

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ

«Дніпровська політехніка»



ЕЛЕКТРОТЕХНІЧНИЙ ФАКУЛЬТЕТ

Кафедра перекладу

ПЕРЕКЛАД У ГАЛУЗІ ЕЛЕКТРОЕНЕРГЕТИКИ

МЕТОДИЧНІ РЕКОМЕНДАЦІЇ ДО САМОСТІЙНОЇ РОБОТИ

студентів спеціальності 035 Філологія

Дніпро

2021

*За поданням методичної комісії спеціальності
035 Філологія (протокол №1 від 31.08.2021 р.)*

Переклад у галузі електроенергетики. Методичні рекомендації до самостійної роботи для студентів спеціальності 035 Філологія / М.В. Орел – Дніпро, 2021. – 63 с. – Режим доступу:

https://pereklad.nmu.org.ua/ua/power_self.pdf

Автор:

Орел М.В. – ст. викладач

Методичні матеріали призначені для студентів спеціальності 035 Філологія, які здобувають кваліфікаційний рівень бакалавра

Матеріали знадобляться для самостійної роботи студентів під час підготовки до контрольних заходів із дисципліни «Переклад у галузі електроенергетики».

Методичні рекомендації містять навчально-методичні матеріали, що сприяють вдосконаленню навичок читання, розуміння та перекладу наукових і технічних текстів. Тематика текстів із дисципліни “Переклад у галузі електроенергетики” стосується питань традиційних видів електроенергетики, виробництва та розподілу електроенергії, енергоефективності та енергозбереження, альтернативної енергетики, видів відновлювальних джерел енергії, цілей та сучасного стану розвитку відновлюваної енергетики в Україні тощо.

ВСТУП

Мета навчальної дисципліни “Переклад у галузі електроенергетики” – опанування теоретичними знаннями та набуття практичних навичок з питань перекладу в галузі електроенергетики.

Дисциплінарні результати навчання: вести пошук, обробляти та аналізувати інформацію з іншомовної фахової літератури і науково-технічної документації; використовувати термінологію, що служить для визначення понять у галузі електроенергетики та електротехніки; вести роботу з уніфікації термінів, удосконалення понять/визначень у галузі електротехніки; аналізувати лексичні й структурні особливості перекладу в галузі електроенергетики; спілкуватися з представниками професійних груп даної галузі.

Базовими дисциплінами курсу є “Практика перекладу з основної іноземної (англійської) мови”, “Основи інформатики та прикладної лінгвістики”, “Основи інжинірингу”.

Тематика практичних занять із дисципліни “Переклад у галузі електроенергетики” стосується питань традиційних видів електроенергетики, виробництва та розподілу електроенергії, енергоефективності та енергозбереження, альтернативної енергетики, видів відновлювальних джерел енергії, цілей та сучасного стану розвитку відновлюваної енергетики в Україні тощо.

Види практичних завдань включають усний та письмовий переклад, дискусії, доповіді, виконання тестових завдань і ситуативних вправ, експерименти, обговорення рефератів, ділові ігри тощо.

Обсяг вивчення дисципліни складає 120 годин.

Засоби діагностики результатів навчання: під час поточного контролю оцінюються відповіді студента на практичних заняттях, результати самостійної роботи з науковою літературою та першоджерелами, якість виконання індивідуального завдання у вигляді реферату.

Модульна контрольна робота проводиться в письмовій формі та включає два завдання. Відповідь на перше з них дає можливість оцінити рівень оволодіння студентом теоретичними питаннями, пов’язаними з перекладознавством. Друге завдання передбачає виявлення практичних навичок студента, аналізувати та розв’язувати практичні завдання з перекладу.

Формою підсумкового контролю є залік.

Оцінювання знань студентів здійснюється відповідно до Положення університету «Про оцінювання результатів навчання здобувачів вищої освіти» кваліфікаційного рівня під час демонстрації регламентованих робочою програмою результатів навчання.

Дані методичні матеріали поклинані допомогти студентам вдосконалити навички перекладу науково-технічних текстів.

UNIT 1

ENERGY EFFICIENCY

Text: THE ELUSIVE NEGAWATT

If energy conservation both saves money and is good for the planet, why don't people do more of it?

line IN WONKISH circles, energy be profitable. The measures it has in efficiency used to be known as “the mind, all of which rely on existing fifth fuel”: it can help to satisfy technology, would earn an average growing demand for energy just as return of 17% and a minimum of 10%. 5 surely as coal, gas, oil or uranium can. 45 The Intergovernmental Panel on

But in these environmentally Climate Change makes a similar point. conscious times it has been climbing It believes that profitable energy the rankings. Whereas the burning of efficiency investments would allow fossil fuels releases greenhouse gases, Pakistan to cut its emissions by almost 10 which contribute to global warming, 50 a third, Greece by a quarter and Britain and nuclear plants generate life- by more than a fifth. threatening waste, the only by-product In other words, big investments in of energy efficiency is wealth, in the energy efficiency would more than form of lower fuel bills and less pay for themselves, and fairly fast. 15 spending on power stations, pipelines 55 Although a lot of money would have and so forth. No wonder that wonks to be spent— \$170 billion a year until now tend to prefer “negawatts” to 2020— by MGI’s reckoning that is megawatts as the best method of only 1.6% of today’s global annual slaking the world’s growing thirst for investment in fixed capital.

20 energy. 60 Moreover, with ample profits to be Almost all blueprints for tackling made, financing should be easy to global warming assume that energy attract.

efficiency will have a huge role to Yet if there are so many lucrative play. In the greenest of futures opportunities to improve efficiency, 25 mapped out by the International 65 why are investors not already taking Energy Agency, a think-tank financed advantage of them? To a degree, they by rich countries, greater efficiency are: in America, for example, “energy accounts for two-thirds of emissions intensity”—the amount of energy averted. The McKinsey Global required to generate each dollar of

30 Institute (MGI), the research arm of 70 output—is falling by about 2% a
 year. the consultancy, thinks that energy This is only partly because
 America’s efficiency could get the world halfway factories, houses, cars and
 appliances towards the goal, espoused by many are becoming more efficient:
 it is also
 scientists, of keeping the because energy-guzzling factories 35 concentration of
 greenhouse gases in 75 have moved to cheaper spots such as the atmosphere
 below 550 parts per China. But globally, too, energy
 million. intensity is falling by around 1.5 % a MGI believes that unlike most year.
 other schemes to reduce emissions, a But as McKinsey points out, there
 40 global energy-efficiency drive would 80 are still hundreds of billions of
 dollars’ worth of unfulfilled but poorly informed about the savings
 on potentially profitable opportunities in offer. Even when they can do the
 energy efficiency available to sums, the transaction costs are high.
 households and companies. What is Despite recent price increases, 85
 holding investors back? One answer 130 spending on energy still accounts for
 is price. In the eyes of many a smaller share of the global economy
 consumers, electricity and fuel are than it did a few decades ago.
 often too cheap to be worth saving, For all these reasons,
 homeowners, especially in countries where their as Lord Stern pointed
 out, tend to 90 prices are subsidised. 135 demand exorbitant rates of return on
 By and large, energy intensity is, investments in energy
 efficiency—of not surprisingly, lower in countries around 30%. They
 generally want new where electricity prices are higher. It boilers or extra
 insulation to pay for is no coincidence that Denmark has themselves
 within two or three years. 95 both high power prices and an 140 Businesses are
 not quite so energy-efficient economy. Among demanding, he says,
 but they still tend American states, for every cent per to put greater
 emphasis on increasing kilowatt-hour by which prices exceed revenues than
 on cutting costs. the national average, energy Similar stories crop up in
 the
 100 consumption drops by about 7% of 145 markets for new homes and offices,
 the average. George David, the boss appliances and vehicles. Builders
 are of United Technologies, a not the ones who end up paying the
 conglomerate that makes air- utility bills, so have little reason to add
 conditioners, lifts and aircraft engines, to the construction costs— and
 hence 105 among other items, argues that higher 150 the price of a home or office—
 by fuel and power prices are the only incorporating energy-saving
 features. motor needed to drive energy The makers of appliances and cars
 efficiency. also know that not all consumers and
 But there are still plenty of profitable drivers will think as carefully about 110
 investment opportunities in energy 155 running costs as about the purchase

efficiency, even in the places with the price. By the same token, landlords most expensive power. David have scant incentive to invest in Goldstein, author of a recent book on energy efficiency on their tenants' energy efficiency, points out that behalf. And power companies are 115 until recently businesses in New York 160 usually keen to encourage their lit their premises more brightly than customers to consume as much power did those in Seattle, despite New as possible. York's much higher power prices. And Financing energy-efficiency Hawaii, the American state with the investments can also be difficult. In 120 dearest power, is not the most 165 the developing world, capital can be efficient. scarce. In rich countries, the savings The problem, analysts explain, is a from making individual homes more series of distortions and market efficient are too small and the failures that discourage investment in overheads involved too high to be of 125 efficiency. Often, consumers are 170 much interest to most banks.

READING

A Understanding main points

Read the text and answer these questions.

- 1 What do you understand by the term 'energy efficiency'?
- 2 What important advantage has energy efficiency over fossil fuels?
- 3 In what way can energy efficiency help the environment?
- 4 What does the term 'energy intensity' mean?
- 5 What are the reasons of insufficient investment in energy efficiency?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Globally, energy intensity is falling.
- 2 Investments in energy efficiency would pay for themselves.
- 3 Power companies encourage their customers to consume less power.
- 4 The makers of appliances and cars know that not all consumers and drivers will think as carefully about the purchase price as about running costs.
- 5 Denmark has both high power prices and an energy-efficient economy.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 The sum of money to be invested in energy efficiency annually.
- 2 The percentage of an average return a global energy-efficiency drive would earn.

- 3 The percentage of rates of return on investments in energy efficiency homeowners demand.
- 4 The supposed number of parts of greenhouse gases in the atmosphere per million.
- 5 The minimum percentage of a return a global energy-efficiency campaign would earn.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- | | |
|--|--|
| 1 power (line 120) | a) a company's profit for a year expressed as a percentage of the capital employed during the year; |
| 2 fossil (line 9) | b) a photographic copy of a plan for making a machine or building a house or other structure; |
| 3 rate of return (line 135) | c) buildings or machines which a business owns and which can be used for a long period of time in the production of other goods; |
| 4 think-tank (line 26) | d) something transacted; a piece of business; |
| 5 running costs (line 155)
millions of years ago; | e) made of substances that were living things many |
| 6 overheads (line 169) | f) difficult to catch, find or remember; |
| 7 fixed capital (line 59) | g) force that can be used for doing work, driving a machine, or producing electricity (= electricity); |
| 8 transaction (line 128) | h) (especially of a business, trade, or job) bringing in plenty of money; profitable; |
| 9 blueprint (line 21) | i) (of costs, amounts, demands etc) much greater than is reasonable, usual, or expected; |
| 10 lucrative (line 63) | j) the amount of money needed for operating a business or other activity; |
| 11 elusive (title) | k) money spent regularly (e.g. on insurance or heating) to keep a business running; |
| 12 exorbitant (line 135) | l) a committee of people experienced in a particular subject, established by an organization, government etc to develop ideas and advise on matters related to that subject. |

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- | | |
|--|--|
| 1 Fuel (line 3): | 2 Conservation (subtitle): |
| a) a solid substance that is burnt to produce heat or power; | a) the act of keeping something from being wasted or lost; |

- b) a material used mainly for power in the engines of protection of animals and plants to cars, aircraft etc; prevent them being lost for ever;
- c) a material that is used for producing power by burning or by rivers from being wasted. atomic means.
- 3 Global warming (line 10):**
- a) the gradual slight warming of the which air surrounding the Earth because of sun's light and heat; and cooking;
- b) a general increase in world temperatures, caused by carbon methane, which is thought to trap dioxide collecting in space heat above the Earth and cause the immediately around the Earth; greenhouse effect;
- c) the weather conditions under which temperature of the air is rising. cause extreme discomfort.
- 4 Greenhouse gas (line 9):**
- a) a gas, especially natural gas is burnt in the home for heating the
- b) a gas, especially carbon dioxide or methane, which is thought to trap dioxide
- c) a gas which is used to poison or the
- 5 Energy (line 4):**
- a) the quality of being full of life and action;
- b) the power which one can use in unprofitable enterprises;
- c) the power which can do work.
- 6 Investment (line 110):**
- a) money claimed for harm done;
- b) money given to support working;
- c) money used for income or profit.
- 7 Energy intensity (line 67):**
- a) the amount of energy required to generate each dollar of output;
- b) the increase in amount of energy;
- c) the amount of energy produced.
- 8 Incentive (line 157):**
- a) a situation that is favourable for a particular purpose;
- b) something which encourages one to greater activity;
- c) the ability to take action without asking for the help or advice of others.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 Their office is in central London, so their are very high.
- 2 The job makes demands upon my time.
- 3 The bank charges a fixed rate for each transaction.
- 4 We are trying to reduce our
- 5 The engine was specially adapted to increase its
- 6 Coal is a fossil fuel.
- 7 The authority of the plant is trying to attract more investment in the

- 8 The report is a for the reform of the nation's tax system.
- 9 Despite all their efforts , success remained
- 10 She looked for an investment with a better

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 energy a) opportunities
- 2 power b) efficiency
- 3 greenhouse c) increases
- 4 utility d) costs
- 5 aircraft e) prices 6 climate f) bills
- 7 investment g) gases
- 8 price h) engines
- 9 electricity i) stations
- 10 construction j) change

E Words with similar or related meanings

- 1 The phrase 'to satisfy growing demand for energy' is used in paragraph 1. What other phrase is used in the same paragraph with a similar meaning?
- 2 The adjective 'profitable' is used several times in the text. What other word is used in the text with a similar meaning (para 5)?
- 3 Three words are used in the text with the meaning of 'income' (para 3, para 4, para 10). What are they?
- 4 The word 'engine' is used in paragraph 7. What other word is used in the same paragraph with a similar but figurative meaning?
- 5 What word could replace 'reduce' (para 3)?
- 6 The phrase 'by about 7%' is used in line 101. What other word is used in the text with a similar meaning to 'about' (para 5)?
- 7 The text uses the noun 'drive' (line 40) to express a planned effort of a group for a particular purpose. Can you think of at least one word to replace it?
- 8 Does the word 'greenest' (para 2) suggest colour or the environment?

F Words that seem similar

- 1 The words 1) 'efficient' (line 121) and 2) 'effective' are similar, but they have slightly different meanings. Match these definitions to the two words: a) producing the desired result; b) working well, quickly, and without waste.
- 2 The terms 1) 'power' (line 120) and 2) 'energy' (line 4) are frequently confused. Which of the following definitions fits the two words? a) the capacity of a physical system to perform work (is measured in joules);

b) the rate at which work is performed or energy is transmitted (is measured in watts and horsepower).

G Phrasal verbs

Find phrasal verbs in the text that match these definitions.

- | | | |
|---|---------|--------|
| a) To happen or appear unexpectedly (para 11). | c | u..... |
| b) To plan in detail in advance (para 2). | m | o..... |
| c) To be in the end (para 11). | e | u..... |
| d) To make (something) to stay in place (para 6). | h | b..... |
| e) To give or be a satisfactory explanation (para 9). | a | f..... |
| f) To trust; to have confidence in (para 3). | r | o..... |
| g) To draw attention to the fact (para 6). | p | o..... |
| h) To give money in exchange for goods that one has bought (para 10). | P | f..... |

H Opposites

Find a word in the text that has an opposite meaning.

- a) encourage (para 9) f) less (para 12)
b) exorbitant (para 12) g) lower (para 8)
c) cheap (para 8) h) save (money) (para 1)
d) big (para 9) i) partly (para 5)
e) easy (para 12) j) increase (para 10)

I Measures

Do you know what these measures mean? If not, check the key.

- a) watt c) megawatt e) gallon g) kilowatt-hour
b) kilowatt d) negawatt f) litre h) terawatt-hour

UNIT 2

COAL AS AN ENERGY SOURCE

Text A: OLD CLEAN COAL

Using photosynthesis to capture exhaust gases from power plants could reduce the emissions produced by coal-fired stations

line FOR its supporters, the idea of 40
growing single-celled algae on
exhaust gas piped from power
stations is the ultimate in recycling.
For its detractors, it is a mere pipe
dream. Whoever turns out to be

different approach. Its reactor is
composed of a series of clear tubes,
each with a second, opaque tube
nested inside. This arrangement 5
makes it possible to bubble the
exhaust gas down through the outer
45

right, though, it is an intriguing idea: instead of releasing the carbon dioxide produced by burning fossil fuels into the atmosphere, why not recapture it by photosynthesis? The result could then be turned into biodiesel (since many species of algae store their food reserves as oil), or even simply dried and fed back into the power station. Of course, if it were really that easy, someone would have done it already. But although no one has yet commercialised the technology, several groups are trying. One of them is GS CleanTech, which has developed a bioreactor based on a patent held by a group of scientists at the Ohio Coal Research Centre. The GS CleanTech bioreactor uses a parabolic mirror to funnel sunlight into fibre-optic cables that carry the light to acrylic sheets inside the reactor. The light over vertical polyester that form the walls of the reactor, which the algae grow on. The polyester is unable to support the weight of the algae, and they fall off into a collection duct underneath. Far from giving it away, power companies might even start charging for it. That would, indeed, be a reversal of fortune.

Text B: DIG DEEP

Carbon storage will be expensive at best. At worst, it may not work

EVEN in the most alternative-friendly future imaginable, coal is unlikely to go away. It is cheap, abundant and often local. So what needs to be more than 1km deep can be done to make coal's use more underground. That depth provides

acceptable? One much-discussed possibility is carbon capture and storage, or CCS, which involves burying CO₂ deep underground. The generating companies have high hopes of it. There are just two problems. No one knows if it will work. And everyone, whether it works or not, 55 expensive—so much so that start to look serious attempt in an actual FutureGen 60

enough pressure to turn CO₂ into what is known as a supercritical fluid, a form in which the stuff is 50 more likely to stay put. The rock question also has to have enough pores and cracks in it to There accommodate the CO₂. Lastly, it knows if needs to be covered with a layer of 15 non-porous, non-cracked rock to 15 provide a leakproof cap. So far, only three successful CCS projects are attractive. The one under way. None of them is actually linked to generating electricity. power station, the project, based in Illinois, was cancelled in January because the expected cost had risen from \$830m to \$1.8 billion. American electricity industry alone produces 1.5m tonnes, which would mean 25 Carbon dioxide reacts with a group finding 1,500 appropriate sites. Even of chemicals called amines. At low transporting that amount of gas temperatures CO₂ and amines would be a huge task. As to the cost, combine. At higher temperatures a report published by MIT reckons they separate. Power-station exhaust 70 on \$25 a tonne to capture CO₂ and 30 can thus be purged of its CO₂, by pressurise it into a superfluid, and \$5 a running it through an amine bath tonne to transport it to its burial site. It before it is vented, and the amine can therefore suggests that power stations be warmed to release the gas where it which dump CO₂ into the atmosphere will do no harm. Better still, the coal 75 should be charged \$30 a tonne. 35 can be reacted with water to produce a Such a charge, whether a tax or a mixture of CO₂ and hydrogen in system of tradable permits to

which the carbon dioxide is much pollute, would change energy more concentrated than in normal flue economics radically but even the gas, so it is easier to scrub out. What 80 most optimistic proponents of 40 is then burned is pure hydrogen. carbon capture and storage doubt it

It is what comes next that is the will be a serious alternative much problem. The disposal of carbon before 2020.

READING

A Understanding main points

Read the text and answer these questions.

- 1 Is coal currently used as a major fuel for electricity generation?
- 2 What's the connection between coal and electricity?

- 3 Does the coal industry continue to expand in many parts of the world? 4 Does coal cause enormous damage to human health and local ecosystems?
5 Why do you think countries continue to employ coal-fired power plants even when they pollute the environment?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Coal is classified as a nonrenewable energy source because it takes millions of years to form.
- 2 Coal contains energy that the plants absorbed from the sun – burning coal releases this energy which can be used to generate electricity.
- 3 Generating electricity using coal is currently relatively inexpensive, but the cost is affected by world coal prices, which can be volatile.
- 4 Burning coal doesn't produce greenhouse gas emissions.
- 5 "Clean coal" usually means capturing carbon emissions from burning coal and storing them under the earth.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 The amount of oil which a hectare of reactors can produce per year. 2
- The supposed amount of ethanol GreenFuel's reactors can obtain. 3
- The annual amount of CO₂ dumped by each CCS project. 4
- The amount of CO₂ American electricity industry produces. 5
- The number of sites needed for burying 1.5m tonnes of CO₂.
- 6 The amount of money needed for capturing a tonne of CO₂. 7
- The cost of transporting a tonne of CO₂ to its burial site.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- | | |
|-------------------------------|---|
| 1 recycling (A, line 4) | a) very simple, usually very small plants that live in or near water; |
| 2 detractor (A, line 5) | b) an area where used, damaged, or unwanted matter is buried; |
| 3 ultimate (A, line 4) | c) a person who supports or argues in favour of smth; |
| 4 algae (A, line 14) | d) the activity of reusing things that have already been used; |
| 5 photosynthesis (A, line 11) | e) a person who says bad things about smb or smth in order to make him/her/it seem less good or valuable; |

- 6 pipe dream (A, line 5) **f)** a defeat or piece of bad luck;
 7 duct (A, line 36) **g)** a thing used in place of another;
 8 exhaust gas(A, line 45) **h)** unwanted gas;
 9 substitute (A, line 67) **i)** a pipe or tube for carrying liquids, air etc;
 10 reversal of fortune **j)** the production of special sugar-like substances that
 (A, line 78) keep plants alive, caused by the action of sunlight;
 11 burial site (B, line 44) **k)** irregular and violent movement of the air;
 12 turbulence (A, line 48) **l)** an impossible hope, plan, idea etc; **13** proponent (B,
 line 80) **m)** the highest point.

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- 1** Carbon (A, line 52): **2** Carbon dioxide (A, line 8):
- a) a poisonous yellowish simple substance (element) that shines and starts to burn; vegetable matter decays;
 b) a simple substance found in a pure form as diamonds, graphite etc or in as coal, petrol etc; kinds of lights;
 c) a simple substance (element) that is especially in the production of power. greenish-yellow gas.
- a)** the gas produced when animals breathe out, when carbon is faintly in the dark or when brought out into the air;
b) a gas that is lighter than air; will not burn and is used in some impure form
c) a non-metallic substance used (element), usually in the form of a atomic power.
- 3** Ethanol (A, line 66): **4** Petrol (A, line 67):
- a) ordinary alcohol found in alcoholic drinks, it is also used for removing fat and oil;
 b) a heavy silver-white metal that is a simple substance. Is liquid at temperatures, and is used in thermometers, barometers etc;
 c) poisonous alcohol found in some coal natural substances, such as wood.
- a)** a thin oil made from the wood or certain trees, used for removing unwanted paint from clothes, brushes etc;
b) a liquid obtained especially from petroleum, used mainly for ordinary producing power in the engines of cars, aircraft etc;
c) an oil made from petroleum, etc, burnt for heat and in lamps for light.
- 5** Oil (A, line 63): **6** Coal (B, line 34):
- a) any of several types of thick fatty liquid used for cooking; can be obtained;
 b) petroleum; a mineral oil obtained from below the surface of the earth, and used to produce petrol;
- a)** rock, earth etc from which metal
b) a sort of white limestone that is hard, cold to touch, and used for buildings, statues, gravestones etc;

- | | |
|--|--|
| <p>c) a pale greenish-yellow oil obtained from olives, used in cooking and for making salad dressings.</p> <p>7 Carbohydrate (A, line 65):</p> <p>a) a common silver-white substance (element), burns with a bright white smell, that forms most of the fireworks and mixtures of metals; Earth's air;</p> <p>b) a soft heavy easily melted greyish-blue metal, used for waterpipes, to roofs etc; very easily;</p> <p>c) any of several substances, such as smelling sugar, which consist of oxygen, hydrogen, and carbon, and which provide the body with heat and (energy). added to the water in public</p> | <p>c) a black or brownish-black mineral which is dug from the earth, and which can be burnt to give heat.</p> <p>8 Hydrogen (B, line 36):</p> <p>a) a gas that is a simple substance (element), without colour or smell, and is used in making most of the fireworks and mixtures of metals;</p> <p>b) a gas, without colour or smell, that is lighter than air, and burns cover</p> <p>c) a greenish-yellow strong-gas that is a simple substance (element) and is found in many chemical compounds. It is usually power</p> <p>swimming pools to help to keep it clean.</p> |
|--|--|

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 We experienced a in the second half of the game.
- 2 She is one of the strongest of the tax reform.
- 3 Grasses, trees and are raw materials for biofuels.
- 4 The children are very enthusiastic about
- 5 The recipe calls for butter, but you can use margarin as a
- 6 The concentration of the in the atmosphere is very high.
- 7 Her say she does not really understand ordinary people.
- 8 The flight was very uncomfortable because of
- 9 His scheme for building a perpetual-motion machine is just a
- 10 To look for the gas leak with a lighted match really was the in stupidity.
- 11 The Weyburn-Midale CO2 project transports carbon dioxide from a coal gasification plant to its in a depleted oil field in Saskatchewan.

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 capture a) oil
- 2 reduce b) products
- 3 grow c) hydrogen
- 4 diffuse d) algae

- 5 produce e) exhaust gases
- 6 bury f) chemical reactions
- 7 burn g) light
- 8 warm h) emissions
- 9 make i) carbon dioxide

E Words with similar or related meanings

- 1 The phrase 'power station' (A, para 1) is used to describe a building in which electricity is made. What other phrase is used in the same text with a similar meaning?
- 2 What other word is used in the text (B, para 6) with the same meaning as 'supporter'?
- 3 The word 'constant' is used in the text with the meaning of 'continually happening or repeated'. What other word is used in the text (B, para 4) with a similar meaning to 'constant'?
- 4 The phrase 'carbon dioxide' is used several times in the texts. Find the chemical formula for 'carbon dioxide' (B, para 3).
- 5 Two words are used in the texts (A, para 4; B, para 3) with the meaning of 'to get rid of'. What are they?
- 6 The word 'to dump' is used in paragraph 5 (B). What similar word is used earlier (para 3) in the text?
- 7 The writer uses two different words (A, para 5; B, para 4) in the meaning of 'material'. What are they?

F Opposites

Find a word in the text that has an opposite meaning.

- a) supporter (A, para 1) e) at best (A, subtitle)
- b) increase (A, subtitle) f) combine (B, para 3)
- c) light (A, para 3) g) low (B, para 3)
- d) waste matter (A, para 5) h) likely (B, para 1)

G Phrasal verbs

Find phrasal verbs in the text that match these definitions.

- a) His statement to be false. t o....
- b) An acid can a base to form a salt. r w....
- c) Water is hydrogen and oxygen. c o....
- d) The information is to the appropriate government department. f b....
- e) The film is a novel by D.H. Lawrence. b o....
- f) The noise was so loud that she her ears her hands. c w....
- g) I'd like to that if don't leave now we shall miss the bus. p o....
- h) She all her money to the poor. g a....

H Questions

Below you will find answers to four different questions. Read the Text B and try to supply the missing questions.

- 1 But although no one has yet commercialised the technology, several groups are trying.
- 2 GreenFuel Technologies, based in Massachusetts, has a different approach.
- 3 The bubbling gas causes turbulence and circulates the algae around the reactor.
- 4 Carbon dioxide reacts with a group of chemicals called amines. 5 They doubt it will be a serious alternative much before 2020.

UNIT 3

NUCLEAR POWER

Text: THE SHAPE OF THINGS TO COME

How tomorrow's nuclear power stations will differ from today's

line THE agency in charge of promoting nuclear power in America describes a new generation of reactors that will be "highly economical" with "enhanced safety", that "minimise wastes" and will prove "proliferation resistant". No doubt they will bake an apple pie, too. stations really be safer than their predecessors? and their neighbours. These new power stations belong to what has been called the third generation of reactors, designs that have been 5 informed by experience and that are considered by their creators to be advanced. But will these new mean 45 Unfortunatly, in the world of predecessors?

10 nuclear energy, fine words are not enough. America got away lightly with its nuclear accident. When the Three Mile Island plant in Pennsylvania overheated in 1979 50 Clearly, modern designs need to be less accident prone. The most important feature of a safe design is that it "fails safe". For a reactor, this means that if its control systems stop 15 very little radiation leaked, and there 55 working it shuts down were no injuries. Europe was not so automatically, safely dissipates the lucky. The accident at Chernobyl in 1986 killed dozens core, and stops both the fuel and the Ukraine in immediately and has affected radioactive waste produced by

20 (sometimes fatally) the health of 60 nuclear reactions from escaping by tens of thousands at the least. Even keeping them within some sort of discounting the association of containment vessel. Reactors that follow such rules are called nuclear power with nuclear "passive". Most modern designs are weaponry, people have good reason

25 to be suspicious of claims that reactors are safe. 65 passive to some extent and some newer ones are truly so. However, Yet political interest in nuclear some of the genuinely passive power is reviving across the world, reactors are also likely to be more thanks in part to concerns about expensive to run.

30 global warming and energy security. 70 **Safety chain?** Already, some 441 commercial Nuclear energy is produced by reactors operate in 31 countries and atomic fission. A large atom provide 17% of the planet's (usually uranium or plutonium) electricity, according to America's breaks into two smaller ones, 35 Department of Energy. Until 75 releasing energy and neutrons. The recently, the talk was of how to neutrons then trigger further break retire these reactors gracefully. Now ups. If this "chain reaction" can be it is of how to extend their lives. In controlled, the energy released can addition, another 32 reactors are be used to boil water, produce steam 40 being built, mostly in India, China 80 and drive a turbine that generates electricity. If it runs away, the result 130 design, too. Its pressurised heavy is a meltdown and an accident (or in water reactors, known as CANDU, are extreme circumstances, a nuclear similar to ordinary pressurised-water explosion—though circumstances reactors (or light-water reactors, as 85 are never that extreme in a reactor 135 they are sometimes known) but they because the fuel is less fissile than contain water in which the hydrogen the material in a bomb). atoms have been replaced by In many new designs the neutrons, deuterium. Heavy water is and thus the chain reaction, are kept expensive. However, the fuel used 90 under control by passing them 140 by CANDU is cheap. through water to slow them down. A South African design, called the (Slow neutrons trigger more break "pebble-bed", is, however, truly ups than fast ones.) This water is passive. Instead of water, it uses exposed to a pressure of about 150 graphite to regulate the flow of 95 atmospheres—a pressure that means 145 neutrons, and instead of making it remains liquid even at high steam, the reactor's output heats an temperatures. When nuclear inert or semi-inert gas such as reactions warm the water, its density helium, nitrogen or carbon dioxide, drops, and the neutrons passing which is then used to drive the 100 through it are no longer slowed 145 turbines. The name of the design enough to trigger further reactions. comes from the fact that the graphite That negative feedback stabilises the is used to coat pebblelike spheres of reaction rate. nuclear fuel. Like the CANDU design, pebble-bed reactors can be Most American nuclear reactors design, pebble-bed reactors can be 105 are pressurised-water reactors of this 150 refuelled while running. type. So is the reactor being built in Further into the future, engineers Olkiluoto in Finland—the largest are developing designs for so-called

planned to date. This reactor will produce 1,600 megawatts when it starts generating electricity, enough by itself to supply the needs of 1.8m households. The Olkiluoto reactor has several protective measures against accidents in addition to its innate design. These include four independent emergency-cooling systems, each capable of taking heat out of the reactor after a shutdown, and a concrete wall designed to withstand the impact, accidental or otherwise, of an aeroplane. Canada, a country that has spent its entire history trying to distinguish itself from its southern neighbour, has its own nuclear fourth-generation plants that could be built between 2030 and 2040. Work on these designs is the job of a ten-nation research programme whose members include America, Britain, China, France, Japan, Africa and South Korea. Three of these designs are for fast reactors (which work without any need for the neutrons to be slowed down). But fast reactors have complicated designs that could prove expensive to build. Whether such reactors would be apple-pie safe is a different question. But 2030 is still a long way away. Plenty of time for the sloganeers to sharpen their pencils.

READING

A Understanding main points

Read the text and answer these questions.

- 1 How is nuclear energy created? How does it work?
- 2 What are the advantages of nuclear energy?
- 3 How is the safety of nuclear power stations ensured?
- 4 How dangerous is nuclear power compared with other forms of energy?
- 5 What kind of resources does nuclear energy require?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Uranium is the fuel most widely used by nuclear plants for nuclear fission.
- 2 Nuclear energy is cleaner and more environmentally friendly than coal-, oil- or gas-fired power stations.
- 3 Nuclear power is a source of energy that emits greenhouse gases.
- 4 Nuclear power plants provide an energy source that is not sustainable.
- 5 Fourth-generation nuclear plants are offering significant advances in safety.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 The number of commercial reactors operating in the world. 2 The percentage of electricity generated by commercial reactors.
- 3 The number of reactors being built in India, China and their neighbours. 4 A figure showing the pressure of water in new nuclear designs.
- 5 The amount of electrical power to be produced by the reactor in Olkiluoto in Finland.

LANGUAGE FOCUS

A Definitions

Match these terms with their definitions:

- | | |
|-------------------------------|---|
| 1 nuclear energy (line 10) | a) a process in which the parts of the nucleus (=centre) of an atom are rearranged to form new substances; |
| 2 nuclear power (line 23) | b) an accident in a nuclear reactor; |
| 3 nuclear reactor (line 104) | c) a number of related chemical changes, each of which causes the next; |
| 4 nuclear weaponry (line 23) | d) the splitting of the nucleus (=centre) of an atom, which results in much power being released; |
| 5 radioactive waste (line 59) | e) a bomb which explodes because of the atomic reactions inside it and which causes terrible destruction; |
| 6 atomic fission (line 72) | f) very powerful weapon which uses atomic power to cause mass destruction and death; |
| 7 nuclear reaction (line 60) | g) the powerful force that is produced when the nucleus (=central part) of an atom is either split or joined to another atom; |
| 8 nuclear explosion (line 83) | h) (a) material (usually uranium or plutonium) that is used for producing heat or power in a nuclear reactor; |
| 9 nuclear accident (line 12) | i) power, usually electricity, from nuclear energy; |
| 10 chain reaction (line 77) | j) a large machine that produces nuclear energy, especially as a means of producing electricity; |
| 11 (nuclear) bomb (line 87) | k) the radioactive by-products from a nuclear reactor, which are difficult to get rid of safely and are usually buried; |
| 12 nuclear fuel (line 148) | l) the extremely fast release of a large quantity of energy as a result of a nuclear chain reaction. |

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- | | |
|--------------------------------------|---|
| 1 Radiation (line 11): | 2 Atmosphere (line 95): |
| a) something which is radiated; | a) the mixture of gases that surrounds the Earth; |
| b) the radiating of heat, light etc; | b) the standard unit of pressure; |

- c) radioactivity. **c)** the air, especially in a room. **3** Neutron (line 75): **4**
Rate (line 103):
- a) a very small piece of matter that **a)** a quantity such as value, cost, or
moves round the nucleus of an atom and that by its movement speed, measured by its relation to
causes an electric current in metal; some other amount;
- b) a very small piece of matter that **b)** a figure showing the number of carries
no electricity and that times one quantity contains another
together with the proton forms the nucleus of used to show the relationship nucleus of
an atom; between two amounts;
- c) a very small piece of matter that **c)** a charge or payment fixed carries
positive electricity and that according to a standard scale.
together with the neutron forms the
nucleus of an atom.
- 5** Protective measure (line 113): **6** Density (line 98):
- a) an action taken to bring about a **a)** the amount of information that can certain
result; be stored per unit of space on a
magnetic tape or disk;
- b) an instrument used for calculating **b)** the relation of the amount of matter
the stated amount, length, weight (the mass) to the space in which the etc;
- c) an action taken to prevent **c)** the quality of being dense.
something dangerous from
happening.
- 7** Generation (line 3): **8** Pressure (line 94):
- a)** all people of about the same age; **a)** force or weight onto something;
- b)** the act or process of generating; **b)** forceful influence; strong
persuasion;
- c)** the members of a developing class of **c)** conditions in one's work , one's
things at certain stage. style of living etc that cause
anxiety and difficulty.

C Word search

Complete the text with the words given below.

A 1 _____ was designed by George Westinghouse and adapted from the
reactors used in 2 _____. Inside a 3 _____, water which is kept under
high 4 _____ to prevent it from boiling has a double function. In a closed
5 _____, it serves as a coolant for the 6 _____ and as a 7 _____ to
slow down the fast 8 _____ created during 9 _____. As the water in the
primary loop circulates, it becomes very hot. This 10 _____ is then

transferred to a 11 _____ of water. The resulting 12 _____ is used to
13 _____ that 14 _____.

- a) pressure h) generate electricity
- b) moderator i) reactor core
- c) drive turbines j) steam
- d) primary loop k) neutrons
- e) heat energy l) nuclear submarines
- f) pressurised water reactor m) fission
- g) secondary loop n) pressurised water reactor

D Words with similar or related meanings

- 1 The adjective 'nuclear' is combined with a number of nouns, such as 'energy', 'accident', 'weapon' etc. What other word from the text can substitute 'nuclear'?
- 2 The word-combination 'nuclear power' is used several times. What other word is used in paragraph 2 with a similar meaning to 'power'?
- 3 The article deals with the question about how tomorrow's nuclear power stations will differ from today's. One more word is used in the text (para 2) with the same meaning as 'station'. What is it?
- 4 What word is used in the text (para 5) with the same meaning as the phrase 'keep under control' (line 89)?
- 5 The verb 'contain' is used in line 136. What other word is used (para 7) that has a similar meaning?
- 6 Two words are used in line 155 that are synonymous. What are they?
- 7 What word from the text could replace the word 'security' (subtitle)?
- 8 "Commercial reactors operate in 31 countries" (para 3). What other word is used in the text (para 4) with a similar meaning to 'operate'?

E Words that seem similar

- 1 The verbs 1) 'stabilise' (line 102) and 2) 'regulate' (line 144) have different meanings. Which of the following definitions fits the word 'stabilise' and which fits the word 'regulate'?
 - a) to make work at a certain speed;
 - b) to become firm, stable or unchanging.
- 2 The verbs 1) 'leak' which is met in the text with the noun 'radiation' (line 15) and the verb 2) 'escape' which is used in the text with the noun 'waste' (line 60) have slightly different meanings. Match these definitions to the two words:
 - a) to get away from an enclosed space;
 - b) to let (a liquid, gas etc) in or out of a hole or crack.
- 3 The phrase 1) 'nuclear fission' (line 72) shouldn't be confused with the phrase 2) 'nuclear fusion'. Match these definitions to the two phrases:

- a) a nuclear reaction in which a heavy nucleus splits spontaneously or on impact with another particle, with the release of energy;
- b) a nuclear reaction in which atomic nuclei of low atomic number fuse to form a heavier nucleus with the release of energy.

F Opposites

Find a word or phrase in the text that has an opposite meaning.

- a) cheap (para 4) e) similar (para 12)
- b) slow (para 6) f) stop (para 7)
- c) retire a reactor (para 3) g) more (para 5)
- d) accident prone (para 4) h) light (para 8)

G Phrasal verbs

Find phrasal verbs in the text that match these definitions:

- a) to escape punishment for something wrong that you have done (para 2); g) a w
- b) to (cause to) stop operating (para 4); s d
- c) to split into smaller units (para 5); b i
- d) to escape (para 5); r a
- e) to make or become slower (para 6); s d
- f) to behave or perform noticeably well (para 8); d o f
- g) to go through (para 6); p t
- h) to have as a place or point of origin (para 9). c f

H References

What do these words refer to in the text?

- a) these (line 31) f) its (line 130)
- b) these (line 4) g) its (line 9)
- c) ones (line 74) h) its (line 98)
- d) ones (line 66) i) their (line 41)
- e) it (line 81) j) them (line 90)

UNIT 4

ALTERNATIVE ENERGY

Text: THE POWER AND THE GLORY

The next technology boom may well be based on alternative energy. But which sort to back

line EVERYONE loves a booming fuel for power stations in market,
 and most booms happen on industrialising Asia. But the rich the back
 of technological change. world sees things differently. The world's

venture capitalists, In theory, there is a long queue of 5 having fed on
the computing boom 45 coal-fired power stations waiting to of the 1980s,
the internet boom of be built in America. But few have the 1990s and
the biotech and been completed in the past 15 years nanotech boomlets of
the early and many in that queue have been 2000s, are now looking
around for put on hold or withdrawn, for two

10 the next one. They think they have 50 reasons. First, Americans have
found it: energy. become intolerant of large, polluting Many past
booms have been industrial plants on their doorsteps. energy-fed: coal-fired
steam power, Second, American power companies oil-fired internal-
combustion are fearful that they will soon have 15 engines, the
rise of electricity, even 55 to pay for one particular pollutant, the mass
tourism of the jet era. But carbon dioxide, as is starting to the past
few decades have been quiet happen in other parts of the rich on that front.
Coal has been cheap. world. Having invested heavily in

Natural gas has been cheap. The gas-fired stations, only to find 20
1970s aside, oil has been cheap. The 60 themselves locked into an
one real novelty, nuclear power, increasingly expensive fuel, they
do went spectacularly off the rails. The not want to make another mistake.
pressure to innovate has been That has opened up a capacity gap
minimal. and an opportunity for wind and

25 In the space of a couple of years, 65 sunlight. The future price of these
all that has changed. Oil is no longer resources—zero—is known. That
cheap; indeed, it has never been certainty has economic value as a
more expensive. Moreover, there is hedge, even if the capital cost of
growing concern that the supply of wind and solar power stations is, at
30 oil may soon peak as consumption 70 the moment, higher than that of
coal continues to grow, known supplies fired ones. run out and new
reserves become

A prize beyond the dreams of avarice

harder to find. The market for energy is huge. At
The price of natural gas, too, has 75 present, the world's population
35 risen in sympathy with oil. That is consumes about 15 terawatts of
putting up the cost of electricity. power. And by 2050, power
Wind- and solar-powered consumption is likely to have risen by
alternatives no longer look so costly comparison. It is true that coal to 30 terawatts.

40 remains cheap, and is the favoured 80 Scale is one of the important
differences between the coming is gearing up its solar-energy
energy boom, if it materialises, and business. Meanwhile, BR and
Shell, its recent predecessors—particularly two of the world's biggest
oil those that relied on information companies, are sponsoring both 85
technology, a market measured in 130 academic researchers and new, small

mere hundreds of billions. Another difference is that new information technologies tend to be disruptive, forcing the replacement of existing

firms with bright ideas, as is Du Pont, one of the biggest chemical companies.

The poor world turns greener

90 equipment, whereas, say, building 135 **too** wind farms does not force the That, at least, is the view from the closure of coal-fired power stations. rich world. But poorer, rapidly For both of these reasons, any developing countries are also taking transition from an economy based more of an interest in renewable 95 on fossil fuels to one based on 140 energy sources, despite assertions to renewable, alternative, green the contrary by some Western

energy—call it like you will—is likely to be slow, as similar changes have been in the past. On the other hand, large 100 the scale of the market provides opportunities for alternatives to prove themselves as the margin and then move into the mainstream, as is happening with wind power at the

businessmen. It is true that China is to building coal-fired power stations at a blazing rate. But it also has a 145 wind-generation capacity, which is expected to grow by two-thirds this year, and is the world's second largest manufacturer of solar panels—not to mention having the largest 105 number of solar-heated rooftop hot water systems in its buildings.

105 moment. And some energy 150 technologies do have the potential to be disruptive. Plug-in cars, for example, could be fuelled with

Brazil, meanwhile, has the world's second-largest and most electricity at a price equivalent to 25 economically honest biofuel 110 cents a litre of petrol. That could 155 industry, which already provides 40% of the fuel consumed by its cars electricity industries all in one go. and should soon supply 15% of its

electricity, too. South Africa is bringing forth a raft of ideas, some leading the effort to develop a new 115 bright, some batty, that is indeed 160 class of safe and simple nuclear reactor—not renewable energy in the strict sense, but carbon-free and thus increasingly welcome. These

This renewed interest in energy is bringing forth a raft of ideas, some 115 bright, some batty, that is indeed 160 class of safe and simple nuclear reactor—not renewable energy in the strict sense, but carbon-free and thus increasingly welcome. These

and others like them, are 120 Google or a Sun among them. 165 prepared to look beyond fossil fuels. More traditional companies are energy where also taking an interest. General and other Electric (GE), a large American cost, the engineering firm, already has a 125 thriving wind-turbine business and

there could just be PayPal or a countries, 165 prepared to look they can. So if renewables alternatives can compete on poor and the rich world alike will 170 adopt them.

READING

A Understanding main points

Read the text and answer these questions.

- 1 What are the alternative energy sources?
- 2 Why is solar sometimes termed the primary renewable energy?
- 3 What are the disadvantages of geothermal energy?
- 4 Why is renewable energy preferable?
- 5 What are the benefits of using renewable energy?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Wood still remains the most common source to produce biomass energy.
- 2 Solar energy is one the alternative energy source that is used most widely across the globe.
- 3 Hydrogen energy is completely renewable and can be produced over and over again on demand.
- 4 Many of the wind turbines can capture much power all at once before feeding it to the power grid.
- 5 Alternative sources of energy produce significant amounts of pollution.

C Information search

Scan the text quickly and find the figures, percentage or sums of money that correspond to the following pieces of information.

- 1 The amount of power which is presently consumed by the world's population.
- 2 The amount of power which the world's population is likely to have consumed by 2050.
- 3 The cost in cents of a litre of petrol at which plug-in cars could be fuelled with electricity.
- 4 The number of the world's biggest oil companies.
- 5 The percentage of total fuel consumed by Brazil's cars which is provided by its biofuel industry.
- 6 The percentage of total electricity Brazil's biofuel industry supplies.
- 7 The percentage of total China's wind-generation capacity by which it is expected to grow.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- 1 glory (title) **a)** a (period of) rapid growth or increase;
- 2 hedge (line 68) **b)** the capacity of the largest sort of coal-fired power station;
- 3 renewable (line 139) **c)** a matter made of substances that were living things many millions of years ago;

- 4 nanotech boomlet (line 8) **d)** the use in science and industry of living things such as cells and bacteria to make drugs and chemicals, destroy waste matter etc;
- 5 boom (line 2) **e)** great fame and admiration;
- 6 biotech boomlet (line 5) **f)** machinery methods etc which can perform processes extremely quickly or make or measure objects which are extremely small; 7 internal-combustion engine **g)** energy from nonconventional [alternative] (line 14) sources of energy;
- 8 capacity (line 63) **h)** 1,000 gigawatts;
- 9 fossil fuel (line 165) **i)** that can be renewed, especially by natural processes or good management;
- 10 terawatt (line 76) **j)** the amount that something can produce;
- 11 gigawatt (line 76) **k)** something that gives protection, especially against possible loss;
- 12 alternative energy (subtitle) **l)** an engine which produces power by the burning of a substance, such as petrol, inside itself.

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- 1 Green energy (line 96):
- a) energy which is produced by a generator;
- b) energy which does not cause harm to the environment;
- c) energy which is produced by a wind turbine.
- 2 Novelty (line 21):
- a) a writer of novels;
- b) a short, not very serious novel, usually about love;
- c) the quality of being novel; interesting newness.
- 3 Information technology (line 84):
- a) the mathematical principles that deal with information and the sending of information between humans and machines;
- b) the science of collecting, arranging, retrieving, and sending out information;
- c) the science or practice of collecting, using, and sending out information by means of computer systems and telecommunications.
- 4 Nuclear reactor (line 160):
- a) a process in which the parts of the nucleus (=centre) of an atom are rearranged to form new substances;
- b) a large machine that produces nuclear energy, especially as a means of producing electricity;
- c) a factory or other place where nuclear weapons might be made.
- 5 Margin (line 102):
- a) a process in which the parts of the nucleus (=centre) of an atom are
- 6 Academic researcher (line 130):
- a) a person with great knowledge of the subjects that are taught to

rearranged to form new substances;

develop the mind rather than to provide practical skills;

b) a large machine that produces nuclear energy, especially as a means of producing electricity; biology;

b) a person who works in a science, especially physics, chemistry, or means of

c) a factory or other place where weapons might be made. the real world and real problems.

c) a person who thinks only about nuclear

7 Scale (line 80):

8 Avarice (line 73):

a) size or level in relation to other or to what is usual; get or keep wealth;

a) extreme eagerness and desire to things

b) a rule or set of numbers comparing measurements on a map or model actual measurements; be best for oneself;

b) the quality of always thinking about oneself and about what will with

c) a set of musical notes in order, downward, and at fixed

c) one's opinion of oneself; upward or self-esteem. separations.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence. 1

Computer circuitry now includes advanced processes made possible by

.....

2 The big tax cuts fuelled a consumer

3 BMW engineers are examining how to make a saloon car that can run with a hydrogen

4 New Zealand and Sweden import a lot of

5 Those who died bravely in battle earned everlasting

6 Buying a house will be a against inflation.

7 This factory has a productive of 200 cars a week.

8 refers to energy sources that have no undesired consequences such as, for example, fossil fuels or nuclear energy.

9 By buying more efficient bridges, over the years, Americans save more than 200-hours annually.

10 Sun, wind, and waves are sources of energy.

D Collocations

Match these verbs and nouns as they occur in the text.

1 venture a) company

2 mass b) boom

3 industrial c) researcher

4 economic d) business

5 energy e) power

- 6 dotcom **f**) tourism
- 7 solar-energy **g**) value
- 8 academic **h**) plant
- 9 chemical **i**) capitalist
- 10 nuclear **j**) technology

E Words with similar or related meanings

- 1 What word is used in the text with the same meaning as ‘boom’ (para 1)?
- 2 What other adjective is used in the text (para 11) with the same meaning as ‘booming’ (para 1)?
- 3 The leading energy sources are coal, oil and natural gas (para 2). What is a general term for all of them (para 13)?
- 4 What word from the text could replace the verb ‘grow’ (para 4)?
- 5 The word ‘price’ is used in paragraph 4. What word with a similar meaning is used in the same paragraph?
- 6 The adjective ‘renewable’ is combined with the noun ‘energy’ (para 9). What other adjectives from the text (subtitle, para 9) can substitute ‘renewable’?
- 7 In paragraph 12 there is a phrase ‘renewable energy source’. Find two words in the text (para 13) that has a similar meaning.

F Words that seem similar

- 1 The verbs **1**) ‘invest’(line 58) and **2**) ‘sponsor’ (line 129) have different meanings. Match these definitions to the two words:
 - a) to support and pay for (part of) an activity;
 - b) to put (money) to a particular use, in order to have a profit.
- 2 The adjective **1**) ‘favoured’ (line 40) and the adjective **2**) ‘welcome’ (line 163) have slightly different meanings. Match these definitions to the two words:
 - a) gladly accepted; received with pleasure;
 - b) having special advantages or desirable qualities.

G Phrasal verbs

Find phrasal verbs in the text that match these definitions:

- a) to search (para 1); l a
- b) to start to behave in a strange, confused way (para 2); g o
- c) to come to an end, so that there is no more (para 3); r o
- d) to increase in amount (para 4); p u
- e) delay (para 5); p o h
- f) to make possible the development of (para 6); o u
- g) to look for outside the range or limits of (para 13); l b
- h) to set free (from control, prison, duty etc) (para 9); s u
- i) to form or make (something) (para 9); b o

j) to produce, especially give birth to (para 10).

b f

H Prepositions

Complete these sentences with a suitable preposition.

1 "The television doesn't work." "Have you plugged it?" 2

They opened the country to trade to trade.

3 Don't rely the bank lending you the money.

4 The new chairman will shake the company.

5 We were looking for a nice place for a new job.

6 They've put the price

UNIT 5

SOLAR ENERGY

Text: BRIGHT PROSPECTS

Energy: Solar power is in the ascendant. But despite its rapid growth it will not provide a significant share of the world's electricity for decades

line LAST year Microsoft outfitted its campus in Silicon Valley with a solar system from Sun-Power, a local company that makes high-efficiency (and, some say, the world's best-looking) solar panels.

A few months later Microsoft's arch-rival, Google, began building

expensive something on an even grander scale-generated in 10 one of the largest corporate solar customers.

believe the may yet be topped by Wal-Mart. In energy have December the retail giant solicited

Decades of bids for placing solar systems on the roofs of many of its supermarkets.

Besides producing favourable publicity, the appeal of using solar power is obvious. Unlike fossil fuels, which produce significant

20 amounts of pollution and enormous amounts of greenhouse gases, the sun's energy is clean and its supply virtually limitless. In just one hour

40 world's electricity, according to the International Energy Agency. The thing that has held back the widespread deployment of solar 5 panels is their price. Sunshine is

45 free, but converting it into electricity is not. At present, solar power is at least two to three times as

as the typical electricity America for retail

50 Even so, many people prospects for solar never looked brighter.

research have improved the efficiency of silicon-based solar

55 cells from 6% to an average of 15%

today, whereas improvements in manufacturing have reduced the price of modules from about \$200

60 2010. Within three to eight years, many in the industry expect the

price of solar power to be cost the

Earth receives more energy from the sun than human beings consume during an entire year. According to America's Department of Energy, solar panels could, if placed on about 0.5% of the country's mainland landmass, provide for all of its current electricity needs. They were first invented decades ago, devices materials electricity— publicity but photovoltaic 0.04% of the years. In a solar power business. This gone unnoticed underground pipelines from corrosion and to power navigational 85 spree. Solar power has become one of the fastest-growing areas: investments have risen from \$59m in 2008 to \$308m in 2010. The main beneficiaries of this 90 windfall are start-ups, such as Nanosolar and Miasole, which are based in Silicon Valley and focus on new technologies. Both firms are betting on “thin film” solar cells, which can be made with vastly less material than based devices. employ new, manufacturing processes reduce the cost of very quickly in future. **technology** depended on though it was

competitive with electricity from the 25 the grid. 65 In the meantime, some European countries and parts of America instituted subsidies to support the adoption of solar power. California's 30 “Million Solar Roofs” initiative, 70 example, will hand out about \$3 billion in rebates and other incentives over a decade to encourage the installation of solar 35 panels. In Europe Germany offers generous 75 producers of solar power feed-in tariffs. As a result of such incentives, the market for solar power has grown by about 40% a 80 earliest buyers of solar panels were 125 gas and oil companies, which began to use solar power in the mid-1970s to protect wellheads and by America's venture capitalists, who have embarked on a spending 130 aids on offshore oil rigs. In the 1980s America's Coast Guard began using solar panels to America's Coast Guard to buoys. By the early 1990s solar cells powered hundreds 135 of diverse off-grid applications including telecoms equipment, emergency roadside phone boxes, and consumer devices such as calculators and watches. 95 **Slow sunrise** semiconductor

The solar industry has in the past profited from the manufacturing improvements of chipmakers, and is now finding ways to benefit from 140 innovations in other high-tech fields. “I think of the silicon solar-cell industry as a marriage between the semiconductor industry, where it gets its base technology, and the CD

140 **Dawn of a new** Humans have always energy from the sun,

105 exploited mostly indirectly for thousands of years. The photoelectric effect was not discovered until 1839, when Alexandre Becquerel, a French physicist, observed that light could generate an electric current between two metal electrodes immersed in a conductive liquid. About 40 years later Charles Fritts, an American inventor, devised the first solar cell. Made with selenium and a thin layer of gold, the device was less than 1% efficient.

110 150 industry, which is very high volume,” says Richard Swan-son, SunPower’s president. But despite the growing infusion of capital, innovation and talent, 155 solar power will provide only a tiny fraction of the world’s electricity needs for the foreseeable future. Even if the industry continues to grow at the same torrid pace, it will 160 not be able to supply more than 1% or so of the world’s electricity needs for at least another decade. That may sound like a gloomy forecast, but some regard it as a huge 165 opportunity. It means there is a lot of room for growth, says Mr Roscheisen, Nanosolar’s irreverent boss.

120 The first terrestrial solar cells were used for off-grid applications in remote locations where placing conventional power lines was not possible or economical. Among the

READING

A Understanding main points

Read the text and answer these questions.

- 1 Three big companies are mentioned in the article. Rank them in terms of their contribution to the success of solar industry, starting with the one most effective.
- 2 What is the main reason for insufficient deployment of solar panels?
- 3 What measures are taken by developed countries to encourage the adoption of solar power?
- 4 What are the pros and cons of solar energy?
- 5 What is the future of solar energy?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 The company Sun-Power produces highly efficient solar panels.
- 2 By using new technologies, start-ups plan to increase the cost of solar panels.
- 3 The first solar cell was made of silicon and a thin layer of gold.
- 4 Solar power provides only a tiny fraction of the world’s electricity needs.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 The percentage of the world's electricity produced by photovoltaic systems in 2010.
- 2 The percentage by which the market for solar power has grown for the past five years.
- 3 The sum of money invested into solar power in America in 2010.
- 4 The percentage of the efficiency the first solar cell had.
- 5 The sum of money for which modules were bought in 2010.

LANGUAGE FOCUS

A Definitions

Match these terms with their definitions:

- | | |
|--|---|
| 1 photoelectric effect (line 107) | a) a very small piece of silicon containing a set of electronic parts and their connections, which is used in computers and other machines; |
| 2 solar cell (line 34) | b) a substance, such as silicon, which allows the passing of an electric current more easily than an insulator, but not as well as a conductor; |
| 3 solar panel (line 6) | c) an offer to do some work at a certain price; |
| 4 semiconductor (line 35) | d) an apparatus for producing electric power from sunlight; |
| 5 chip <i>also</i> silicon chip (line 143) | e) the receiver of a benefit or advantage, especially of money or property; |
| 6 power line (line 122) | f) the process connected with the generation of electricity between two metal electrodes immersed in a conductive liquid under the influence of light; |
| 7 grid (line 64) | g) an unexpected lucky gift or gain, especially money; |
| 8 module (line 58) | h) a very great rival; |
| 9 windfall (line 90) | i) a network of electricity supply wires connecting power stations; |
| 10 bid (line 14) | j) a number of solar cells working together; |
| 11 arch-rival (line 8) | k) an independent part or unit which can be combined with others to form a structure or arrangement; |
| 12 beneficiary (line 89) | l) a large wire carrying electricity over land or underground from where the electricity is produced to where it is used. |

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- | | |
|--------------------------|-------------------------|
| 1 Electricity (line 36): | 2 Technology (line 93): |
|--------------------------|-------------------------|

- | | |
|---|--|
| a) the power which is carried usually that by wires; need skill; | a) a method of doing something |
| b) the powerful force that is produced scientific when the nucleus of an atom is either split or joined to another practical use in industry; atom; | b) knowledge dealing with and industrial methods and their |
| c) the power which is produced or heat. something. | c) a planned way of doing caused by |
- 3** Installation (line 11):
- | | |
|---|--|
| a) a piece of equipment intended for gas particular purpose; mixed into it, usually without | 4 Conductive liquid (line 113): |
| b) an apparatus in a fixed state ready use; electricity; | a) (a) liquid containing a solid or chemical change; |
| c) something necessary or useful for one's job. and has no fixed shape. | b) (a) liquid able to conduct for |
- 5** Solar system (line 3):
- | | |
|---|--|
| a) the sun together with the planets will happen as one wishes; | 6 Prospect (line 51): |
| b) such a system round another star; | a) the expectation that something going round; |
| c) the system which uses the power of sun's light. soon. | b) (a) possibility; |
| | c) something which is productive the |
- 7** Innovation (line 145):
- | | |
|---|--|
| a) a suggested (business) offer, arrangement, or settlement; | 8 Dawn (of) (line 102): |
| b) practical ability or skill in a particular area of activity; | a) the time of day when light first appears; |
| c) a new idea, method, or invention. | b) the beginning or first appearance of a new period, idea, feeling etc; |
| | c) at the first light of day. |

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 These two companies are in the computer industry.
- 2 Over the years the solar industry has been able continuously to reduce the cost of silicon-based
- 3 Samsung and LG, a South Korean conglomerate, more often link their appliances with cables and than with wireless technology.
- 4 are used in making transistors.
- 5 As the billions of transistors on the get smaller, there is more room to add extra functions.
- 6 In Japan, where electricity is expensive, solar power is now fully cost competitive with power from the
- 7 "Thin film" solar cells use little or no
- 8 for building the bridge were invited from British and American firms.

- 9 As prices for silicon have gone up, so have prices of solar
- 10 People on high incomes will be the main of these changes in the tax laws.

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 convert a) efficiency
2 institute b) a bid
3 reduce c) solar power
4 generate d) a process
5 use e) cost
6 improve f) light
7 employ g) an electric current
8 protect h) a subsidy
9 place i) a power line
10 solicit j) wellheads

E Words with similar or related meanings

- 1 Two words are used many times with the meaning of 'force that can be used for doing work, driving a machine, or producing electricity'. What are these?
- 2 What other word is used in the text (para 2) with the same meaning as 'sunlight' ?
- 3 The collocation 'manufacturing improvements' is used in paragraph 8. What word is used in the same paragraph with a similar meaning?
- 4 What phrase is used in paragraph 5 with a similar meaning to 'innovations' (line 154)?
- 5 What phrase (para 5) could replace the phrase 'at the torrid pace' (line 159)?
- 6 The phrase 'infusion of capital' is used in line 153. What word with a similar meaning is used earlier in the text (para 4)?
- 7 The phrase 'produce electricity' is used in line 39. What other phrase is used in paragraph 5 with the same meaning?
- 8 The verb 'invent' is used in line 32. What word with a similar meaning is used in paragraph 6?

F Words that seem similar

- 1 The words 1) 'economical' (line 123) and 2) 'efficient' (line 118) have slightly different meanings. Match these words with their definitions:
- a) using money, time, goods etc, carefully and without waste;
b) working well, quickly, and without waste.
- 2 The adjectives 1) 'significant' (line 19) and 2) 'enormous' (line 20) which describe the noun 'amounts' have completely different meanings. Match these definitions to the two words:
- a) of noticeable importance, effect, or influence;

- b) extremely large.
- 3 The verb **1)** ‘devise’ (line 117) and the noun **2)** ‘device’ (line 117) are confusingly related words. Match these words with their meanings:
- a) an invention or plan;
- b) invent, create, contrive.
- 4 The adjectives **1)** ‘conventional’(line 122), **2)** ‘typical’ (line 48) and **3)** ‘traditional’ (line 97) have slightly different meanings. Match these definitions to the three words:
- a) produced, done, or used in accordance with tradition;
- b) following accepted customs and standards, sometimes too closely and without originality;
- c) exhibiting the qualities, traits, or characteristics that identify a kind, class, group, or category.
- 5 The phrasal verbs **1)** ‘profit from’ and **2)** ‘benefit from’ (para 8) have different meanings. Match them with their meanings:
- a) to make a profit from something;
- b) to get help or an advantage from something.

G Phrasal verbs

Find phrasal verbs in the text that match these definitions:

- a) to supply (para 1); p f
- b) to refrain from (para 2); h b
- c) to distribute (para 4); h o
- d) to direct one’s attention to something (para 5); f o
- e) to risk (money) on the result of a future event (para 5); b o
- f) to rely on (para 6); d o
- g) to gain advantage (as a result of something) (para 8). b f
- h) to begin doing something. e o

H Understanding meanings

Choose the right definition of the word ‘room’ in the phrase ‘there is a lot of room for growth’ as it is given in the text (line 165):

- a) space available for something;
- b) opportunity for doing something;
- c) the people present in a room;
- d) a part or division of a building enclosed by walls, floor, and ceiling.

UNIT 6

WIND POWER

Text A: WHERE THE WIND BLOWS

A grandiose plan to link Europe's electricity grids may recast wind power from its current role as a walk-on extra to being the star of the show

line WIND power has two problems. 40
You don't always get it where you
want it and you don't always get it
when you want it. According to Dr
Schmid, the head of ISET, an
alternative-energy institute at the
University of Kassel, in Germany,
grid continent-wide power distribution
allow systems in a place like Europe
10 would deal with both of these points.
The question of where the wind is 50
blowing, would no longer matter
for because it is almost always blowing
somewhere. If it were windy in
Spain but not in Ireland, current
would flow in one direction. On a
Germany, blustery day in the Emerald Isle it
Netherlands would flow in the other.
to Dealing with when the wind
blows is a subtler issue. In this
context, an important part of Dr
Schmid's continental grid is the
branch of Norway. It is not that
Norway is a huge consumer. Rather,
the country is well supplied with
hydroelectric plants. These are one
customers of the few ways that energy from
transient sources like the wind can
stage be stored in grid-filling quantities.
turbine-strong 30 The power is used to pump water up
cost into the reservoirs that feed the 70
hydroelectric turbines. That way it is
tap when needed. The capacity of
reservoirs is so large, that
35 should the wind drop all over
does happen on rare 75
plants could and though it currently has a capacity
gap of only 25 megawatts, increasing that
adding more turbines.

Put like this, a Europe-wide grid
seems an obvious idea. That it has
not yet been built is because AC
power lines would lose too much 5
power over such large distances.
45 Hence the renewed interest in DC.
Dr Schmid calculates that a DC
of the sort he envisages would
wind to supply at least 30% of the
power needed in Europe. Moreover,
it could do so reliably—and that
means wind power could be used
base-load power supply.
A group of Norwegian companies 15
have already started building high
voltage DC lines between
55 Scandinavia and the
though these are intended as much
sell the country's power as to 20
accumulate other people's. And
60 Airtricity—an Irish wind-power
company—plans even more of them.
It proposes what it calls a Supergrid.
This would link offshore wind farms 25
in the Atlantic ocean and the Irish,
North and Baltic seas with
65 throughout northern Europe.
Airtricity reckons that the first
of this project, a 2,000
farm in the North Sea, would
70 about \$2.7 billion. That farm would
generate 10 gigawatts. An equivalent
amount of coal-fired capacity would
75 cost around \$2.3 billion. Such offshore
farms certainly work. Airtricity
Europe—which
already operates one in the Atlantic,
occasions—the hydro
plants spring into action and fill in the
gap for up to four weeks. merely means

Text B: TRAPPED WIND

Compressed air might help to make wind power more reliable

line Wind-power turbines have played an important step in renewable energy intermittent but now the future of wind power power can cause just variability. By 2011, a 5 compressed-air energy storage wind-powered compressed-air plant plants, air is pumped into large had been built in Iowa.

underground formations where it Compression, can be used later to deliver a large Attleboro, amount of energy that it received. another 10 Pumping water into the reservoir compresses air of a hydroelectric power plant may advantage of be a good way of storing energy wasteful steps: the captured by wind farms—but what if the mechanical power of there are no such plants to hand and a windmill into electricity and its subsequent reconversion into mechanical power in a compressor. an air-compressing windmill, squirrelled away in hermetically fine for storing energy, cannot transmit electricity directly to the grid. The firm will not produce its first prototype until 2020, but sceptics already worry that what it gains on the swings, it will lose on the roundabouts —or, in this case, on the turbines. Most other compressed air energy storage plants operate under the same principle, although to increase efficiency they are more focused on retaining the heat associated with compression. One of the major issues with compressed air energy storage is that when you compress air it heats up. When the electricity is required it needs to be expanded,

Meanwhile, General a small firm based in Massachusetts, is taking approach. Its windmill directly. This has the eliminating two conversion of a But while 60

35 variations in the price of electricity. which requires heat. In addition,
 the When power is cheap, it is used to cooler the air, the more you can
 run their compressors. When it is store. Companies are therefore
 trying expensive, the valves are opened 80 to find ways to store the heat
 and the generators turn. generated during compression, so it 40
 Compressed-air plants are can then be used to heat the air for
 inefficient, and so they are the expansion helping drive more
 commercially viable only in places efficiency in the overall process.

READING

A Understanding main points

Read the text and answer these questions.

- 1 What is wind energy?
- 2 What are the advantages of wind-generated energy?
- 3 What are the economic obstacles to greater wind power usage?
- 4 Are there environmental problems facing wind power?
- 5 Why do we need energy storage?
- 6 What countries produce the most wind energy in the world?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Compressed air energy storage is a way to store energy generated at one time for use at another time using compressed air.
- 2 Wind power consists of converting the energy produced by the movement of wind turbine blades driven by the wind into mechanical energy.
- 3 Wind energy is a source on non-renewable energy.
- 4 Wind energy has the potential to become the backbone of a future secure global energy supply.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 The cost of the first stage of the Supergrid.
- 2 The sum of money equivalent to €2 billion.
- 3 The capacity of the farm to be built in the North Sea.
- 4 The cost of an amount of coal-fired capacity equivalent to that of the capacity of the farm.
- 5 The capacity of the offshore farm which operates in the Atlantic.
- 6 The number of turbines to be built in the North Sea.

D How the text is organized

These phrases summarise the main idea of each paragraph. Match each phrase with the correct paragraph:

Text A

- 1 advantages of a dc grid;
- 2 perspectives of the airtricity's project;
- 3 designation of dc lines in northern europe;
- 4 problems of wind power;
- 5 how hydroelectric plants work in norway;
- 6 where the wind is blowing.

Text B

- 1 attempts of companies to store heat;
- 2 the way of storing energy;
- 3 how a compressed-air energy storage plant operates;
- 4 the approach of general compression;
- 5 building a compressed-air plant in the american midwes;
- 6 the future of wind power.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- 1 wind power (A, line 1) a) a place where liquid is stored;
- 2 voltage (A, line 55) b) a part of a machine, for compressing gas or air;
- 3 hydroelectric turbine (A, line 32) c) a structure with large sails or similar parts which are turned round by the wind, used to produce power for electricity;
- 4 reconversion (B, line 57) d) a large wire carrying a powerful electrical power;
- 5 reservoir (A, line 31) e) power produced by wind;
- 6 current (A, line 15) f) a doorlike part of a pipe or tube which opens and shuts so as to control the flow of liquid, air, gas etc through it;
- 7 capacity (A, line 33) g) the amount that something can hold or contain;
- 8 valve (B, line 38) h) a continuously moving mass of liquid or gas, especially one flowing through slower-moving liquid or gas;
- 9 prototype (B, line 63) i) the first form of something, especially of a machine or industrial product, from which all later forms develop, sometimes with improvements;
- 10 compressor (B, line 37) j) electric force measured in volts;
- 11 windmill (B, line 52) k) an engine or motor in which the pressure of water, usually at very high temperatures, drives a special wheel, producing a circular movement;
- 12 high-tension line l) conversion back to a previous state. (B, line 15)

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

1 Generator (B, line 22):

2 Power supply (A, line 52):

- a) a piece of machinery with moving parts which changes power from working;
 b) a machine that generates something, electricity; building, machine etc;
 c) a small machine for crushing or stated solid material.
- a)** a steep downward movement of parts of an aircraft with the engines steam, oil etc;
b) the flow of electricity to a especially building, machine etc;
c) (a system for) the supplying for grinding the something needed.
- 3** Alternative energy (A, line 6):
 a) the energy that is different from traditional one;
 b) the energy produced by stations;
 c) the energy produced by underground of steam.
- 4** Grid (A, line 22):
a) the power which is produced by usual or various means, which is carried by wires;
b) the wires and other equipment conventional power that work an electrical apparatus;
c) a network of electricity supply sources of steam. wires connecting power stations.
- 5** Alternating current (AC) (A, line 42):
 a) a flow of electricity that regularly direction at a very fast rate
 b) the flow of electrons in one direction around a circuit
 c) the direction of a current of water point.
- 6** Current (A, line 45):
a) something flowing or moving changes forward continuously;
b) a natural flow of water moving across country between banks of a river;
c) the flow of electricity past a fixed point.
- 7** Power line (A, line 43):
 a) a long mark used as a limit or order;
 b) a large wire, carrying electricity or underground from where it is used;
 c) (a piece of) string or cord.
- 8** Direct current (DC) (A, line 45):
a) the flow of electrons back and forth;
b) a flow of electricity that moves in over land or underground from one direction only; where electricity is produced to where it is used;
c) the flow of neutrons in a wire.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 The fuel tank has a of 12 gallons.
- 2 High is the best way to transmit power.
- 3 Power is transmitted along
- 4 The is strongest in the middle of the river.
- 5 When of water into ice occurs, it freezes.
- 6 In a a wheel of special blades is driven round at high speed by water.
- 7 The of the heart and blood vessels allow the blood to pass in one direction only.

- 8 A forces substances into less space.
 9 The first were used for crushing grain.
 10 The volume of this is 100,000 cubic meters.

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 store a) a valve
 2 pump b) air
 3 supply c) an approach
 4 link d) mechanical power
 5 convert e) electricity
 6 turn f) a generator
 7 open g) energy 8 take h) power
 9 compress i) water
 10 transmit j) wind farms

E Words search

Find a word in the text that has a similar meaning:

- | | |
|---------------------------------|------------------------------------|
| a) power (B, para 2); | f) quantity (A, para 6); |
| b) mean (A, para 2); | g) huge (A, para 3); |
| c) operate (A, para 6); | h) high-tension (A, para 5); |
| d) wind farm (A, para 5); | i) underground cavern (B, para 2); |
| e) problem (A, para 2, para 3); | j) capture (B, title). |

F Words that seem similar

- 1 The words 'variation'(B, line 35) and 'variability' (B, line 46) have slightly different meanings. Which of the following definitions fits the word **1)** 'variation' and which fits the word **2)** 'variability'?
- a) having the tendency to vary, not to stay the same or steady;
 b) (an example or degree of) varying.

G Prepositions

Complete these sentences with a suitable preposition.

- 1 When a windmill compresses air, it converts a mechanical powerelectricity.
 2 In direct current electrons flow one direction.
 3 At present, power is mostly supplied traditional power stations.
 4 Wind power can be used the production of electric power.
 5 The Global Network Institute, based in California, reckons that wind and geothermal power could be gathered places like South America and Siberia.

- 6 Edison was right to argue that DC is the best way to transmit electricity any given voltage.
- 7 Wind power gives power which is very consistent from year year.

H Questions

Below you will find answers to five different questions. Read the Text B and try to supply the missing questions.

- 1?
They are designed to take advantage of variations in the price of electricity.
- 2?
They decided to build a wind-powered compressed-air plant in Iowa.
- 3?
Two wasteful steps.
- 4?
\$2.3 billion.
- 5?
By 2011.

I Culture note

- 1. Emerald Isle, the name for Ireland, used in literature, often humorously.
- 2. Iowa, a state in the Midwestern United States.
- 3 Massachusetts, a state in the northeast of the US which has Boston as its capital city.

UNIT 7

GEOHERMAL ENERGY

Text A: BLOWING HOT AND COLD

Geologists are getting more juice out of the ground

<p>line GOLDILOCKS, the fussy, blonde, larcenous heroine of an English a children's story, liked her porridge a neither too hot, nor too cold, but just right. Most engineers looking for underground sources of steam to into generate geothermal power have similar tastes. If the steam is much colder than 150°C, it will start to cools 10 condense into water before it can be 50 to start used to turn a turbine. On the other using a hand, steam hotter than 400°C,</p>	<p>The power station at Chena uses the spring water to heat up R134a, fluid hitherto employed mainly as refrigerant. Since R134a has a 5 45 relatively low boiling point, the water is hot enough to convert it a gas. This gas is used to drive the turbine just as steam would be. Icy water from a nearby river then the gas back to liquid form, the cycle again. The idea of liquid with a lower boiling point</p>
--	---

although richer in energy, is harder than water to drive a turbine is to find and to handle. Two new nothing new—it has simply not 15 projects, however, aim to push back 55 proved worthwhile in the past.

both these limits.

Geothermal power stations tap of utilities is teaming up to do just aquifers heated by contact with hot the opposite: harness steam that is rocks in volcanic regions—or, in hot much hotter than the norm. The 20 but dry spots, they pump water past 60 wells of most geothermal plants are such rocks to heat it up. The about 2km deep. But the Icelandic temperature of the steam produced outfit hopes to drill to depths of 4km varies, depending on how hot the or more, to get closer to the magma source is and how much heat it loses that rises towards the surface along 25 on its way to the surface. 65 local faultlines. In such areas the

Not all geothermal activity is hot enough to bring water to the boil.

The Chena hot springs, in Alaska, not for example, are just right for only extra building materials, but 30 bathers, at a porridge-like 43°C, but 70 also more durable ones, to cope with not much use for traditional the higher pressures and of geothermal power generation. Even temperatures. But Olafur Flovenz, Iceland Geosurvey, believes that only 74°C. Nonetheless, its owners, although the costs might increase, 35 in conjunction with United 75 the amount of electricity generated Technologies, an engineering could rise by as much as ten times. If conglomerate, have worked out how the project succeeds, it would bring to generate power from the tepid the costs down even further. Better flow—the coldest ever used in a yet, it could be replicated in any 40 geothermal plant. 80 country with a volcano.

Text B: BENEATH YOUR FEET

Geothermal could be hot

line THE Phillipines are not generally hot, associated with the cutting edge of that technological change. In one 45 heat.

respect, though, the country is ahead Dr Tester reckons that spending 5 of its time: around a quarter of its about \$1 billion on demonstration electricity is generated from projects over the next 15 years underground heat. Such heat is free, would allow 100 gigawatts-worth of inexhaustible and available day and 50 EGSS to be created in America by

notice that the Earth's interior is so no one thinks of drilling for

about \$1 billion on

projects over the next 15 would allow 100

50 EGSS to be

night. 2050, at a commercially acceptable price.

10 It is also a part of geology that sees parts of the country devastated eruptions from time to time. The geysers that turn the 55 is not as easy as it sounds. Until the generators are merely the gentlest term EGS was coined, the field was 15 manifestations of this volcanism. known as hot-dry-rock geothermal

The question that exercises Jefferson energy. A century of data collected Tester, a researcher at MIT, is by oil companies suggest it is whether it is possible to have the one 60 impermeable rocks such as granite without the other. The Earth's that are the most effective reservoirs 20 depths are, above all, hot of heat. Their very dryness increases everywhere. So if there is no natural their heat capacity. But to get the volcanism around to bring this heat heat out you have to make them to the surface, his answer is to create 65 permeable. Hence the "engineered" controlled, artificial volcanism—what is the new name.

25 is known as an engineered The Cooper Basin in South geothermal system (EGS). Instead of Australia has the hottest non relying on natural hot springs, you volcanic rocks of any known place make your own. 70 in the world, and Australia leads the field in exploiting subterranean heat, 30 In principle, this is easy. Drill with seven firms snooping around two parallel holes in the ground, a the area. One of them, few hundred metres apart, and carry Geodynamics, on drilling until the rock is hot recently completed what it claims is enough (say 200°). Then pump cold 75 a commercial-scale well. And the water down one hole and wait for it turbines will also turn soon at an 35 to come back the other at a suitably elevated temperature. The experimental non-commercial superheated water turns to steam project at Soultz, in France. has which you use to power a generator. 80 If it can be made to work, EGS got the lot. No unsightly turbines. In Dr Tester's view, the reason this No need to cover square kilometres 40 source of power is neglected is that of land with vast mirrors. And it is it is invisible. Everybody feels the always on. Anybody got a billion wind and the sun, but only miners dollars handy?

READING

A Understanding main points

Read the text and answer these questions.

- 1 What is geothermal energy?
- 2 Why is geothermal energy "environmentally friendly"?
- 3 Why is geothermal energy considered a renewable resource?

- 4 How does geothermal energy work?
- 5 What is the future of geothermal energy?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Geothermal energy is thermal energy generated and stored in the Earth.
- 2 Geothermal energy is renewable because the Earth has retained a huge amount of the heat energy that was generated during formation of the planet.
- 3 The source of geothermal power is the sand contained inside the Earth.
- 4 Geothermal energy refers to the production of energy using the internal heat of the Earth's crust.
- 5 There are many advantages of geothermal energy.

C Information search

Scan the text quickly and find the figures, percentage or sums of money that correspond to the following pieces of information.

- 1 The degree of heat of steam at which it starts to condense into water.
- 2 The temperature of steam at which it is richer in energy.
- 3 The temperature of water within the spa's wells at Chena.
- 4 The supposed temperature of steam according to "IDDP".
- 5 The depth of wells of most geothermal plants.
- 6 The sum of money to be spent on demonstration projects.
- 7 The amount of electricity the EGSS will generate in America by 2050.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- | | |
|-------------------------------------|---|
| 1 geothermal energy
(B, line 57) | a) the most advanced position, where important action is taken; |
| 2 geothermal plant
(A, line 40) | b) something that produces power, such as electricity, gas, or petrol; |
| 3 cutting edge (B, line 2) | c) the energy produced from the heat found deep inside the earth; |
| 4 boiling point (A, line 52) | d) a place where water can be taken from underground; |
| 5 well (A, line 60) | e) the temperature at which a liquid boils; |
| 6 juice (A, subtitle) | f) a hydroelectric power station which transforms the Earth's interior heat into power; |
| 7 refrigerant (A, line 44) | g) a set of things needed for a particular purpose a set of things needed for a particular purpose; |
| 8 spa (A, line 33) | h) the line of crack in the Earth's surface along which one band of rock has slid against another; |

- 9 source (A, line 6) i) (of a volcano) outpouring of fire, lava etc;
- 10 faultline (A, line 65) k) a place with a spring of mineral water where people come for cures of various diseases;
- 11 eruption (B, line 12) l) a place from which something comes;
- 12 subterranean (B, 54) m) being, lying, or operating under the surface of the earth;
- 13 outfit (A, line 62) n) a substance that is used to refrigerate.

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

1 Steam (A, line 6):

- a) water in the state of a gas produced by boiling;
- b) substance like air, which is not solid or liquid and usually cannot be seen;
- c) a very small drop of liquid.

2 Spring (A, line 28):

- a) the place where a river enters a lake, larger river, or the ocean;
- b) a place where water naturally flows out from the ground; be seen;
- c) a stream or river that flows into a larger one.

3 Rock (A, line 19):

- a) a very high hill, usually a bare or snow-covered one;
- b) solid mineral material used in the building industry;
- c) the solid mineral material forming part of the surface of the earth and similar planets.

4 Magma (A, line 63):

- a) a set of substances mixed so as to give a combined effect;
- b) hot melted rock found below solid surface of the earth;
- c) (a) liquid containing a solid or gas mixed into it, usually without other chemical change.

5 Flow (A, line 39):

- a) a large amount of ice, snow, dirt, rock falling suddenly down the mountain;
- b) movement of something in one direction;
- c) an overflow of a large amount of water beyond its normal limits.

6 Granite (B, line 60):

- a) a hard solid substance found in the ground and often used for building side of houses;
- b) a type of rock containing calcium and other substances;
- c) a very hard usually grey rock, used for building and making roads.

7 Geyser (B, line 13):

- a) a large area of water, surrounded by land; exploding;
- b) a natural spring of hot water which from time to time rises suddenly into the air from the earth;

8 Volcano (A, line 80):

- a) (a loud noise caused by) an act of by exploding;
- b) a sudden shaking of the earth's surface, which may be violent enough to cause great damage;

- c) water of a stream, river, etc, falling down over rocks, intermittently boils, sending a tall column of water and steam into the air. c) a hot spring in which water straight sometimes from a great height.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 Oil has a low
- 2 Our car uses a lot of
- 3 We'll have to find a new of income.
- 4 There have been several volcanic this year.
- 5 became very fashionable places in the UK and Europe in the 18th and 19th centuries.
- 6 Before drilling they tested all their
- 7 Electricity generated by is much cheaper than that generated by hydroelectric power stations.
- 8 The old in the village had a wall round it and a bucket that could be lowered for water.
- 9 This new model is at the of computer technology.
- 10 Magma rises towards the earth surface along local

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 drive a) steam
- 2 generate b) subterranean energy
- 3 pump c) information
- 4 require d) artificial volcanism
- 5 replicate e) a generator
- 6 harness f) a turbine
- 7 turn g) a project
- 8 create h) building material
- 9 provide i) water
- 10 extract j) geothermal energy

E Words with similar or related meanings

- 1 The phrase 'is available day and night' is used in paragraph 1 (B). What other phrase is used in the last paragraph of the text with a similar meaning?
- 2 What word (A, para 1) could replace the word 'subterranean' (B, para 5)?
- 3 The noun 'well' is used several times in the text. What other word has a similar meaning in the text (B, para 3)?

- 4 The verb 'harness' is used in the text (A, line 58). What other words are used there (A, para 4) with a similar meaning to 'harness'?
- 5 The slang 'juice' (A, subtitle) has its equivalent in the text B (para 1). What is it?
- 6 The word 'reservoir' is used in line 62 (B). What word with a similar meaning is used earlier in the text

F Words that seem similar

The words **1** 'source' (A, line 6) and **2** 'spring' (A, line 28) have different meanings. Match these definitions to the two words:

- a) a place where water comes up naturally from the ground;
 b) a place from which something comes.

G Phrasal verbs

Find phrasal verbs in the text that match these definitions:

- | | | |
|--|---------|---------|
| a) to change into another form, substance, or state (A, para 4). | c | i |
| b) to make or become warm or hot (A, para 2). | h | u |
| c) to work together for a shared purpose (A, para 5). | t | u |
| d) to try to find (A, para 1). | l | f |
| e) to deal successfully with a difficult situation (A, para 6). | c | w |
| f) to cause to fall or come down (A, para 6). | b | d |
| g) to continue, especially in spite of difficulties (B, para 3). | c | o |
| h) to use as a base for future action (B, para 6). | g | o |
| i) to find by reasoning or calculating (A, para 3). | w | o |
| j) to depend on (B, para 2). | r | o |

H Word search

Find a word in the text that has a similar meaning:

- | | |
|-------------------------------|------------------------|
| a) hard (A, para 1) | h) price (A, para 6) |
| b) heat (up) (A, para 3) | i) coin (B, para 2) |
| c) region (A, para 5) | j) company (A, para 3) |
| d) convert (into) (A, para 4) | k) energy (A, para 1) |
| e) elevate (B, para 3) | l) let (A, para 4) |
| f) plant (A, para 2) | m) force (B, para 6) |
| g) create (B, para 2) | n) land (B, para 3) |

I Opposites

Find a word in the text that has an opposite meaning.

- | | |
|--------------------------|-------------------------|
| a) lose (A, para 1) | e) natural (B, para 2) |
| b) high (A, para 4) | f) increase (A, para 6) |
| c) permeable (B, para 5) | g) hot (A, para 1) |
| d) hard (B, line 3) | h) without (A, para 2) |

F Culture note

- 1 Alaska, the largest state in the US, which is northwest of Canada.
- 2 Goldilocks, the main character in the children's story *Doldilocks and the Three Bears*.
- 3 Iceland, an island country in the Atlantic Ocean south of the Arctic Circle.
- 4 MIT, *abbrev.* for Massachusetts Institute of Technology: an important and respected US university in Cambridge, Massachusetts.
- 5 Phillipines, a country made up of over 700 islands off the southeast coast of Asia. Capital: Manila.

UNIT 8

BIOFUEL

Text: WOODSTOCK REVISITED

Energy: Could new techniques for producing ethanol make old-fashioned trees the biofuel of the future?

line MANKIND has used trees as a 40 source of fuel for thousands of years. But now the notion of exploiting trees for fuel is being updated with a high-tech twist. The idea is to make ethanol, a biofuel that usually comes from maize (corn) or sugar cane, from trees instead. Politicians and environmentalists are embracing ethanol for a number of reasons. Unlike oil, ethanol is renewable: to make more of it, you grow more crops. And blending ethanol into 15 ordinary petrol, or burning it directly in special "flex-fuel" engines, reduces greenhouse-gas emissions. Why use trees, rather than maize cane. or sugar cane, as a feedstock for maize is a bit 20 ethanol? Because "treethanol" has the kernels are the potential to be much more mixed with energy efficient. The ratio of the added to energy yielded by a given amount of ethanol to the energy needed to ethanol is much more difficult and expensive than producing it from other crops. But the science, technology and economics of 5 treethanol are changing fast. 45 Researchers are racing to develop ways to chip, ferment, distil and refine wood quickly and cheaply. Trees are a particularly promising 10 feedstock because they grow all round, require vastly less fertiliser and water and contain far more carbohydrates (the chemical precursors of ethanol) than food crops do. Ethanol is the result of the 55 fermentation of sugars, which is why it can be so simply and efficiently made from sugar Making ethanol from more complicated: 60 ground into flour and water, and enzymes are break the carbohydrates from the maize down into sugars, which can 25

produce it is called the "energy balance". The energy balance for ethanol made from maize is the subject of much controversy, but the America's energy department puts it at 1.3; in other words, the ethanol of yields 30% more energy than was needed to produce it. For ethanol of made from sugar cane in Brazil, the problem is energy balance is 8.3, according to enzymes exist, 35 the International Energy Agency.

But for ethanol made from trees, 75 grasses and other types of biomass up the energy balance can be as high as 16. Producing such "cellulosic" enzymes. Grass, trees and other biomass feedstocks consist of a 125

mixture of cellulose, hemicellulose limited and lignin, a tough material that which is what helps plants keep their shape. Two strength and large producers of industrial lignin 85 enzymes are Genencor, an American 130 grow firm, and Nowozymes, from Denmark.

Treethanol has particular appeal in countries that have a lot of trees at 90 and import a lot of fossil fuel. Top of the list is New Zealand, which is tree's planning to produce ethanol from a hemicelluloses in type of willow, and Sweden, which breakdown and is relying heavily upon wood-based processes more 95 solid as part of its plan to wean itself 140

off oil by 2020. Even if the right cocktails of enzymes can be found, sceptics say treethanol will still have several 100 problems to overcome. In particular, 145 trees take much longer to grow than food crops—so it might existing varieties it ought to be sense to make cellulosic possible to identify those well suited growing grasses, to ethanol production. Conventional 105 biomass from food 150 breeding and cloning are very

then be fermented into ethanol.

65 Making ethanol from cellulosic feedstocks is harder still, however, since it involves breaking down tough, winding chains of cellulose 30 and hemicellulose from the walls of plant cells to liberate the sugars. 70 This can be done using a cocktail of five or six enzymes. The that although such they are expensive.

The lure of bioprospecting
So if cellulosic ethanol is to live to its promise, researchers will have to find cheaper and more efficient improve ethanol-production 80 economics.

A tree's rate of growth is by its lignin structure, determines the tree's form. Trees containing less and more cellulose would both faster and also produce more ethanol. Some transgenic trees of this kind are being tested in America. Scientists are looking 135 ways to modulate the genes that determine the structure of a sugar-containing order to make the fermentation efficient.

But Steven Strauss, a forest biologist at Oregon State University, says that because of the great genetic variation in willows and 100 poplars, genetic modification may not be necessary. By screening grass or ethanol from fast-growing crops. Some

environmentalists efficient when there is such a variety worry that having
struggled for years of species and hybrids to choose to protect forests
from from and the tight regulation of overexploitation, demand for
genetically modified organisms

110 biofuels could undermine their
effort.

And now for Frankentreeethanol
The idea is to create new, fast-
growing trees to address this

115 problem, either through careful 160 breeding or genetic modification. A
team led by Vincent Chiang, a
biologist at North Carolina State

new University, is investigating the

production of ethanol from
modified trees. Their

results clearly point out
can drastically

wood, the oldest of them all.

155 makes using the technology
expensive and time consuming.

Hundreds of thousands of years
ago, when man first gained mastery
over fire, wood was his primary

160 fuel. In the past few centuries fossil

fuels have risen to prominence, with
calamitous consequences for the

world's climate. A diversity of

fuels and energy sources seems the 120

165 most likely future. It would be genetically

fitting if humanity's portfolio of new preliminary

energy technologies had a place for that transgenic wood

1 **READING**

2

3 **A Understanding main points**

4 Read the text and answer these questions.

5 1 Why has interest in biomass energy resources from forests been rapidly increasing
6 in recent years?

7 2 Is ethanol energy-efficient?

8 3 What is the ethanol fuel energy balance?

9 4 How does the production of biomass and ethanol affect the environment?

10

11 **B Understanding details**

12 Mark these statements T (true) or F (false) according to the information in the text.

13 Biofuel is a type of energy source derived from renewable plant and animal
14 materials.

15 The common method for converting biomass into ethanol is called gasification.

16 Enzymes can be used to break down biomass into liquid sugars.

17 Trees containing more lignin and less cellulose would both grow faster and also
18 produce more ethanol.

19

20 **C Information search**

21 Scan the text quickly and find the figures, percentages or sums of money that
22 correspond to the following pieces of information.

23 1 The energy balance for ethanol made from trees, grasses and other types
24 of biomass containing a lot of cellulose.

25 2 The energy balance for ethanol made from sugar cane.

26 3 The energy balance for ethanol made from maize.

27 4 The cost of a gallon of ethanol produced from trees.

28 5 The percentage by which the ethanol yields more energy than was
29 needed to produce it.

30

31 **LANGUAGE FOCUS**

32

33 **A Definitions**

34 Match these terms with their definitions:

35 1 ethanol (line 6) **a** the material from which the cell walls of plants are made, used
36 in making paper, plastic etc;

37 2 cellulose (line 68) **b** ordinary alcohol found in alcoholic drinks. It is also used
38 for removing fat and oil;

39 3 enzyme (line 61) **c** any of several substances, such as sugar, which consist of
40 oxygen, hydrogen, and carbon, and which provide the body with heat and power;

41 4 carbohydrate **d)** catalyst produced by certain living cells, which can (line 62)
42 cause chemical change in plants or animals or can make these changes happen
43 more quickly;
44 5 biomass (line 37) **e)** matter from dead or living plants or animals;

- 6 kernel (line 59) **f)** a living thing produced from parents of different breeds;
- 7 species (line 152) **g)** the business of keeping animals or plants for the purpose of obtaining new and better kinds;
- 8 hybrid (line 152) **h)** the part of a nut, large grain, or seed, inside its hard covering;
- 9 breeding (line 116) **i)** a division of animals or plants below a genus, which can breed together to produce young of the same kind;
- 10 cell (line 70) **j)** that can be renewed, especially by natural processes or good management;
- 11 genetically modified (line 154) **k)** crops, seeds developed by changing the plant's genetic structure to produce larger crops;
- 12 renewable (line 12) **l)** a very small division of living matter, with one centre of activity (nucleus).

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

1 Biofuel (line 6):

- a) a substance that is burnt to produce heat or power that is solid;
- b) a type of heavy oil used instead of petrol etc in diesel engines; hairs on its stem and leaves;
- c) the fuel made from maize (corn), or trees.

2 Cane (line 19):

- a) the hard smooth thin, often hollow, stem of certain plants;
- b) a plant with pink flowers and fine hairs on its stem and leaves;
- c) a plant with red, white, or blue flowers.

3 Engine (line 16):

- a) a machine which generates electricity;
- b) an apparatus used for discovering the presence of a particular effect, light, heat, sound etc;
- c) a piece of machinery with moving parts which changes power from steam, electricity, oil etc, into another, used to show the movement.

4 Energy balance (line 25):

- a) a number that measures some quality or process;
- b) the ratio of the energy yielded by a given amount of ethanol to the energy needed to produce it;
- c) a figure showing the number of parts times one quantity contains another, used to show the relationship between two amounts.

5 Gene (line 135):

- a) a very small division of a living thing with one centre of activity (nucleus);
- b) any of the structures shaped like rods that are found in living cells and contain the chemical patterns which control what an animal or

6 Cloning (line 150):

- a) cutting a piece from one plant and matter, tying it to place inside a cut of another, so that it could grow there; plant is like;
- b) producing a single plant or animal in a nonsexual way from any one

cell, and exactly the same form as the parent;

c) any of several small parts of the material at the nucleus of a cell, that control the development of all qualities in a living thing.

c) the process of producing genetically identical individuals of an organism either naturally or artificially.

7 Environmentalist (line 10):

a) someone who scientifically studies weather conditions and says what the weather is likely to be in the future;

b) a person who tries to prevent the environment from being spoilt;

c) a person who studies plants or animals.

8 Petrol (line 15):

a) a liquid obtained especially from petroleum, used mainly for producing power in the engines of cars, aircrafts etc;

b) a substance in a state between solid and liquid;

c) (a) liquid able to turn a solid Substance into liquids.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 There is a lot of disagreement among scientists and ordinary people about the advantages and disadvantages of food.
- 2 The from a donkey and a horse is called a mule.
- 3 Most energy experts reckon that using maize-based as a substitute for petrol can reduce America's demand for petrol by 10-15% at best.
- 4 This rare bird has become an endangered
- 5 Sun, wind, and waves are sources of energy.
- 6 We must encourage research on feedstocks, tomorrow's energy crops.
- 7 Fifty-three years after their invention, silicon-based solar still make up more than 90% of the market.
- 8 are linked together in cell nuclei on structures called chromosomes.
- 9 Diversa, a biotech firm based in San Diego, is developing capable of breaking down hemicellulose.
- 10 Trees use the carbon thus sequestered to make molecules like, and thus more tree.

D Collocation

Match these verbs and nouns as they occur in the text.

- 1 exploit **a)** crops
- 2 produce **b)** enzyme
- 3 reduce **c)** problems
- 4 protect **d)** transgenic trees

- 5 ferment e) genes
- 6 test f) forests
- 7 find g) ethanol s
- 8 grow h) trees
- 9 overcome i) greenhouse-gas emissions
- 10 modulate j) wood
- 11 undermine k) efforts

E Words with similar or related meanings

- 1 The phrase 'use trees' is met in paragraph 1. What other phrase is used in the same paragraph with a similar meaning?
- 2 What other adjective is used in the text with the same meaning as 'difficult' (para 4)?
- 3 The collocation 'produce ethanol' is used in paragraph 3. What other phrase is used in paragraph 4 with a similar meaning?
- 4 Ethanol is made from maize, sugar cane, trees, and grass. What is a general word for all of them (para 4)?
- 5 What word from the text (para 2) could replace the word 'yielded' (line 23)?
- 6 The word 'cocktail' is used twice (paras 4 and 7) to describe the process of making ethanol. What other word is used in the article (para 5) with a similar meaning?
- 7 The word 'diversity' is used in line 163. What word with a similar meaning is used earlier in the text (para 10)?

F Words that seem similar

- 1 The words **1)** 'tree'(line 1) and **2)** 'wood' (line 47) have slightly different meanings. Match these words with their meanings:
 - a) a tall plant with a wooden trunk and branches, that live for many years;
 - b) the substance of which the trunks and branches of trees are made, which is cut and used for various purposes.
- 2 The adjective **1)** 'tough' (line 68) and the adjective **2)** 'tight' (line 153) have quite different meanings. Match these definitions to the two words:
 - a) well ordered or firmly controlled;
 - b) strong.
- 3 The nouns **1)** 'mankind' (line 1) and **2)** 'humanity' (line 166) have slightly different meanings. Match these words with their meanings:
 - a) the human race, both men and women;
 - b) human beings generally.

G Phrasal verbs

Find phrasal verbs in the text that match these definitions:

- a) to have confidence in (para 6);

r

u

carbon dioxide, of petrol costs about 25 cents, that is 25 but you still have to get rid of the an attractive reduction.

carbon dioxide), or just water itself, via electrolysis.

The widespread adoption of plug-ins might also reduce carbon-dioxide

But why bother? Why not cut out 70 the middlemen and plug your car in 30 directly into the electricity mains a instead? And that, it seems, is what may happen. You don't hear much drive about the hydrogen economy these engine. If the days. Nor fuel cells. The buzz-source such as 35 phrase now is "plug-in hybrid". gain is Plug-ins should not be confused with

emissions, depending on what sort of power station made the electricity the first place. Even energy from coal-fired station is less polluting than the serial explosions that 75 an internal-combustion energy comes from a wind or nuclear, the enormous.

existing hybrid vehicles, such as Toyota's Prius, which contains an 80 internal-combustion engine as well they 40 as two electric ones. Either sort may the system. In fact, they may remake General electricity as well as transport. Musk's 85 **Don't all recharge at once** 130 The

Beyond that, the rise of plug-ins has implications for the electricity industry itself. If they succeed, will put an unanticipated load on reality with amazing speed. production of the Tesla, Elon Musk's new sports car, began in March.

That is certainly the view of Peter draws Corsell of Gridpoint, a company lithium-ion based in Arlington, Virginia. His power laptop firm hopes to make its living selling range of 90 the load-management technology because required for "smart grids". Mr of Corsell reckons it will become essential if plug-ins arrive in force.

Tesla is not even a hybrid. It all of its power from batteries (the sort that computers), and it has a 135 350km. It can manage that its price of \$109,000 buys a lot of batteries; Tesla owners are not the sort who count their pennies.

At the moment, the grid would be 95 unable to cope if a large number of commuters arriving home plugged in their cars more or less attractive by the day. General Motors simultaneously to recharge them.

Mass-production plug-ins are not far away either, and the rising price of petrol makes them look more

Yet if those same cars were 145 recharged at three o'clock in the morning, when demand is low, it would benefit both consumer (who would get cheap power) and producer (who would be able to sell otherwise wasted electricity). Such 150 cars might even act as micropeakers

intends to launch a plug-in hybrid called the Volt, and Toyota plans a 100 plug-in version of the Prius. Only Honda and Mercedes seem to be sticking to fuel cells. It is all very encouraging. But what would really make a difference would be a 105 breakthrough in battery technology. At the moment, lithium-ion

–reservoirs of electrical energy that a power company could draw on if a car were not on the road. Managing plug-ins, Mr Corsell thinks, will be around the smart grid's killer application. In sunny climes, plug-ins might also provide another use for solar cells. Google is already experimenting with photovoltaic car parks. These have awnings covered in solar cells which will shade its employees' cars and simultaneously recharge them. That is an idea which could be spread. Supermarkets, for example, might find that car parks with plugs would attract customers who wanted to top up their cars. And the more opportunities there are for less stationary cars to be recharged, the more likely they are to be bought. Plug-ins are moving from idea to

batteries are the favoured variety. This kind of battery uses lithium in its ionic form. When the battery is fully charged, these ions hang around one of its electrodes, the anode, which is usually made of graphite. During operation, the ions migrate within the battery from this electrode to the other one, the cathode, and electrons pass between the electrodes through an external circuit. It is that current of electrons which drives the motor. The cathode may be made of a variety of materials. Cobalt oxide is traditional but expensive. Manganese oxide is becoming popular. But the future probably lies with iron phosphate, which has of a tendency to overheat, a problem that has resulted in battery recalls in the past.

READING

A Understanding main points

Read the text on page and answer these questions.

- 1 What are the effective alternatives for petrol?
- 2 Why do we need alternative fuels in cars?
- 3 Hydrogen has virtually no greenhouse gas emissions, hasn't it?
- 4 Are propane vehicles typically more expensive than those running on petrol?
- 5 What are the advantages of electric motors over petrol engines?

B Understanding details

Mark these statements T (true) or F (false) according to the information in the text.

- 1 Electricity can be used to power plug-in electric vehicles, which are increasingly available.
- 2 Propane is a readily available gaseous fuel that has been widely used in vehicles throughout the world.
- 3 The major fossil fuel alternatives to petrol are: ethanol and hydrogen.
- 4 The major non-fossil alternative fuels are: liquid petroleum gas and compressed natural gas.
- 5 Petrol is a derivative of petroleum.

C Information search

Scan the text quickly and find the figures, percentages or sums of money that correspond to the following pieces of information.

- 1 An average car's daily range taken for the calculation of annual petrol consumption.
- 2 The cost in cents of the electrical equivalent of a litre of petrol.
- 3 The price of Tesla.
- 4 The number of electric engines Toyota's Prius contains.
- 5 The number of internal-combustion engines Toyota's Prius contains.
- 6 The range of the Tesla.
- 7 The time of the day when demand for recharging of cars' batteries seems to be low.

LANGUAGE FOCUS

A Definitions

Match the words from the text with their corresponding definitions:

- | | |
|---------------------------------------|---|
| 1 internal-combustion engine (line 3) | a) machine that changes electrical power into movement, and is used for working other machines; |
| 2 mains (line 30) | b) an apparatus for producing electricity consisting of a group of connected electric cells; |
| 3 buzz-phrase (line 34) | c) a liquid obtained especially from petroleum, used mainly for producing power in the engines of cars, aircrafts etc; |
| 4 hybrid vehicle (line 37) | d) a piece of machinery with moving parts which changes power from petrol into movement; |
| 5 electric motor (line 41) | e) an engine, such as a car engine, which produces power by the burning of a substance, such as petrol, inside itself; |
| 6 petrol engine (line 45) | f) a vehicle using two different forms of power, such as
an electric motor and an internal combustion engine, or an electric motor with a battery and fuel cells for energy storage; |
| 7 battery (line 47) | g) especially <i>BrE</i> a supply of electricity produced centrally and brought to houses etc by wires; |
| 8 electrical socket (line 51) | h) a piece of plastic or other material with holes in it, which is fixed into a wall or on to the end of a wire, and to which electrical equipment can be connected for the electricity supply; |
| 9 petrol (line 48) | i) a phrase related to a specialized subject, which is thought to express something important but is often hard to understand; |

- 10** solar cell (line 113) **j)** restore electrical energy in (a battery or a battery-operated device) by connecting it to a power supply;
- 11** plug (line 122) **k)** a conductor used to establish electrical contact with a nonmetallic part of a circuit;
- 12** stationary car (line 125) **l)** the car which is standing still, not moving;
- 13** recharge (line 85) **m)** a small plastic object with two or three metal pins that are pushed into an electric socket to connect with the electricity supply;
- 14** electrode (line 156) **n)** an apparatus for producing electric power from sunlight.

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

1 Anode (line 156):

- a)** either of the points at the ends of a magnet where its power of pulling iron towards itself is strongest;
- b)** the part of an electrical instrument (such as a battery) which collects electrons, often a rod of wire represented by the sign (+);
- c)** the end of a magnet which turns naturally away from the Earth.

3 Ion (line 155):

- a)** an atom or molecule with a net electric charge due to the loss or gain of one or more electrons;
- b)** a very small piece of matter that carries positive electricity and that together with the neutron forms the nucleus;
- c)** a very small piece of matter that the nucleus of an atom causes an positively and negatively charged electric current in metal.

5 Generator (line 39):

- a)** a machine which generates especially electricity;
- b)** a part of a machine that turns round on a fixed point;
- c)** a machine for storing electricity, especially in a car engine.

2 Cathode (line 160):

- a)** a very small piece of matter that is like an electron but is positively charged;
- b)** the part of an electrical instrument (such as a battery) from which electrons leave, often a rod of wire represented by the sign (-);
- c)** the end of a magnet which turns naturally towards the Earth.

4 Electrolysis (line 27):

- a)** the decomposition of an electrolyte by the action of an electric current passing through it;
- b)** the combining of separate substances into a complete whole;
- c)** the force, caused by the moves round movement and exchange of and that by its movement

causes an positively and negatively charged electric current in metal.

6 Grid (line 64):

- a)** the flow of electricity to a something, building, machine etc;
- b)** a network of electricity supply wires connecting power stations;
- c)** the wires and other equipment that work an electrical apparatus.

7 Car park (line 79):

- a) an open space where cars and other vehicles may be parked, sometimes payment; heavy that is carried by the
- b) a shelter for a car; with only a roof be and one or two sides, often built a side of a house; machine etc;
- c) a place where motor vehicles are repaired and petrol and oil may also be sold.

8 Load (line 57):

- a) something that is being or is to be carried, especially something for a small vehicle, ship, person etc;
- b) the amount of work that must be done by a member of a group, a against
- c) the power of an electricity supply.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 The car won't start because the has gone flat (=has lost all its power).
- 2 We filled the car with before the long journey. 3 "Does your radio work off the or from a battery?" 4 Plug the iron into that, will you?
- 5 Chemists have discovered about 30,000 inorganic chemical compounds, almost any of which might theoretically be suitable material for an
- 6 "How did you manage to drive into a"?
- 7 In the UK, a can be also called a 'gas station'.
- 8 Traditional are made of silicon, like computer chips.
- 9 Petrol-electric attain their fuel economy by using in stop-start city traffic and when cruising on the highway.
- 10 Around 50% of cars sold in Europe today rely solely on conventional

D Collocations

Match these verbs and nouns as they occur in the text.

- 1 extract (para 1) a) cheap power
- 2 recharge (para 7) b) a load
- 3 attract (para 8) c) a motor
- 4 launch (para 10) d) a battery
- 5 reduce (para 5) e) carbon-dioxide emissions
- 6 charge (para 11) f) a plug-in hybrid
- 7 drive (para 11) g) customers
- 8 put (para 6) h) cars
- 9 get (para 7) i) electricity

E Phrasal verbs

Find phrasal verbs in the text that match these definitions.

- a) (of a machine) to stop suddenly (para 3); c o
- b) to gain the use of (a system) by making an electrical connection worth it (para 3); p i..... c) contribute; to (begin) to have an influence (para 3); k i.....
- d) to lose power and stop working (para 4); r d.....
- e) to gain control over and responsibility for (smth) (para 4); t o.....
- f) to rely; place trust on *or* upon (para 5); d o.....
- g) to connect to a supply or electricity with a plug (subtitle); p i.....
- h) to make use of a supply of something (para 7); d o.....
- i) to fill (a partly empty container) with liquid (para 8); t u.....
- j) to delay or move slowly (para 11). h a.....

F Prepositions

Complete these sentences with a suitable preposition from Exercise F. a)

You can plug the national computer network.

- b) The engine keeps cutting when I go up hills.
- c) The coal industry is running
- d) “The television doesn’t work.” “Have you plugged it”?”
- e) I took a painkiller an hour ago, I wish it would kick
- f) Who do you think will take now that the governor has been dismissed?
- g) I’ll have to draw my savings to pay for the repairs.
- h) “Your petrol tank is nearly empty; let me top it”.

F Words that seem similar

1 The words 1) ‘variety’ (line 152) and 2) ‘range’ (line 62) have slightly different meanings. Match these words with their meanings:

- a) the area of variation between upper and lower limits on a particular scale;
- b) the quality or state of being different or diverse; the absence of uniformity or monotony.

2 The nouns 1) ‘mains’ (line 30) and 2) grid (line 91) have slightly different meanings. Match these words with their meanings:

- a) a system of wires through which electricity is connected to different power stations across a region;
- b) the source of electricity supply through cables.

UNIT 10

THE TECHNOLOGICAL FUTURE

Text: FLIGHT OF FANCY

The world of energy must change if things are to continue as before

line AS SAMUEL GOLDWYN wisely
observed, you should never make
predictions, especially about the
the future. As far as predicting the
technological future is concerned,
people almost always either
overshoot or undershoot. Holidays
irrelevant. on the moon by 2000, as forecast in
the 1960s? Not exactly. A quick hop
10 out of atmosphere, courtesy of 50
Virgin Galactic, is the limit of that
vision for the moment. On the other
hand, a seemingly boring way of
linking computer files full of data
15 on subatomic physics can turn into a 55
on world wide web of information in
half a decade.

In retrospect, this special report
turbines will no doubt be proved to have
application, but 20 been guilty of both over- and
turbines is far undershooting. It has begun from
taking a spanner the premise that big changes are
afoot in the energy field, and has
tried to pick the technologies most
as 25 likely to be important. Some 65
outcomes are mutually exclusive. A
truly electric car would eliminate
such the need for biofuels, except,
in aircraft. Truly cheap electricity, that are now niche 30
price electric cars out 70 products but might suddenly
breakthrough in the blossom, to the embarrassment of
of carbon prophets. Maybe, too, the hydrogen
back into economy will rear its head again—
Geothermal but only if a way can be found of
35 may be better than solar. Solar may 75
high be better than wind. density. That would require a
has ignored some material that can absorb large
will not volumes of it. One for Dr Gerber's
that favourite materials genome project, perhaps. 40
years away, as it 80 This report has also ignored the
efficiency, except in the as a fifth of the world's electricity.

always has been and probably
always will be. Giant satellites
collecting sunlight and beaming
energy to Earth as microwaves are 5
45 an idea of heroic proportions, but
enough sunlight gets through the
atmosphere to make them
Other technologies may make a
contribution, but only on a small
scale. The idea of floating platforms
that capture wave energy is
technically feasible, but it seems
more trouble than building wind
turbines. Tidal power works, but
even more than hydro, it depends
geography. And the idea of
liberating hydro from geography
with small, free-standing
may have local
60 maintaining such
more trouble than
to a windmill.

All sorts of wacky but intriguing
ideas are being looked into, such
flying turbines that would exploit
the high winds of the jetstream. And
so are perfectly sensible ones,
as ultracapacitors for storing perhaps,
30 biofuels might
of the market. A
capture and storage
dioxide would bring coal
play with a vengeance.
storing the gas easily and at
The report
technologies because they
get anywhere. Fusion,
of fantasists, is 30
question of
special context of

small grids. The “negawatts”, as efficiency are has always been there is hairshirtedness to which helps profile changes energy-

The same could happen to solar energy, which is ten years behind wind, and geothermal, with a 2085 year lag. Whether it would happen faster if carbon emissions were charged for at an honest price is a moot point. Certainly, that is the only way to bring about the 90-135 widespread adoption of carbon dioxide capture and storage. But for the rest, the best way might, paradoxically, be what exists now: a threat that is real enough for 95 electricity generators to price it into their future calculations without affecting their existing plants. The lack of new coal-fired capacity creates a real opportunity 145 for alternatives, among them renewables. But the lack of an actual carbon price still keeps the cost of existing electricity down, and thus the necessary incentives in place to 105 150 make Google’s cheaper-than-coal equation a reality.

idea of improvements in sometimes known, a favourite of greens. But too often a gleeful their pronouncements, to explain why high-profile changes such as the introduction of efficient light bulbs are viewed cynically by so many people.

135 widespread adoption of carbon dioxide capture and storage. But for the rest, the best way might, paradoxically, be what exists now: a threat that is real enough for 95 electricity generators to price it into their future calculations without affecting their existing plants. The lack of new coal-fired capacity creates a real opportunity 145 for alternatives, among them renewables. But the lack of an actual carbon price still keeps the cost of existing electricity down, and thus the necessary incentives in place to 105 150 make Google’s cheaper-than-coal equation a reality.

recent conference: “You are not going to conserve your way out of the problem”. The need to keep doing 110 the same thing—consuming energy in ever larger quantities—is a force roll for change. How quickly that change will happen is hard to tell.

Sunlit uplands

115 In some fields, such as technology, change suddenly or not at all. In others, such as energy, it can happen gradually to start with, but as the of 120 curve accelerates upward there comes a point where things move very fast. Ten years ago wind turbines were marginal. Now they

If and when such cheaper alternatives arrive, the markets of Asia will open and Mr Khosla, an 155 Indian-born American, will see the fruits of this adopted homeland out into his native country. It will be a long time before King Coal and Queen Oil are dethroned completely,

160 but their reigns as absolute monarchs of all they survey are coming slowly to an end. A large variety of new energy technologies are at various stages 165 development. Obviously, it is impossible to predict which of the options will win in the marketplace – this will be determined by future

- 5 compound interest (line 82) **e**) a small piece of metal with a hollow through it for screwing onto a bolt in order to fix or fasten something;
- 6 with a vengeance (line 24) **f**) a greatly respected person whose ideas are followed;
- 7 breakthrough (line 22) **g**) a person who claims to be able to tell the course of future events;
- 8 premise (line 15) **h**) a product aimed at a particular group of people;
- 9 forecast (line 6) **i**) a statement of future events based on some kind of knowledge and judgement;
- 10 feasible (line 37) **j**) a large car or other motor vehicle that uses a lot of petrol;
- 11 spanner (line 43) **k**) interest calculated both on the original sum of money lent or borrowed and on the unpayed interest already earned or charged;
- 12 guru (line 74) **l**) to a high degree; with greater force than is usual;
- 13 fusion (line 27) **m**) a solemn declaration of statement.

B Understanding expressions

Choose the best explanation for each word or phrase from the text.

- | | |
|--|--|
| <p>1 World wide web (line 11):</p> <p>a) the international charity organization which supports conservation;</p> <p>b) the system for making information available, anywhere in the world, to computer users who are connected to the internet;</p> <p>c) an international organization that the rules of trade between different nations.</p> | <p>2 Information technology (line 84):</p> <p>a) the mathematical principles that deal with information and the sending of information between humans and machines;</p> <p>b) the giving or selling of modern equipment such as computers, or the knowledge necessary to operate the equipment, by Western countries to developing countries;</p> <p>c) storing, using and sending deals with information by means of computer systems and telecommunications.</p> |
| <p>3 Carbon dioxide (line 23):</p> <p>a) the gas produced when animals breathe out, when carbon is burned in air, or when animal or vegetable matter decays</p> <p>b) a gas that is a simple substance, without colour or smell, that forms most of the earth's air</p> | <p>4 Microwave (line 31):</p> <p>a very short electric wave, used in sending messages by radio, in radar, and especially in cooking food;</p> <p>b) radio broadcasting or receiving on waves of between about 150 and 550 metres in length;</p> |

- c) a strong gas with a sharp smell used in chemicals to help plants grow c) radio broadcasting or receiving on in waves of 1000 metres in length.

5 Hydrogen (line 50):

- a) a gas present in the air that is a simple substance (element), is without colour, taste, or smell, and is necessary for all forms of life on Earth;
- b) a gas that is a simple substance (element), without colour or smell, is lighter than air, and burns very easily;
- c) a gas that is a simple substance (element) that is lighter than air, will not burn, and is used in airships and some kinds of lights.

6 Carbon (line 96):

- a) a common silver-white metal that is a simple substance (element), burns with a bright white light, and is used in fireworks;
- b) a simple substance (element) found in a pure form as diamonds, graphite etc, or in impure form as coal, petrol etc;
- c) a silver-white metal that is a simple substance (element) and is found in bones, teeth, and chalk.

7 Alternative (line 105):

- a) a special right or advantage that only one person or group has;
- b) something, especially a course of action, that may be taken or chosen instead of one or more others;
- c) possession of, or control over, smth which is not shared by others.

8 Greens (line 60):

- a) people who try to prevent the environment from being spoiled;
- b) green leafy vegetables that are cooked and eaten;
- c) leaves and branches used for decoration, especially at Christmas.

C Complete the sentence

Use an appropriate word or phrase from Exercise A to complete each sentence.

- 1 It's simply not economically to stage such a lavish production.
- 2 British and American justice works on the that an accused person is innocent until he's proved guilty.
- 3 The newspaper's that the government would only last for six months turned out to be wrong.
- 4 The wind's blowing; it's almost impossible to walk against it.
- 5 There is a major in the treatment of cancer.
- 6 J.M. Keynes was the of the new economics.
- 7 A of doom is someone who always says that bad things will happen.
- 8 A is an instrument which is held in the hands and used for doing special jobs.
- 9 The Pope made made a on the subject of the war.

- | | | | | |
|----|-------------------|--------------------------------|-----------|--|
| 7 | consume (para 7) | g) need for biofuels | 10 | This metal is formed by the of two other types of metal. |
| 8 | maintain (para 3) | h) technologies | | |
| 9 | make (para 3) | i) technological future | | |
| 10 | affect (para 9) | j) computer files | | |

D Collocations

Match these verbs and nouns

as they occur in the text.

- | | | |
|---|--------------------|--------------------------|
| 1 | link (para 1) | a) plants |
| 2 | predict (para 1) | b) a contribution |
| 3 | pick (para 2) | c) turbines |
| 4 | eliminate (para 2) | d) energy |
| 5 | capture (para 3) | e) electricity |
| 6 | store (para 4) | f) wave energy |

E Words with similar or related meanings

- The phrase 'improvements in efficiency' is used in paragraph 5. What other phrase is used in the same paragraph with a similar meaning?
- The expression 'make a contribution' is used in paragraph 3. What verb is used in paragraph 8 with a similar meaning?
- What word-combination from the text (para 11) could replace the word 'homeland' (para 11)?
- What phrase from the text could replace the word 'predict' (para 1)?
- The verb 'cost' is used in paragraph 10. What other word is used in the same paragraph that has a similar meaning?
- Two nouns are used in paragraph 7 that are synonymous. What are they?

F Phrasal verbs

Find phrasal verbs in the text that match these definitions.

- to change in form or nature (para 1); t i.....
- to cause to return (para 2); b b.....
- to cause to come to a particular course of action (para 2); b i.....
- to make the price of (one's goods) so high that people are p o..... unwilling to pay (para 2);
- to (cause or help to) pass through, or come successfully to the g t..... end of (para 3);
- to vary according to; be decided by (para 3); d o.....
- to set free (from control, prison, duty etc) (para 3); l f.....
- to examine the meaning of causes of; investigate (para 4); l i.....
- at the beginning (para 8); s w...
- to cause to happen (para 9); b a.....
- to control; prevent from increasing (para 10); k d.....
- to unroll (para 11). r o.....

g) opposites

Find a word or phrase in the text that has an opposite meaning.

a) overshoot (para 1) **d)** suddenly (para 8)

b) reality(title) **e)** worse (para 2)

c) slowly (para 7, para 8) **f)** blossom (para 2)

F Culture note

1 Goldwyn, Samuel (1882-1970) a US film producer who started the company that became MGM and had an important part in the development of the Hollywood film industry.

2 Galactic, the large group of stars in which our own sun and its planets lie.

Методичне забезпечення

Орел Майя Василівна

ПЕРЕКЛАД У ГАЛУЗІ ЕЛЕКТРОЕНЕРГЕТИКИ
МЕТОДИЧНІ РЕКОМЕНДАЦІЇ ДО САМОСТІЙНОЇ РОБОТИ
для студентів спеціальності 035 Філологія

Електронний ресурс

За редакцією укладача