



## Lesson 1

Topic: Producing electricity

## Exploring fossil fuels

### Lesson concepts

- Energy from a variety of sources can be used to generate electricity
- Scientific understandings and inventions affect people's lives
- Ideas, explanations and processes can be communicated

### Learning alerts

Be aware of students thinking that all sources of energy are sustainable and can be easily regenerated.

### Suggested next steps for learning

- Explain that fossil fuels are not able to be regenerated quickly enough to be considered sustainable.

### Lesson notes

In this lesson, students will explore fossil fuels and how they are used as the number one energy source around the world. They will also learn how fossil fuels are used to generate electricity.

## Science start-up answers

1. Personal response required.

## Lesson answers

2. a.

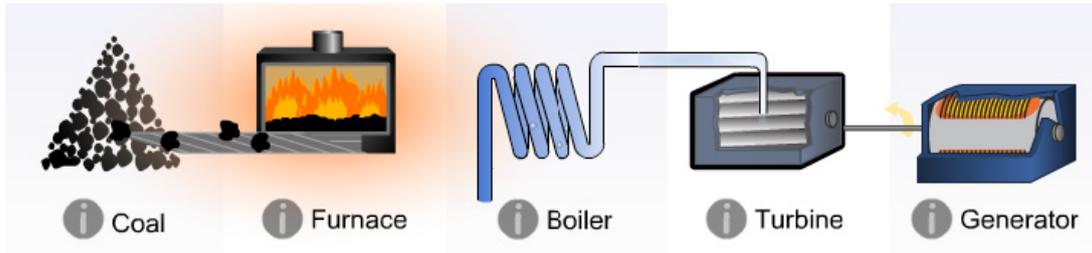
	True	False
The coal we use today first started to form 260 million years ago.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Coal is not a fossil fuel.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Buried peat eventually turned into coal.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

3. No answer required.

4. a. No answer required.  
b. No answer required.

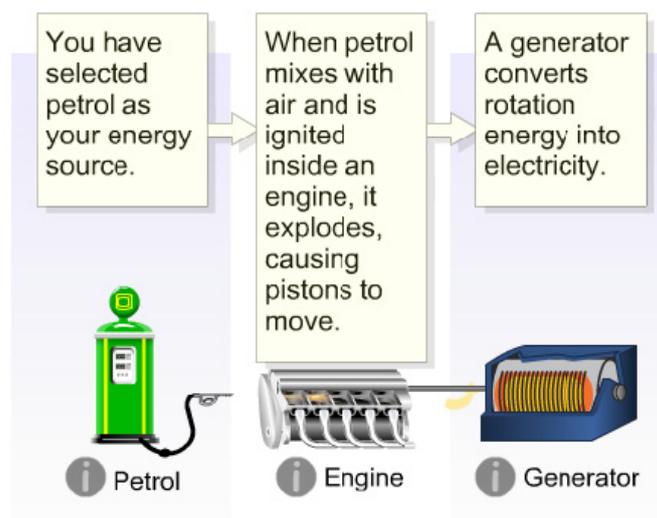


5. a.



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b.



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6. The similarities between petrol and coal and how they are used to produce electricity are:

- Petrol and coal are both fossil fuels
- Both use a generator

7. Using coal and petrol to generate electricity makes a lot of pollution that can affect people's health.

8. a. Fossil fuel: Fossil fuels are formed from the remains of plants and/or animals that undergo a range of geological processes over a long period of time.

b. Turbine: a propeller-type device that produces rotational energy



## Lesson 2

### Topic: Producing electricity

## Investigating renewable energy sources (1)

### Lesson concepts

- Energy from a variety of sources can be used to generate electricity
- Scientific understandings and inventions are used to solve problems that directly affect people's lives
- Scientific knowledge is used to inform personal and community decisions
- Ideas, explanations and processes can be communicated

### Learning alerts

Be aware of students thinking that sustainable and renewable are the same thing.

### Suggested next steps for learning

- Explain that renewable means the resource can be regenerated in a shorter period of time while sustainable is about ongoing long-term availability for use.

### Lesson notes

In this lesson students will learn about renewable energy sources. They will learn how renewable energy sources are used to produce electricity and the energy transformations that take place. They will also learn about the advantages and disadvantages using these energy sources to produce electricity has on communities.

Students can use the internet for additional research if they have access.

## Recap answers

1.

Term	Definitions
fossil fuel	formed over a long period of time from the remains of plants and animals
energy transformation	the change from one form of energy to another
conductor	material through which energy can be transferred
turbine	propeller-type device that produces rotational energy



## Lesson answers

2. a. For example:
  - Using renewable energy does not harm the environment like non-renewable energy
  - Renewable energy does not contribute to global warming
  - Renewable energy is environmentally friendly.
3. Personal response required.
4. Answers to **Sheet 1 – Researching renewable energy sources** attached.
5. No answer required.



## Lesson 3

### Topic: Producing electricity

## Investigating renewable energy sources (2)

### Lesson concepts

- Energy from a variety of sources can be used to generate electricity
- Scientific understandings and inventions are used to solve problems that directly affect people's lives
- Scientific knowledge is used to inform personal and community decisions
- Ideas, explanations and processes can be communicated

### Learning alerts

Be aware of students thinking that sustainable and renewable are the same thing.

### Suggested next steps for learning

- Explain that renewable means the resource can be regenerated in a shorter period of time while sustainable is about ongoing long-term availability for use.

### Lesson notes

In this lesson students will learn about renewable energy sources. They will learn how renewable energy sources are used to produce electricity and the energy transformations that take place. They will also learn about the advantages and disadvantages using these energy sources to produce electricity have on communities.

Students can use the internet for additional research if they have access.

### Lesson answers

1. No answer required.
2. Answers to **Sheet 1 – Researching renewable energy sources** attached.
3. a. For example: I would recommend they produce electricity from solar energy.  
b. For example: I would recommend they produce electricity from tidal or wind energy.
4. For example: Wind energy is a renewable and sustainable energy source. There will always be wind so no matter how much we use now, it will not affect the amount we use in the future.
5. No answer required.



## Sheet 1 Answers

### Researching renewable energy sources

A range of different renewable sources of energy are used to produce electricity in Australia.

Research some of these energy sources (solar, wind, tidal, moving water or geothermal) and complete the table below.

Energy source	Solar
<b>How is the energy source used to produce electricity?</b>	<p>Students may provide answers for either photovoltaic or concentrated solar power or both.</p> <p>Photovoltaic: Sunlight hits the solar cells in the solar panels and is converted into electrical current.</p> <p>CSP: Mirrors or lenses turn to follow the sun and focus the sunlight into a small beam. The concentrated small beam is then used to heat a liquid (water or oil) which produces steam. The steam then turns a turbine, which is connected to a generator. The generator converts it into electricity.</p>
<b>Write or draw the energy transformations that occur when producing electricity from a solar energy source</b>	<p>Students may provide answers for either photovoltaic or concentrated solar power or both.</p> <p>Photovoltaic: Sunlight falls on the solar panels where it is transformed into electricity. It then enters the inverter where it is transformed into usable electricity.</p> <p>CSP: The concentrated solar energy heats liquid making steam. The steam turns the turbine, transforming the heat energy to rotational energy. The rotational energy is transformed into electrical energy in the generator.</p>
<b>Describe advantages of using this energy source for communities</b>	<ul style="list-style-type: none"><li>• Renewable</li><li>• Does not make any polluting gases</li><li>• Sunlight is free</li><li>• It does not make any noise</li><li>• Once solar panels are installed, there is very little maintenance</li></ul>
<b>Describe disadvantages of using this energy source for communities</b>	<ul style="list-style-type: none"><li>• Currently, electricity generated from solar power can only occur during the day when the sun is shining</li><li>• Cloud cover can reduce efficiency</li><li>• Can be expensive to install</li></ul>



Energy source	Wind
How is the energy source used to produce electricity?	<p>For example:</p> <p>A propeller attached to a large tower is rotated by the wind. The spinning propeller spins a turbine. The turbine is connected to a generator which produces electricity.</p>
Write or draw the energy transformations that occur when producing electricity from a wind energy source	<p>For example:</p> <p>Movement energy in the wind pushes the propeller and is transformed into rotational energy in the turbine. The rotational energy is then transformed into electrical energy in the generator.</p>
Describe advantages of using this energy source for communities	<ul style="list-style-type: none"><li>• Wind is free.</li><li>• No pollution is produced as no fossil fuels are needed to power machinery.</li><li>• The land where wind turbines are situated can still be used. For example, cattle can graze around wind turbines.</li><li>• Power can be easily supplied to remote areas through local wind farms.</li><li>• Available in a range of sizes depending on need.</li></ul>
Describe disadvantages of using this energy source for communities	<ul style="list-style-type: none"><li>• May be interruptions to electricity supply because wind is unpredictable.</li><li>• Areas of high wind are usually near the coast, so land may be expensive.</li><li>• Migrating flocks tend to like strong winds and might collide with wind generators.</li><li>• Wind generators can be noisy, preventing having housing locally.</li><li>• Wind generators may affect telecommunication reception.</li></ul>



Energy source	Hydroelectricity
How is the energy source used to produce electricity?	For example: Flowing or falling water spins a turbine which is connected to a generator which generates electricity.
Write or draw the energy transformations that occur when producing electricity from this energy source	For example: The movement energy of flowing or falling water is transformed into rotational energy when it spins the turbine. The rotational energy is transformed into electrical energy in the generator.
Describe advantages of using this energy source for communities	<ul style="list-style-type: none"><li>• It is a renewable energy source.</li><li>• Once the dam is built, the energy is virtually free.</li><li>• Does not produce waste or pollution.</li><li>• Much more reliable than wind, solar or wave power.</li><li>• Electricity can be generated constantly and as needed.</li><li>• Water can be stored above the dam ready to cope with peaks in demand.</li><li>• Hydroelectric power stations can increase to full power very quickly, unlike other power stations.</li><li>• Hydroelectric power stations can produce a great deal of power very cheaply.</li><li>• Water can be pumped back up into the dam to be used again.</li><li>• Contributes to the storage of drinking water.</li></ul>
Describe disadvantages of using this energy source for communities	<ul style="list-style-type: none"><li>• The dams are expensive to build. However, many dams are also used for flood control or irrigation, so building costs can be shared.</li><li>• Building a large dam will flood a very large area upstream, causing problems for animals that live there.</li><li>• Finding a suitable site can be difficult: the impact on residents and the environment may be unacceptable.</li><li>• Water quality and quantity downstream can be affected, which can have an impact on plant life.</li></ul>