaluate your work.

Requirements	Percentage of Total Grade	Comments	
Career Profile		**Student Comments**	**Teacher Comments**
Source materials. Uses at least three valid sources.	20%		
Career description. Clearly explains the tasks and responsibilities carried out by people in this career.	30%		
Educational requirements. Clearly explains the education and technical skills required to get a job in this career field.	10%		
Engaging description. Describes the career in a way that makes it sound engaging and interesting.	20%		
Follows the assigned format. Description fits the format assigned by the teacher.	10%		
Writing mechanics. Uses proper grammar, sentence structure and vocabulary.	10%		
Total	**100%**		

Handout 8: Tips for Interviewing

Interviewing is a great way to meet people and to learn information you couldn't learn in other ways. You may conduct your interviews in person, over the telephone, or via email. Whichever way you choose, be sure to prepare in advance. Know what you plan to ask during the interview and be prepared for any follow-up.

The following techniques, for use before, during and after the interview, will help you get the most out of the experience.

Preparing for the Interview

Contact the interviewee. Get in touch with the person you'd like to interview. Describe the purpose and length of your interview. Arrange a time to meet in person or to talk on the phone. If you plan to record your interview, ask for permission to do so in advance. If you plan to conduct the interview by email, let the person know your timeframe for sending questions and receiving a response.

Conduct research. Do your homework! Look for information about the interviewee's job before you speak with him or her. Background information will help you focus and ask questions you might not otherwise have thought of.

Think about topics. Decide what information you want to get out of the interview. Remember, an interview is a chance to get information that you may not be able to find anywhere else. Make a list of the important points you want to cover, such as questions from the "What Is My Job Like" list that you were unable to answer in your other research.

List your questions. Write a list of questions to ask the interviewee and have your teacher or someone else review them. Ask open-ended questions rather than ones that may be answered with yes or no. For example, instead of asking, "Do you like your job?" ask, "What is the most exciting part of your job?"

Order your questions. Ask your questions in a logical sequence, from basic questions (e.g., "How did you first get interested in this type of career?") to more specific questions (e.g., "What do you do when you discover there may be a power shortage?").

During the Interview

Dress appropriately. If you're interviewing someone in person, dress for the situation. Always be clean and neat, and avoid clothes with logos, graphics or sayings. To interview a businessperson, wear nice pants or a skirt and a button-down shirt or blouse. If your interviewee is someone in the community, dress neatly but less formally.

Arrive (or call) on time. Don't keep your interviewee waiting. If you are using email, be sure to send the questions on the day you arranged.

Have the right gear. Be prepared with a notebook and a pen or a pencil. If you are using a tape recorder or video camera, learn how all the controls work before you arrive and give yourself a few extra minutes to set up the equipment.

Warm up. Be polite and friendly. Always begin by thanking the person for his or her time**.** If your interview is in person or on the phone, spend a few minutes to get acquainted and put your subject at ease before you ask your questions. (For example, you might ask whether the person

has been interviewed about their job before or briefly explain your project.) However, in an email, after thanking the person for his or her time, it's best to get right to the point.

Let the interviewee do the talking. Don't interrupt and be sure to give the person time to answer each question. Resist the temptation to jump in if your subject doesn't answer right away. Give him or her time to think. Use pauses as a chance to take notes, rather than moving straight to the next question. You should also practice active listening—make eye contact and show your interest by nodding your head and making appropriate comments, such as "Uh-huh" and "I see."

Take notes/record the interview. If you are interviewing by phone and you are recording it, always ask, "Is it ok if I record this conversation?" If you're not recording the interview, take detailed notes on your interviewee's responses, writing down key information. Be sure to note important or interesting phrases that you may want to quote. If necessary, read the quotation back to the interviewee to be sure you have it right. Also, make sure you have spelled all names correctly. Don't worry about using full sentences or writing down every word, unless you are planning to quote them. The notes are for you to remember what's important. If you are recording the interview, focus on your interviewee's responses and jot down what you will want to refer to later.

Ask follow-up questions. Your list of questions will provide the backbone for the interview, but answers to those questions may require follow-up. If an answer makes you think of another question, go ahead and ask it. Listen carefully to interviewees' responses and don't be afraid to ask for additional information or clarification, such as "Can you give me an example?" or "Does that mean that ____?" For email interviews, send a second message with follow-up questions based on the interviewee's responses.

Wrap up. At the end of the interview, thank the interviewee again. Ask if it would be OK to call or email if you have any further questions. Offer to send a copy of your final project—and be sure to follow through!

After the Interview

Thank your interviewee. Send an email or a card thanking the person for their time and the information he or she shared.

Review your notes. As soon as possible after the interview, read over your notes and add any information you remember from the interview but didn't write down at the time. (The sooner you do this the better, as your memory of the conversation will help you make sense of your notes.) You may want to type and organize them. Write any additional questions that you have.

If necessary, follow up. If your interviewee has agreed, ask follow-up questions, including verifying quotations or spellings, in a phone call or an email. Thank the interviewee for this additional time.

Evaluate the interview. Reflect on the interview process. What went well? What didn't go well? What will you change the next time you conduct an interview? Write down your reflections in your journal.

Sample Interview Questions

1. How did you get started in the energy industry?
2. What responsibilities do you have as a [JOB TITLE]?
3. What kinds of jobs or work experience did you have before getting to this point? What was your career path like?
4. Can you please describe a typical day in your job?
5. What is the most exciting part of your job?
6. What did you study in high school and college?
7. How has the smart grid impacted your job, and what impact do you anticipate it will have in the future?
8. Can you describe some of the recent innovations in the energy industry?
9. Why do you like working in the energy industry?
10. What recommendations would you give to a high school student who is interested in a career in the energy field?

Resources

Lesson 1

Career Quest Websites and Postings

CPS Energy Career Center
http://www.cpsenergy.com/about_cps_energy/careers

Energy Central Network, EnergyCentralJobs.com
www.energycentraljobs.com

Institute of Electrical and Electronics Engineers (IEEE) Job Site
http://careers.ieee.org/article/bestjobs_0612.php

SmartGridNews.com, Smart grid jobs: Where to find them
http://www.smartgridnews.com/artman/publish/Stimulus_Tools_Resources/Smart_Grid_Jobs_Toolkit-704.html

The Wall Street Journal: Careers
http://online.wsj.com/public/page/news-career-jobs.html

U.S. Department of Energy: The Smart Grid Workforce
http://energy.gov/articles/power-jobs-smart-grid-workforce

Lesson 2

Videos of Smart Grid Jobs

"CPS Energy Works for You"
http://www.cpsenergy.com/About_CPS_Energy/Careers/Works_for_You_videos.asp

MyVirtualJobFinder.com (March 25, 2009). Electrical Power Line Installers and Repairers..
http://www.youtube.com/watch?v=ymq41MNWOfk&list=UUFJ80CLbvkjsMFKMQhAAkLA

Green Jobs, GreenJobSpider.com (October 7, 2010). Maine Getting 2000 Smart Grid Jobs.
https://www.youtube.com/watch?v=0V7y1qE5bkw&index=15&list=UUq1Z1JwkGbW0NnKE_2BM5BQ

ColoradoLeeds. (April 24, 2009). Retooling for Renewable Energy Jobs.
http://www.youtube.com/watch?v=OZl2Z4G5KRQ

Retailcrossing. (n.d.). Green Advocates See New Job Potential Post-Election.
http://www.dailymotion.com/video/x7m8hj_green-advocates-see-new-job-potenti_news

PennFuture. (May 29, 2008). Great Green Jobs, part 1.
http://www.youtube.com/watch?v=rTvuHBY9cTY

PennFuture. (May 29, 2008). Great Green Jobs, part 2.
http://www.youtube.com/watch?v=K4x4h4pO6Z0

IEEE Technical Activities. (January 19, 2009). A Smart Grid for Intelligent Energy Use.
http://www.youtube.com/watch?v=YrcqA_cqRD8
Scientific American (March 30, 2011). What is the sSmart gGrid?
https://www.youtube.com/watch?v=-8cM4WfZ_Wg

Con Edison NY (August 10, 2010). Smart Grid Animation. SmartGridNews.com.
http://www.smartgridnews.com/artman/publish/Business_Smart_Grid_101_Resources/Now-Playing-ConEdisonNY-Smart-Grid-Animation-2857.html

Nowcast San Antonio (June 16, 2011). Webcast: CPS Energy and San Antonio Mayor Julian Castro announce SA2020 initiative
http://nowcastsa.com/blogs/charlotteanne-lucas/webcast-cps-energy-and-san-antonio-mayor-julian-castro-announce-sa2020-ini

Lesson 3

Source Materials for Job Research

In addition to the sources below, any of the sources listed under Lesson 1 and Lesson 2 may also prove useful for student career research.

Unit 2 (General Resources)

Websites and Online articles

Office of Electricity Delivery & Energy Reliability. (n.d.). Smart grid. U.S. Department of Energy.
www.oe.energy.gov/smartgrid.htm

Consortium for Electric Reliability Technology Solutions
www.certs.lbl.gov/

California Energy Commission
http://www.energy.ca.gov/

California Public Utilities Commission
www.cpuc.ca.gov/puc/

Energy Central Network, EnergyCentralJobs.com
www.energycentraljobs.com

California State University, Sacramento – California Smart Grid Center
www.ecs.csus.edu/csgc/

UCLA Smart Grid Energy Research Center
www.smartgrid.ucla.edu/

Pacific Gas & Electric – Smart Grid Information
www.pge.com/en/safety/systemworks/electric/smartgrid/index.page

San Diego Gas and Electric – Environment Page
www.sdge.com/environment

SmartGridNews.com: “Smart Grid Jobs: Where to Find Them”
www.smartgridnews.com/artman/publish/Stimulus_Tools_Resources/Smart_Grid_Jobs_Toolkit-704.html

STEMConnector: “Where are the STEM Jobs? (2012-2013)
www.stemconnector.org/sites/default/files/store/STEM-Students-STEM-Jobs-Executive-Summary.pdf

Fast Company, “Why Women are Ditching STEM Careers – and How to Change it,” Jan. 27, 2015
www.fastcompany.com/3041381/strong-female-lead/why-women-are-ditching-stem-careers-and-how-to-change-it

NBCNews.com: “New Technologies, Contracts Bolster Growing Energy Storage Business,” Jan. 25, 2015
www.nbcnews.com/science/environment/new-technologies-contracts-bolster-growing-energy-storage-business-n292386

SustainableBusiness.com: “California Reaches 500,000 Clean Energy Jobs This Year,” Jan. 9, 2015
www.sustainablebusiness.com/index.cfm/go/news.display/id/26086

Environmental Defense Fund: “National Program Aims to Expand Minority Participation in Energy Sector,” Dec. 17, 2014
http://blogs.edf.org/energyexchange/2014/12/17/national-program-aims-to-expand-minority-participation-in-energy-sector/

ZDNet: “The Future of Tech Jobs: 5 Themes to Watch,” September 7, 2014
http://www.zdnet.com/the-future-of-tech-jobs-5-themes-to-watch-7000033392

US News & World Report: “Report: STEM Job Market Much Larger Than Previously Reported,” Feb. 5, 2014
www.usnews.com/news/stem-solutions/articles/2014/02/05/report-stem-job-market-much-larger-than-previously-reported

The New York Times: “Utilities Seek Fresh Talent for Smart Grids,” December 29, 2010
www.nytimes.com/2010/12/30/business/energy-environment/30utility.html?pagewanted=all

U.S. Department of Energy, “Women @ Energy”
www.energy.gov/diversity/listings/women-energy

White House: Educate to Innovate
www.whitehouse.gov/issues/education/k-12/educate-innovate

Books

Friedman, Thomas L. *Hot, Flat, and Crowded: Why We Need a Green Revolution—And How it Can Renew America*. Farrar, Straus, and Giroux, 2008.

Goldstein, David B. *Saving Energy, Growing Jobs: How Environmental Protection Promotes Economic Growth, Profitability, Innovation, and Competition*. Bay Tree Publishing, 2007.

Background on the Smart Grid

What is the Smart Grid?

The smart grid is a dramatically upgraded version of our nation's current power grid that enables digital communication between utilities and their customers to promote the most efficient use of energy. By incorporating information-sharing and technology into every stage of electricity generation, delivery and consumption, the smart grid helps consumers and businesses better understand their electricity use, allowing them to make better decisions about when to use energy and how to save money on their electricity bills. The smart grid also helps utilities reduce the frequency and duration of outages; utilize cleaner, renewable energy sources; and improve reliability.

The smart grid presents a tremendous benefit to the world. When fully deployed, it will save people money, help conserve energy and improve the environment. It will also address the expected burden of increased energy use and reduce the need to build more fossil-fuel or nuclear power plants while encouraging the use of renewable energy sources like wind and solar. The smart grid will also strengthen national security by lessening our dependence on foreign oil and create jobs domestically in the through the emergence of a high-growth industry in the U.S.

The Smart Grid: Promoting Energy Efficiency and Cost Savings

For consumers, the smart grid helps them understand how much energy they are using and what that energy costs. Consumers using the smart grid can receive in-home notifications that alert them to low or high energy-price periods. As a result, consumers can choose to do certain tasks, such as laundry, when there is less demand and rates are lower.

Numerous studies have demonstrated that consumers reduce their energy consumption from 5-15% when they understand how much energy they're using and how much it costs. Savings approximately double when awareness is coupled with in-home devices that can be set to automatically respond to price signals or other information. In addition, the smart grid's ability to interface to thermostats and automatically control heating and air conditioning systems also offers tremendous potential for energy savings.

On the utility side, the smart grid helps power companies better manage when and how to generate electricity. With real-time access to customer demand, utilities can decide to bring power plants on and off-line to meet energy needs without producing excess, wasted generation. In addition, improved communication between utilities and their customers offered by the smart grid allows utilities to address service interruptions immediately. This helps utilities better manage resources during an outage, helping to speed the restoration process and efficiently respond to the needs of their customers.

Studies show that by making the current grid just 1% more efficient – either through behavior modification, upgraded appliances or distribution efficiencies – the U.S. could save 52.40 billion pounds of carbon dioxide. That's equivalent to removing 4.33 million cars from our roadways. In addition, the smart grid is expected to help save an estimated, $46 billion to $117 billion over the next 20 years by avoiding the costs of constructing of power plants, transmission lines and substations.

Source: Silver Spring Networks Smart Grid Fact Sheet

Energy Facts

- The Department of Energy estimates a 40% increase in U.S. demand for electricity by the year 2030.

- According to the American Council for an Energy-Efficient Economy report released in June 2010 on the energy efficiency benefits of smart grid deployment, consumers could reduce consumption by 4-12%, with a net savings of between $2 billion and $35 billion over the next 20 years.

- With a full rollout, U.S. value created from smart grid could equal some $131 billion a year by 2019, according to a 2010 study by McKinsey & Company.

- The number of electronics products per household has doubled since 1997, and they consume 11% of residential electricity, according to the Consumer Electronics Association.

- Consumers given information about energy use and pricing have been shown to reduce their energy consumption by 5-15%. This is approximately doubled by the availability of enabling technologies, including programmable communicating thermostats and smart appliances. A 2% reduction in end-use energy consumption that is enabled by smart grid deployment can deliver 0.1 gigatons of US CO2e GHG reductions. (Source: Demand Response and Smart Grid Coalition)

- With 124 million households paying an average of $1200 per year (DOE EIA data), total residential electricity bills add up to $148 billion. A cut back of 5-15% could equal savings of $7.5 to $22 billion per year. (Source: Demand Response and Smart Grid Coalition)

- The Electric Power Research Institute has estimated that in the United States, a smart grid would reduce carbon from electric power by 25% or roughly 10% of overall U.S. CO2 emissions. This savings is estimated to have the same impact as removing 140 million cars from the road.

- According to industry research, up to 6% of central-plant generated electric power is lost during transmission and distribution delivery.

- Smart grid deployments present significant opportunities to reduce greenhouse gas emissions by 5-9% from 2005 levels and deliver 0.7 gigatons of CO2e GHG reductions that amount to nearly one-quarter of the Waxman-Markey targets for 2030.

- If all U.S. households saved 15% on their energy use by 2020, the greenhouse gas savings would be equivalent to taking 35 million cars off the road and would save consumers $46 billion on their energy bills, or $360 per customer each year. (Source: NARUC)

Source: Silver Spring Networks Energy Fact Sheet

Glossary of Energy, Smart Grid and Water Terms

ACCESS POINTS – Specially configured nodes on wireless local area networks (WLANs). Access points act as a central transmitter and receiver of WLAN radio signals.

ADVANCED METER INFRASTRUCTURE (AMI) – Refers to the full measurement and collection system that includes meters at the customer site; communication networks between the customer and a service provider, such as an electric, gas or water utility; and data reception and management systems that make the information available to the service provider.

AUTOMATIC METER READING (AMR) –The technology of automatically collecting consumption, diagnostic and status data from water meter or energy metering devices (gas, electric) and transferring that data to a central database for billing, troubleshooting and analyzing.

AVERAGE COST – The revenue requirement of a utility divided by the utility's sales. Average cost typically includes the costs of existing power plants, transmission and distribution lines, and other facilities used by a utility to serve its customers. It also includes operating and maintenance, tax and fuel expenses.

AVERAGE DEMAND – The energy demand in a given geographical area over a period of time. For example, the number of kilowatt-hours used in a 24-hour period, divided by 24, tells the average demand for that period.

BATTERY – An electrochemical device that stores and furnishes electric current.

BLACKOUT – A power loss affecting many electricity consumers over a large geographical area for a significant period of time.

BROWNOUT – A controlled power reduction in which the utility decreases the voltage on the power lines so customers receive weaker electric current. Brownouts can be used if total power demand exceeds the maximum available supply. The typical household does not notice the difference.

DEMAND (Utility) – The level at which electricity or natural gas is delivered to users at a given point in time. Electric demand is expressed in kilowatts.

DEMAND RESPONSE – Occurs when consumers use less energy during times of typical peak energy use. The grid then becomes better able to handle energy loads. It also refers to software that manages customer consumption of electricity in response to supply conditions; for example, having electricity customers reduce their consumption at critical times or in response to market prices.

DIGESTERS – Large tanks in which microorganisms break down biodegradable material. In the process of wastewater treatment, biological waste can be broken down and fuels created, such as methane.

DISTRIBUTED GENERATION – Use of smaller, widely dispersed plants and more varied energy sources closer to where the energy is being used.

DISTRIBUTION SYSTEM (Electric Utility) – The substations, transformers and lines that convey electricity from high-power transmission lines to ultimate consumers.

DYNAMIC PRICING – A way of charging the consumer based on hourly variations in power costs. The three main categories of dynamic pricing are as follows:

Real-time pricing – Consumers are charged based on hourly fluctuations in the cost of power. Consumers can use real-time pricing to plan their electricity use when prices are lowest.Peak-time rebate – Consumers are charged the same base rate regardless of when they use power, but they can earn rebates, or money back, if they use less power during peak periods.Critical-peak pricing – For a small number of peak demand hours each year, prices can increase as much as 500%. Customers who reduce their usage during these periods pay a slightly lower rate.ELECTRIC CAR – An automobile that is powered exclusively by electricity that is stored in batteries or another energy storage device. To recharge these vehicles, they must be plugged into a socket in a manner similar to an electrical appliance.

ELECTRIC UTILITY – Any person or state agency with a monopoly franchise (including any municipality), which sells electric energy to end-use customers.

ENERGY – Usable power needed to do work, to move an object, or to grow and sustain living things. Energy may be stored (potential) or working (kinetic). Forms of energy include chemical, radiant, gravitational, mechanical, thermal, sound and nuclear. Some sources of energy include sunlight, wind, water, oil, gas, coal, nuclear reactions and heat within the Earth (geothermal).

ENERGY CREATION – The process whereby energy is actually converted from one form into another form that is usable and which can be harnessed to power devices and systems. Using gravity to turn water's kinetic energy into electrical energy through the use of dams, generators and turbines/dynamos is an example.

ENERGY STORAGE – The use of batteries or other devices, such as an electric circuit element called a capacitor, to store generated energy, eliminating the need to use energy at the moment of generation.

GAS UTILITY – Any person engaged in, or authorized to engage in, distributing or transporting natural gas, including, but not limited to, any such person who is subject to the regulation of the Public Utilities Commission.

GRID – The electric utility companies' transmission and distribution system that links power plants to customers through high power transmission line service. It is a network of electrical distribution in the United States that consists of: Western Connection, Eastern Connection and Texas Interconnection. Alaska and Hawaii have separate grids.

HYDRO-GENERATOR – A turbine that harnesses the energy necessary to create electricity by capturing the kinetic energy of water, either through a dam or – in the case of in-line hydro generators – through water transport pipes.

HYDRO ENGINEER – An engineer concerned with creating or managing systems that collect, store, control, transport, regulate, measure, create energy from or use water.

INDEPENDENT POWER PRODUCER (IPP) – Generates power that is purchased by an electric utility at wholesale prices. The utility then resells this power to end-use customers. Although IPPs generate power, they are not franchised utilities, government agencies or qualifying facilities. IPPs usually do not own transmission lines to transmit the power that they generate.

INDEPENDENT SYSTEM OPERATOR (ISO) – A neutral operator responsible for maintaining instantaneous balance of the grid system. The ISO performs its function by controlling the dispatch of flexible plants to ensure that loads match resources available to the system.

INVESTOR-OWNED UTILITIES – A private company that provides a utility, such as water, natural gas or electricity, to a specific service area.

KILOWATT HOUR – A unit for measuring energy, commonly used for electricity. It corresponds to one kilowatt (kW) of power being used over a period of one hour.

LOAD – The amount of electric power supplied to meet one or more end-user's needs.

LOAD MANAGEMENT – Steps taken to reduce power demand at peak load times or to shift some of it to off-peak times. This may be with reference to peak hours, peak days or peak seasons. The main thing affecting electric peaks is air-conditioning usage, which is therefore a prime target for load management efforts. Load management may be pursued by persuading consumers to modify behavior or by using equipment that regulates some electric consumption.

METER – A device for measuring levels and volumes of a customer's gas and electricity use.

MUNICIPAL ELECTRIC UTILITY – A power utility system owned and operated by a local jurisdiction.

MUNICIPAL UTILITY – A provider of utility services owned and operated by a municipal government.

NONRENEWABLE ENERGY – Power source that is harvested for one-time use, primarily from fossil fuels such as oil, coal and natural gas.

NUCLEAR ENERGY – Power obtained by splitting heavy atoms (fission) or joining light atoms (fusion). A nuclear energy plant uses a controlled atomic chain reaction to produce heat. The heat is used to make steam run conventional turbine generators.

PEAK DEMAND – The highest electrical demand within a particular period of time. Daily electric peaks on weekdays occur in late afternoon and early evening. Annual peaks occur on hot summer days.

PLUG-IN HYBRID ELECTRIC VEHICLES – Cars and trucks whose engines use a combination of gasoline and electrical power to maximize fuel efficiency. To recharge the electrical battery, these vehicles are designed to plug into a socket in a manner similar to an electrical appliance.

RELAYS – Extend the RF signal in spots where a meter isn't located and an Access Point remains out of reach. Behaving much like repeaters in an Ethernet network, Relays are easily deployed on pole tops or building floors to propagate the RF signal.

RENEWABLE ENERGY – Resources that constantly renew themselves or that are regarded as practically inexhaustible. These include solar, wind, geothermal, hydro and wood. Although particular geothermal formations can be depleted, the natural heat in the earth is a virtually inexhaustible reserve of potential energy. Renewable resources also include some experimental or less-developed sources such as tidal power, sea currents and ocean thermal gradients.

RENEWABLE RESOURCES – Renewable energy resources are naturally replenishable, but flow-limited. They are virtually inexhaustible in duration, but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, hydro, geothermal, solar and wind. In the future they could also include the use of ocean thermal, wave and tidal action technologies. Utility renewable resource applications include bulk electricity generation, on-site electricity generation, distributed electricity generation, non-grid-connected generation and demand-reduction (energy efficiency) technologies.

ROLLING BLACKOUT – A series of intentional electrical power outages in a region created to conserve energy when the power supply is low.

SMART GRID – A comprehensive set of technologies and devices working together in homes, businesses and throughout the electrical distribution system. Collectively, smart grid

technologies are like a nervous system through which all of the parts of the electrical grid communicate and interact. The smart grid has been compared to an Internet for energy. Some features of a smart grid include:

1. Using two-way communication to monitor energy use
2. Shifting use from peak to off-peak periods through the use of dynamic pricing
3. Two-way energy distribution where users may generate some of their own energy (e.g., with solar panels, wind generators or plug-in electric vehicles)
4. Use of distributed generation to take advantage of a wide variety of energy sources, including using renewable energy sources during periods of availability
5. Updating infrastructure, including rebuilding and renovating aging power plants and distribution cables and lines to use more efficient technologies, as well as creating state-of-the-art energy distribution systems

SMART METER – A device installed in a home to monitor household energy use and provide information on the amount and cost of energy use throughout the day. Smart meters are designed to allow users to adjust their energy use to save energy and money. The information that is recorded is communicated at least daily back to the utility for monitoring and billing purposes.

SUBSTATION – Parts of an electrical supply grid, substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels.

TIME-OF-USE METER – A measuring device that records the times during which a customer uses various amounts of electricity. This type of meter is used for customers who pay time-of-use rates.

TIME-OF-USE (TOU) RATES – The pricing of electricity based on the estimated cost of electricity during a particular time block. Time-of-use rates are usually divided into three or four time blocks per 24-hour period (on-peak, mid-peak, off-peak and sometimes super off-peak) and by seasons of the year (summer and winter). Real-time pricing differs from TOU rates in that it is based on actual (as opposed to forecasted) prices, which may fluctuate many times a day and are weather-sensitive, rather than varying with a fixed schedule.

TOPOGRAPHY – Pertaining to the physical nature of the land, often recorded in 3-D relief on topographical maps or schematics that allow an understanding of the way terrain is laid out.

UTILITY – A company engaged in producing and distributing electrical power for the public.

WASTEWATER TREATMENT PLANT – A facility used to remove biological, mineral or chemical waste from water, with the goal of allowing the treated water to be made available for a variety of uses. Types of waste include biological (treating water from homes to remove sewage and other impurities), agricultural (treating water to remove animal waste, pesticides, fertilizers and other farm run-off) and industrial (removing heavy metals, chemicals and other byproducts of industrial use).

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