4th grade Science – Energy as a Resource

Unit 1 – Energy, Waves: Waves and Information

Lesson 1 – Think like an engineer: T.H. Culhane p. 32

Obj: Identify an engineering problem, its constraints, and criteria for a solution.

Sustainable -_____

_____

Transform -_____

_____

Answer the following questions

What two problems did T.H. Culhane identify?

How does T.H. Culhane's energy solution make use of available materials?

What is the device called that T.H. and his organization developed? How does it work?

Lesson 2 – Nonrenewable Energy Resources p. 44

Obj: List energy resources derived from nature that are nonrenewable.

Brain Pop – Fossil Fuels and Nuclear Energy

Fossil Fuels -_____

_____

Nonrenewable energy resources -_____

_____

Answer the following questions

Identify four nonrenewable energy resources.

What type of energy is transformed into electricity in nuclear power plants?

What do people really mean when they say a power plant "produces" energy?

Power and pollution: the advantages and disadvantages of fossil fuels

By Encyclopaedia Britannica, adapted by Newsela staff on 07.06.17
Word Count **640**
Level **730L**

Big Bend Power Station is a major coal-fired power plant near Apollo Beach, Florida.

Fossil fuels are used as a source of energy. This energy fuels our cars, heats our homes and lights our schools.

Fossil fuels are natural substances that formed over millions of years. Examples of fossil fuels are oil, gas and coal.

People have used fossil more and more since the mid-1700s. This is when new ways of manufacturing were invented.

Today, almost all of the world's energy supplies are from fossil fuels.

But, fossil fuels are nonrenewable. This means once we use them, they are gone. It takes millions of years for more fossil fuels to be made.

Coal

Coal is one of the most-used fossil fuels. Almost one-third of electricity in the U.S. comes from coal.

Most coal formed about 359 to 299 million years ago. Dead plants fell into the swamps and settled at the bottom. Over millions of years, sediment covered the decaying plant matter. The weight of the sediment compressed it. It formed into peat.

Over time, more sediment covered the peat. Pressure and heat changed the peat into a soft coal. Then, more heat and pressure changed it into even harder forms of coal.

Hard coals are considered the best kind of coal. They do not release as many pollutants as other types of coal.

Oil And Natural Gas

Petroleum is a name for oil. Oil and natural gas formed through a similar process, often in the same swampy place. They were made from the buried remains of tiny water organisms. The organisms died and sank to the muddy swamp bottom. Then, their buried remains changed into a substance called kerogen.

Heat and pressure changed the kerogen into petroleum. This took millions of years to happen. Some of the petroleum was liquid and some was gas. Natural gas formed at the deeper, hotter spots.

The main liquid fossil fuels used today are made from oil. These include gasoline, jet fuel and oils used for heat, like kerosene. Natural gas is used for heating and cooking. It is also used to generate electricity.

Other Fossil Fuels

Peat and coke are solid fossil fuels.

Peat is used for heating when there are not other fuels available. But, it burns slowly and produces a lot of smoke and not much heat.

Coke is what is leftover after gases and tar are taken from some types of coal. Coke is used to make iron and in other processes.

Oil shale and tar sands are also fuel sources. But, using them for fuel is difficult and expensive. So, these resources are not a good option.

Where Fossil fuels Are Found

Fossil fuels are not found equally around the world. Most of the world's coal was formed in the United States, Russia and China. Australia, India and South Africa also have large amounts of coal.

More than half of the world's known oil and natural gas is in the Middle East.

Pollution, Global Warming

There are other downsides to using these fossil fuels. A big one is the harm they cause.

Burning petroleum and coal releases harmful gases into the air. Smog is a buildup of harmful gases. Smog makes it harder for people to breathe, leading to problems like asthma. Also, burning fossil fuels releases carbon dioxide into the air. Over the years, the amount of carbon dioxide has built up. This increases Earth's temperatures and is a cause of climate change. Climate change is harmful to people, animals, plants and land.

So, scientists are coming up with new ways to make energy.

For example, some cars can use electricity instead of gasoline. Homes can be heated using energy from the sun. And, some electric power plants use wind or water instead of coal.

These alternative energy sources are forms of renewable resources. This means they will not run out like fossil fuels. They are also better for our environment.

Quiz

1 Read the paragraph from the section "Coal."

> *Hard coals are considered the best kind of coal. They do not release as many pollutants as other types of coal.*

Which phrase from the article BEST helps you understand the meaning of "pollutants"?

(A) natural substances

(B) fuel sources

(C) large amounts

(D) harmful gases

2 Read the paragraph from the section "Pollution, Global Warming."

> *These alternative energy sources are forms of renewable resources. This means they will not run out like fossil fuels. They are also better for our environment.*

What does the author mean by "renewable resources"?

(A) energy sources that can be replaced

(B) newly discovered types of energy

(C) energy that is made from fossil fuels

(D) more powerful types of energy

3 What does the introduction [paragraphs 1-5] show you?

(A) how fossil fuels are formed and why it takes so long

(B) where and when fossil fuels were discovered

(C) examples of fossil fuels and how they are used

(D) what fossil fuels are and why they can be harmful

4 Read the selections from the section "Oil And Natural Gas."

> *They were made from the buried remains of tiny water organisms. The organisms died and sank to the muddy swamp bottom. Then, their buried remains changed into a substance called kerogen.*
>
> *Heat and pressure changed the kerogen into petroleum. This took millions of years to happen.*

Which answer choice BEST describes the structure of these selections?

(A) problem and solution

(B) sequential order

(C) compare and contrast

(D) order of importance

Lesson 3 – Renewable Energy Resources p. 46

Obj: List energy sources derived from nature that are renewable.

Brain Pop – Solar Energy and Energy Sources

Renewable energy resources -_____

_____

Solar Energy -_____

_____

Wind Energy - _____

_____

Answer the following questions

List three renewable energy sources

How is electricity generation from wind and water similar to electricity generation from fossil fuels?

Solar plane's historic journey promotes clean energy

By Damian Carrington, The Guardian, adapted by Newsela staff on 08.02.16
Word Count **553**

Solar Impulse 2 lands at Moffett Field in Mountain View, California, April 23, 2016. The aircraft recently became the first renewable energy-powered plane to fly around the world. AP/Noah Berger

For the first time, a solar-powered airplane flew around the world. Solar Impulse 2 touched down in the city of Abu Dhabi early Tuesday.

The plane's wings collect power from the sun. In March 2015, Solar Impulse 2 took off in Abu Dhabi, in the Middle East. The plane later crossed both the Pacific and Atlantic Oceans using no gas. It had spent more than 23 days in the air.

Bertrand Piccard was one of the pilots. Near the end of the trip, he talked to reporters.

He said: "It is a very, very special moment – it has been 15 years that I am working on this goal. All the clean technologies we use, they can be used everywhere. These technologies now can make the world much better."

The Benefits Of Renewable Energy

Piccard said renewable energy can make money. It can also help the Earth at the same time.

During daylight, solar panels on the wings absorb sunlight. The sun's energy charges the plane's batteries. Then the batteries power the motor and propeller. The pilots climbed high during the day and glided down at night to conserve power. The plane flies at about 30 miles an hour. It can go even faster if the sun is bright.

The plane could fly almost forever but the pilots cannot. There were grueling conditions aboard.

Piccard switched off as pilot with André Borschberg. They spent up to five days in the cabin. Each took only short naps. The single seat in the plane was also the toilet. Borschberg flew the longest leg, 4,000 miles over the Pacific from Japan to Hawaii. He smashed the record for the longest flight without a break.

But Piccard said his biggest struggle was getting his pilot's license. He worked for it over six years.

Another Challenge

Piccard and Borschberg are both Swiss. They are also both adventurers. Piccard made the first non-stop balloon flight around the world in 1999. Borschberg, once a Swiss air force fighter pilot, has had brushes with death.

Piccard said flying from Cairo, Egypt, to Abu Dhabi was tough. They had to go high up to avoid the bumpy air below.

"It is a much more demanding and exhausting flight," he said. "There were moments in the last night that I could not rest at all. I just had to fight with my flight controls."

Rough Pacific Crossing

Solar Impulse's journey was difficult even on the ground. Crosswinds in China caused the team to wait for weeks in 2015. During the Pacific crossing, overheated batteries forced the crew to spend the winter in Hawaii. The team also needed to raise money from companies to pay for their flight.

Piccard said his ground team had made the record-breaking flight possible.

"I will give to each of them a big hug because they made my dream possible."

The aim of the adventure was to show what renewable energy can do.

Pushing Clean Power

Piccard wants to start a group for clean power. That way, experts can tell world leaders how to fight climate change and still make money.

Ban Ki-moon is a leader in the United Nations. It is a group of countries. He said: "This is a historic day for Captain Piccard and the Solar Impulse team, but it is also a historic day for humanity."

Quiz

1 Read the sentences from the introduction [paragraphs 1-4].

Select the sentence that explains what is MOST remarkable about Solar Impulse 2.

(A) Solar Impulse 2 touched down in the city of Abu Dhabi early Tuesday.

(B) In March 2015, Solar Impulse 2 took off in Abu Dhabi, in the Middle East.

(C) The plane later crossed both the Pacific and Atlantic Oceans using no gas.

(D) He said: "It is a very, very special moment – it has been 15 years that I am working on this goal."

2 Read the section "The Benefits Of Renewable Energy."

Which paragraph BEST explains how the solar plane works?

3 Overall, the article is organized around:

(A) a pilot and his achievements

(B) a flight and its importance

(C) an airplane and its design

(D) a journey and its challenges

4 Read the paragraph from "Rough Pacific Crossing."

> *Solar Impulse's journey was difficult even on the ground. Crosswinds in China caused the team to wait for weeks in 2015. During the Pacific crossing, overheated batteries forced the crew to spend the winter in Hawaii. The team also needed to raise money from companies to pay for their flight.*

Which answer choice BEST describes the structure of the paragraph?

(A) main idea and details

(B) compare and contrast

(C) sequence of events

(D) problem and solution

Lesson 4 – Energy Resources, Obtain and Combine Information p. 48 - 51

Obj: Compare the effects of different energy sources on the environment.

Brain Pop – Natural Resources and Save the Environment

Answer the following questions

Which resources have the greatest disadvantages? Explain.

Is there such thing as a "clean" fossil fuel? Explain.

Where do we get our energy and fuels?

How does the U.S. energy consumption affect the environment? Cite evidence from the graphs to support your answer.