TEACHER’S GUIDE
ENERGY CHECKUP:
Power Down for the Environment
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Global Climate Change

“Human activities, such as the release of greenhouse gases from burning fossil fuels are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depends on the understanding of climate science, engineering capabilities, and other kinds of knowledge such as understanding of human behavior and on applying this knowledge wisely in decisions and activities.”

— MS-ESS3 Earth and Human Activity, Grade Six

From: Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten–Grade Twelve (adopted by California State Board of Education, September, 2013).
Introduction and Overview

*Energy Checkup: Power Down for the Environment* is an educational unit for students in grades 5–6 and above. It is designed to increase students’ knowledge of where the energy (electricity and natural gas) they use comes from, how it is used in their homes and schools, and ways it can be used wisely and not wasted. Students will participate in hands-on activities that will help them understand what it means to power down and be energy-efficient.

Time for a Checkup

Students will learn that an energy-efficient person conserves natural resources and uses only enough electricity or natural gas to get a task or job done. As students participate in checkup activities they investigate where energy is used at school and make recommendations on how students and teachers can power down and save energy. Students involve their own family members in identifying actions they can take at home to save both energy and money.

Connections

In this educational unit students also discover that at present most of the energy used in the United States is generated by fossil fuels (petroleum, coal, and natural gas). Through their readings, research, and class discussion they learn that when fossil fuels are burned to produce electricity, greenhouse gas (GHG) emissions are released into the atmosphere. These heat-trapping gases contribute to global climate change. Students will be able to make the connections between their own daily use of energy, its production, and environmental impacts. They will understand how their own energy-efficient behaviors can help reduce the impacts of energy production on the environment.

Teachable Moments

The three lessons in this curriculum can be presented as a stand-alone unit or as part of a larger study of energy, energy efficiency, and the environment.

Each lesson offers teachers background, student objectives, materials needed, vocabulary, detailed procedures, and extension activities. Teachers will discover many “teachable moments” when students are engaged in these lessons.
The teacher's guide is accompanied by a 28-page *Energy Checkup: Power Down for the Environment* student activity book which is distributed at the beginning of the study. These activity books are consumable and should be taken home at the end of the study to share with family members.

**Connecting to the Content Standards**

Lessons in this Energenius Educational Program have been correlated to Common Core State Standards (CCSS) * and the Next Generation Science Standards (NGSS) ** for grades five and six.

The three lessons in this guide along with the student activity book and suggested extension activities provide many exciting and challenging opportunities for students.

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*California Common Core State Standards for English-Language Arts & Literacy in History/Social Studies, Science and Technical Subjects* (Adopted by the California State Board of Education August, 2010 and modified March, 2013)

**Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten–Grade Twelve* (adopted by California State Board of Education, September, 2013),
Lesson at a Glance

This lesson and the student activity book opens with the question — why power down for the environment? This question will be answered for them as they get actively involved with this study. An introductory activity, What is Powering Your Day? focuses students on all the energy (electricity and natural gas) that is needed each day to keep things running. Readings and illustrations in the activity book will help students learn how electricity is generated and travels to where it is needed to power their lives.

Teacher Background

Lesson 1 provides students an introduction or reintroduction to how electricity is generated, and the long path electricity and natural gas travel to reach homes and schools. Students will complete charts identifying how each day they use energy both at home and school. They take on the role of energy investigators as they do a walk-about the school to record how energy is being used and where it is wasted. They make energy-saving recommendations to the principal and take on action projects to get the whole school involved in powering down its energy use.

Working in small groups students will create an illustrated Word Wall featuring new words from this opening lesson. Some students will research YouTube videos that help explain to classmates the power path of electricity while others will create energy-saving messages that will be featured on large posters. They will also complete a review and recall word-matching activity in this introductory lesson.

Student Objectives

• Students will be able to read and summarize informational text on the power path of electricity and natural gas.
• Students will be able to conduct research projects in response to assigned and bonus activities (e.g., working and contributing to group activities).
• Students will be able to identify energy use and waste at the school.
• Students will be able to discuss and present information on global climate change from www.epa.gov/climatechange/kids and other websites.
• Students will be able to define new vocabulary and contribute to the Word Wall.

Materials

Provided:

Needed:
• Internet access
• Materials for creating posters

Time Needed

Two to three class periods
climate change
Refers to any significant change in measures of climate (such as temperature, precipitation, droughts, warming of the oceans) lasting for an extended period of time. www.epa.gov/climatechange/basic.info

goal
A fossil fuel and a nonrenewable energy source. Coal comes from the remains of plant life that lived many millions of years ago.

electricity
A secondary form of energy that is used for lighting, heating, and running forms of transportation.

emission
A discharge or release of pollutants into the air, such as from a power plant, smokestack, or automobile engine.

energy efficiency
The use of energy without waste. Energy efficiency refers to work done using the smallest amount of energy needed.

environment
Something that surrounds: surroundings. The natural environment includes land, air, water, and other features of nature.

fossil fuels
Fuels formed from the remains of plants and animals that lived over 70 million years ago. Coal, oil, and natural gas are fossil fuels.

greenhouse effect
The effect produced when greenhouse gases trap solar radiation in the Earth’s atmosphere and warm the planet. This process occurs naturally and has kept the Earth’s temperature about 60 degrees Fahrenheit warmer than it would be without it. Current life on Earth could not continue without the greenhouse effect. www.energystar.gov/index.cfm?c=kids.kids_index

greenhouse gas (GHG)
A gas, such as carbon dioxide (CO₂) or methane (CH₄), that traps the heat of the sun in the Earth’s atmosphere.

natural gas
An air-like substance found in the Earth that can be burned for heat or fuel.

natural resource
A materials used by people. Water, air, plants, and soil are examples of natural resources.

nonrenewable energy
An energy source such as coal or oil that cannot be easily replenished. They were formed millions of years ago.

petroleum (oil)
A natural, thick, flammable liquid made of the remains of plants and animals that lived over 70 million years ago.

power plant
A place where energy is generated.

renewable energy
An energy source such as solar or wind that can be restored by nature.
Procedures

1. Display some small appliances or electronic devices that require electricity to “work” (e.g., battery chargers, hair dryer, a study lamp, etc.). Ask the class what is needed for the appliance/equipment to work. Plug in the appliances/equipment and discuss the “jobs” they perform. For example, the lamp provides light, and the hair dryer provides heat to dry hair. Tell students that the class will be investigating energy, where it comes from, how we use it, and how it can be used wisely and not wasted.

Distribute the Energy Checkup: Power Down for the Environment activity books. Have students analyze what they think this title means? What is a checkup? What is meant by “power down”? Explain that in this study energy refers to the electricity and natural gas that keeps (or powers) all our appliances, electronic equipment, and devices. Announce that the class will be studying more about the energy they use each day and why it should be used in an energy-saving manner and not wasted.

2. Review the Table of Contents with students, and discuss the quote from Stephen Chu. Have students write their names on the inside cover of the activity book. Ask students to read Why Power Down for the Environment? On page 1. After reading this silently they should pair and share with a partner what they think are the major ideas in this reading. Have a class discussion related to these major ideas and tell students at the end of this study they will “revisit” this Why? page.

“As the saying goes the Stone Age didn’t end because we ran out of stones. We transitioned to better solutions. The same opportunity is before us with energy efficiency and clean energy.”

— Steven Chu, American physicist (1948-)

3. Present and/or review the vocabulary that will be covered in this first lesson. Students should be encouraged to use the glossary in their own activity books and to also determine the meaning of words and phrases from how they are used in the text.

Have students read page 2, What is Powering Your Day? Ask them to discuss some of the many ways their personal lives depend on energy each day. Also ask them to identify and provide examples of energy use beyond those in the reading.
Ask students to give examples of what it means to be energy-efficient. Have students look at the chart on page 3 and the directions on page 2 on how to complete the chart. Review their responses and discuss items on the chart that could be powered down to save energy.

4 Introduce the reading Power Path: Electricity on page 4 and also the Power Point! text on the same page. Have students work in small groups to discuss what they discovered from the text on this page. Focus students on the long journey, from the time an energy source is mined or dug, to the point where electricity powers a video game or lights a city street. Organize small groups of students to complete one or more of the activities listed on page 4. Students should be prepared to present their findings or projects to the whole class.

5 Introduce Power Path: Natural Gas, on page 5. This is the path that natural gas takes to reach where it is used in homes, schools, factories, and other buildings. Students will learn from their reading that in homes natural gas is most often used for cooking, drying clothes, and for water and space heating. Natural gas is used both in power plants to generate electricity and it is also used in a direct way by being piped right into homes and other buildings for use in heating and cooking. Assign students to work in small groups to answer the three questions about natural gas that are listed on page 5.

6 Organize the class into small groups and assign each group a part of the Our Energy Use and the Environment text (page 6) to read and present to the class. Each group should encourage active listening by having questions they will ask of other classmates. At the end of these presentations have students summarize major ideas they have learned about environmental impacts of energy use and production. Major ideas should include that power plants burning fossil fuels to generate electricity release greenhouse gases into the atmosphere. These heat-trapping gases are warming the planet and contributing to global climate change (e.g., droughts, warming of the ocean, melting of glaciers, rising sea levels, less snowpack, etc.).

Ask students to work in their small groups to complete one of the four activities suggested on page 6.

7 Assign students the Review and Recall activity on page 7. Explain that they are to make a match between definitions with the correct words or phrases. This can be completed as an open book activity. Have students write paragraphs
using a certain number of the words or phrases as a follow up activity. See Appendix A for the Answer Key to this Review and Recall activity.

8 Introduce the Power Down at School activities by having a discussion of the Power Point! on page 8. Ask students what the major ideas in this text are and what, if anything, was a surprise to them. Discuss how all the class will be involved in conducting a checkup of how energy is used (and also wasted) throughout the school. An interview with the principal or a school energy manager should be planned before the students actually do their Power Down walk through the school. Teachers and staff at the school should all be notified of this energy checkup activity that students will be conducting.

9 Discuss how the charts on pages 9 and 10 will be used to record what they see on their energy investigations. These charts should be adjusted to reflect your own school setting as school facilities can vary widely. Before beginning students can make these adjustments in their activity books. Some schools, for example, have a multi-purpose room but no cafeteria, while other schools might have a gym but no auditorium.

Remind students that after their Power Down walk they will make a list of general recommendations to present to the principal and other school staff. These recommendations should be written in a “positive” manner and not in a way that reflects badly on any staff member.

10 Schedule time to review the charts and/or photos that students have taken of wasteful situations they observed. Remind students that when energy is wasted, natural resources are wasted, and money is wasted too. Refer students again to the Power Point! (on page 8) about the projected savings if schools would practice energy-efficient behaviors.

Conclude lesson 1 with a reading of the text You Have the Power: Take Action and a completion of the activities listed on page 11. Organize students in groups to complete one or more of the three activities. Schedule time for the groups to work together to complete the recommendations, the energy-saving slogans, posters, and a bulletin board to illustrate how the school could power down its use of energy.
Extend the Learning

∫ Organize an Energy Patrol
An energy patrol includes students who volunteer to observe energy use in a classroom and/or the entire school. Patrol members monitor where energy is being wasted in classrooms and throughout the school building. The monitoring includes lights left on in empty rooms, computers not set in energy-saving mode, leaking faucets, windows open when heaters are working, lack of recycling, as well as paper and other supplies being wasted.

Monitors also identify good energy-saving behaviors taking place in the school. Information on forming an energy patrol can be searched at www.energyquest.ca.gov.

∫ Energy Auditor: A Green Job
Students can research the job of an energy auditor and determine what this job involves and what skills are needed. Students should relate this job to the “investigation” they conducted on energy use at the school.

They can develop a Q and A interview with a “hypothetical” energy auditor based on the research they did on the job of an auditor. The interview can be an interesting way to present this job to the rest of the class. Students will write both the question and answers and role play their interviews.

Students should discuss at the end of the interviews what makes this job a green job.

∫ Vampire Energy Poster Contest
Spread the word at the school about vampire, stand-by, or leaking energy by having your class sponsor a poster contest. The posters should alert students to be aware of these vampires that are standing by and not powering anything. These vampires waste energy and also money spent on utility bills. See www.standbylbl.gov

Ask the principal to be involved in selecting a panel to judge the posters and to provide a few prizes. All the entries should be posted around the school.
Lesson at a Glance

Students shift their power down emphasis from the school to the home in this lesson. Through a checkup survey on their own energy use they focus on whether they are using more energy than needed to get a job done. They write their own energy checkup items and also research websites that indicate that machines and appliances along with people can be energy-efficient.

Teacher Background

Our lives are filled with machines, electronic equipment, and devices that work for us and they all need energy to make them work. As students develop their own energy checkup survey items they focus on just how much energy they do use each day.

The survey items students write will vary because family situations differ. For example, some students are allowed to adjust the thermostat, or use the clothes washer, or heat a meal while only adults in some families do these things. Students learn in this lesson that although energy-saving behaviors are important there are fix-its or technologies that help save energy.

Student Objectives

- Students will be able to read and interpret text and visual information on creating survey items.
- Students will be able to collaborate on class projects by contributing to research and presentations.
- Students will be able to search the internet to research assignments and will cite/evaluate sources of information.
- Students will be able to recall and define vocabulary used in this study.

Materials

Provided:

Needed:
- Internet access

Time Needed

One to two class periods
1. Introduce lesson 2 by telling students that they are about to answer some sample energy checkup items in their activity books. Stress that their individual responses do not have to be shared and they should be honest in answering. Students are given three possible responses to check — always, sometimes, or never. Discuss, for example, survey item 3 about letting the water run while brushing teeth. Students should be reminded that when water is wasted energy is also wasted and vice-versa.

2. Use question 1 about unplugging chargers when they are not charging anything for a discussion of vampire or leaking energy. Vampire or phantom energy is what is wasted when cell phone, laptop, cordless phones, mp3 players, or other devices are plugged in but not doing their “work.” This vampire energy is not only wasting energy but money too.
Teachers wanting to tally responses to the sample survey items could have students write on paper the numbers 1 to 5 and after each number (reflecting that survey question) to write always, sometimes, and never. Papers, without any names, can be collected and a tally done to determine how students are doing so far about powering down! This activity could be repeated later in the school year to see any changes in energy-saving behaviors.

Assign students to write their own eight survey items on how they use energy at home. This activity could be assigned as homework. Stress to students that they should not just repeat any of the five items listed on page 12. Remind students again to be honest in answering these survey items.

Ask students to volunteer to read some of their survey items but they DO NOT have to share their responses. Explain that this checkup survey is to help them personally identify how they could “power down” in their own homes.

Assign students the reading on page 14 on Energy-Efficient Fix-Its. Fix-Its refers to the appliances, electronic equipment, lighting (CFLs and LED bulbs), and other devices that save energy. Informational text so far in this activity book has made references only to people being energy-efficient, or using only the amount of energy needed to get a job done. Now they will discover that there are ways to save energy when energy-efficient products are combined with energy-efficient behaviors.

Ask students to summarize the text on page 14 by writing a paragraph on what it means for a person or a device to be energy-efficient. They should give their paragraphs a title that could entice others to read it. Have students share their writings either by posting them or reading aloud during a class session.

Organize the students into small groups to work together to complete the activities on page 15. Students should be able to document their responses by providing the source of information they used to complete this activity. Schedule times for students to present their findings to the class. (Sample answers to these activities can be found in the Answer Key in Appendix A.)

Summarize this lesson by reviewing the activities they completed in lesson 2 and by asking each student to say one thing they will now do “differently” to power down at home.
Shifting Demand for Energy
The peak demand for energy each day is between noon and 7:00 p.m. Students could analyze why the demand of energy shifts during peak times during the day. They could also ask their parents and guardians why they think there are peak demand times for energy.

Students should report their findings to the class. They should also include how peak demand impacts the utilities that are providing the energy.

Conduct a discussion on actions that households, businesses, and schools could shift demand for energy to non-peak hours.

Connections: Water Needs Energy
When we wash our hands, clothes, or take a shower or just watch water go down the drain, there is “energy” at work. Energy is needed to pump, transfer, and distribute water. Energy is used at wastewater treatment plants to clean and purify waters. All of this moving and treating of water takes a lot of energy.

Promote a Water-Wise School:
1. Form hydro teams to investigate where water is being used in your school.
2. List and discuss where water is being wasted and where it is being used without waste.
3. Make recommendations on how students and staff could conserve water. List the water-saving behaviors and water-efficient technologies that will help conserve water.
4. Create posters or a digital photo display to promote water conservation at your school.
5. Create a bulletin board or mural to illustrate that when water is conserved, energy is also conserved.

POWER POINTS!
Organize students in small groups to develop their own Power Points. These Power Points can be posted around the school to will help inform others the importance of not wasting energy and water too.

Students could include these Power Points in the school newspaper or class bulletins, parent newsletters, etc.
Lesson at a Glance

How do we measure and pay for the energy we use? This lesson opens with an activity on how the electricity and natural gas people use is measured and priced. They learn new terms like watts and therms to add to the Word Wall. A crossword Power Puzzle helps to review some key concepts and vocabulary from this study. The lesson concludes with an activity to get families involved in a Home Energy Checkup that can be completed online.

Teacher Background

This final lesson provides activities related to how the energy we use is measured and paid for by consumers. They learn that saving energy also saves money! An annotated listing of websites covering energy related topics provides students ideas to continue this study. Also featured are websites that will help them form green (or environmental) teams at their school.

Power Puzzle

The Power Puzzle with its 24 words covers vocabulary and concepts presented in this unit. The puzzle can be used as a closed or open book activity.

At the end of the activity book is a letter for students to share with parents and guardians. This letter covers what students have been learning in class and also how to go online and complete the Pacific Gas and Electric Company (PG&E) Home Energy Checkup. The Home Energy Checkup can be found at www.pge.com/homeenergycheckup.

Student Objectives

• Students will be able to explain how energy use is measured in therms and kilowatt-hours.
• Students will be able to analyze a chart illustrating where money is spent on energy.
• Students will be able to recall energy-related vocabulary and concepts from this study.
• Students will be able to summarize what they have learned in this study.

Materials

Provided:

Needed:
• Internet access

Time Needed

Two class periods
Vocabulary

kilowatt
A unit of measurement of electric power that equals 1,000 watts.

therm
A measurement of the amount of natural gas that is used.

utility
An agency or company that supplies electricity, natural gas, water, or phone service.

watt
A measure of power.
Introduce the activity Paying for Power (pages 16–17) by asking students if they know how the school or their family pay for the amount of “power” they use. Discuss their responses and ask students to read the text and analyze the graph on page 16 and to review the Power Point! text on page 17. Ask students why people don’t just pay a flat rate for electricity and natural gas (e.g., consumers pay for what they actually use). Explain that usage can vary widely by size of homes, energy-saving behaviors and wasteful habits of the people that live in the home.

Discuss that the bar graph shows where money is spent on energy in an average U.S. household. Ask what is meant by an average household in the United States. An average only provides a big picture by taking what is spent nationally for such things as cooling and space heating. Ask students if people living in the Mojave Desert of California would pay more for air conditioning (cooling) than people living in the Sierra mountains where it snows a part of the year. Residents in the mountains would no doubt be paying more for heating than those living in the desert.

Assign students to analyze the graph, Where Does the Money Go? and complete the activities on page 17. Ask if there are any items on the graph that they do not understand. For example, they should know that space heating refers to a furnace or other type of heating used to heat a house or apartment, while water heating refers to the money spent to heat water for showers, washing dishes, or clothes.

Review their responses and ask students to correct, if needed, their activity books. See Answer Key in Appendix A. Ask students if there are vocabulary words from this activity they want to add to the Word Wall in the class.

Ask students to look at the list of websites on page 18. Assign small groups of students to work together to review one or more sites. They should report back to the class on what they discovered and how this information related to what they have been learning in this study. The websites listed on page 19 under Organize a Green Team offer suggestions on how your class or school could create such a team to conserve natural
resources and protect the environment.

6 Have students turn to the Power Puzzle on pages 20–21. This puzzle can be completed as an open book activity, thus allowing students to review past activities and refer to their own glossary. Review the answers with students and ask if there were any items that were not easily understood. The Answer Key to the Power Puzzle is in Appendix A.

7 Ask students to turn to Page 26, the PG&E Home Energy Checkup, and read the text which is directed to their parents or guardians. Discuss the importance of getting all the family involved in saving energy. Remind students of their own school and home checkup investigation and surveys that helped them learn energy-saving behaviors.

8 Summarize the final activities in this lesson and next have students return to page 1 in their books to re-read Why Power Down for the Environment? Discuss with students how this question was answered for them as they completed this study.

Remind students to take home their activity books to share with parents, guardians, and other family members.
Answer Keys for Student Activities

**NOTE:** Answers to the energy use and energy-saving idea activities will vary, but examples could include:

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### Section 1 Activity

**Page 7, Our Energy Use and the Environment: Review and Recall Activity**

**Words or Phrases:**

- **f** wind power
- **k** greenhouse gases
- **m** fossil fuels
- **g** deposits
- **d** energy efficiency
- **e** drought
- **i** pollutants
- **l** checkup
- **c** conservation
- **h** odorized
- **b** voltage
- **n** appliance
- **a** carbon dioxide
- **j** climate

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### Section 2 Activity

**Page 15, Energy-Efficient Fix-Its: Five Questions**

**Sample Answers:**

1) The designation of ENERGYSTAR means that appliance, electronic device lighting, office equipment is one that is energy-efficient. This is a government labeling program.

2) Vampire energy is energy that is wasted when appliances and electronic equipment is in standby mode. Some examples in a household could be video game devices, televisions, and coffee makers.

3) A quicker shower saves energy because it takes energy to heat the water and also energy to transport and clean the water before it is ready to use again.

4) Motions sensors save energy because they go off when people leave a room and go on only when people occupy a room. There is not waste waiting for lights to be turned off by a person. Saving energy means saving money because households and schools are charged by the amount of energy they use.

5) Some of the biggest energy users in an average home are those that involve heating and cooling. There is both space heating (furnaces) and water heating. Air conditioning (AC) is also a big energy user for some families who live where the weather is very hot. Climate affects how much energy is used by a family.
Section 3 Activity

Page 17, Paying for Power: Where Does the Money Go?

1) In an average US home 14% of a utility bill is for heating water and another 29% is for space heating. An average California home would pay $688 annually for these heating functions. Note: The text on page 16 provides an average yearly energy cost for California of $1,600.

2) Lighting and electronics in an average U.S. home accounts for 16% of a utility bill. These two items would annually cost an average California family $256 dollars.

3) Answers about energy-saving actions and technologies will vary.

4) Answers related to recommendations (energy-saving technologies for their homes) will vary by student.

Section 3 Activity

Pages 20-21, Power Puzzle

Solution to crossword puzzle:
alternative energy
See renewable energy.

appliance
A type of equipment, usually powered by electricity, used to perform a function. Common appliances include dishwashers, refrigerators, microwave ovens, and televisions.

atmosphere
The whole mass of air surrounding the Earth.

battery
A device that stores energy and produces an electric current.

carbon dioxide (CO₂)
See greenhouse gas.

checkup
To examine, survey or evaluate.

chemical energy
Energy that is stored in a substance that is released during a chemical reaction. Chemical energy, for example, stored in batteries, can be changed into electrical energy.

circuit
A circular path that an electric current travels.

climate
The average weather in a place over a long period of time.

climate change
Refers to any significant change in measures of climate (such as temperature, precipitation, droughts, warming of the oceans) lasting for an extended period of time. [www.epa.gov/climatechange/basic.info](http://www.epa.gov/climatechange/basic.info)

coal
A fossil fuel and a nonrenewable energy source. Coal comes from the remains of plant life that lived many millions of years ago.

compact fluorescent light bulb (CFL)
A bulb that produces light by passing electricity through a gas.

conservation
The management, protection, and wise use of natural resources.

demand response
Programs and ways that energy companies (utilities) and consumers can better manage when and how they use energy. Using less energy during peak demand hours is an example of demand response.

distributed generation
The generation of electricity near to the place where it is being used. On-site distributed energy generation examples include a school powered by solar panels, a farm powered by its wind turbines, and an office building powered by fuel cells.

drought
A long period of dry weather.

electric grid
All the networks that carry electricity from power plants to where it is used. The grid includes power lines, substations, transformers, distribution wires, and more.

electricity
A secondary form of energy that is used for lighting, heating, and running forms of transportation.

emission
A discharge or release of pollutants into the air, such as from a power plant, smokestack, or automobile engine.

energy efficiency
The use of energy without waste. Energy efficiency refers to work done using the smallest amount of energy needed.
environment
Something that surrounds: surroundings. The natural environment includes land, air, water, and other features of nature.

fossil fuels
Fuels formed from the remains of plants and animals that lived over 70 million years ago. Coal, oil, and natural gas are fossil fuels.

generator
A device used to convert mechanical energy into electrical energy.

global warming
Global warming is an average increase in the temperature of the atmosphere near the Earth’s surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, “global warming” often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities. www.epa.gov/climatechange/basics/

green
A color. Green can also be used to mean a person or process that helps protect or is “friendly” to the environment.

greenhouse effect
The effect produced when greenhouse gases trap solar radiation in the Earth’s atmosphere and warm the planet. This process occurs naturally and has kept the Earth’s temperature about 60 degrees Fahrenheit warmer than it would be without it. Current life on Earth could not continue without the greenhouse effect. www.energystar.gov/index.cfm?c=kids.kids_index

greenhouse gas (GHG)
A gas, such as carbon dioxide (CO₂) or methane (CH₄), that traps the heat of the sun in the Earth’s atmosphere.

greenhouse gas emission
A discharge of greenhouse gas (GHG) into the atmosphere.

green jobs
Careers or jobs that focus on protecting the environment and conserving natural resources.

grid
The overall layout of a distribution system for electricity. See electric grid.

kilowatt
A unit of measurement of electric power that equals 1,000 watts.

kilowatt-hour (kWh)
A unit of measurement of electricity used which translates to one kilowatt used for one hour.

light-emitting diode (LED)
A bulb that contains a semiconductor diode that emits light when conducting electrical current.

natural gas
An air-like substance found in the Earth that can be burned for heat or fuel.

natural resource
A materials used by people. Water, air, plants, and soil are examples of natural resources.

nonrenewable energy
An energy source such as coal or oil that cannot be easily replenished. They were formed millions of years ago.

oil
See petroleum.

outage
A period of time when a power supply is not available.
**peak demand**
The times during the day when the demand for electricity is the highest. This period of the day is between noon and 7:00 p.m.

**petroleum (oil)**
A natural, thick, flammable liquid made of the remains of plants and animals that lived over 70 million years ago.

**pollution**
Impurities in air, water, and land that create an unclean environment.

**power plant**
A place where energy is generated.

**propane**
A nonrenewable energy source that is produced as a by-product of natural gas processing and oil refining.

**renewable energy**
An energy source such as solar or wind that can be restored by nature.

**solar energy**
Energy which comes directly from the sun.

**substation**
A facility where the voltage of electricity flowing through a transmission line is reduced.

**survey**
To collect information through observations, questionnaires, etc., and analyze it. The tool for collecting information.

**therm**
A measurement of the amount of natural gas that is used.

**transformer**
A device to change the voltage of an electric current.

**transmission line**
Wires used to carry electricity from a power plant to a substation, where the voltage is reduced.

**turbine**
A machine with blades used in the production of electricity. Turbines can drive a generator by the forces of steam, moving water, or wind. See generator.

**vampire energy**
A measure of how hard electricity is being pushed through a conductor such as a transmission line. Energy wasted when a charger is left plugged in after the device is fully charged or by a device left in a stand-by state.

**utility**
An agency or company that supplies electricity, natural gas, water, Internet, or phone service.

**voltage**
A measure of how hard electricity is being pushed through a conductor such as a transmission line.

**watt**
A measure of power.

**wind**
The word used to describe any natural movement of air in the atmosphere.

**weather**
What is happening in the atmosphere right now in a given place.
A World of Abbreviations

Teachers decipher and use many abbreviations in their daily work life. Abbreviations of late include CCSS for Common Core State Standards, NGSS for Next Generation Science Standards, and the acronym STEM. STEM has become an abbreviated way for educators, journalists, politicians, and parents to discuss and emphasize the teaching of science, technology, engineering, and mathematics.

The Utility World

In the energy utilities world there are also many abbreviations and right up front is DSM (Demand Side Management). DSM is something that affects more than utility workers in the energy sector because it involves anyone who is a consumer of energy. DSM covers actions that influence the amount of energy used and the time of day it is used. DSM also covers households and businesses that are generating their own electricity and often have a surplus to return to the electric grid.

DSM is an overarching idea that is made up of three main parts. These parts are energy efficiency (EE), demand response (DR), and distributed generation (DG). The California Public Utilities Commission (CPUC) refers to these three parts as Integrated Demand Side Management (IDSM).*

Demand Side Management (DSM)

DSM gives the consumer programs designed to both change the level and patterns of energy they demand. Utilities (the supply side) now offer incentives, real-time data, and messages related to shifting time of use, along with familiar energy efficiency tips.

Demand side management (DSM) programs have energy efficiency (EE) as a primary goal. Energy efficiency (EE) is also a major component in all of the PG&E Energenius materials beginning with the preschool child up through the middle school student. Students using the Energenius materials, are also introduced, as age appropriate, to demand response (DR) and distributed generation (DG).

* A California Public Utilities Commission IDSM Program Summary Fact Sheet can be downloaded at www.cpuc.ca.gov.
Appendix B
**California Common Core Standards**

**Energy Checkup: Power Down for the Environment Correlations for Grade 5**

<table>
<thead>
<tr>
<th>Common Core Standards</th>
<th>Lesson One</th>
<th>Lesson Two</th>
<th>Lesson Three</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language Standards (LS)</strong></td>
<td><strong>Power Down: Follow the Paths</strong></td>
<td><strong>Power Down at Home</strong></td>
<td><strong>Connections</strong></td>
</tr>
<tr>
<td>Vocabulary Acquisition &amp; Use</td>
<td>ACTIVITIES</td>
<td>ACTIVITIES</td>
<td>ACTIVITIES</td>
</tr>
</tbody>
</table>
| 5. LS.4c. Consult reference materials, both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases. | Students:  
• create a Word Wall with new vocabulary from reading the power path of electricity.  
• complete a Review and Recall exercise to match key words and phrases with correct definitions. | Students:  
• utilize the glossary and text to match precise meanings of vocabulary (e.g., energy-efficient technologies, fix-its, devices, etc.). | Students:  
• consult the glossary and informational text to solve the power down puzzle that utilizes domain-specific vocabulary. |

**Reading Standards for Informational Text (RST) Craft and Structure**

| RST.4. Determine the meaning of general academic and domain-specific words and phrases in a text. | Students:  
• utilize informational text to determine domain-specific vocabulary related to energy sources, use, and production.  
• analyze text to determine the path of electricity and natural gas. | Students:  
• read information on writing survey questions and apply findings to their own surveys.  
• determine from informational text how both people and devices can be energy-efficient. | Students:  
• review informational text to solve a power down crossword puzzle that utilizes domain-specific words and phrases. |

**Reading Standards for Informational Text (RST) Integration of Knowledge & Ideas**

| RST.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. | Students:  
• integrate informational text and student produced diagrams to illustrate the formation of petroleum and natural gas. | Students:  
• combine info from a bar graph and text to analyze how energy is used in US households.  
• utilize suggested web-based resources to research and write about topics related to this study. | Students:  
• consult the glossary and informational text to solve the power down puzzle that utilizes domain-specific vocabulary. |

*California Common Core State Standards for English-Language Arts & Literacy in History/Social Studies, Science and Technical Subjects (Adopted by the California State Board of Education August, 2010 and modified March, 2013)*
### Common Core Standards Lesson One

**Power Down: Follow the Paths**

#### Reading Standards for Informational Text (RST)

**Range of Reading Level of Text Complexity**

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.RST.1.0.0</td>
<td>read informational text and write about what they gained from this website.</td>
</tr>
<tr>
<td>5.RST.1.0.0</td>
<td>utilize informational text along with class discussions to understand key points to understand natural gas and petroleum formation.</td>
</tr>
</tbody>
</table>

#### Writing Standards (WS)

**Research to Build and Present Knowledge**

<table>
<thead>
<tr>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.WS.6.0.0</td>
</tr>
<tr>
<td>5.WS.7.0.0</td>
</tr>
</tbody>
</table>

### Common Core Standards Lesson Two

**Power Down at Home**

#### Reading Standards for Informational Text (RST)

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.RST.1.0.0</td>
<td>read informational text and write about topics related to this energy study.</td>
</tr>
<tr>
<td>5.RST.1.0.0</td>
<td>utilize web-based resources to research and write personal actions to save energy at home and school, and discuss the environmental impacts of energy production.</td>
</tr>
</tbody>
</table>

#### Writing Standards (WS)

**Research to Build and Present Knowledge**

<table>
<thead>
<tr>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.WS.6.0.0</td>
</tr>
<tr>
<td>5.WS.7.0.0</td>
</tr>
</tbody>
</table>

### Common Core Standards Lesson Three

**Connections**

#### Reading Standards for Informational Text (RST)

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.RST.1.0.0</td>
<td>read and comprehend informational text in section on the Home Energy Checkup in order to present the idea to family members.</td>
</tr>
<tr>
<td>5.RST.1.0.0</td>
<td>revisit opening of activity book on why an energy checkup for the environment and analyze what they have read to help them analyze the reasons for this study.</td>
</tr>
</tbody>
</table>

#### Writing Standards (WS)

**Research to Build and Present Knowledge**

<table>
<thead>
<tr>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.WS.6.0.0</td>
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<tr>
<td>5.WS.7.0.0</td>
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</tbody>
</table>

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**Common Core State Standards**

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.RST.1.0.0</td>
<td>read informational text and write about topics related to this energy study.</td>
</tr>
<tr>
<td>5.WS.6.0.0</td>
<td>complete short research projects using several sources as part of their study on the formation of petroleum and natural gas (<a href="http://www.eia.gov/kids">www.eia.gov/kids</a>).</td>
</tr>
<tr>
<td>5.WS.7.0.0</td>
<td>conduct short research projects using several sources as part of their study on the formation of petroleum and natural gas (<a href="http://www.eia.gov/kids">www.eia.gov/kids</a>).</td>
</tr>
<tr>
<td>Common Core Standards (continued)</td>
<td></td>
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<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Writing Standards (WS)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Range of Writing</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Lesson One</strong></td>
<td></td>
</tr>
<tr>
<td><em>Power Down: Follow the Paths</em></td>
<td></td>
</tr>
<tr>
<td><strong>ACTIVITIES</strong></td>
<td></td>
</tr>
<tr>
<td>5.WS.10. Write routinely over extended and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
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<tr>
<td>• utilize informational text along with a class discussion to create and write personal energy-saving ideas.</td>
<td></td>
</tr>
<tr>
<td>• create posters and/or bulletin boards for their school by utilizing informational text and by writing their own energy conservation slogans or messages.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td>• create their own Energy Use Survey by reviewing informational text and by writing energy-efficient survey items.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td>• utilize web-based resources to research and write about topics related to this energy study.</td>
<td></td>
</tr>
<tr>
<td>• write personal actions to save energy at home and school, and discuss the environmental impacts from energy use.</td>
<td></td>
</tr>
<tr>
<td><strong>Speaking and Listening (SL) Comprehension and Collaboration</strong></td>
<td></td>
</tr>
<tr>
<td>5.SL.1d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td>• utilize informational text and a class discussion to complete a chart identifying the ways they use energy at school and home.</td>
<td></td>
</tr>
<tr>
<td>• utilize informational text along with a class discussion to create and write personal energy-saving ideas.</td>
<td></td>
</tr>
<tr>
<td>• create posters and/or bulletin boards for their school by utilizing informational text and writing energy conservation slogans or messages.</td>
<td></td>
</tr>
<tr>
<td>• read informational text, analyze diagrams, and discuss key points to understand natural gas and petroleum formation.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td>• create their own Energy Use Survey by reviewing informational text and writing energy-efficient survey items.</td>
<td></td>
</tr>
<tr>
<td>• discuss and recall relevant information from activity book related to energy conservation and environmental impacts of energy production and use.</td>
<td></td>
</tr>
<tr>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td>• analyze data from a utility bill to discuss energy costs and identify big &quot;energy users.&quot;</td>
<td></td>
</tr>
<tr>
<td>• write personal actions to save energy at home and school, and discuss the environmental impacts of energy use.</td>
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</tr>
</tbody>
</table>
## California Common Core Standards*

### Energy Checkup: Power Down for the Environment Correlations for Grade 6

<table>
<thead>
<tr>
<th>Common Core Standards</th>
<th>Lesson One</th>
<th>Lesson Two</th>
<th>Lesson Three</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RSIT.1.</strong> Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.</td>
<td>Students: • reference informational text from readings in activity book in order to discuss environmental impacts of energy generation from fossil fuels.</td>
<td>Students: • cite text in analyzing the purpose of survey items as they relate to “powering down” of energy use at home.</td>
<td>Students: • cite text and Power Point! to help analyze how the language of energy measurement works.</td>
</tr>
<tr>
<td><strong>RSIT.2.</strong> Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.</td>
<td>Students: • read and summarize text that provides details on the path electricity travels from power plants to reach where it is used. • read informational text and summarize the journeys of natural gas from drilling stage to the end user.</td>
<td>Students: • read text and discuss the main ideas related to creating survey items on energy use. • read text and analyze how to apply the concepts of always, sometimes, or never to answering the survey items.</td>
<td>Students: • read and summarize how the language of energy measurement works (e.g., how do we pay for the energy we use ?). • read informational text and analyze a bar graph to determine where money is spent on energy.</td>
</tr>
<tr>
<td><strong>RSIT.3.</strong> Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).</td>
<td>Students: • analyze the quotation from Steven Chu (American physicist) related to how he referenced the stone age to connect with energy efficiency and clean energy. • analyze the key idea in the Power Point (p. 8) that money spent by schools on energy could be saved and spent on materials and equipment (e.g., other priorities).</td>
<td>Students: • read text and discuss the “idea” of how people as well as devices can be energy-efficient.</td>
<td>Students: • read informational text on page 16 and discuss the idea of geographic differences (and household preferences) in how energy is used.</td>
</tr>
<tr>
<td><strong>RSIT.4.</strong> Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</td>
<td>Students: • discuss the definitions of new words in this lesson (or new meanings for specific words). • contribute to a Word Wall for the classroom. • complete the Review and Recall activity matching definitions with correct word or phrases.</td>
<td>Students: • determine the meaning of how both a person and a technology can be energy efficient (e.g., section on fix-its or EE technologies).</td>
<td>Students: • recall phrases and words in order to complete the Power Down crossword puzzle.</td>
</tr>
</tbody>
</table>

* California Common Core State Standards for English-Language Arts & Literacy in History/Social Studies, Science and Technical Subjects (Adopted by the California State Board of Education August, 2010 and modified March, 2013)
### Common Core State Standards (continued)

<table>
<thead>
<tr>
<th>Reading Standards for Informational Text (RSIT)</th>
<th>Lesson One</th>
<th>Lesson Two</th>
<th>Lesson Three</th>
</tr>
</thead>
</table>
| **6.RSIT.6.** Determine an author's point of view or purpose in a text and explain how it is conveyed in the text. | Students:  
- determine the purpose of informational text in this activity book by analyzing and discussing page 1 (e.g., why power down for the environment?). | Students:  
- discuss the inclusion of video game systems to illustrate how power is used when equipment is in idle mode. | Students:  
- combine information from a bar graph chart and text to analyze how energy, on average, is used in US households. |
| **6.RSIT.7.** Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. | Students:  
- integrate textual information and student-produced diagrams to illustrate the formation of petroleum and natural gas.  
- use information from text and from a YouTube video to explain how electricity is generated in a power plant. | Students:  
- integrate information from text and from a YouTube video to explain how electricity is generated in a power plant. | Students:  
- combine information from a bar graph chart and text to analyze how energy, on average, is used in US households. |

<table>
<thead>
<tr>
<th>Writing Standards (WS)</th>
<th>Lesson One</th>
<th>Lesson Two</th>
<th>Lesson Three</th>
</tr>
</thead>
</table>
| **6.WS.2.** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization and analysis of relevant content. | Students:  
- write a list to examine ways they personally use energy during a typical day in their own lives.  
- write responses to questions (p. 5) that indicate they have gained information on the path of natural gas from drilling state to the end use.  
- develop and write a list of recommendations for saving energy at the school. | Students:  
- write text for survey items they plan to respond to as a basis for completing activities in lesson two.  
- write informational text (p. 14 activity) on energy-efficient technologies and/or on what it means to power down. | Students:  
- write, in response to activity on page 17, about energy-efficient actions or technologies they would suggest to consume less energy.  
- write in response to Internet research activity their OWN description of what they discovered at one of the suggested websites. |
| **6.WS.2a.** Introduce a topic or thesis statement; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. | Students:  
- organize group and individual presentations related to their energy investigations of various locations within the school (e.g., using a variety of strategies and visuals). | Students:  
- organize information about energy use surveys using the template provided or other strategies to enhance their understanding of survey tools. | Students:  
- write in response to activity on page 17, about energy-efficient actions or technologies they would suggest to consume less energy.  
- write in response to Internet research activity their OWN description of what they discovered at one of the suggested websites. |
<table>
<thead>
<tr>
<th>Common Core Standards</th>
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<th>Lesson Three</th>
</tr>
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<tbody>
<tr>
<td><strong>Writing Standards (WS)</strong></td>
<td><strong>Power Down: Follow the Paths</strong></td>
<td><strong>Power Down at Home</strong></td>
<td><strong>Connections</strong></td>
</tr>
</tbody>
</table>
| **6.WS.6.** Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others. | Students:  
- use the Internet (EPA government website) to learn about greenhouse gases and global climate change. Projects will include writing about what they gained from this EPA website.  
- collaborate on projects using information from the Internet to complete activities on energy sources, energy efficiency, and energy audits. | Students:  
- will complete writing activities using the Internet to find descriptive materials on energy efficient technologies (fix-it devices). | Students:  
- will preview a number of suggested websites and describe the information they found helpful/relevant on these sites. |
| **6.WS.7.** Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate. | Students:  
- conduct short research projects using several sources as part of their study on the formation of petroleum and natural gas. (www.eia.gov/kids — a suggested site to begin) | Students:  
- conduct short research projects on energy efficient technologies (or fix-it devices). | Students:  
- research from a list of suggested websites and write a description of the information gained from one or more of these sites. |
| **6.WS.9.** Draw evidence from literary or informational texts to support analysis, reflection, and research. | Students:  
- use informational text on fossil fuels and greenhouse gas emissions to support the connections between personal energy use, energy production, and global climate change. | Students:  
- read the informational text to support the data in the bar graph on household energy use. | Students:  
- read the informational text to support the data in the bar graph on household energy use. |
<table>
<thead>
<tr>
<th>Common Core Standards</th>
<th>Lesson One</th>
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<th>Lesson Three</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speaking and Learning Standards (SLS)</strong></td>
<td><strong>Power Down: Follow the Paths</strong></td>
<td><strong>Power Down at Home</strong></td>
<td><strong>Connections</strong></td>
</tr>
<tr>
<td><strong>6.SLS.1.</strong> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.</td>
<td>Students:</td>
<td>Students:</td>
<td>Students:</td>
</tr>
<tr>
<td></td>
<td>• participate in group projects by “actively” contributing to discussions and overall presentations to the entire class (e.g., power down activities on pages 8 and 11).</td>
<td>• work in small groups to complete the five questions related to energy saving technologies (page 15 of activity book).</td>
<td>• interpret a bar graph (Where Does the Money Go?) that illustrates by percentage where money goes in the US to pay for the energy that powers households.</td>
</tr>
<tr>
<td></td>
<td>• jointly develop recommendations on energy savings to present to the school principal.</td>
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<td></td>
</tr>
<tr>
<td><strong>6.SLS.2.</strong> Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.</td>
<td>Students:</td>
<td>Students:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• interpret information on global climate change from websites, YouTube videos, and print text in student activity book (e.g., students also discuss how graphic materials will enhance their own presentations to classmates).</td>
<td>• interpret a bar graph (Where Does the Money Go?) that illustrates by percentage where money goes in the US to pay for the energy that powers households.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reading Standards for Literacy in Science &amp; Technical Subjects (RST)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6-8.RST.1.</strong> Cite specific textual evidence to support analysis of science and technical texts.</td>
<td>Students:</td>
<td>Students:</td>
</tr>
<tr>
<td></td>
<td>• cite specific text, for example, on transmission lines, voltage, nonrenewable sources, transformers, etc. when discussing the power path of electricity.</td>
<td>• cite specific text on the two paths of natural gas.</td>
</tr>
<tr>
<td></td>
<td>• cite specific text on the two paths of natural gas.</td>
<td></td>
</tr>
<tr>
<td><strong>6-8.RST.4.</strong> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</td>
<td>Students:</td>
<td>Students:</td>
</tr>
<tr>
<td></td>
<td>• determine that symbols are used for chemical elements in the text they are reading (e.g., $\text{CO}_2$ for carbon dioxide). They also determine the meaning of greenhouse gas (GHG) emissions, global climate change and other related terms.</td>
<td>• recall specific words, key terms and symbols to complete the Power Down crossword puzzle.</td>
</tr>
</tbody>
</table>
### Common Core State Standards (continued)

<table>
<thead>
<tr>
<th>Common Core Standards</th>
<th>Lesson One Power Down: Follow the Paths</th>
<th>Lesson Two Power Down at Home</th>
<th>Lesson Three Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading Standards for Literacy in Science &amp; Technical Subjects (RST)</strong></td>
<td>ACTIVITIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8.RST.6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.</td>
<td>Students • analyze the purpose of the text that explains how electricity is generated at a power plant. • analyze the purpose of the text that explains the connections between energy production and energy use and global climate change.</td>
<td>Students • analyze the purpose of the text that explains that there are energy-efficient (EE) devices along with energy-saving actions/behaviors.</td>
<td>Students • analyze the purpose of a graph and text that explain where energy is used in households.</td>
</tr>
<tr>
<td><strong>Writing Standards for Literacy in History/Social Studies, Science &amp; Technical Subjects (WHST)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8.WHST.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</td>
<td>Students • write text explaining what they observed during their energy “audit” of the school. • write text with their recommendations on how the school can save energy by taking certain actions and installing EE devices.</td>
<td>Students • use the Internet to research what the ENERGYSTAR designation means and also to explain standby (vampire) energy.</td>
<td>Students • use the Internet to research what the ENERGYSTAR designation means and also to explain standby (vampire) energy.</td>
</tr>
<tr>
<td>6-8.WHST.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</td>
<td>Students • use the Internet to facilitate written responses to activities in lesson (e.g., EPA student site on global climate change: <a href="http://www.epa.gov/climatechange/kids/index.html">www.epa.gov/climatechange/kids/index.html</a>; <a href="http://www.eia.gov">www.eia.gov</a>).</td>
<td>Students • expand their study of energy by selecting website listed on “Powering to the Internet” (page 18) to visit and make reports.</td>
<td>Students • expand their study of energy by selecting website listed on “Powering to the Internet” (page 18) to visit and make reports.</td>
</tr>
<tr>
<td>6-8.WHST.9. Draw evidence from informational texts to support analysis, reflection, and research.</td>
<td>Students • read informational text in this first lesson to help them research, analyze and write on topics related to environmental impacts of their own energy use and energy production.</td>
<td>Students • reflect on informational text to summarize and write on the opening question of why power down for the environment.</td>
<td>Students • reflect on informational text to summarize and write on the opening question of why power down for the environment.</td>
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### Next Generation Science Standards*

#### Energy Checkup: Power Down for the Environment Correlations for Grade 5

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<tr>
<td><strong>5. Earth and Human Activity</strong></td>
<td><strong>ESS3.C: Human Impacts on Earth Systems</strong></td>
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| 5-ESS3-1. Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. | Students:  
- analyze how their everyday use of energy at home and school have major effects on the environment.  
- discuss what they can do as individuals to save energy, conserve resources and protect the environment  
- visit an EPA kids’ website to learn about global climate change and how by saving energy they are limiting the greenhouse gas emissions that contribute to global climate change.  
- develop recommendations how the school can save energy and protect the Earth’s resources. | Students:  
- respond to survey items on their everyday use of energy and identify how they can save energy and not waste natural resources.  
- develop survey items related to their everyday use of energy in their own homes.  
- discuss what individual energy-saving actions they can take to reduce impacts on the environment. | Students:  
- research on listed websites those that focus on actions they can take to “green the school.” |

*Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten–Grade Twelve (adopted by California State Board of Education, September, 2013)*
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<td><strong>3-5. Engineering Design</strong></td>
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<td><strong>ETS1.B: Developing Possible Solutions</strong></td>
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**3-5-ETS1-2.** At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

**Students:**
- work in small groups to do an “energy audit” of the school and communicate with peers about how the school could save energy (e.g., technologies and personal behaviors).

| Crosscutting Concepts | |
| Influence of Science, Engineering, and Technology on Society and the Natural World | |

**3-5-ETS1-1.** People’s needs and wants change over time, as do their demands for new and improved technologies.

**Students:**
- learn about the new technologies in lighting (LED, CFLs) and other energy-saving technologies like motion sensors, double pane windows, ENERGYSTAR labeled products, etc.
- discuss why people want energy-efficient appliances and electronics.
**Next Generation Science Standards**

**Energy Checkup: Power Down for the Environment Correlations for Grade 6**

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<td><strong>MS. Weather and Climate</strong></td>
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<td><strong>ESS2.C: The Roles of Water in the Earth’s Surface</strong></td>
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<tr>
<td><strong>MS-ESS2.5.</strong> Complex patterns of the changes and movement of water in the atmosphere ... are major determinants of local weather patterns.</td>
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<tr>
<td><strong>ESS2.D: Weather and Climate</strong></td>
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<tr>
<td><strong>MS-ESS2.6.</strong> Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms and living things. These interactions vary... and can affect oceanic and atmospheric flow patterns.</td>
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</table>

**Students:**
- study (as an extension activity) about the nexus between water and energy use and discuss the determinants of weather patterns. They distinguish between “climate” and “weather.

**Students:**
- visit an EPA kids website to learn about climate change and read text on how air pollution and greenhouse gas emissions are contributing to global climate change.
- read text and research the impacts on the environment of burning fossil fuels (e.g., heat-trapping gases are warming the planet).
### Disciplinary Core Ideas

#### MS. Weather and Climate

**ESS3.D Global Climate Change**

**MS-ESS3.5.** Human activities such as the release of greenhouse gases from burning fossil fuels are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.

**ACTIVITIES**

- Students:
  - study how energy production from fossil fuels produces air pollution and greenhouse gases that contribute to global climate change.
  - visit a web site to learn about the effects of global climate change (www.epa.gov/climatechange/kids).

### Crosscutting Concepts

*(Influence of Science, Engineering, and Technology on Society and the Natural World)*

**MS-ETS1.1.** All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

- Students:
  - learn throughout this study how our natural resources are limited and must be conserved. They discuss (in context of energy use and energy production) the consequences on people and the environment.
  - analyze the use of energy in their daily lives and discuss what energy (electricity and natural gas) provides for them and their families.

- Students:
  - analyze the positive use of energy in their daily lives and discuss what energy (electricity and natural gas) provides for them and their families.

- Students:
  - discuss, while analyzing household use of energy in the US, how our natural resources are limited and must be conserved. They discuss (in context of energy use and energy production) the consequences on people and the environment.
  - analyze the use of energy in their daily lives and discuss what energy (electricity and natural gas) provides for them and their families.
Disciplinary Core Ideas  | ACTIVITIES
--- | ---
**Crosscutting Concepts:** Influence of Science, Engineering, and Technology on Society and the Natural World)  
**MS. Ecosystems: Interactions, Energy, and Dynamics**

**MS-LS2.5.** The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

Students:
- Identify and research energy-saving technologies (fix-its) that can be applied along with energy efficient behaviors.
- Discuss the impact in the society of using technologies along with personal behaviors to save energy, and reduce the greenhouse emissions that contribute to global climate change.
Human Impacts on Earth Systems

Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

— 5-ESS3-1 Earth and Human Activity, Grade Five

From: Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten–Grade Twelve (adopted by California State Board of Education, September, 2013.)
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

— MS-ETS1.1 Weather and Climate, Grade Six

From: Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten–Grade Twelve (adopted by California State Board of Education, September, 2013.)
Did you know?

The use of natural light from the windows in your classroom is called “daylighting” and can save energy. Open the blinds and let the sun shine in!