

Energy

Introduction

The ELA materials designed for the theme Energy consist of three parts:

- Part I Forms of Energy (40 minutes)
- Part II Energy Change (80 minutes)
- Part III Electricity Generation (80 minutes).

Part I Forms of Energy covers basic concepts concerned with energy and the characteristics of different forms of energy. In the lesson in which this ELA is used, students are expected to learn the different forms of energy.

Part II Energy Changes focuses on energy conversion. In developing understanding of energy conversion, students also learn two sentence patterns commonly used to describe energy change:

- “*When..., ...is converted/changed into...*” and
- “*When..., ...is converted/changed into...*”

Part III Electricity Generation demonstrates to students how electricity is generated in a power station; and the impact of power generation on global warming. This ELA requires students to learn through reading a piece of text, with the aid of video clips.

The classroom activities developed for this teaching package integrate the use of different English skills in a science learning context. Lesson plans for the three Parts are provided, together with teacher’s notes.

Acknowledgement

This set of materials was produced jointly by the teachers of King Ling College and the ELA research team.

ELA Lesson Plan – PART I Forms of Energy

Description: This ELA material ‘Forms of Energy’ covers Section 4.1, Unit 4 of the CDC Science syllabus. It aims to introduce English terms for different forms of energy, which have been introduced in previous lessons using Chinese as the medium of instruction. The first part of the material is an explanation sheet describing the different forms of energy and showing pictures that illustrate energy changes. Students complete a worksheet (Task A) based on the explanation sheet. The second task (Task B) provides an opportunity for students to try taking notes. Although students have learned about the concepts through Chinese, the ELA materials develop these concepts further and at the same time introduce the associated English terms and descriptions.

The ELA requires 40 minutes.

Content Objective: After completing the activity, students should be able to name the different forms of energy and explain their characteristics.

Language Objective: After completing the activity, students should be able to

- understand and use the English terms related to energy forms (e.g., *forms of energy, give out, emit, sound energy, light energy, heat energy, kinetic energy, moving objects, electrical energy, chemical energy, potential energy, stored*)
- understand and use the English expressions for explaining different forms of energy, e.g.,
 - *When an object gives out sound energy, it makes sound.*
 - *When an object emits light energy, it gives light.*
 - *Heat energy can make an object become hotter. When an object gets heat energy, its temperature may rise.*
 - *Moving objects have kinetic energy.*
 - *Electrical energy can be easily changed into other forms of energy and carried through wire. It is a commonly used form of energy.*
 - *Chemical energy is stored in many things. It can be changed into other forms of energy in many ways such as by burning.*
 - *Potential energy is stored in many things in different ways. When an object is raised, it gains potential energy. When objects, such as springs are compressed, stretched or bent, they gain potential*

energy.

- discuss examples of objects or activities shown in pictures that involve different forms of energy, e.g.,
 - When we play the guitar, the guitar gives out sound energy because its strings vibrate.*
 - The sun is hot and bright. It gives out heat energy and light energy.*
 - The torch uses dry cells to work. Dry cells supply electrical energy to the torch.*
 - The children are running. They have kinetic energy.*
 - Burning gasoline provides cars with energy to move. Gasoline contains chemical energy.*
 - We need food. Food contains chemical energy that can be changed to heat to keep us warm.*
 - When we go up the escalator, we gain potential energy. When we go down the escalator, we lose potential energy.*
 - A fishing rod stores potential energy when it is bent.*
 - When there is a storm, lightning and thunder may appear. Lightning and thundering involves light, sound, heat and electrical energy.*
 - When a space shuttle is launched, the launching process involves light, sound, heat, chemical, kinetic and potential energy.*

Material/Tools • explanation sheet and worksheet

PART I – Forms of Energy

Steps

Task A: Forms of Energy (Pair work: 20-25 mins)

1. Distribute the worksheet of Task A and Task B.
2. Introduce the English terms of the different forms of energy by going through the pictures and description of different forms of energy with the class, highlighting the characteristics of each form of energy. (TN1)
3. Ask students to work in pair to complete Items 1 to 7.
4. Check answers. Ask different students to read out the forms of energy and help students learn how to read the phrases that describe each form of energy.
5. Go through the pictures in Items 8 to 17, describing what each picture is about.
6. Ask students to complete Items 8 to 17 in pairs.
7. Check answers by asking students to read aloud their answers in complete sentences.

Task B – Note taking (Individual work: 10-15 mins)

8. Give students 5 minutes to review Task A again. Ask them to highlight any vocabulary and phrases they think useful.
9. Ask students to write what they have highlighted in the space provided in Task B. (TN2)
10. Walk around and take a look at students' note-taking.
11. In case some students do not know which vocabulary items to note down, give them some examples by jotting down some key words on the board and ask them to use them when completing the worksheet. (TN3)
12. Summarize the lesson by highlighting and reading aloud again each form of energy.

Teacher's Notes (TN)

TN1: Students have learned the terms in Chinese before this lesson.

TN2: Tell students to use the back of the paper if the space is not enough.

TN3: If time allows, the teacher may ask a couple of students who have completed Task B to write down the vocabulary they have used on the board. Then some students can be selected to read aloud the vocabulary. Mistakes in spelling and pronunciation should be corrected .

PART I Forms of Energy

Task A: Forms of Energy

Look at the following pictures showing examples of objects or activities that involve different forms of energy described in the box.



Switched-on light bulb



Riding a roller coaster



Getting warm by a fireplace



Crying



Diving



Coal



Switched-on electric fan



Stretched bow

Different forms of Energy

Sound energy When an object gives out sound energy, it makes sound.

Light energy When an object emits light energy, it gives light.

Heat energy Heat energy can make an object become hotter. When an object gets heat energy, its temperature may rise.

Kinetic energy Moving objects have kinetic energy.

Electrical energy Electrical energy can be easily changed into other forms of energy and carried through wire. It is a commonly used form of energy.

Chemical energy Chemical energy is stored in many things. It can be changed into other forms of energy in many ways such as by burning.

Potential energy Potential energy is stored in many things in different ways. When an object is raised, it gains potential energy. When objects, such as springs are compressed, stretched or bent, they gain potential energy.

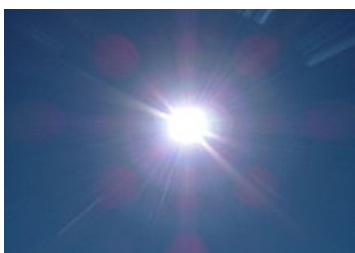
Match different forms of energy with an example of objects or activities.

Activities	Forms of Energy	Objects /
1) 熱能	_____ <u>heat energy</u> _____	_____ <u>getting warm by a fireplace</u> _____
2) 光能	_____	_____
3) 聲能	_____	_____
4) 動能	_____	_____
5) 勢能	_____	_____
6) 化學能	_____	_____
7) 電能	_____	_____

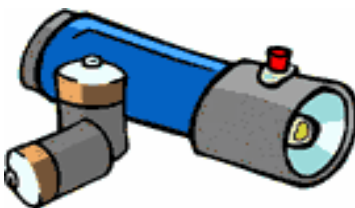
What form(s) of energy are involved in the following objects/activities?



8) When we play guitar, the guitar gives out _____ because its strings vibrate.



9) The sun is hot and bright. It gives out _____ and _____.



10) The torch uses dry cells to work. Dry cells supply _____ to the torch.



11) The children are running. They have _____.



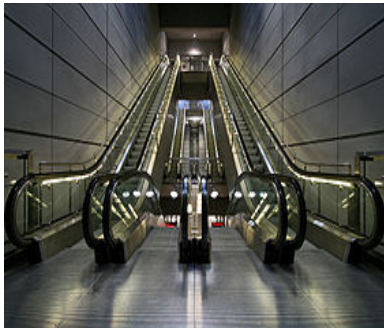
12) Burning gasoline provides cars with energy to move.

Gasoline contains _____.



13) We need food. Food contains _____

which can be changed to heat to keep us warm.



14) When we go up the escalator 流動電梯, we gain

_____.

When we go down the escalator, we lose

_____.



15) A fishing rod stores _____

when it is bent.



16) When there is a storm, thunder 雷 and lightning 閃電 may appear.

Thunder and lightning involve _____



17) When a space shuttle is launched, the launching 發射 process

involves _____

Task B: Note Taking

Write down any vocabulary and their meaning/examples in the space provided.

Vocabulary	Meaning/Examples
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

PART I Forms of Energy **Teacher's Version**

Task A: Forms of Energy

Look at the following pictures showing examples of objects or activities that involve different forms of energy described in the box.



Switched-on light bulb



Riding a roller coaster



Getting warm by with a fireplace



Crying



Diving



Coal



Switched-on electric fan



Stretched bow

Different forms of Energy

Sound energy When an object gives out sound energy, it makes sound.

Light energy When an object emits light energy, it gives light.

Heat energy Heat energy can make an object become hotter. When an object gets heat energy, its temperature may rise.

Kinetic energy Moving objects have kinetic energy.

Electrical energy Electrical energy can be easily changed into other forms of energy and carried through wire. It is a commonly used form of energy.

Chemical energy Chemical energy is stored in many things. It can be changed into other forms of energy in many ways such as by burning.

Potential energy Potential energy is stored in many things in different ways. When an object is raised, it gains potential energy. When objects, such as springs are compressed, stretched or bent, they gain potential energy.

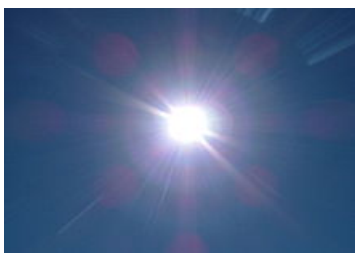
Match different forms of energy with an example of objects or activities.

- | | | |
|--------|--------------------|--|
| 1) 熱能 | <u>heat energy</u> | <u>switched-on light bulb/getting warm by a fireplace</u> |
| 2) 光能 | light energy | switched-on light bulb/getting warm by a fireplace |
| 3) 聲能 | sound energy | crying |
| 4) 動能 | kinetic energy | diving/riding a roller coaster/crying/
switched-on electric fan |
| 5) 勢能 | potential energy | diving/stretched bow/riding a roller coaster |
| 6) 化學能 | chemical energy | coal/getting warm by a fireplace |
| 7) 電能 | electrical energy | switched-on light bulb/electric fan |

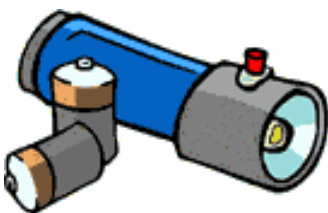
What form(s) of energy are involved in the following objects/activities?



8) When we play guitar, the guitar gives out **sound energy** because its strings vibrate.



9) The sun is hot and bright. It gives out **heat energy** and **light energy**.



10) The torch uses dry cells to work. Dry cells supply **electrical energy** to the torch.



11) The children are running. They have **kinetic energy**.

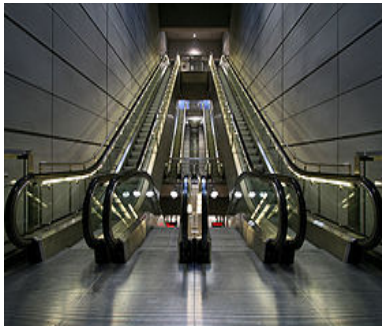


12) Burning gasoline provides cars with energy to move.

Gasoline contains **chemical energy**.



13) We need food. Food contains **chemical energy** that can be changed to heat to keep us warm.



14) When we go up the escalator 流動電梯, we gain **potential energy**. When we go down the escalator, we lose **potential energy**.



15) A fishing rod stores **potential energy** when it is bent.



16) When there is a storm, lightning 閃電 and thunder 雷 may appear. Lightning and thundering involves **light, sound, heat and electrical energy.**



17) When a space shuttle is launched, the launching 發射 process involves **light, sound, heat, chemical, kinetic and potential energy.**

Task B: Note Taking

Write down any vocabulary and their meaning/examples in the space provided.

Vocabulary	Meaning/Examples
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

ELA Lesson Plan – PART II Energy Changes

Description: This set of ELA materials focuses on Energy Changes and covers Section 4.2, Unit 4 of the CDC Science syllabus. The activities include three tasks (A, B and C) and can be completed within an 80-min lesson. Task A helps students to review what they have learned in Part I; it includes a vocabulary exercise and a video clip. Task B introduces the concept of energy changes with a video clip demonstrating energy conversion. Students will learn the sentence pattern – “*When..., ...is converted/changed into...*” – which is commonly used in describing energy conversion. In Task C, students will be asked to carry out a simple experiment on energy change; the instructions for the experiment are in English. The task also provides an opportunity for students to practise using the sentence pattern learned in Task B to describe energy change. Finally, Task D provides students with more examples of energy converters, and students have to describe the energy changes by using another sentence pattern– “*... converts/changes...into...*”.

Content Objective: After completing the activity, students should be able to:

- give examples of energy changes
- apply understanding of energy changes to describe energy change in daily life energy converters

Language Objective: After completing the activity, students should be able to:

understand and use the English terms related to energy changes (e.g., *batteries, fusion, fission, atomic bombs, nuclear power plant, soccer, guitar, shake torch, works without using cells, initial form of energy, final form of energy, energy conversion process, energy converter, device, refrigerator, television, microwave oven, rubbish bin, toaster, gas stove, electric boiler, dishwasher*);

- follow simple instructions on experiments on energy change
- describe the process of energy changes using the sentence pattern of “*When..., ...is converted/changed into...*” e.g.,
 - When water is poured down, potential energy is changed into kinetic energy.*
 - When the ball drops, potential energy is changed into kinetic energy.*
 - When the ball runs down the track and hits the tiles, the potential energy is changed into kinetic energy.*

- understand and use the English expressions for explaining energy conversion, e.g.,
 - *Energy conversion is a process of changing energy from one form to another.*
 - *The way the shake torch works is an example of energy conversion.*
 - *An energy converter is a device that converts energy.*
 - *When a television is on, electrical energy is converted into heat energy and light energy.*
 - *When a car moves, chemical energy is converted into kinetic energy.*
 - *When a person sings, chemical energy is converted into sound energy.*
 - *When a person dives, potential energy is converted into kinetic energy.*
 - *When I rub my hands, kinetic energy is converted into heat and sound energy.*

- understand and use the English expressions for explaining energy conversion, e.g.,
 - *A radio changes electrical energy into sound energy.*
 - *A toaster changes electrical energy into heat energy.*
 - *A dishwasher changes electrical energy into kinetic energy.*
 - *An electric boiler changes electrical energy into heat energy.*
 - *A lamp changes electrical energy into light and heat energy.*
 - *A water tap changes potential energy into kinetic energy.*
 - *A television changes electrical energy into light and heat energy.*

Material/Tools

- Worksheets includes Tasks A, B, C and D
- A shake torch for class demonstration or a shake torch for each groups of students
- An internet accessible computer and a projector for showing online video clips.

PART II – Energy Changes (~ 80 mins)

Steps

Task A: Revision - Forms of Energy (15-20 mins)

1. Review the English terms of energy forms (see TN1). Ask students to complete Items 1 to 7 (individual work).
2. Check answers.
3. Call different students to read aloud the English terms to the class.
4. Display on the board some pictures (or use PowerPoint slides) illustrating different forms of energy (such as a flame from burning charcoal, the Sun, a boy/girl running, an electric lamp, a ball at the edge of a tall shelf). Ask students to discuss in pairs for 4-5 minutes the forms of energy involved in each picture.
5. Ask a few students to name the energy involved in each picture. Try to involve as many students as possible. The teacher will give feedback accordingly.

(Steps 1–3 ensure students recall the terms in English and steps 4 and 5 helps the teacher check whether students understand the meaning of each energy form.)

6. Ask students to *work in pairs* to complete Item 8. (see TN2)
7. Check answers.

Task B: Energy Changes 能量轉變/ Energy Conversion 能量轉換 (Pair work: 25-30 mins)

8. Review the concept of energy changes, highlighting the pronunciation of the term and its meaning.
9. Play the video, *Energy Conversion Project*
<http://www.youtube.com/watch?v=DBZ0Tmkel5E&feature=related> to demonstrate how energy changes.
10. Explain briefly Task B Item 1 to the class.
11. Play the video again.
12. Ask students to complete Item 1. Draw students' attention to the sentence pattern "When..., ... is changed into..." and provide opportunities for them to practise it.
13. Check answers by asking students to read aloud their answers in complete sentences.
14. Show students a shake torch/Give each group a shake torch.
15. Briefly explain its characteristics.

16. Explain the highlighted vocabulary in Item 2.
17. Ask students to complete Item 2.
18. Check answers. Ask students to read aloud their answers in complete sentences.
19. Move on to Task B Item 3.
20. Draw students' attention to the sentence pattern

“*When* _____, _____ *is converted into* _____” and provide opportunities for them to practise it.

21. Ask students to complete Item 3.
22. Check answers. Ask students to read aloud their answers in complete sentences.

Task C: Do It Yourself – Energy Conversion (Individual work: 5 mins)

23. Ask students to read the first three lines and carry out the experiment.
24. Ask students to complete Task C. The teacher will give assistance to individual students.
25. Check answers. Ask students to read aloud their answers in complete sentences. (see TN3)

Task D: Energy Converters (Pair work: 10-15 mins)

26. Explain the task by going through the two paragraphs with the class. Draw students' attention to the sentence pattern

“_____ *changes* _____ *into* _____.” and provide opportunities for them to practise it.

27. Ask students to complete Task D.
28. Check answers. Ask students to read aloud their answers in complete sentences.

Round up (5 mins)

29. Highlight again the two sentence patterns:

“*When* _____, _____ *is changed into* _____”

“_____ *changes* _____ *into* _____.”

30. Ask students to in pairs, reading to one another the phrases in the vocabulary box (at the

end of Task B Item 2). Ask a few students to read aloud to the class. The teacher will comment on the pronunciation and ask the class to read the terms, if necessary.

... is converted into...	...被轉換為...
... is changed into...	...被轉變為...
energy conversion	能量轉換
energy change	能量轉變
energy converter	能量轉換器
initial	起初的, 開始的
final	最終的

Teacher's Notes (TN)

TN1: Students have learned the English terms of energy forms in the previous lesson so this lesson starts with a revision of the vocabulary

TN2: It may be necessary to play the video again to help students complete the task.

TN3: Teachers may ask students to suggest an energy conversion process other than those mentioned in the worksheet. They should describe the process (i) graphically (i.e. _____ → _____) and (ii) verbally (i.e. When _____, _____ is changed into _____).

PART II Energy Changes

Task A: Revision– Forms of Energy

Write down the forms of energy in English. (Individual work)

- 1) 熱能 heat energy
- 2) 光能 _____
- 3) 聲能 _____
- 4) 動能 _____
- 5) 勢能 _____
- 6) 化學能 _____
- 7) 電能 _____

8) Which of the following activities or objects involve different forms of energy? Circle the word(s) in the box below. (Pair works)

Sun	candle light	fusion 核聚變	playing soccer
wind	vegetables	fission 原子核分裂	playing guitar
shouting	batteries	atomic bombs 原子彈	running
lightning	jumping	gun	eating
rain	coke	nuclear power plant 核發 電廠	fighting

Task B: Energy Changes 能量轉變/ Energy Conversion 能量轉換

1) Watch the video *Energy Conversion Project*

<http://www.youtube.com/watch?v=DBZ0Tmkel5E&feature=related> How does the energy change?

Potential energy → kinetic energy

When water is poured down, potential energy is **changed into** kinetic energy.

When the ball drops, a) p is **changed into** b) k .

When the ball runs down the **track** 軌道 and hits the tiles, the c) _____ is **changed into** d) _____.

2) Fill in the blanks to complete the passage about how the shake torch works.

The picture shows a **shake torch** 手搖電筒. It works without using cells. How do you make it work? To make the shake torch work, we a) _____. When we **shake** 搖 the torch, we give b) _____ energy to the torch. It is the **initial** 起初的 form of energy. After shaking, the torch gives out c) _____ energy. It is the **final** 最終的 form of energy. In this **energy conversion** 能量轉換 process, d) _____ is converted into e) _____. To summarize, **when** f) _____, g) _____ **is converted into** h) _____.



The way the shake torch works is an example of energy conversion. Energy conversion is a process of changing energy from one form to another. In this process, the torch is an **energy converter** 能量轉換器. It is a device 設備 that converts energy.

Vocabulary

... is converted into...	...被轉換為...
... is changed into...	...被轉變為...
energy conversion	能量轉換
energy change	能量轉變
energy converter	能量轉換器
initial	起初的, 初始的

final

最終的

3) Describe the energy conversion in each of the following cases.

A television is on.



- a) When a television is on, _____ energy is converted into _____ energy and _____
- b) energy.

A car moves



- b) When _____,
- _____ is converted into _____.

A person sings



- c) When _____,
- _____.

A person dives



Task C: Do it Yourself – Energy Conversion

Follow the steps and answers the questions.

Rub your hands quickly for about 20 times.

What do your hands feel?

My hands feel a) _____

Do you hear any sound? b) _____



How did the energy change?

c) _____ → d) _____ + e) _____

Describe the energy conversion.

f) When I rub my hands, _____

Task D: Energy Converters

People invent machines and devices to improve our quality of life. All machines and devices are energy converters. They change energy from one form into another. Take a radio as an example.

 A radio **changes** **into** .

There are many energy converters in the kitchen. Find five of them in the picture below. Describe the energy conversion for each of them.



- Suggested Items
- Refrigerator
 - Television
 - Microwave oven
 - Rubbish bin
 - Toaster
 - Water tap
 - Lamp
 - Cup
 - Gas stove
 - Knife
 - Electric boiler
 - Soap
 - Dishwasher

Write your answers below by yourself.

	Energy converter	Energy conversion
E.g.	Toaster	A toaster changes electrical energy into heat energy.
1		
2		
3		
4		

5		
---	--	--

PART II Energy Changes (Teacher's Version)

Task A Key: Revision– Forms of Energy (10-15 mins)

Write down the forms of energy in English. (Individual work)

- 1) 熱能 heat energy

- 2) 光能 **light energy**

- 3) 聲能 **sound energy**

- 4) 動能 **kinetic energy**

- 5) 勢能 **potential energy**

- 6) 化學能 **chemical energy**

- 7) 電能 **electrical energy**

8) Watch the video, *Energy Intro* <http://www.youtube.com/watch?v=z7lCkQV7GEE>

Which of the following activities or objects appeared in the video that involve different forms of energy? Circle your answers. (Pair work)

Sun	candle light	fusion 核聚變	playing soccer
wind	vegetables	fission 原子核分裂	playing guitar
shouting	batteries	atomic bombs 原子彈	running
lightning	jumping	gun	eating
rain	coke	nuclear power plant 核發 電廠	fighting

Task B Key : Energy Changes 能量轉變 / **Energy Conversion** 能量轉換 (Pair work: 25-30mins)

- 1) Watch the video *Energy Conversion Project*
<http://www.youtube.com/watch?v=DBZ0Tmkel5E&feature=related>. How does the energy change?

Potential energy → kinetic energy

When water is poured down, potential energy **is changed into** kinetic energy.

When the ball drops, a) potential energy **is changed into** b) kinetic energy.

When the ball runs down the **track** 軌道 and hits the tiles, the c) potential energy **is changed into** d) kinetic energy.

- 2) Fill in the blanks to complete the passage about how the shake torch works.

The picture shows a **shake torch** 手搖電筒. It works without using cells. How do you make it work? To make the shake torch work,

we a) shake it. When we **shake** 搖 the torch, we give b) kinetic energy to

the torch. It is the **initial** 起初的 form of energy. After shaking, the torch gives out

c) electrical energy. It is the **final** 最終的 form of energy. In this **energy conversion** 能量轉換 process, d) kinetic energy is converted into e) electrical energy. To summarize, **when** f) we shake the torch, g) kinetic energy **is converted into** h) electrical energy.

The way the shake torch works is an example of energy conversion. Energy conversion is a process of changing energy from one form to another. In this process, the torch is an **energy converter** 能量轉換器. It is a device 設備 that converts energy.



Vocabulary

... is converted into...	...被轉換為...
... is changed into...	...被轉變為...
energy conversion	能量轉換
energy change	能量轉變
energy converter	能量轉換器
initial	起初的, 初始的
final	最終的

3) Describe the energy conversion in each of the following cases.

A television is on.



a) When a television is on, **electrical** energy is converted into **heat** energy and **light** energy.

A car moves

b) When **a car moves**, **chemical** energy is converted into **kinetic** energy.



A person sings



c) When **a person sings**, **chemical** energy is converted into **sound** energy.

A person dives

When a person dives, **potential** energy is converted into **kinetic** energy.



Task C Key: Do it Yourself – Energy Conversion (Individual work: 5 mins)

Follow the steps and answers the questions.

Rub your hands quickly for about 20 times.

What do your hands feel?

My hands feel a) **hot**.

Do you hear any sound? b) **Yes**



How did the energy change?

c) **kinetic energy** → d) **heat energy** + e) **sound energy**

Describe the energy conversion.

f) When I rub my hands, **kinetic energy is converted into heat and sound energy.**

Task D Key: Energy Converters (Pair/Group work: 10-15 mins)

People invent machines and devices to improve our quality of life. All machines and devices are energy converters. They change energy from one form into another. Take a radio as an example.

_____ A radio _____ **changes electrical energy into sound energy.**

There are many energy converters in the kitchen. Find five of them in the figure below.

Describe the energy conversion for each of them.



Suggested Items

- Refrigerator
- Television
- Microwave oven
- Rubbish bin
- Toaster
- Water tap
- Lamp
- Cup
- Gas stove
- Knife
- Electric boiler
- Soap
- Dishwasher

Give your answers below and don't let your classmates see them

	Energy converter	Energy conversion
E.g.	Toaster	A toaster changes electrical energy into heat energy.
1	Dishwasher	A dishwasher changes electrical energy into kinetic energy.
2	Electric boiler	An electric boiler changes electrical energy into heat energy.
3	Lamp	A lamp changes electrical energy into light and heat energy.
4	Water tap	A water tap changes potential energy into kinetic energy.
5	Television	A television changes electrical energy into light and heat energy.

ELA Lesson Plan – PART III Electricity Generation

Description: This set of ELA materials focuses on Part III Electricity Generation and covers Section 4.4, Unit 4 of the CDC Science syllabus.. Three tasks are developed to let students use English to learn about electricity generation and one of its related issues, global warming. The lesson starts with Task A which includes a short passage and a video clip. The passage explains the process of electricity generation, and is accompanied by a video showing how a power station works. The video complements the passage by helping students understand what they read. Task B brings out the problem of global warming as caused by electricity generation. A video is used to arouse awareness of the issue. It is followed by a passage briefly explaining the causes and consequences. Finally, Task C is a revision of the vocabulary learned in the previous tasks. Students are required to complete a vocabulary table as a summary of the lesson.

Content Objectives: After completing the activity, students should be able to:

- explain how energy conversion takes place in a power station
- describe the meaning of global warming caused by electricity generation

Language Objectives: After completing the activity, students should be able to use English to:

- understand and use the English terms related to electricity generation (e.g., *electricity generation, power station, boiler, turbine, generator, generate, coal, natural gas, fuel, steam, drive, convert into, energy conversion, global warming, fossil fuel, release, carbon dioxide, greenhouse gas, heat waves, storm, flood, sea level rise, extinct, recycle waste,, renewable energy, causes, effects, consequences.*
- answer questions concerning electricity generation, e.g.,
 - *What does the power station do?*
The power station generates electricity.
 - *Give examples of the fuels commonly used for generating electricity?*
They are coal, oil and natural gas.
 - *What are the major parts of the power station for generating electricity?*

A boiler, a turbine and a generator.

- *The boiler produces steam. What is the steam for?
The steam drives the turbine and the generator to produce electricity.*
- answer questions concerning global warming, e.g.,
 - *Name some causes of global warming
waste / oil slicks / carbon dioxide*
 - *What are the consequences (results) of global warming?
Storms / floods / heatwaves*
 - *What can you help?
Save up water / use bicycle more often / sort garbage / use renewable energy*
 - *What is released when generating electricity that causes global warming?
When fossil fuels like oil and coal are burnt, carbon dioxide is released. Carbon dioxide is a greenhouse gas that causes global warming.*
 - *What are some problems caused by global warming?
The sea level is rising and people may have to move away from coastal areas. More storms and floods may happen. Some areas may become too dry for farming. Some animals and plants may become extinct.*

- Material/Tools
- Worksheets – Task A, Task B and Task C
 - An internet accessible computer and a projector for showing online video clips.

PART III Electricity Generation (~ 80 mins)

Steps

Task A: How a Power Station Works (Individual work: 15-20 mins)

This is a reading comprehension activity in which students will read a passage describing how power stations work. Students will then fill in the blanks in a given figure making use of terms they have read in the passage.

1. Distribute the worksheet.
2. Ask students to read Passage I – *How is electricity generated in a power station?* silently. Ask them to underline the words they do not understand.

3. When students have finished reading, play the video – *How a coal power station works* http://www.youtube.com/watch?v=SeXG8K5_UvU . Remind students to pay attention to the instruction given in the video. It helps them to understand the passage. (TN1: the teacher is suggested not to explain the passage. The video is supposed to help students understand the passage and learn the pronunciation of the highlighted vocabulary.)
4. After students have viewed the video, go back to the passage and go through it with the class.
5. Ask students to complete Items 1 to 5.
6. Check answers.
7. Ask students to work in pairs to read to each other in complete sentences the description of energy change in the boiler, turbine and generator. Call a few students to read the sentences to the class and comment on their reading of the sentences.

Task B: Global Warming 全球暖化 (20-25 mins)

8. Ask students to suggest some problems caused by electricity generation (depending on learners' characteristics, the teacher may ask students to use Chinese for this part).
9. Bring out the concept of global warming.
10. Take a brief look at Questions 1 to 3 with students before playing the video.
11. Play the video – *Global Warming Ad* (0-1:30)
<http://www.youtube.com/watch?v=gLGeEYLcoro&feature=PlayList&p=94636298B6434E7E&index=2>
12. Ask students to answer Questions 1 to 3. (**pair work**)
13. Check answers.
14. Take a brief look at Passage II *Why does electricity generation cause global warming?* with the class by going through the subheadings, the highlighted words and Questions 4 and 5.
15. Ask students to read Passage II and answer the questions. (**Individual work**)
16. Check answers by asking students to read aloud their answers in complete sentences.

Task C: Vocabulary (pair work: 25 mins)

17. Ask students to go back to Tasks A and B and take a look at the vocabulary they have come across.

18. Ask students to work in pairs to complete the vocabulary table.
19. Check answers by asking a few students to write their answers on the board.
20. Ask other students to comment on the answers and correct any mistakes.
21. After students have corrected their peers, if necessary, correct any other mistakes they might have missed.
22. Read aloud the vocabulary with the class. Ask students to practise the pronunciation a couple of times.

Round up (5 mins)

23. Summarize the process of electricity generation.
24. Draw students' attention once again to the sentence patterns – "*When..., ... is converted into...*" and "*When..., ... converts... into...*".and provide further opportunities for practice.

PART III Electricity Generation

Task A: How a Power Station Works

Read Passage I and then watch the video *How a coal power station works*

http://www.youtube.com/watch?v=SeXG8K5_UvU to see how a power station works.

Passage I

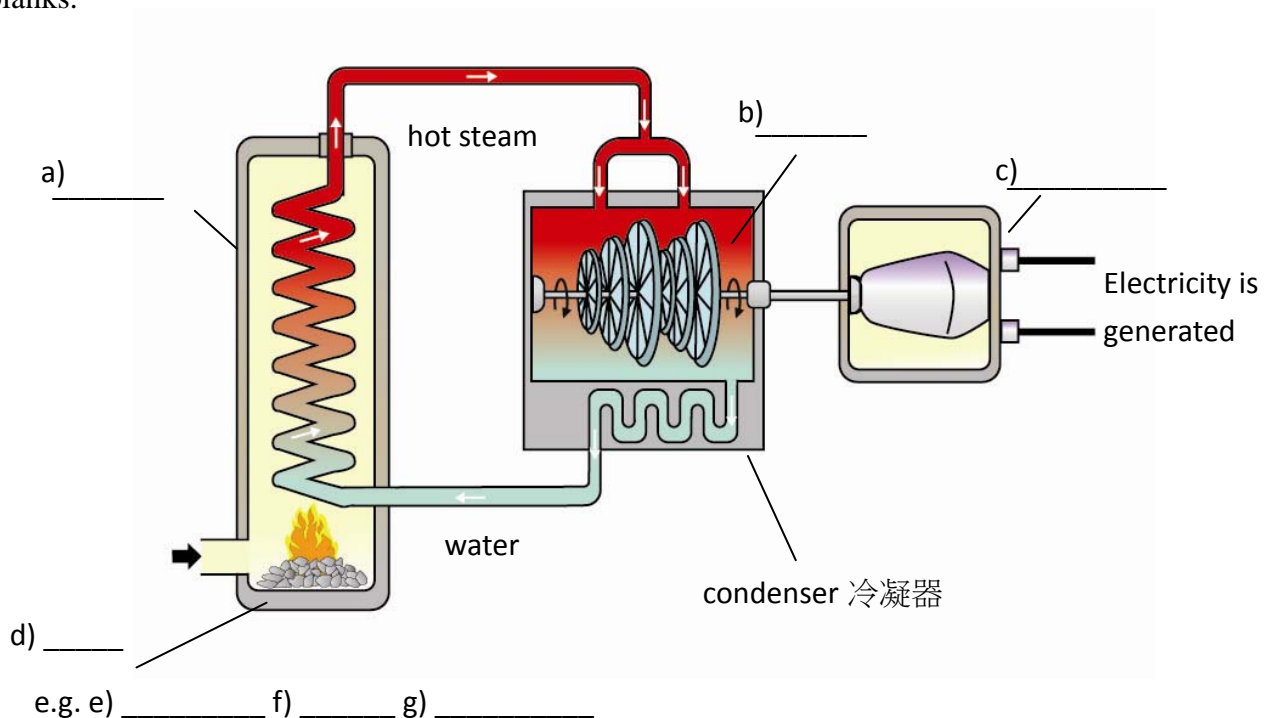
How is electricity generated in a power station?

The **power station** 發電站 generates electricity. It consists of three major parts: a **boiler** 鍋爐, a **turbine** 渦輪機 and a **generator** 發電機. In the boiler, fuels such as coal, oil or natural gas are burned in order to boil water and produce steam. The steam drives 驅動 the turbine and the generator to produce electricity.

During this process, energy conversion takes place several times. **When** fuels are burned, chemical energy stored in the fuels **is converted into** heat energy. Then, the heat energy is converted into kinetic energy by the turbine and makes the generator move. Finally, the generator **converts** the kinetic energy **into** electrical energy. Let's watch a video to see how this works – *How a coal power station works*.

Complete the following questions.

1. This picture shows the electricity generation process. Complete the picture by filling in the blanks.



2. What does the power station do?

The power station _____.

3. Give examples of the fuels commonly used for generating electricity.

They are _____.

4. What are the major parts of the power station which generate electricity?

_____.

5. The boiler produces steam. What is the steam used for?

_____.

Task B Key: Global Warming 全球暖化(25 mins)

Watch *Global Warming Ad.* (0-1:30)

<http://www.youtube.com/watch?v=gLGeEYLcoro&feature=PlayList&p=94636298B6434E7E&index=2>

Watch the video, *Global Warming Ad.* And answer the following questions by **circling** the correct answers. (Pair work)

1. What causes global warming?

food	wastes	oil slicks 水面浮油
oxygen	plastic	carbon dioxide

2. What are the **consequences** (results) of global warming?

snows	storms	volcanic eruption 火山爆發
floods	earthquakes 地震	heatwaves 熱浪

3. How can you help?

save up water	use bicycle more often	drive your own car more often
sort garbage 廢物分類	use more paper	use renewable energy 再生能源

Read Passage II and answer the following questions. (Individual work)

Passage II

Why does electricity generation cause global warming?

When **fossil fuels** 化石燃料 like oil and coal are burned in order to generate electricity, the burning **releases** 釋放 **carbon dioxide** into the air. Carbon dioxide is a **greenhouse gas** 溫室氣體 and a major cause of global warming.

What will the consequences be if global warming gets worse?

Global warming has already caused many problems. The sea level is rising and some animals are already moving away from their natural habitats. If the warming gets worse, some kinds of plants and animals may become **extinct** (disappear completely) because they cannot find a suitable environment in which to survive.. Also, more storms and floods may occur. Sea level may rise so much that people have to move away from the coastal areas. Some areas may become too dry for farming.

4. What is released by power stations that cause global warming?

When _____ are burned, _____
_____ is released. It is a _____ gas causes most of
the warming.

5. What problems are caused by global warming?

The problems are:

- a) _____ is rising and people may have to _____;
- b) more _____ and _____ may happen;
- c) some areas may become too dry for _____; and
- d) some animals and plants may become _____.

Task C: Vocabulary (20-25 mins)

Review the vocabulary you learned in Tasks A and B. Complete the vocabulary table.

Electricity Generation 發電 (名詞)		Global Warming 全球增溫	
power station	發電站		化石燃料
	渦爐		釋放
	渦輪機	carbon dioxide	二氧化碳
generator	發電機		溫室氣體
generate electricity	發電 (動詞)		熱浪
	煤		風暴
	天然氣		洪水
	燃料	sea level rise	海平面上升
	蒸汽		絕種
	驅動	recycle waste	循環再造
... is converted into...	...被轉換為...		再生性能源
...converts...into...	...轉換為...	cause(s)	原因 (名詞) 引起 (動詞)
	能量轉換		後果

PART III Electricity Generation (Teacher's Version)

Task A Key: How a Power Station Works (Individual work: 15-20 mins)

Read Passage I and watch the video *How a coal power station works*

http://www.youtube.com/watch?v=SeXG8K5_UvU to see how a power station works.

Passage I

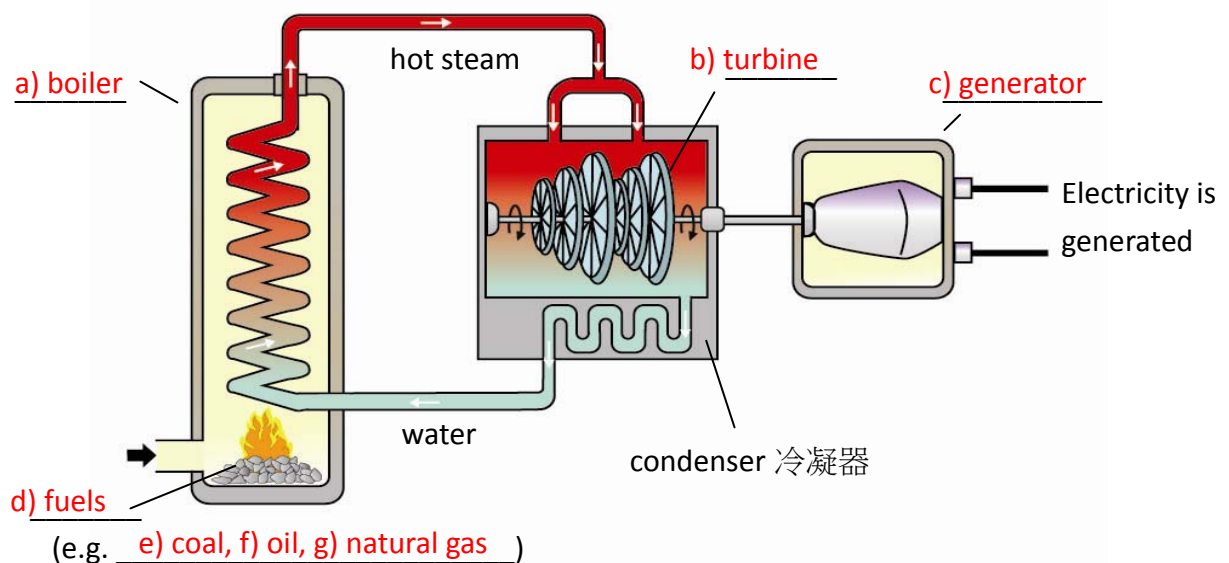
How is electricity generated in a power station?

The **power station** 發電站 generates electricity. It consists of three major parts: a **boiler** 渦爐, a **turbine** 渦輪機 and a **generator** 發電機. In the boiler, fuels such as coal, oil and natural gas are burned to boil water and produce steam. The steam drives 驅動 the turbine and the generator to produce electricity.

During this process, energy conversion takes place several times. **When** fuels are burned, chemical energy stored in the fuels **is converted into** heat energy. Then, the heat energy is converted into kinetic energy by the turbine and makes the generator move. Finally, the generator **converts** the kinetic energy **into** electrical energy. Let's watch a video to see how this works – *How a coal power station works*.

Complete the following questions.

1. This picture shows the electricity generation process. Complete the picture by filling in the blanks.



2. What does the power station do?

The power station **generates electricity**.

3. Give examples of the fuels commonly used for generating electricity?

They are **coal, oil and natural gas**.

4. What are the major parts of the power station for generating electricity?

A boiler, a turbine and a generator.

5. The boiler produces steam. What is the steam for?

The steam drives the turbine and the generator to produce electricity.

Task B Key: Global Warming 全球增温(25 mins)

Watch *Global Warming Ad.* (0-1:30)

<http://www.youtube.com/watch?v=gLGeEYLcoro&feature=PlayList&p=94636298B6434E7E&index=2>

Watch the video, Global Warming Ad, answer the following questions by circling correct answers. (Pair work)

1. What causes global warming?

food	waste	oil slicks 水面浮油
oxygen	plastic	carbon dioxide

2. What are the **consequences** (results) of global warming?

snows	storms	volcanic eruption 火山爆發
floods	earthquakes 地震	heatwaves 熱浪

3. What can you help?

save up water	use bicycle more often	drive your own car more often
sort garbage 廢物分類	use more paper	use renewable energy 再生性能源

Read Passage II and answer the following questions. (Individual work)

Passage II

Why does electricity generation cause global warming?

When **fossil fuels** 化石燃料 like oil and coal are burned for generating electricity, the burning **releases** 釋放 **carbon dioxide** into the air. Carbon dioxide is a **greenhouse gas** 溫室氣體 and a major cause of global warming.

What will the consequences be if global warming gets worse?

Global warming has already caused many problems. The sea level is rising and some animals are already moving away from their natural habitats. If the warming gets worse, some kinds of plants and animals may become **extinct** (disappear completely) because they cannot find a suitable environment in which to survive. Also, more storms and floods may happen. The sea level may rise so much that people have to move away from coastal areas. Some areas may become too dry for farming.

4. What is released when generating electricity that causes global warming?

When fossil fuels like oil and coal are burnt, carbon dioxide is released. It is a greenhouse gas causes most of the warming.

5. What are the problems caused by global warming?

The problems are:

- a) **sea level** is rising and people may have to **move away from coastal areas**;
- b) more **storms** and **floods** may happen;
- c) some areas may become too dry for **farming**; and
- d) some animals and plants may become **extinct**.

Task C Key: Vocabulary (20-25 mins)

Review the vocabulary you learnt in Tasks A and B. Complete the vocabulary table.

Electricity Generation 發電 (名詞)		Global Warming 全球增溫	
power station	發電站	fossil fuel	化石燃料
boiler	渦爐	release	釋放
turbine	渦輪機	carbon dioxide	二氧化碳
generator	發電機	greenhouse gas	溫室氣體
generate electricity	發電 (動詞)	heatwave	熱浪
coal	煤	storm	風暴
natural gas	天然氣	flood	洪水
fuel	燃料	sea level rise	海平面上升
steam	蒸汽	extinct	絕種
drive	驅動	recycle waste	循環再造
... is converted into...	... 被轉換為...	renewable energy	再生性能源
...converts...into...	...轉換為...	cause(s)	原因 (名詞)引起 (動詞)
energy conversion	能量轉換	consequence(s)	後果