OVERVIEW

Sources of Energy

FOCUS QUESTION

Why have people used energy from different sources?

About the Lesson

OBJECTIVES

Content Objectives

- Understand information in time lines, graphs, diagrams, and charts.
- Explain how visuals support understanding of a text.
- Understand that energy comes from nonrenewable and renewable resources.

Language Objectives

- Compare and contrast information from text and visuals, using a graphic organizer.
- Use complete sentences to tell a partner how time lines, graphs, diagrams, and charts support understanding.
- Explain in writing why people have used energy from different sources.

ACADEMIC TALK

See **Glossary of Terms** on pp. 478–485.

visuals, time line, bar graph, diagram, chart

Spanish Cognates

visuales, diagrama

Build Knowledge

Lesson texts build knowledge about:

- Why people have used different natural resources as fuel
- How people use energy from both nonrenewable and renewable resources
- How people have found ways to use energy from recycled waste

Plan Student Scaffolds

- Use **i-Ready data** to guide grouping and choose strategic scaffolds.
- Use **Teacher Toolbox** resources as needed to address related skills:
  - —Cite textual evidence
  - —Text structure
- Partner English learners with students who can serve as language models to support them during Sessions 2 and 4. **EL**
- Preview texts and activities to anticipate barriers to engagement, access, and expression. Modify based on needs.

Use Protocols That Meet the Needs of All Students

In order to increase engagement and validate cultural and linguistic behaviors, specific protocols are included in the lesson. To further customize activities for your students, consider optional protocols listed on pp. A46–A51.

PROTOCOL	SESSION	VALIDATES
Vote with Your Feet	1	movement, multiple perspectives
Give One, Get One	1, 2	movement, shared responsibility
Pass It On	1, 3, 5	spontaneity, connectedness
Jump in Reading	2	spontaneity, collective success
Pick a Stick	2, 3	spontaneity
Shout Out	3, 4, 5	spontaneity, multiple ways to show focus
Musical Shares	4	movement, musicality, social interaction

LEARNING PROGRESSION | Interpret Visual Information

Students build on this skill:
RI.3.7 Use information gained from illustrations and the words in a text to demonstrate understanding of the text.

Students learn this skill:
RI.4.7 Interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears.

Students prepare for this skill:
RI.5.7 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 review and practice:

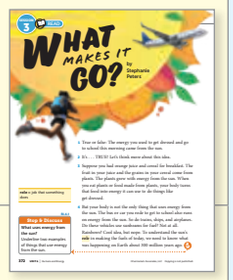
- **RI.4.1** Make inferences
- **RI.4.3** Analyze a scientific text
- **RI.4.4** Determine word meanings

LESSON PLANNING GUIDE

TEXT 1: First Came Fire: A Story of Energy and Fuel • SCIENCE ARTICLE

		TEXT AT-A-GLANCE	ENGLISH LEARNER SUPPORT (EL)
SESSION 1	**SCAFFOLD READING** 	**Concepts/Background** • using fuel to create energy • creating fire from fuel • how dead plants turn into fuel **Language** • **Vocabulary:** *fuel, natural gas, oil well, petroleum, turning to* • **Idiom:** *pound for pound*	**Speaking/Reading** • Activate prior knowledge **Listening/Reading** • Analyze phrases **Reading** • Leverage cognate knowledge **Listening/Speaking** • Use sentence frames
SESSION 2	**PRACTICE THE FOCUS STANDARD** • Formative Assessment		**Speaking/Reading** • Leverage cognate knowledge **Writing** • Use sentence frames

TEXT 2: What Makes It Go? • SCIENCE ARTICLE

SESSION 3	**SCAFFOLD READING** 	**Concepts/Background** • how energy from the sun is used • how rock forms from sand and clay • how fossils form **Language** • **Vocabulary:** *formed, pressure, power plants, pollution, environment, turbine, nonrenewable, renewable* • **Informal Language:** *turns into (energy), runs on (energy)*	**Speaking/Reading** • Identify informal language, Determine multiple meanings of words **Listening/Speaking** • Use sentence frames, Rephrase questions
SESSION 4	**PRACTICE THE FOCUS STANDARD** • Formative Assessment		**Listening/Reading** • Reinforce academic vocabulary **Speaking/Writing** • Create captions, Talk before writing

TEXT 3: Cool Solutions: Trash to Gas • SCIENCE ARTICLE

SESSION 5	**INDEPENDENT READING AND PRACTICE** • Formative Assessment 	**Concepts/Background** • how waste moves to landfills • using biogas as fuel **Language** • **Vocabulary:** *morsel, solutions, waste, organic, break down, recycling, developed, reuse, manure, sludge*	**Reading** • Leverage cognate knowledge **Speaking/Reading** • Paraphrase, Identify formal language **Writing** • Use sentence frames

KNOWLEDGE BUILDING

SESSION 6	**RESPOND TO THE FOCUS QUESTION** • *Why have people used energy from different sources?*	• Integrate information from the lesson texts • Collaborative discussion • Short response	**Reading/Writing** • Use sentence frames **Speaking/Writing** • Collaborate with a partner

Before Teaching the Lesson

Preview the texts before teaching the lesson to plan scaffolds. If needed, provide students with information below before they read. As an alternate means of representation, provide images or diagrams related to natural resources, renewable energy, and energy transformations.

- **First Came Fire: A Story of Energy and Fuel**
  - —**Energy** makes things move or change. It is connected to motion, heat, and electricity.
  - —Energy cannot be created or destroyed, but it can be changed from one form to another.
- **What Makes It Go?**
  - —**Natural resources** are materials from the earth that people use to make things. People use some natural resources to change energy from one form to another and produce electricity.
  - —**Renewable energy** is energy made from resources such as sunlight, water, and wind that do not "run out" when we use them.
  - —**Nonrenewable energy** is made from resources such as fossil fuels. When we burn fossil fuels, we cannot use them again. They cannot be replaced in our lifetime because they take millions of years to form.

Talk About the Topic

BUILD STUDENTS' INTEREST

1 - Introduce the lesson topic and the Focus Question. Tell students they will read, talk, and write about sources of energy.
- Have students **Turn and Talk** about the topic and Focus Question.
- Invite students to use their home language. **EL**
- Have students **Raise a Hand** to share something they know about energy.

2 - Ask students to complete Notice and Wonder with a partner.
- Use **Vote with Your Feet** to have students show which text they are most interested in reading.

SESSION 1 TALK ABOUT THE TOPIC

Sources of Energy

1 **FOCUS QUESTION**

Why have people used energy from different sources?

2 **NOTICE AND WONDER**

Look at the titles and images of the three texts you will read in this lesson. What do you notice? What do you wonder? Discuss your ideas with a partner.

3 **TALK ABOUT WORDS**

Circle the terms below that you know. Pick one term and tell a partner what you know about it.

energy	renewable resources
fuel	nonrenewable resources
waste	fossil fuels

I think the word ___ means ___ because ___.

One example of ___ is ___.

LESSON 19

First Came Fire:
A Story of Energy and Fuel
by Jessica Miller

What Makes It Go?
by Stephanie Peters

Cool Solutions:
Trash to Gas
by Danielle Jansen

- Introduce the focus standard. **Say,** *As you read, you will use the information in visuals, such as time lines and bar graphs, to help you understand the text.*

3 INTRODUCE ESSENTIAL CONCEPTS

- Have students use **Give One, Get One** to complete Talk About Words.
  - —Encourage students to identify cognates in their home language to help make sense of unfamiliar terms. Spanish cognates include *energía/energy, recurso renovable/renewable resource,* and *recurso no renovable/nonrenewable resource.* **EL**
  - —Have students use the sentence frames to help them talk about terms.
- Ask students to **Raise a Hand** to share their definitions. (Sample definition: Fuel is something you burn to produce heat or power.)
- Record student definitions and display them. Remind students that they will learn more about these terms throughout the lesson.
- Use **LISTEN FOR** to monitor understanding. Use **Help & Go** scaffolds as needed.
- **LISTEN FOR** Students use background knowledge, titles, photos, and familiar word parts to make sense of the terms.

HELP & GO: Vocabulary

- Remind students to use the titles and photographs to look for clues about the meaning of the terms.
- Encourage students to look inside the word for familiar prefixes (*non-, re-*), suffixes (*-able*), and base words (*new, source*).
- Encourage students to look inside the word for word parts that are cognates in their home language. **EL**

1 Support Reading

- Set a purpose for reading. **Say,** *In this text, you will read to learn about the history of energy. Use the time line and bar graph to help you understand the text.*
- Have students read paragraphs 1 and 2. Have them circle unknown words and mark confusing parts with a question mark.
- Preview the images in the time line and have students share what they know about fire and fuel. **EL**
- Use **CHECK INs** and related **Help & Go** scaffolds as needed to support understanding of the text. Monitor based on annotations, observation, and your knowledge of students.
- **CHECK IN** Students understand the content vocabulary word *fuel* and time-order words.

HELP & GO: Vocabulary

- Clarify the meaning of *fuel* in paragraphs 1 and 2. **Ask,** *What does the text say about fuel? You need fuel to make a fire. People burned wood, oil, and dung as fuel. What is fuel? something you burn to make fire*
- Clarify phrases that show time: *for thousands of years, for as long as, for a long time.* **EL**

2 Stop & Discuss

- Have students **Turn and Talk** to complete the **Stop & Discuss**.
- **LISTEN FOR** People looked for fuels they could burn to cook, stay warm, and create light. People looked for new fuels when one ran out.

HELP & GO: Comprehension

- **Say,** *Reread paragraphs 1 and 2. Why did people need fuel? to make fire and use its energy to cook food, stay warm, and light up the dark What did people burn as fuel? wood, oil, dung, and coal Why did people look for a fuel they could use instead of wood? They had cut down too many trees.*

SESSION 1 READ

First Came Fire

A Story of Energy and Fuel

by Jessica Miller

source = where something comes from

dung = animal waste

1

1 People have used fire for thousands of years to cook food, stay warm, and light up the dark. Fire is a powerful **source** of energy. But to make fire and use its energy, you need a fuel. So, for as long as people have been using fire, they have been looking for fuel.

2 People found that certain types of materials, such as wood, oil, and cow **dung**, could be burned as fuel for a fire. For a long time, wood was the main source of fuel for many people. But as more and more trees were cut down, people searched for other fuels and, finally, found something deep underground: coal.

2

RI.4.1

Stop & Discuss

Why did people look for fuels?

Underline details that tell why people looked for fuels. Discuss the details with your partner.

FUEL USE

More than 400,000 years ago

People begin to control fire and use it for heat, light, and cooking. People use fuel such as wood and dried dung, or animal poop.

More than 3,000 years ago

Coal is first used in China.

1500s

Coal replaces wood as fuel in parts of Europe. As time goes on, coal is used by more and more people.

1821–1859

First successful natural gas well is dug (1821) and first oil well is drilled (1859) in the United States.

LESSON 19

3

3 Coal is a fuel that looks like hard black lumps of rock. It formed over millions of years from dead plants that got buried under layers of dirt and rock. Pound for pound, coal gives off more energy when it is burned than wood does, and it burns longer, too. Coal continues to be used to heat homes, as well as to power engines and generate, or make, electricity.

4 Natural gas and petroleum are other fuels that formed over millions of years from living things that died. In the 1850s, people in the United States started using petroleum, also called oil. Gasoline, which powers many cars and trucks, is made from oil.

5 Over time, scientists have learned that fuels such as coal and oil have **disadvantages**. Burning them pollutes the air, and they can't be replaced once they're used up. So, more and more people are turning to different sources of energy to power their homes, vehicles, and machines.

disadvantages = problems; things that cause difficulty

4

RI.4.3

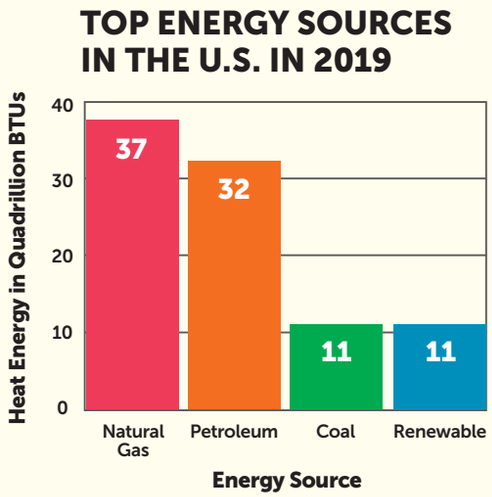
Stop & Discuss

How is coal helpful? How is it harmful?

Underline one way coal is helpful and one way it is harmful.

1880s

First electricity plants are built. The plants are fueled by coal. Electricity is used for lighting and for powering trains and other vehicles.



3 Support Reading

- Have students read paragraphs 3–5 and the time line.
- **CHECK IN** Students understand the phrase *pound for pound* and key content words.

HELP & GO: Vocabulary

- Read aloud the sentence in paragraph 3 that begins with *Pound for pound*. Explain that this phrase is an idiom used to compare one thing with another. **Ask,** *What two things are compared? a pound of coal and a pound of wood* **Ask,** *What does the comparison help you understand? A pound of coal gives off more heat and burns longer than a pound of wood.*
- Have students identify Spanish cognates: *generate (generar), disadvantage (desventaja).* **EL**

4 Stop & Discuss

- Have students **Turn and Talk** to complete the **Stop & Discuss**.
- **LOOK FOR** Students underline relevant details.

HELP & GO: Comprehension

- Have students reread paragraphs 3 and 4. **Ask,** *Why do people use coal instead of wood? Coal burns longer and gives off more heat. What do people use coal for? to heat homes and generate electricity*
- Have students reread paragraph 5. Clarify that *turning to* means people are starting to use something different. **Ask,** *Why are people looking for different sources of energy? Burning coal pollutes the air. It can't be replaced once it's used up.*
- Provide sentence frames for discussion: *Coal is helpful/harmful because* ___. **EL**

Discuss the Whole Text

Use **Pass It On** with the whole class to revisit the Focus Question: *Why have people used energy from different sources?* Record responses for students to reference later.

Reconnect to the Text

Have students **Raise a Hand** to recall "First Came Fire: A Story of Energy and Fuel." **Ask,** *What is energy? What are some kinds of fuel?*

1 Introduce the Standard

- Use **Jump in Reading** to have students read the introduction.
- Have students share ideas about what is shown in the time line and bar graph in "First Came Fire."
- Explain that readers interpret the visuals in a text and use the information to better understand the topic.
- Ask students to use cognates to understand academic terms (*visuales, línea, gráfico*). **EL**

2 Reread/Think

MODEL THE STANDARD Use the bar graph to model how to interpret information in a visual and connect it to information in the text.

- **Say,** *Paragraph 3 says people still use coal, but the bar graph tells more about energy sources today. The height of the bars helps me to compare the energy sources. The bars for "Coal" and "Renewable" are the same height, so those sources are used the same amount. Petroleum and natural gas have longer bars, which shows those sources are used more.*

GUIDE STANDARDS PRACTICE Have partners reread paragraphs 2–4 to complete the chart using information from both the text and the visuals.

- **Ask,** *What information does paragraph 2 provide about wood? Wood was the main source of fuel for a long time. What additional information can you find about wood in the time line? The time line is more specific: People burned wood 400,000 years ago.*
- Guide students to look for information about coal and petroleum in the text and the visuals.

SESSION 2 PRACTICE

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines . . .) and explain how the information contributes to an understanding of the text in which it appears.

Interpret Visual Information

1
- **Visuals** such as time lines and bar graphs can help show information and explain ideas in a text.
- A **time line** shows the dates of important events in the order they happened. A **bar graph** shows amounts or numbers of items in different categories.

2 Reread/Think

How have wood, coal, and oil been used as fuel over time? Reread "First Came Fire: A Story of Energy and Fuel" and complete the chart with information from both the visuals and the text.

Fuel	Information from the Text	Information from the Visuals
wood	**(para. 2) for a long time was main source of fuel for fire**	**(time line) used more than 400,000 years ago as fuel for fire**
coal	**(para. 2) after a long time, people found coal** **(para. 3) burned; used to heat homes, power engines, generate electricity**	**(time line)** • **3,000 years ago in China** • **1500s: replaced wood in Europe** • **1880s: first electricity plants** **(bar graph) 2019: used less than petroleum and natural gas**
petroleum (oil)	**(para. 4)** • **U.S. started using oil in 1850s** • **used to make gasoline**	**(time line) 1859: first oil well, U.S.** **(bar graph) second-most–used energy source in the U.S. in 2019**

LESSON 19

3 Talk

How have wood, coal, and oil been used as fuel over time?

- Talk about what you have learned using information from both the text and the visuals.
- Explain how the visuals helped you better understand the topic.

The text says ___.
The time line explains ___.
The bar graph shows ___.

Long ago, ___.
Now ___.

4 Write

How has coal been used over time? Use information from the text and the visuals to support your response.

Sample response: People have burned coal to create heat and cook food. The time line shows that coal was first used in China 3,000 years ago. Then, in the 1500s, coal replaced wood as fuel in parts of Europe. In the 1880s, the first electricity plants were fueled by coal. Today, coal is still burned to heat homes, power engines, and generate electricity. But the bar graph shows that in 2019, coal was not the main source of energy in the United States. Now coal is used less than petroleum and natural gas and as much as renewable resources. People are looking for new sources of energy that don't pollute or run out.

WRITING CHECKLIST

- ☐ I explained how coal has been used over time.
- ☐ I included information from the text, time line, and bar graph.
- ☐ I used complete sentences.
- ☐ I used correct spelling, punctuation, and capitalization.

3 Talk

- Have students use **Give One, Get One** to complete the Talk activity. Students can talk about wood with their first partner, coal with their second partner, and petroleum with their third partner.
- Tell partners to share one thing they learned from the text and one thing they learned from the time line or bar graph.
- Then have partners work together to summarize what they learned about how the fuel was used long ago and how it is used now.
- **LISTEN FOR** Students use the text, time line, and bar graph to identify information about energy over time. ✓

HELP & GO: Standards Practice

- **Say,** *Paragraph 3 explains how coal is used to heat homes, power engines, and generate energy. What additional information does the time line give about coal? The time line says that coal was first used in China more than 3,000 years ago, and that in the 1500s, coal replaced wood as fuel in parts of Europe.*

- After students complete the activity, use **Pick a Stick** to have 2–3 students share what they learned with the whole class.
- **Ask,** *Why do you think the author used a time line? The time line summarizes the history of fuel. It shows it in an easy-to-understand way.*

4 Write

- Have students complete the Write task and use the checklist to check their work.
- Encourage students to use the sentence frames from the Talk section in their responses. **EL**
- Use written responses to determine whether students need additional support. ✓

1 Support Reading

- Set a purpose for reading. **Say,** *In this session, you will read to learn more about sources of energy. Look for new information in the text and visuals.*
- Have students read paragraphs 1–4. Have them circle unknown words and mark confusing parts with a question mark.
- Use **CHECK INs** and related **Help & Go** scaffolds as needed.
- **CHECK IN** Students understand informal language and multiple-meaning words such as *cool, turns,* and *runs*.

HELP & GO: Vocabulary

- Ask students to explain the meaning of informal language: *cool, nope*. **EL**
- Have students reread paragraphs 3 and 4 and explain the meaning of *turns* and *runs* as used in the phrases *turns . . . into* (*changes . . . into*) and *runs on energy* (*uses energy to go*). Have them practice using the phrases in their own sentences.

2 Stop & Discuss

- Have students complete the **Stop & Discuss** and then **Turn and Talk**.
- **LOOK FOR** Students underline details about what uses energy from the sun.

HELP & GO: Comprehension

- Have students reread paragraphs 3 and 4. **Ask,** *What grew with energy from the sun? plants When does your body use energy from the sun? when you eat plants or food made from plants What runs on energy from the sun? vehicles What do vehicles use that the sun helped make? fuel*
- Explain that in paragraph 4 the author asks a series of questions about fuel that will be answered in the next section.

SESSION 3 READ

WHAT MAKES IT GO?

by Stephanie Peters

1 1 True or false: The energy you used to get dressed and go to school this morning came from the sun.

2 It's . . . TRUE! Let's think more about this idea.

3 Suppose you had orange juice and cereal for breakfast. The fruit in your juice and the grains in your cereal come from plants. The plants grew with energy from the sun. When you eat plants or food made from plants, your body turns that food into energy it can use to do things like get dressed.

4 But your body is not the only thing that uses energy from the sun. The bus or car you rode to get to school also runs on energy from the sun. So do trains, ships, and airplanes. Do these vehicles use sunbeams for fuel? Not at all. Rainbows? Cool idea, but nope. To understand the sun's **role** in making the fuels of today, we need to know what was happening on Earth about 300 million years ago.

role = job that something does

2 RI.4.1

Stop & Discuss

What uses energy from the sun?

Underline two examples of things that use energy from the sun.

LESSON 19

3

5 Back then, before dinosaurs lived, plants grew all over Earth. These plants used energy from the sun to make food for themselves, which helped them grow. But once the plants and other living things died, sand and clay covered them, slowly turning to rock. Over time, more and more layers of rock formed over the dead things. The crushing weight of all this rock squeezed the dead material. Then, over millions of years, heat and the pressure from all that rock turned the dead material into fossil fuels.

6 Fossil fuels come in three forms: a black rock called coal, a black or brownish liquid called petroleum (oil), and a clear gas called natural gas. (If fossil fuels are rocks, liquid, and gas, why are they called *fossil* fuels? Well, just like fossils, they come from things that lived long ago.)

7 Some power plants use fossil fuels to make electricity, and people still burn fossil fuels to heat their homes. Gasoline, which is made from oil, powers most of the cars, buses, trains, and airplanes we use to travel. All these fossil fuels we burn come from plants that grew millions of years ago using energy from the sun.

4

RI.4.1

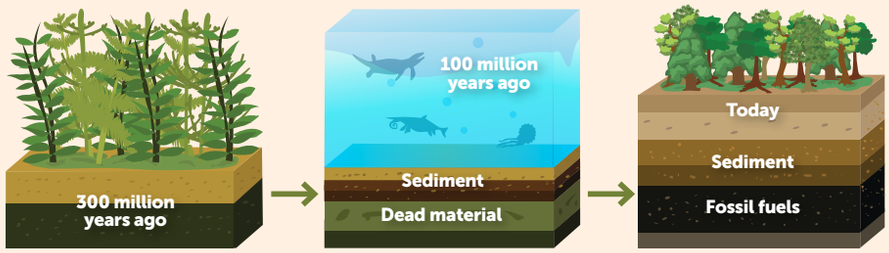
Stop & Discuss

Which statement would the author agree with?

- [x] Fossil fuels form slowly, but people use them a lot.
- [ ] Fossil fuels form quickly, and people use them a little.

Explain your choice to a partner.

HOW FOSSIL FUELS WERE FORMED



Plants used energy from the sun to grow.

Over millions of years, water and layers of sediment buried dead materials.

Heat and pressure turned the dead materials into fossil fuels such as coal.

3 Support Reading

- Have students read paragraphs 5–7 and the diagram.
- **CHECK IN** Students understand multiple-meaning words and key vocabulary such as *formed* and *pressure*.

HELP & GO: Vocabulary

- Guide students to look around the word to identify context clues for *formed* and *pressure* in paragraph 5. (formed: *slowly turning to rock;* pressure: *crushing weight of all this rock squeezed*)
- Have students share their understanding of multiple-meaning words and phrases: *plants, power plants; powers; formed, forms*. Help them clarify the meaning of these words in context. **EL**

4 Stop & Discuss

- Have students complete **Stop & Discuss** independently, then **Turn and Talk**.
- Provide sentence frames for discussion, such as *The author would agree/not agree with ___ because the text says ___*. **EL**
- **LOOK FOR** Students understand that fossil fuels form slowly but people use them a lot.

HELP & GO: Comprehension

- Have students reread paragraph 5. **Ask,** *How long did it take to turn the dead material into fossil fuels? millions of years*
- Have students reread paragraph 7. **Ask,** *How do people use fossil fuels? to make electricity, heat homes, and power vehicles What phrase in the last sentence gives you a clue about how much fossil fuel people use? "All these fossil fuels" suggests a lot.*

- Have students **Shout Out** which statement they chose. Then use **Pick a Stick** to have one or two students share their thinking and evidence with the group.

5 Support Reading

- Have students read paragraphs 8–10 and the chart.
- **CHECK IN** Students understand the terms *renewable* and *nonrenewable*.

HELP & GO: Vocabulary

- Guide students to look inside the word *renewable* for familiar prefixes and suffixes.
- Guide students to look around the word *nonrenewable* for clues to its meaning. (not last forever; millions of years to be replaced)

6 Stop & Discuss

- Have students **Turn and Talk** to complete the **Stop & Discuss**.
- Have students rephrase the question. **EL**
- **LISTEN FOR** Students understand that nonrenewable resources pollute and will run out, while renewable resources will not run out and create less pollution.

HELP & GO: Sentence Comprehension

- **Say,** *In paragraph 8, what does "they" refer back to in the second sentence? the fossil fuels: petroleum, coal, and natural gas What do you learn about fossil fuels? They take millions of years to be replaced, are nonrenewable, and create pollution.*

Discuss the Whole Text

- Use **Pass It On** to revisit the Focus Question. Students can give one example from the text on each turn.
  - —**Ask,** *What are the three forms of fossil fuels, and how do people use them?*
  - —**Ask,** *What three renewable resources are mentioned, and why do people use them?*
- Record and display responses next to those recorded for the first text.

SESSION 3 READ

5

8 Today, more than 80% of the world's energy still comes from fossil fuels. But petroleum, coal, and natural gas will not last forever, and they take millions of years to be replaced. They are nonrenewable resources. They also create pollution, which harms human health and the environment. So, people must find **alternative** sources of energy.

alternative = different

9 Renewable resources are one option. Renewable energy sources, such as **solar energy**, wind energy, and hydropower (water power), create less pollution and will not run out. When it is cloudy or calm, we don't have to wait long for more sun and wind. At least not as long as the millions of years it would take for dead animals or plants to turn into oil or coal!

solar energy = energy from the sun

10 People have explored different ways to use energy from natural resources for centuries. And every new discovery has had a huge effect on the way people live. What will the energy of the future be?

RENEWABLE RESOURCES

ENERGY SOURCE	DESCRIPTION
 Solar	• Energy from sunlight • Can be turned into electricity or heat • Heats buildings, warms water, powers vehicles and tools
 Wind	• Energy from moving air (wind) • Can be used to generate electricity • Wind turns the blades of a turbine. The turbine spins a generator, which generates electricity.
 Hydropower	• Energy from moving water • Can be used to produce electricity • Flowing water turns a turbine to spin a generator, which generates electricity.

6

RI.4.1

Stop & Discuss

What is the difference between renewable and nonrenewable resources?

Use details and examples from the text and chart to support your answer.

Renewable resources are different because ___.

SESSION 4 PRACTICE

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines . . .) and explain how the information contributes to an understanding of the text in which it appears.

LESSON 19

1 Interpret Visual Information

- A **diagram** is a drawing or picture that explains what something looks like or how it works. A diagram can help explain a complicated idea.
- A **chart** organizes information in a way that makes it easier to find and understand.

2 Reread/Think

How is the sun connected to the fossil fuels we use today? Reread "What Makes It Go?" Complete the chart with information from the text and the diagram on page 373 that will help you answer the question.

Information from the Text	Information from the Diagram
(paragraph 5) • **Plants grew using energy from the sun before dinosaurs lived.** • **Sand and clay covered dead things and turned to rock.** • **Over time, more layers of rock formed above the dead material and squeezed it.** • **Over millions of years, heat and pressure turned the dead material into fossil fuels.**	• **Arrows and captions show fossil fuels took 300 million years to form.** • **Section 1: 300 million years ago, plants grew using energy from the sun.** • **Section 2: Picture, labels, and caption show water + sediment buried dead materials.** • **Section 3: Heat and pressure turned dead material into fossil fuels.**

Reconnect to the Text

Have students **Raise a Hand** to recall "What Makes It Go?" **Ask,** *What are examples of fossil fuels and renewable resources?*

1 Practice the Standard

- Ask students to look at the visuals in the text and match them with the academic terms. (*diagram, chart*) Explain that this type of chart is also called a *table*. **EL**
- Have students **Turn and Talk** about what the chart and diagram show and how they organize information.

2 Reread/Think

MODEL THE STANDARD Model how to understand information in a visual. Have students **Shout Out** answers to the questions below.

- **Ask,** *Which visual will help you answer the question* How is the sun connected to the fossil fuels we use today? *diagram*
- **Say,** *On page 373, the diagram "How Fossil Fuels Were Formed" shows a process over time. Arrows connect one part of the process to the next. In the first section, the label "300 million years ago" tells me when fossil fuels started forming. It also lets me know that each arrow represents a very long time. What do the picture and caption show about how fossil fuels started? started as plants*

GUIDE STANDARDS PRACTICE Have students complete the graphic organizer.

- **Say,** *Use information from the captions and labels to understand what each picture shows about how fossil fuels were made and how this connects to the sun.*
- **Ask,** *How does the first step in the diagram connect to the sun? Plants grew using energy from the sun.*
- Read aloud paragraph 5 to students and have them say or write their own captions for each picture in the diagram. **EL**

3 Talk

- Have students use the sentence frames to **Turn and Talk** to respond to the Talk question.
- Use **Help & Go** scaffolds as needed.
- **LISTEN FOR** Students explain information clearly about how the diagram helped them understand more about the way fossil fuels formed.

HELP & GO: Academic Discussion

- If a student's explanation is unclear, you might ask the student to reword it with more precise academic language or help them to do so.

4 Write

- Remind students that their response should be supported with information from the diagram and the text.
- Have students **Turn and Talk** before they write. **EL**
- Have students work independently to complete the Write activity.
- **LOOK FOR** Students interpret the diagram and explain how its visuals and text helped them understand how fossil fuels formed.

HELP & GO: Writing

- Encourage students to use sentence frames from the Talk activity to help them write their responses.

- Have students share their work using **Musical Shares**.
- Use written responses to determine whether students need additional support.

SESSION 4 PRACTICE

3 Talk

How did the diagram help you understand more about how fossil fuels were formed? Share the information from your chart with a partner. Listen to your partner's information.

The diagram shows ___.

The diagram helps me picture ___.

First, ___. Next, ___. Finally, ___.

4 Write

How were fossil fuels formed? Use information from the text and diagram to support your response.

Sample response: The text explains that fossil fuels took millions of years to form. First, plants and other living things died and were covered by sand and clay. Next, the sand and clay turned to rock. Then, more layers of rock formed. Finally, heat and pressure turned the dead material into fossil fuels. The diagram shows how fossils fuels started forming 300 million years ago. Each picture shows the layers of plants, living things, and sediment during each step in the process. The arrows and captions explain that each picture shows what happened at a different time.

WRITING CHECKLIST

- ☐ I explained how fossil fuels formed.
- ☐ I included information from the text and the diagram.
- ☐ I used complete sentences.
- ☐ I used correct spelling, punctuation, and capitalization.

SESSION 5 READ LESSON 19

COOL SOLUTIONS: TRASH TO GAS

by Danielle Jansen

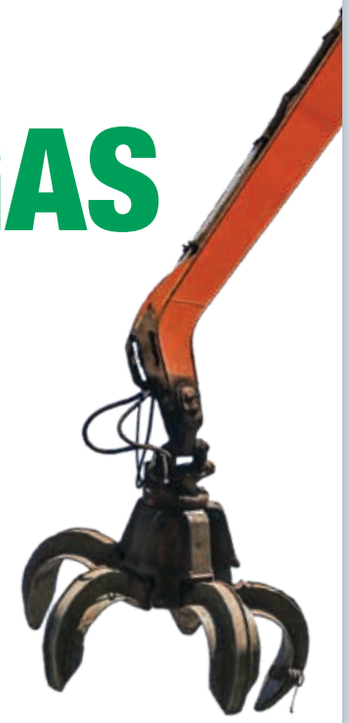
1

1 Lunch is almost over. You crunch into the last morsel of your apple. Then you toss your apple core into the trash bin. In a week or two, this trash will be dumped in a landfill, where the trash will remain.

2 In the United States, people throw away tons and tons of waste every year, and most of it goes to landfills. Can you guess the most common type of waste at landfills? It's not plastic, and it's not paper—it's food!

3 Food is a kind of organic waste. Organic waste is plant or animal material that breaks down over time. This waste takes up a lot of space in landfills, but imagine if it could be turned into something useful, instead of sitting in a landfill, left there to rot.

4 Sweden has thought of one solution. In 2005, the country **banned** organic waste in landfills. What does Sweden do with all this organic waste, then?



banned = stopped allowing

Reconnect to the Texts

Display responses to the Focus Question for "First Came Fire: A Story of Energy and Fuel" and "What Makes It Go?" Have students **Raise a Hand** to make connections between the two texts.

1 Independent Reading

- **Note:** The text describes how poop is recycled. Some students may giggle as they read.
- **Say,** *Today you will independently read text and visuals to learn more about energy. As you read, stop at the end of each page to ask yourself questions about the text.*
- If students need more support, work with them in small groups.
- Use **CHECK INs** and related **Help & Go** scaffolds as needed.
- **CHECK IN** Students understand the meaning of *morsel, waste,* and *breaks down*.

HELP & GO: Vocabulary

- Remind students to look around the word for clues to the meaning of words in paragraphs 1–3: *morsel* (last morsel of your apple), *waste* (throw away), and *breaks down* (rot).
- Encourage students to look for words with cognates in their home language: *organic (orgánico/a).* **EL**

2 Independent Reading

- **CHECK IN** Students understand that organic waste can be used to produce fuel instead of sitting in landfills.

HELP & GO: Comprehension

- Have students reread the diagram. **Ask,** *What is used to make biogas? organic waste What is biogas used for? fuel How does the diagram connect to paragraph 3? Using organic waste to make biogas is better than having it sit in a landfill.*

- **CHECK IN** Students understand that *it* in paragraph 7 refers to the process described in paragraph 6 of turning poop into fuel.

HELP & GO: Sentence Comprehension

- In paragraph 7, clarify that *it* in *Here's how it works* refers to an idea in paragraph 6: recycling waste that gets flushed down the toilet.
- In paragraph 7, point out the colon at the end of the phrase *Here's how it works*. **Say,** *The colon shows that the text that comes after "Here's how it works" will explain how something works. What does the text that comes after the colon explain? The text explains how the waste flushed down the toilet goes to the treatment plant to get turned into fuel.*

- **CHECK IN** Students understand that people recycle human waste to make biogas that can be used as fuel.

HELP & GO: Comprehension

- Point out the question *Why poop?* in paragraph 6. **Ask,** *What answer does the author give to that question? When poop breaks down, it can create biogas.*
- **Say,** *Reread paragraph 7. What do people make out of biogas? fuel*
- Check that students understand and can paraphrase why people recycle human waste: bacteria can break it down into biogas (bi-o-gas). Biogas can be used as fuel. **EL**

SESSION 5 READ

2 HOW BIOGAS IS MADE

Organic waste is collected and prepared. → The organic waste goes in a big tank where bacteria break it down. → As bacteria break down the organic waste, biogas is produced. → Biogas is turned into fuel that powers vehicles.

5 The waste is taken to a plant, a place where something is produced. At the plant, waste is broken down by tiny living things called bacteria. When bacteria break down the waste, they produce biogas. Biogas can be used as a fuel to power cars, buses, and other vehicles. In fact, this biogas powers more than 200 city buses in Sweden!

6 But people don't stop at recycling food waste. Some have also developed plants that reuse animal manure from farms or human waste (poop) that gets flushed down the toilet. Why *poop*? Well, when poop breaks down, it can also create biogas!

7 Here's how it works: The waste that people flush down the toilet travels to a treatment plant. There, the waste is separated from water. Machines take this waste, remove and clean the water, and then release the water into the sea. What's left is lots of thick muddy stuff called sludge. As the sludge breaks down, it makes biogas. The treatment plant uses biogas to make fuel for vehicles.

8 People are still looking for new ways to use waste, and maybe one day, all our trash will skip the landfill and become fuel.

SESSION 5 PRACTICE

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines . . .) and explain how the information contributes to an understanding of the text in which it appears.

LESSON 19

Respond to Text

3 Reread/Think

Reread "Cool Solutions: Trash to Gas." Choose the best response to each question.

1. Which information from the text is also in the diagram on page 378?

A. Organic waste takes up a lot of space in landfills.

B. Machines separate human waste from water.

C. Biogas can be used as a fuel to power cars, buses, and other vehicles.

D. The waste people flush down the toilet travels to a treatment plant.

2. What does the word *common* mean as it is used in paragraph 2?

A. belonging to all

B. appearing a lot

C. simple

D. general

3. Write an **X** in the box next to each detail to show whether it describes information in the text, information in the diagram, or information in both the text and the diagram.

	Text	Both	Diagram
The waste is taken to a power plant.	X		
The organic waste goes in a big tank.			X
Biogas is turned into fuel for vehicles.		X	

3 Reread/Think

- Have students complete the Reread/Think items independently.
- Check that students understand that *human waste* is a more formal way of saying *poop*. **EL**

Answer Analysis

After students complete the independent practice, have them use **Shout Out** to share their responses to each item. Use the answer analysis below to clarify ideas.

1. The correct choice is **C**. It is the only piece of information from the text that is supported by the diagram. This idea is expressed in paragraph 5 and in the last section of the diagram. Choice **A** does not appear in the diagram. Choices **B** and **D** provide information about human waste, which is not what the diagram shows. **DOK 1 | RI.4.7**

2. The correct choice is **B**. The text uses the word *common* to describe the type of waste that is most often found in landfills. Choices **A**, **C**, and **D** describe other meanings of the word *common*. **DOK 2 | RI.4.4**

3. See answers on the student page. **DOK 2 | RI.4.7**

4 Answer Analysis

4. The correct choice is **A**. The diagram on page 378 shows the steps in the process of changing organic waste into fuel. The diagram does not include the information in choices **B**, **C**, and **D**. **DOK 2 | RI.4.7**

5 Write

- Have students respond independently to the Write prompt. **DOK 3 | RI.4.7**
- If students need more support, work with them in small groups to guide them through writing.
- If needed, provide sentence frames to help students construct responses: *The text gives information about ___. The diagram helps me understand ___.* **EL**

Lesson Wrap-Up

- Use **Pass It On** to have students revisit the Focus Question using examples from the text.
- **Ask,** *Why do people use different types of waste as sources of energy? What do they use it for?*
- Record and display students' responses next to their responses from the first two texts.

SESSION 5 PRACTICE

4 Reread/Think

4. How does the diagram on page 378 help the reader understand paragraph 5?

A. It shows the steps organic waste goes through to become fuel.
B. It shows the amount of organic waste needed to make biogas.
C. It shows how long it takes to make biogas with organic waste.
D. It shows how often the big tank is filled with organic waste.

5 Write

How do details from both the text and the diagram explain how waste is turned into fuel? Use at least **one** example from the text and **one** from the diagram to support your response.

Sample response: The text gives details about the process of turning waste into fuel, but the diagram shows pictures of each step in the process. For example, the text explains that waste is taken to a plant where it is broken down by bacteria. The diagram shows a photo of food waste connected to a photo of a huge tank where bacteria break down the waste. That helps me picture the waste, the tank, and the relationship between those two things.

WRITING CHECKLIST

- ☐ I answered the question.
- ☐ I used at least one example from the text and one from the diagram.
- ☐ I used correct spelling, punctuation, and capitalization.

SESSION 6 PUT IT TOGETHER LESSON 19

Respond to the Focus Question

Why have people used energy from different sources?

1 Reread/Think

Sample responses shown.

Choose one text from the lesson to reread with a partner.

TEXT: **"What Makes It Go?"**

What is one source of energy that people use, and how have they used it? Why have people used energy from that source?

1. **People use wind to generate electricity.**

2. **People use wind because it is renewable.**

2 Talk

Share what you learned from the text you reread. Use the sentence frames to get started.

People have used energy from ___ to ___.

People have used ___ as a source of energy because ___.

3 Write

Why have people used energy from different sources? Use information from at least two texts in your response.

Respond to the Focus Question

Read the Focus Question. Tell students that today they will answer the question using information from all three texts.

1 Reread/Think

- Have partners reread one text and complete the Reread/Think section. Ask them to mark one interesting fact in the text and think of one question they still have.
- Remind students to use the visuals.

2 Talk

- Have students **Raise a Hand** to share an interesting fact from the text or a question they still have.
- Then use **Compare and Connect** to guide a whole-class discussion. **Ask,** *What energy sources did we read about? How are they alike? How are they different?*

3 Write

- Have students respond independently to the prompt.
- Encourage students to use the sentence frames from the Talk section to help them write their responses. **EL**
- Use **Help & Go** scaffolds as needed.
- **LOOK FOR** Students use information from two texts to answer the question *Why have people used energy from different sources?*

HELP & GO: Writing

- Have students complete the activity as a partner-writing activity. **EL**
- Guide students to create their own writing checklists.