Energy Conversions:
Blackout in Ergstown
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Safety Guidelines for Science Investigations

1. **Follow instructions.** Listen carefully to your teacher’s instructions. Ask questions if you don’t know what to do.

2. **Don’t taste things.** No tasting anything or putting it near your mouth unless your teacher says it is safe to do so.

3. **Smell substances like a chemist.** When you smell a substance, don’t put your nose near it. Instead, gently move the air from above the substance to your nose. This is how chemists smell substances.

4. **Protect your eyes.** Wear safety goggles if something wet could splash into your eyes, if powder or dust might get in your eyes, or if something sharp could fly into your eyes.

5. **Protect your hands.** Wear gloves if you are working with materials or chemicals that could irritate your skin.

6. **Keep your hands away from your face.** Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.

7. **Tell your teacher if you have allergies.** This will keep you safe and comfortable during science class.

8. **Be calm and careful.** Move carefully and slowly around the classroom. Save your outdoor behavior for recess.

9. **Report all spills, accidents, and injuries to your teacher.** Tell your teacher if something spills, if there is an accident, or if someone gets injured.

10. **Avoid anything that could cause a burn.** Allow your teacher to work with hot water or hot equipment.

11. **Wash your hands after class.** Make sure to wash your hands thoroughly with soap and water after handling plants, animals, or science materials.
What Is a Design Argument?

1. It answers a question with a claim about which solution best meets the criteria.

2. It connects evidence to each of the criteria. Evidence can be:
   - data or information from testing
   - ideas from texts and experiences

3. It describes any limitations.

4. It is written for an audience.

5. It uses scientific language.
Getting Ready to Read: Systems

1. Before reading the book Systems, read the sentences below.
2. If you agree with a sentence, write an “A” on the line before the sentence.
3. If you disagree with a sentence, write a “D” on the line before the sentence.
4. After you read the book, return to this page and read the sentences again. Decide whether your ideas have changed. Be ready to explain your thinking.

_______ Systems can have just a few parts or many parts.
_______ When a system changes, it always breaks.
_______ Systems do not interact with other systems.
_______ Parts of a system help the system perform its function.
_______ A system can be part of another larger system.
Reading Reflection: Systems

1. Read each question below.
2. Use what you read in Systems to help you answer each question.
3. Use ideas from the text to support your thinking.

If a change is made to a system, does that mean the system will fail? Why or why not?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why do you think it’s important for scientists and engineers to think about systems?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a list of as many systems as you can think of. Try to think of examples that were not described in the book Systems.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
# Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:

1. Read the sentence from the book *Systems* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning in the table.

<table>
<thead>
<tr>
<th>Word</th>
<th>Sentence from the book</th>
<th>Meaning 1</th>
<th>Meaning 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>part</td>
<td>A wheel is just a <strong>part</strong> of a bicycle.</td>
<td>when things move away from each other</td>
<td>a piece of something such as an object, activity, or period of time</td>
</tr>
<tr>
<td>light</td>
<td>These parts all have different functions: ... the windows let in <strong>light</strong> but keep out cold air. ...</td>
<td>not heavy</td>
<td>something that makes things visible</td>
</tr>
<tr>
<td>cold</td>
<td>Homes in <strong>cold</strong> places have a system for heating.</td>
<td>low temperature</td>
<td>a common sickness</td>
</tr>
<tr>
<td>switches</td>
<td>A home electrical system has wires, outlets for plugging devices in, and <strong>switches</strong> for turning the electricity on and off.</td>
<td>to change position or direction</td>
<td>a device for making and breaking the connection in an electric circuit</td>
</tr>
</tbody>
</table>
Daily Written Reflection

Think about a system that you have at home. What is the system’s function and what are the system’s parts?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Building a Simple Electrical System

1. With your group, use a solar panel, a fan, and two wires to build an electrical system that functions. (The fan will spin when it functions.)

2. Predict what you can do to make the fan spin more quickly or slowly. Test your ideas, and then discuss what caused the fan to spin more quickly or slowly.

3. Predict what you can do to make the fan spin in a different direction. Test your ideas, and then discuss what caused the fan to spin in a different direction.

4. In the space below, draw your functioning system. Be sure to label every part. (Hint: In order to function, the system needs one part that was not included in your bag of materials.)
Text Features Scavenger Hunt

1. Look through Systems to find an example of each of the text features in the left column of the table.
2. Record the page number where that text feature can be found.
3. Write a brief description of the text feature.
4. Explain what the text feature helps you understand.

<table>
<thead>
<tr>
<th>Text feature</th>
<th>Page</th>
<th>Description</th>
<th>This helps me understand . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>cover</td>
<td>Systems (the name of the book)</td>
<td>The book will be about different systems.</td>
</tr>
<tr>
<td>Table</td>
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<td></td>
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<tr>
<td>Glossary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bold word</td>
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<td></td>
<td></td>
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</tbody>
</table>
# Text Features Scavenger Hunt (continued)

<table>
<thead>
<tr>
<th>Text feature</th>
<th>Page</th>
<th>Description</th>
<th>This helps me understand . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image (drawing, diagram, or photo)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table of contents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td></td>
<td></td>
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</tbody>
</table>
### Parts of a System

1. With your partner, look through *Systems* and choose one of the systems described in the book.
2. Write the name of the system and its function on the two lines below.
3. Record each part of the system in the left column of the table below.
4. Beside each part, record the part’s function.
5. Use as many rows as you need.

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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Daily Written Reflection

Name five things at home or at school that use electrical energy. Explain how you know.

___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Electrical Energy in the *Energy Conversions* Sim

1. Circle each device you find in the *Energy Conversions* Sim that has electrical energy as an energy input.

2. Make an “X” across each device that does not have electrical energy as an energy input.

How can you tell if a device in the Sim is using electrical energy?

___________________________________________________________________
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Daily Written Reflection

Where do you see evidence of energy in your everyday life?

___________________________________________________________________

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Make a drawing if it helps you explain your thinking. Label your drawing.
Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.

2. Record your ideas in the first two boxes.

3. Then, put the ideas together. Write a new understanding in box below the arrow.

   Idea:

   Source: It's All Energy

   +

   Idea:

   Source: Building simple electrical systems

   New understanding:
Daily Written Reflection

List any electrical devices you can think of that have sound energy as an output.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Forms of Energy in the Subway

Look at the picture of the Ergstown subway on page 17. Name at least two forms of energy that you see evidence of. What is your evidence?

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___________________________________________________________________

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___________________________________________________________________
Forms of Energy in the Subway (continued)
Writing an Argument About the Blackout

1. Read the question and circle the claim that you think best answers the question.

2. Circle the sources of your evidence.

3. Write your evidence in the space provided.

Question:
 What happened to the electrical system the night of the Ergstown blackout?

Claim: (Circle one.)

- All the lights in the electrical system broke.
- Something went wrong with the electrical system.

Sources of Evidence: (Circle each one you will use.)

- *Energy Conversions* Simulation
- *It’s All Energy* reference book
- Simple Electrical System (the one you built)
- images of Ergstown before and during the blackout

What is your evidence?

___________________________________________________________________
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Writing an Argument About the Blackout (continued)

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Chapter 1: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists and engineers investigate in order to figure things out. Am I getting closer to figuring out a design that improves Ergstown's electrical system?

I understand why a device might not work. _____ Yes _____ Not yet

I understand what happens when a device is plugged in. _____ Yes _____ Not yet

I understand where energy in a system comes from. _____ Yes _____ Not yet

I understand what happens when there is not enough energy in a system. _____ Yes _____ Not yet

I understand what happens when there are too many devices in a system. _____ Yes _____ Not yet

I understand why the lights went out in Ergstown. _____ Yes _____ Not yet

I understand that science affects everyday life. _____ Yes _____ Not yet

What about the blackout in Ergstown or energy are you still wondering?

___________________________________________________________________
___________________________________________________________________
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Daily Written Reflection

Think of five electrical devices that you use the most at home, at school, or other places. What are the output energy forms of those devices? (Example: I use light energy from overhead lights.)

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Energy Input and Output Table

1. Read the Electrical Devices section in It’s All Energy. Use information from the book to complete the table below.

2. Record each electrical device you read about in the first column.

3. Next to each device, record its function (in the second column), its input energy form (in the third column), and its output energy form (in the fourth column).

<table>
<thead>
<tr>
<th>Device</th>
<th>Function</th>
<th>Input energy form</th>
<th>Output energy form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
**Observing Energy Conversions in the Sim**

1. Build and run a system in the Sim with **light as an output energy form**.
2. Think of a name for your system. Record it in the first column below.  
3. In the same row, record the system’s parts, an electrical device in the system, and the output energy form (or forms) of that device.  
4. Build and run a system in the Sim with **sound as an output energy form**.  
5. Repeat steps 2 and 3 to complete the bottom row of the table.

<table>
<thead>
<tr>
<th>System name</th>
<th>Parts</th>
<th>Electrical device</th>
<th>Output energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Daily Written Reflection

When you clap your hands, you are converting motion energy to sound energy. Can you think of other things you do that have sound energy, motion energy, or thermal energy as energy outputs?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Getting Ready to Read: *Energy Past and Present*

2. If you agree with a sentence, write an “A” on the line before the sentence.
3. If you disagree with a sentence, write a “D” on the line before the sentence.
4. After you read the book, return to this page and read the sentences again. Decide whether your ideas have changed. Be ready to explain your thinking.

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devices convert electrical energy into other forms of energy.</td>
<td></td>
</tr>
<tr>
<td>Today people use electrical devices to do many of the same things that people did before electrical devices existed.</td>
<td></td>
</tr>
<tr>
<td>People could not take hot baths in the past, because there was no electricity.</td>
<td></td>
</tr>
<tr>
<td>Light, sound, motion, and thermal energy were all available in the past.</td>
<td></td>
</tr>
<tr>
<td>We can’t learn anything about saving electrical energy from the people who lived in the past.</td>
<td></td>
</tr>
</tbody>
</table>
Reading Reflection: Energy Past and Present

1. Read each question below.
2. Use what you read in Energy Past and Present to help you answer each question.
3. Use evidence from the text to support your thinking.

Imagine you lived in the past. What would you use to help you see at night? What energy form is being converted and what is it being converted to?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Think of an electrical device that you use to do something. Explain how you could use another kind of energy besides electrical energy to do the same thing. (For example, you could use the sun's energy to dry your clothes.)
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What is the function of electrical devices in an electrical system? Choose one electrical device that you read about in the book and explain its function.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
**Multiple Meaning Words**

Some words can mean more than one thing. For each word in the chart:
1. Read the sentence from *Energy Past and Present* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning in the table.

<table>
<thead>
<tr>
<th>Word</th>
<th>Sentence from the book</th>
<th>Meaning 1</th>
<th>Meaning 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>run</td>
<td>Every day we use electrical energy to <strong>run</strong> so many different devices . . .</td>
<td>to move at a speed faster than a walk</td>
<td>to work</td>
</tr>
<tr>
<td>form</td>
<td>These devices all convert electrical energy into other <strong>forms</strong> of energy. . .</td>
<td>a type or kind</td>
<td>a document with spaces in which to record information</td>
</tr>
<tr>
<td>cool</td>
<td>To keep <strong>cool</strong> when it’s hot, people run electric fans and air conditioners.</td>
<td>to be impressive</td>
<td>of a low temperature</td>
</tr>
<tr>
<td>plant</td>
<td>. . . wires transfer electrical energy from a power <strong>plant</strong> to the fan in your house.</td>
<td>a living organism that needs water, sunlight, and carbon dioxide</td>
<td>a station</td>
</tr>
</tbody>
</table>
# Synthesizing Ideas About Converting Energy

1. Read the question below. As you read *Energy Past and Present*, look for ideas in the text that will help you answer the question.

2. Record ideas from the text in the boxes below. Include page numbers.

3. Then, with your class, connect the ideas together to answer the question. Write your new understanding in the box below the arrow.

## Question:
How do devices have so many different output energy forms when they are plugged into the same electrical system?

<table>
<thead>
<tr>
<th>Idea:</th>
<th>Page:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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New understanding:
Daily Written Reflection

What is one way that you have worked as a systems engineer in this unit?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Energy Output from a Hair Dryer

1. Look at the image of the hair dryer.
2. Then use what you have learned to answer the questions below.

A hair dryer is a device that blows hot air to dry people's wet hair. Think about the hair dryer's output energy. This energy form is called ________________________________

How did it become that energy form?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Roundtable Discussion

1. With your group, assign Discussion Leader numbers from 1 to 4.
2. Discussion Leader 1 will ask the first Discussion Question and lead the group’s discussion. The Discussion Leader may ask any of the Follow-up Questions to keep the discussion going.
3. Take turns asking questions until all four group members have had a turn leading the discussion.
4. Be ready to share your group's thinking with the class.

Discussion Questions:

Discussion Leader 1: Do you think the City Planner’s solutions make sense? Why or why not?

Discussion Leader 2: How do you think the people of Ergstown will feel if they have to stop using some devices? Why do you think that?

Discussion Leader 3: How do you think the people of Ergstown will feel about having the town install more LED lights to replace older lights? Why do you think that?

Discussion Leader 4: Which solution do you think best meets the criteria?

Follow-up Questions:

- What do you think?
- Why do you think so?
- Does anyone have a different idea?
- Do you agree or disagree? Why?
Daily Written Reflection

What are some ways that you save energy at home? At school?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Gathering Evidence in the Sim

1. In the Energy Conversions Sim, set up each energy system shown below.
2. After you build each system, change the amount of energy transferred in so that **at least 10 units of light energy** are transferred out of the system.
3. For each system, record the amount of energy transferred in and the amount of light, thermal, and sound energy transferred out.
4. Use what you learn to answer the questions at the bottom of page 34.

**Test 1:**

![Diagram of a solar panel and light bulb]

Energy transferred in: _______________________

Energy transferred out:

- Light: ____________
- Thermal: ____________
- Sound: ____________

**Test 2:**

![Diagram of a solar panel and LED]

Energy transferred in: _______________________

Energy transferred out:

- Light: ____________
- Thermal: ____________
- Sound: ____________
Gathering Evidence in the Sim (continued)

Test 3:

![Diagram of energy conversion components: Wind, Flywheel, Generator, Lightbulb]

Energy transferred in: _______________________

Energy transferred out:

Light: _____________ Thermal: _____________ Sound: _____________

Test 4:

![Diagram of energy conversion components: Wind, Flywheel, Generator, LED]

Energy transferred in: _______________________

Energy transferred out:

Light: _____________ Thermal: _____________ Sound: _____________

What happened when you switched from lightbulbs to LEDs?
___________________________________________________________________

Will Ergstown use less energy by replacing streetlight lightbulbs with LEDs?
___________________________________________________________________

___________________________________________________________________

___________________________________________________________________
Gathering Evidence from *It's All Energy*

1. Think about the claim you want to support.
2. Look through *It's All Energy* for evidence that will support that claim.
3. Record the evidence you find, along with each page where you found it.

___________________________________________________________________
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Design Argument About Reducing the Number of Blackouts in Ergstown

1. Read the question and the two possible solutions.
2. Read the criteria and think about which solution will best meet them.
3. Write a claim that answers the question.
4. Record your evidence. Explain how your evidence shows that the solution meets all of the criteria.

Question:
Which is the best solution for reducing the number of blackouts in Ergstown?

Possible solutions:
Get people to stop using some devices.
Replace older streetlights with LED streetlights.

Criteria:
Converts less energy from the grid. (Uses less energy.)
 Doesn't change how people use their devices.
Design Argument About Reducing the Number of Blackouts in Ergstown (continued)
Chapter 2: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists and engineers investigate in order to figure things out. Am I getting closer to figuring out a design that improves Ergstown's electrical system?

I understand why a device might not work.  _____ Yes  _____ Not yet

I understand what happens when a device is plugged in.  _____ Yes  _____ Not yet

I understand where energy in a system comes from.  _____ Yes  _____ Not yet

I understand what happens when there is not enough energy in a system.  _____ Yes  _____ Not yet

I understand what happens when there are too many devices in a system.  _____ Yes  _____ Not yet

I understand why the lights went out in Ergstown.  _____ Yes  _____ Not yet

I understand that science affects everyday life.  _____ Yes  _____ Not yet

What about the blackout in Ergstown or energy are you still wondering?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Daily Written Reflection

All the devices in your house stopped working suddenly. What do you think is the problem? Why?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
## Light the LED

1. With your partner, use the *Energy Conversions* Simulation to build several different systems. Each system should include no more than six parts and one part must be an LED.

2. Select one of the systems that you build.

3. In the table below, list each of the parts of that system in order—use only as many boxes as you need. (Hint: The part under the number 1 should be the part of the system that you selected by tapping the circle in the Sim.)

4. Then answer the question.

<table>
<thead>
<tr>
<th>Parts of the System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

In the system you built, where did the energy come from?

___________________________________________________________________
Synthesizing Ideas About Energy Sources

1. Read pages 28–33 in the Energy Sources section of It’s All Energy.
2. After you read about each energy source, think about how ideas from the book are connected to what you observed in the Sim.
3. Record your ideas in the table below.
4. Read pages 34–41 in It’s All Energy.

<table>
<thead>
<tr>
<th>Energy source</th>
<th>Ideas from the Book and the Sim</th>
</tr>
</thead>
<tbody>
<tr>
<td>fossil fuels</td>
<td></td>
</tr>
<tr>
<td>wind</td>
<td></td>
</tr>
<tr>
<td>sun</td>
<td></td>
</tr>
</tbody>
</table>

What new understanding do you have about Ergstown’s electrical system?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Scientific Language for Synthesizing

On page ___________ of the book, I read ______________.

I also observed ______________.

When I read about ______________ it made me think that ______________.

Based on ______________, I can conclude that ______________.

Because of ______________, I now think that ______________.

This idea is important because ______________.
Daily Written Reflection

What new ideas do you have about energy sources?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
You can use this page to record notes or create drawings.
Daily Written Reflection

Pick one energy source and describe what type of converter you would use to convert that form of energy into electrical energy. Then write about one benefit of using that source of energy.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Getting Ready to Read: *Sunlight and Showers*

1. Before reading the book *Sunlight and Showers*, read the sentences below.

2. If you agree with a sentence, write an “A” on the line before the sentence.

3. If you disagree with a sentence, write a “D” on the line before the sentence.

4. After you read the book, return to this page and read the sentences again. Decide whether your ideas have changed. Be ready to explain your thinking.

   ______ Light energy can be used to kill germs in water.

   ______ Things become warmer in sunlight because the light energy is converted into thermal energy.

   ______ Engineers do not have to test their ideas.

   ______ Solar energy can be used to make water hot.

   ______ Engineers often work together to solve problems in the world.
Reading Reflection: *Sunlight and Showers*

1. Read each question below.

2. Use what you read in *Sunlight and Showers* to answer each question.

3. Use evidence from the text to support your thinking.

Choose one of these things that the students did during their design process. Explain what the students did and why you think it was important.

- Learn
- Find available materials
- Plan
- Test materials
- Synthesize findings
- Test the product

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Look at page 4. What criteria did the students use in their design?

Criteria 1:__________________________________________________________

___________________________________________________________________

Criteria 2:__________________________________________________________

___________________________________________________________________

Criteria 3:__________________________________________________________

___________________________________________________________________

Criteria 4:__________________________________________________________

___________________________________________________________________
Reading Reflection: *Sunlight and Showers* (continued)

Draw a diagram of a shower that you would design for a community that gets little sun and where it often snows.
Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:
1. Read the sentence from *Sunlight and Showers* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning in the table.

<table>
<thead>
<tr>
<th>Word</th>
<th>Sentence from the book</th>
<th>Meaning 1</th>
<th>Meaning 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>rest</td>
<td>The students went back to the U.S. and shared their data with the <strong>rest</strong> of the team.</td>
<td>to relax</td>
<td>the remaining part</td>
</tr>
<tr>
<td>kind</td>
<td>They wanted to build the water heaters in Guatemala, so they found out what <strong>kinds</strong> of building materials are available there.</td>
<td>type</td>
<td>to be nice</td>
</tr>
<tr>
<td>holds</td>
<td>Professor Gadgil <strong>holds</strong> a glass of water that was cleaned by his machine.</td>
<td>to pause</td>
<td>to carry</td>
</tr>
<tr>
<td>shower</td>
<td>Whenever we get dirty, we can take hot <strong>showers</strong>.</td>
<td>a little bit of rain</td>
<td>a bath in which water is sprayed on the body</td>
</tr>
</tbody>
</table>
School Backup Electrical Energy System

1. Imagine that your school is going to install a backup electrical system that can function during a blackout.

2. Decide what would be the best backup energy source to use. Be sure to consider things such as cost and whether the energy source is available in your area.

3. Then answer the questions below. Use evidence from the It’s All Energy reference book.

What is the best backup energy source for your school?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

How does the energy from the source become electrical energy?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why is this the best backup energy source for your school? Use evidence from the Energy Sources section (pages 26–41) of It’s All Energy to help support your argument.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Engineering Practices

1. Read *Sunlight and Showers*. As you read, complete the table below.

2. In the first column, record some of the engineering practices in the book.

3. In the second column, make connections between what engineers in the book do and your work as a systems engineer.

4. Then answer the question below the table.

<table>
<thead>
<tr>
<th>What engineers do</th>
<th>What we do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>Page:</td>
<td></td>
</tr>
<tr>
<td>Page:</td>
<td></td>
</tr>
</tbody>
</table>

What new understanding do you have about what engineers do?
Daily Written Reflection

Which of the engineering practices described in Sunlight and Showers did you find the most interesting? Why?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Wind Turbine Criteria Checklist: First Design

1. Build your wind turbine.
2. Then read each of the criteria below.
3. Check each of the criteria that your wind turbine meets.

______ It spins as fast as possible.

• Does your wind turbine spin when you blow on it or spin it with your hands?
• Does your wind turbine spin when it’s in front of a fan?
• What can you change to make it spin faster?

______ It spins when the air moves slow and when it moves fast.

• Does your wind turbine spin even when you blow on it gently?
• Does your wind turbine spin when it’s in front of a fan on a low setting?
• Does your wind turbine spin when it’s in front of a fan on a high setting?

______ It spins when the air blows from different directions.

• Does your wind turbine spin when you blow on it from the front?
• Does your wind turbine spin when you blow on it from the side?
• Does your wind turbine spin when you hold it in front of a fan, facing the fan?
• Does your wind turbine spin when you hold it in front of a fan, facing a different direction?
Daily Written Reflection

What does your wind turbine do well? What would you like to improve about it?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Wind Turbine Criteria Checklist: Revised Design

1. Continue building your wind turbine. Make changes that you think will improve your design.

2. Then read each of the criteria below.

3. Check each of the criteria that your wind turbine meets.

_______ **It spins as fast as possible.**

- Does your wind turbine spin when you blow on it or spin it with your hands?
- Does your wind turbine spin when it’s in front of a fan?
- What can you change to make it spin faster?

_______ **It spins when the air moves slow and when it moves fast.**

- Does your wind turbine spin even when you blow on it gently?
- Does your wind turbine spin when it’s in front of a fan on a low setting?
- Does your wind turbine spin when it’s in front of a fan on a high setting?

_______ **It spins when the air blows from different directions.**

- Does your wind turbine spin when you blow on it from the front?
- Does your wind turbine spin when you blow on it from the side?
- Does your wind turbine spin when you hold it in front of a fan, facing the fan?
- Does your wind turbine spin when you hold it in front of a fan, facing a different direction?
Designing a Wind Turbine

Draw a diagram of the wind turbine that your team designed. Include the energy source. Label each part of the system.
Designing a Wind Turbine (continued)

In the table below, list each of the most important parts of your wind turbine system. Then describe the function of each part.

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What is one design change that your team made after the peer review?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Daily Written Reflection

What do you know about the design cycle? How did you use this process to build your wind turbine?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Roundtable Discussion

1. With your group, assign Discussion Leader numbers from 1 to 4.
2. Discussion Leader 1 will ask the first Discussion Question and lead the group’s discussion. The Discussion Leader may ask any of the Follow-up Questions to keep the discussion going.
3. Take turns asking questions until all four group members have had a turn leading the discussion.
4. Be ready to share your group's thinking with the class.

Discussion Questions:

Discussion Leader 1: How well does installing solar panels meet the criteria?

Discussion Leader 2: How well does installing wind turbines meet the criteria?

Discussion Leader 3: Which criteria do you think would be the most important to meet very well?

Discussion Leader 4: Which solution do you think we should choose, based on the criteria?

Follow-up Questions:

- What do you think?
- Why do you think so?
- Does anyone have a different idea?
- Do you agree or disagree? Why?
Design Argument About Reducing Blackouts in Ergstown

1. Read the question and the two possible solutions.
2. Read the criteria and think about which solution will best meet them.
3. Think about the evidence you have been gathering and discussing with the class. Circle the sources of evidence you will use.
4. Write a claim that answers the question.
5. Support your claim with evidence.
6. Describe any limitations of the solution you chose.

Question:
Which is the best solution for reducing the number of blackouts in Ergstown?

Possible solutions: (Circle one.)
- Install new solar panels.
- Install new wind converters.

Criteria:
- Increases the amount of energy in the electrical system.
- Isn’t too expensive.
- Is safe for the environment.

Sources of evidence: (Circle the ones you use.)
- designing a wind converter
  - It’s All Energy
- building a simple electrical system
  - Energy Conversions Simulation
- with a solar panel
  - Climate Report
Design Argument About Reducing Blackouts in Ergstown

(continued)
You can use this page to record notes or create drawings.
Chapter 3: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists and engineers investigate in order to figure things out. Am I getting closer to figuring out a design that improves Ergstown's electrical system?

I understand why a device might not work. ______ Yes ______ Not yet

I understand what happens when a device is plugged in. ______ Yes ______ Not yet

I understand where energy in a system comes from. ______ Yes ______ Not yet

I understand what happens when there is not enough energy in a system. ______ Yes ______ Not yet

I understand what happens when there are too many devices in a system. ______ Yes ______ Not yet

I understand why the lights went out in Ergstown. ______ Yes ______ Not yet

I understand that science affects everyday life. ______ Yes ______ Not yet

What about the blackout in Ergstown or energy are you still wondering?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Daily Written Reflection

What have you learned about how systems work? What do you think might happen if one part of a system isn’t working?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Getting Ready to Read: Blackout!

1. Before reading the book Blackout!, read the sentences below.
2. If you agree with a sentence, write an “A” on the line before the sentence.
3. If you disagree with a sentence, write a “D” on the line before the sentence.
4. After you read the book, return to this page and read the sentences again. Decide whether your ideas have changed. Be ready to explain your thinking.

_______ In a blackout, lights do not work, but other electrical devices do.
_______ Blackouts can happen when people use a lot of electrical energy.
_______ Blackouts can last an hour or many days.
_______ Blackouts are always caused by bad weather.
_______ Every blackout is caused by failure of the electrical grid.
Reading Reflection: Blackout!

1. Read each question below.
2. Use what you read in Blackout! to answer each question.
3. Use evidence from the text to support your thinking.

What are some of the causes of blackouts?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

How can a heat wave cause a blackout?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Choose one blackout that you read about. Record the title and page number below. Then, answer the question on the next page.

Article title: ______________________________________________________
_________________________________________________________________
Page: ____________
Reading Reflection: *Blackout!* (continued)

What would you recommend the people who live in the area of the blackout do to prevent blackouts in the future? Why?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
### Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:
1. Read the sentence from *Blackout!* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning in the table.

<table>
<thead>
<tr>
<th>Word</th>
<th>Sentence from the book</th>
<th>Meaning 1</th>
<th>Meaning 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>article</td>
<td>This book is a collection of <strong>articles</strong> about failures in the electrical system.</td>
<td>a piece of writing on a subject that is included in a magazine, newspaper, etc.</td>
<td>an individual object (such as an article of clothing)</td>
</tr>
<tr>
<td>rolling</td>
<td>Heat Wave Leads to <strong>Rolling</strong> Blackouts.</td>
<td>to move on wheels</td>
<td>continuing in a series of stages</td>
</tr>
<tr>
<td>plant</td>
<td>Daily blackouts are affecting millions of people in India as coal shortages shut down several major power <strong>plants</strong>.</td>
<td>an herb or other small vegetable growth</td>
<td>a building or factory where something is made</td>
</tr>
<tr>
<td>power</td>
<td>Millions Without Power After Hurricane Sandy.</td>
<td>the ability to control people or things</td>
<td>to supply a device with electrical energy</td>
</tr>
</tbody>
</table>
**Parts of the System That Failed: Simple Electrical System**

1. Write about the simple electrical system that you observed. Which part or parts of the simple electrical system failed? Circle that part or parts.
2. Explain your response in the space below.
3. Explain what caused the system to function when you made a change.

**Simple Electrical System**

```
Source  →  Converter  →  Wires  →  Converter
```

What evidence makes you think this?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What caused the system to function when you made a change?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Daily Written Reflection

Think of a system that includes these parts: the sun, a solar panel, wires, and a lamp. Describe two possible ways that you could make this system fail and explain why each failure would occur.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Parts of the System That Failed: *Blackout!*

1. On the line below, record the title of the article you read in *Blackout!*
2. Based on that article, which part or parts of the system failed? Circle that part or parts in the Electrical System below.
3. Explain your response in the space provided below.

Article Headline:

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

What evidence did you see or read about in the article that makes you think this?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

The Electrical System

| Part: Sources | Function: To provide energy to the system |
| Part: Converter | Function: To convert energy from sources into electrical energy |
| Part: Wires/Electrical Grid | Function: To transfer electrical energy from many sources to other places |
| Part: Converter | Function: To convert electrical energy to other energy forms |

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### Synthesizing Ideas About System Failure

1. Read the question below. Talk about it with your group.

2. Record ideas from *Blackout!* and from other sources in the boxes below. If you use an idea from *Blackout!,* write the page number where you found that information.

3. Then, connect the ideas together to answer the question. Write your new understanding in the box below the arrow.

**Question:** How might a system fail?

<table>
<thead>
<tr>
<th>Idea:</th>
<th>Page:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New understanding:
Reviewing Evidence

1. Carefully examine each piece of evidence to try to find another possible cause of the blackouts in Ergstown.
2. Record what you observe about each piece of evidence in the “What I observe” column.
3. Synthesize what you observe with what you read in Blackout! in order to think about what the evidence means for Ergstown. Write your ideas about this in the third column.

<table>
<thead>
<tr>
<th>Source of evidence</th>
<th>What I observe</th>
<th>Why might this evidence be important?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ergstown Weather Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ergstown Blackout Map</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ergstown Regional Map</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Daily Written Reflection

What do you now know about the electrical system?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Roundtable Discussion

1. With your group, assign Discussion Leader numbers from 1 to 4.
2. Discussion Leader 1 will ask the first discussion question and lead the group’s discussion. The Discussion Leader may ask any of the Follow-Up Questions to keep the discussion going.
3. Take turns asking questions until all four group members have had a turn leading the discussion.
4. Be ready to share your group’s thinking with the class.

Discussion Questions:

Discussion Leader 1: What does the Ergstown Weather Report tell us about what might have caused the blackouts?

Discussion Leader 2: What does the Ergstown Blackout Map tell us about what might have caused the blackouts?

Discussion Leader 3: What does the Ergstown Regional Map tell us about what might have caused the blackouts?

Discussion Leader 4: What do you think caused the blackouts?

Follow-up Questions:

- What do you think?
- Why do you think so?
- Does anyone have a different idea?
- Do you agree or disagree? Why?
Explaining Ergstown’s Blackout

1. Read the question below.
2. Explain what caused the blackout. Make sure to describe why this caused Ergstown’s electrical system to fail.

Question: What caused the blackout in Ergstown?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Considering Solutions for Reducing Blackouts

1. Consider each possible solution in the Grid Improvements column below.
2. Review the evidence that you have.
3. In the right-hand column, record what is good and what is not so good about each solution.

Sources of evidence:
- Considering Solutions chart (notebook pages 78–79)
- System Failure investigation
- Evidence from Ergstown
  - It’s All Energy
- Blackout!
## Considering Solutions for Reducing Blackouts (continued)

<table>
<thead>
<tr>
<th>Grid improvements</th>
<th>Additional information</th>
<th>Cost</th>
<th>What is good and not so good about this solution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add backup wires</td>
<td>Adding wires means that if one wire breaks, there is another wire left working.</td>
<td>$$$</td>
<td>Good:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not so good:</td>
</tr>
<tr>
<td>Strengthen grid connections</td>
<td>Strengthening connections will help wires stay connected during storms.</td>
<td>$$</td>
<td>Good:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not so good:</td>
</tr>
</tbody>
</table>
## Considering Solutions for Reducing Blackouts (continued)

<table>
<thead>
<tr>
<th>Grid improvements</th>
<th>Additional information</th>
<th>Cost</th>
<th>What is good and not so good about this solution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move grid underground</td>
<td>Moving wires underground will protect the wires from storms</td>
<td>$$$$</td>
<td>Good:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not so good:</td>
</tr>
</tbody>
</table>
You can use this page to record notes or create drawings.
Daily Written Reflection

The electrical grid is one part of the larger electrical system. What happens to the electrical system if the electrical grid is not functioning?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Gathering Evidence of Efficiency in the Sim

1. In the Energy Conversions Sim, set up tests to compare how efficient these different energy solutions are: sun (solar energy), wind (wind power), and fuel (fossil fuel power plant).

2. Record your observations and results below.

**Test A:** Build two similar systems that both have an LED output device. Use a different energy source and source converter for each system.

**System 1:** What parts does it include?

Energy transferred in: _____________________________________________

Energy transferred out: ___________________________________________

**System 2:** What parts does it include?

Energy transferred in: _____________________________________________

Energy transferred out: ___________________________________________

Compare the difference in light energy output between System 1 and System 2. Which system is more energy efficient? Record your evidence.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________
Gathering Evidence of Efficiency in the Sim (continued)

**Test B:** Build two similar systems that have light as the output energy form. Use two **different electrical devices** to produce light.

**System 3:** What parts does it include?

Energy transferred in: ________________________________

Energy transferred out: ________________________________

**System 4:** What parts does it include?

Energy transferred in: ________________________________

Energy transferred out: ________________________________

Compare the difference in light energy output between System 3 and System 4. Which system is more energy efficient? Record your evidence.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________
Daily Written Reflection

What have you learned about energy that might help you in your daily life?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Make a drawing if it helps you explain your thinking. Label your drawing.
Preparing for the Town Hall Meeting

1. Refer to your completed Possible Solutions for Improving Ergstown Electrical System chart.

2. Read the question below.

3. Pick two solutions that you want to propose in response to the question.

4. For each solution, write what part of the system should be improved and how. Next, explain how the solution meets the criteria and provide evidence for that. Then, explain one way the solution does not meet the criteria very well.

**Question:** What are the best solutions for improving Ergstown’s electrical system and why?

**Solution 1:** I think we should improve the ____________________________

by _____________________________________________________________

This solution meets the criteria because:

_________________________________________________________________

_________________________________________________________________

My evidence is:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
Preparing for the Town Hall Meeting (continued)

This is one way the solution does not meet the criteria very well:
___________________________________________________________________
___________________________________________________________________

Solution 2: I think we should improve the __________________________
by __________________________.
___________________________________________________________________

This solution meets the criteria because:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

My evidence is:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

This is one way the solution does not meet the criteria very well:
___________________________________________________________________
___________________________________________________________________
Preparation for the Town Hall Meeting (continued)

Scientific Language for the Town Hall Meeting

The best solution for Ergstown is ____________.

This solution meets the criteria of ____________ because ____________.

The evidence for this is ____________.

The limitation of this solution is ____________.

Follow-up Questions in the Town Hall Meeting

Which solutions are not very expensive?

Which solutions are safe for the environment?

Which solutions save energy or convert more energy?

Which solutions are the most reliable?

Which solutions will not bother the people of Ergstown?
## Synthesizing Ideas About the Electrical System

1. Read the Unit Question.
2. Write your ideas about the question, using all you have learned about energy.
3. Then, connect the ideas together to answer the Unit Question. Write your new understanding in the box below the arrow.

**Unit Question:** How does the electrical system work?

<table>
<thead>
<tr>
<th>What I learned about systems:</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>What I learned about energy sources:</th>
<th></th>
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<tbody>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>What I learned about converters:</th>
<th></th>
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<tbody>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>What I learned about the electrical grid:</th>
<th></th>
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<tbody>
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</table>

New understanding:
Chapter 4: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists and engineers investigate in order to figure things out. Am I getting closer to figuring out a design that improves Ergstown's electrical system?

I understand why a device might not work. _____ Yes _____ Not yet

I understand what happens when a device is plugged in. _____ Yes _____ Not yet

I understand where energy in a system comes from. _____ Yes _____ Not yet

I understand what happens when there is not enough energy in a system. _____ Yes _____ Not yet

I understand what happens when there are too many devices in a system. _____ Yes _____ Not yet

I understand why the lights went out in Ergstown. _____ Yes _____ Not yet

I understand that science affects everyday life. _____ Yes _____ Not yet

What about the blackout in Ergstown or energy are you still wondering?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

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Glossary

**argument**: the use of evidence to say why one idea is the best
**argumento**: el uso de evidencia para decir por qué una idea es la mejor

**claim**: a proposed answer to a question
**afirmación**: una respuesta propuesta para una pregunta

**convert**: to change from one form to another
**convertir**: cambiar de una forma a otra

**converter**: something that changes one form of energy to another
**convertidor**: algo que cambia una forma de energía a otra

**criteria**: the things that engineers think about and test in order to know how well something solves a problem
**criterios**: las cosas que los ingenieros piensan y testean con el fin de saber cuán bien algo soluciona un problema

**design**: to try to make something new that solves a problem
**diseñar**: intentar crear algo nuevo que resuelva un problema

**electrical device**: a machine that converts electrical energy to another form of energy
**aparato eléctrico**: una máquina que convierte la energía eléctrica en otra forma de energía

**electrical energy**: the form of energy that is transferred through wires
**energía eléctrica**: la forma de energía que se transfiere a través de cables

**electrical grid**: wires that transfer electrical energy from many sources to many other places
**red eléctrica**: cables que transfieren energía eléctrica proveniente de muchas fuentes hacia muchos otros lugares
energy: the ability to make things move or change
energía: la capacidad de hacer que las cosas se muevan o cambien

engineer: a person who uses science knowledge to design something in order to solve a problem
ingeniero/a: una persona que usa conocimientos científicos para diseñar algo que resuelva un problema

evidence: information that supports an answer to a question
evidencia: información que respalda una respuesta a una pregunta

form (of energy): type or kind (of energy)
forma (de energía): tipo o clase (de energía)

function: what something can do
función: lo que algo puede hacer

source: the place where something comes from
fuente: el lugar desde donde viene algo

synthesize: to put together multiple pieces of information in order to understand something
sintetizar: juntar varias piezas de información con el fin de entender algo

system: a group of parts that work together
sistema: un grupo de partes que trabajan juntas

transfer: to move something from one place to another
transferir: mover algo de un lugar a otro
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Your Investigation Notebook

Scientists use notebooks to keep track of their investigations. They record things they learn from other scientists. Sometimes they draw or make diagrams. They record ideas and information they want to remember.

Your Investigation Notebook is a place for you to keep track of:

- investigations you do in class.
- what you learn from reading science books.
- your questions, predictions, and observations.
- your explanations and the evidence you find to support those explanations.
- your ideas!

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