МІНІСТЕРСТВО ОСВІТИ І НАУКИ, МОЛОДІ ТА СПОРТУ УКРАЇНИ

ХАРКІВСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ

МІСЬКОГО ГОСПОДАРСТВА

МЕТОДИЧНІ ВКАЗІВКИ
ДЛЯ ОРГАНІЗАЦІЇ ПРАКТИЧНОЇ РОБОТИ З ДИСЦИПЛІН
«ІНОЗЕМНА МОВА»,
«ІНОЗЕМНА МОВА (ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ)»
(АНГЛІЙСЬКА МОВА)

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(Модуль 2)

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Методичні вказівки для організації практичної роботи з дисциплін «Іноземна мова», «Іноземна мова (за професійним спрямуванням)» (англійська мова) (для студентів 1 курсу денної форми навчання напряму 6.050701 «Електротехніка та електротехнології» спеціальності «Електротехнічні системи електроспоживання» / Харк. нац. акад. міськ. госп-ва; уклад.: С. А. Бучковська. – Х.: ХНАМГ, 2012 – 75 с.

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Методичні вказівки призначені для організації практичної роботи студентів у другому семестрі згідно з затвердженою робочою програмою навчальних дисциплін «Іноземна мова», «Іноземна мова (за професійним спрямуванням)», укладених відповідно освітньо-кваліфікаційним вимогам до знань і вмінь студентів напряму підготовки «Електротехніка та електротехнології», які в майбутньому будуть працювати у сфері електричного електроспоживання.

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MODULE 2.1
UNIT 1

1 LEAD-IN

1. What well-known phenomena are associated with electricity?
2. What have you heard about the first manifestations of electricity that the humanity came across?
3. Do you know WHO
   - presented the idea that electricity had positive and negative elements and that the flow was from positive to negative?
   - proved that lightning was a form of electricity?
   - developed the first electric battery?
   - discovered magnetic induction?
   - invented the electric light bulb?
   - discovered electric waves and how to measure them?
   - developed the first real AC motor?

2 READING

From the History of Electricity

Electricity is a general term encompassing a variety of phenomena resulting from the presence and flow of electric charge. These include many easily recognizable phenomena, such as lightning, static electricity, and the flow of electrical current in an electrical wire as well as less familiar concepts such as the electromagnetic field and electromagnetic induction.

The word is from the New Latin ēlectricus, 'amber-like', coined in the year 1600 from the Greek ήλεκτρον (electron) meaning amber (hardened plant resin), because static electricity effects were produced classically by rubbing amber.

Electrical phenomena have been studied since antiquity, though advances in the science were not made until the seventeenth and eighteenth centuries. Practical applications for electricity however remained few, and it would not be until the late nineteenth century that engineers were able to put it to industrial and residential use. The rapid expansion in electrical technology at this time transformed industry and society. Electrical power is the backbone of modern industrial society, and is expected to remain so for the foreseeable future.

Long before any knowledge of electricity existed people were aware of shocks from electric fish. Ancient Egyptian texts dating from 2750 BC referred to these fish as the 'Thunderer of the Nile'. Electric fish were again reported millennia later by ancient Greek, Roman and Arabic naturalists and physicians. Possibly the earliest and nearest approach to the discovery of the identity of lightning, and electricity from any other source, is to be attributed to the Arabs, who before the 15th century had the Arabic word for lightning (raad) applied to the electric ray. Ancient cultures around

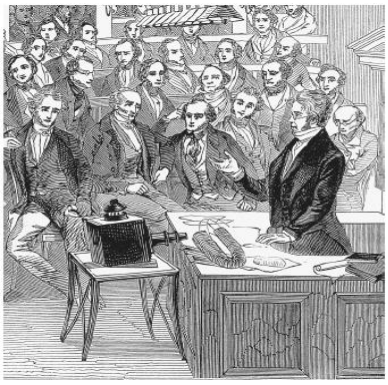
the Mediterranean knew that certain objects, such as rods of amber, could be rubbed with cat's fur to attract light objects like feathers. Thales of Miletos made a series of observations on static electricity around 600 BC, from which he believed that friction rendered amber magnetic, in contrast to minerals such as magnetite, which needed no rubbing. Thales was incorrect in believing the attraction was due to a magnetic effect, but later science proved a link between magnetism and electricity.

Electricity would remain little more than an intellectual curiosity for millennia until 1600, when the English scientist William Gilbert made a careful study of electricity and magnetism, distinguishing the lodestone effect from static electricity produced by rubbing amber.

Further work was conducted by Otto von Guericke, Robert Boyle, Stephen Gray and C. F. du Fay. In the 18th century, Benjamin Franklin conducted extensive research in electricity, selling his possessions to fund his work. In June 1752 he is reputed to have attached a metal key to the bottom of a dampened kite string and flown the kite in a storm-threatened sky. A succession of sparks jumping from the key to the back of the hand showed that lightning was indeed electrical in nature.

In 1791, Luigi Galvani published his discovery of bioelectricity, demonstrating that electricity was the medium by which nerve cells passed signals to the muscles.

Alessandro Volta's battery, or voltaic pile, of 1800, made from alternating layers of zinc and copper, provided scientists with a more reliable source of electrical energy than the electrostatic machines previously used. The recognition of electromagnetism, the unity of electric and magnetic phenomena was due to Hans Christian Oersted and André-Marie Ampère in 1819-1820.



Michael Faraday invented the electric motor in 1821, and Georg Ohm mathematically analysed the electrical circuit in 1827. Electricity and magnetism were definitively linked by James Clerk Maxwell, in particular in his 'On Physical Lines of Force' in 1861 and 1862.

While the early 19th century had seen rapid progress in electrical science, the late 19th century saw the greatest progress in electrical engineering. Through such people as Nikola Tesla, Thomas Edison, Ottó Bláthy, Ányos Jedlik, Sir Charles Parsons, Joseph Swan, George Westinghouse, Ernst Werner von Siemens, Alexander Graham Bell and Lord Kelvin, electricity was turned from a scientific curiosity into an essential tool for modern life, becoming a driving force for the Second Industrial Revolution.

2.1 Reading comprehension. Answer the following questions to the text.

1. What induces electricity?
2. What words did the word *electricity* derive from? What was the choice of these words connected with?
3. When did the humanity start to learn the phenomenon of electricity?
4. When did people start using electricity in their practical needs?
5. What role belongs to electrical power in modern industrial society?
6. What unusual phenomena were observed by ancient people long before any knowledge of electricity?
7. How did William Gilbert's experiments contribute to the study of electricity?
8. What experiment was conducted by Benjamin Franklin in the 18th century? What did it prove?
9. What other important inventions in the theory of electricity were made by scientists in the 18th century?
10. How can the 19th century progress in electrical science be characterised? What importance did this stage have for the whole mankind development?

3 VOCABULARY

3. 1 Match the following notions in electricity with their definitions.

1	electromagnetic induction	**a**	The generation of a magnetic field around a current-carrying conductor.
2	electric charge	**b**	The combination of an electric (E) field and a magnetic (H) field.
3	static electricity	**c**	Any of a class of devices, consisting of a group of electrochemical cells that convert chemical energy into electrical energy.
4	electromagnetism	**d**	The force (voltage) that produces an electric current in a circuit.
5	electric current	**e**	Electric charge at rest, generally produced by friction or electrostatic induction.
6	battery	**f**	The production of a voltage in a coil because of a change in the number of magnetic lines of force (flux linkages) passing through the coil.
7	electromagnetic field	**g**	A basic physical quantity that is a source of electromagnetic fields.
8	electromotive force	**h**	The flow of electrons through a circuit.

1- …; 2- …; 3- …; 4- …; 5-…; 6- …; 7-…; 8-…

3.2 Look through the information about the famous Benjamin Franklin's experiment. Choose the right word from the box to fit into the text.

jar batteries charge batteries scale rods natural invisible electricity charge use ascertain motor contribution shock

Benjamin Franklin Kite Experiment

This experiment is one that most of us have heard something about. The most common belief is that the scientist flew a kite into some storm clouds and received an electric shock, discovering electricity. Whilst this is not strictly true, this experiment was a major **1)** ……. to physics, increasing our knowledge of **2)** ……. phenomena.

The first thing to note is that Benjamin Franklin did not discover electricity – the principle was known long before that and primitive capacitors and **3)**…… were already in **4)**……... by researchers.

Static electricity had been known about for thousands of years, although never fully understood, with most scientists believing that it was an **5)**'……. liquid'.

Franklin's contribution was that he believed that lightning was a form of static electricity on a huge **6)**……... , and designed a number of experiments to try to **7)**……... the truth.

After designing experiments with conducting lightning **8)** ……., which proved to be dangerous, he settled upon using a kite. The idea was to fly the kite into the storm clouds and conduct electricity down the kite string. A key was then attached near the bottom, to conduct the **9)** ……. and create a **10)**…… . The kite was struck by lightning and, when Franklin moved his hand towards the key, a spark jumped across and he felt a **11)** ……. , proving that lightning was electrical in nature. The evidence showed that he actually intended for the electricity to jump into a primitive form of capacitor known as a Leyden **12)** ……., and that touching the key was purely accidental.

Benjamin Franklin was also the first scientist to use the terms positive and negative **13)** …….. . His discoveries led to further research into the nature of electricity, influencing the invention of **14)** …….. by Volta, and the electric **15)** …….. by Faraday in the early nineteenth century.

4 LANGUAGE REVIEW

● The Passive, changing from active into passive voice. ● Adjectives; the order of adjectives.

4.1 Analyse the formation of the passive forms and derive the general grammar rule.

	Active	Passive
Present Simple	*They often **install** new electrical equipment.*	*New electrical equipment is often **installed**.*
Present Continuous	*They **are installing** new electrical equipment.*	*New electrical equipment **is being installed**.*

Present Perfect	*They **have installed** new electrical equipment.*	*New electrical equipment **has been installed**.*
Present Perfect Continuous	*They **have been installing** new electrical equipment.*	_____
Past Simple	*They **installed** new electrical equipment.*	*New electrical equipment **was installed**.*
Past Continuous	*They **were installing** new electrical equipment.*	*New electrical equipment **was being installed**.*
Past Perfect	*They **had installed** new electrical equipment.*	*New electrical equipment **had been installed**.*
Past Perfect Continuous	*They **had been installing** new electrical equipment.*	_____
Future Simple	*They **will install** new electrical equipment.*	*New electrical equipment **will be installed**.*
Future Continuous	*They **will be installing** new electrical equipment.*	_____
Future Perfect	*They **will have installed** new electrical equipment.*	*New electrical equipment **will have been installed**.*
Future Perfect Continuous	*They **will have been installing** new electrical equipment.*	_____
Infinitive	*They are going to **install** new electrical equipment.*	*New electrical equipment is going to **be installed**.*
Modals	*They **must install** new electrical equipment.*	*New electrical equipment **must be installed**.*

We form the **passive** with the verb **to …** in an appropriate tense form of active voice and the **……** of the main verb.
The future continuous, the present perfect continuous, the past perfect continuous and the future perfect continuous are **…** normally used in the passive.

Following the rule derived rewrite the sentences in the passive.

1. Millions of people use electricity every day to make their daily lives easier.

_____

2. The ways we produce electricity can cause some nasty side effects.

_____

3. The engineers are reviewing all department IT systems.

_____

4. They have closed the hydroelectric station to perform some maintenance work.

_____

5. The developers will not finish the project by the end of the month.

_____

6. Fossil fuels release pollutants such as carbon, sulfur and ash when they are burnt.

_____

7. They may not deliver the cargo tomorrow.

_____

8. We are going to change the instructions.

_____

9. The company spent a lot of money on this electrical grid.

_____

4.2 Match the sentences in the Passive to the relevant description.

1	*Oil and gas **are found** beneath the ground or see.*	**a**	to move important information (the object of the active sentence) to the beginning
2	*The results of these two last experiments **are being taken** into consideration by the scientists.*	**b**	when we want to be impersonal and not mention the name of the person who performs the action (in scientific and technical processes)
3	*Repairs **are being made** on the runway.*	**c**	the action itself is more important than the person who carries it out (as in news headlines, newspaper articles, formal notices, instructions, advertisements, etc)
4	*A lot of serious mistakes **have been made**.*	**d**	we refer to an unpleasant event and we do not want to say who or what is to blame (or we want to make statements more polite)
5	*The whole area **was evacuated**.* (news report)	**e**	the person, who carries out the action, is unknown, unimportant or obvious from the content

1- …; 2- …; 3- …; 4- …; 5-…

4.3 Read the text about the stored energy and batteries choosing the correct variant.

Stored Energy and Batteries

Energy *cannot create /cannot be created* or *destroy/destroyed*, but it *can be saved/can save* in various forms. One way to store it is in the form of chemical energy in a battery. When connected in a circuit, a battery *produces/is produced* electricity.

If you *look/are looked* at a battery, it will have two ends: a positive terminal and a negative terminal. If you *connect/are connected* the two terminals with wire, a circuit *forms/is formed*. Electrons *will be flown/will flow* through the wire and a current of electricity *produces/is produced*.

Inside the battery, a reaction between the chemicals *takes/is taken* place. But reaction *takes/is taken* place only if there is a flow of electrons. Batteries *can store/can be stored* for a long time and still *work/are worked* because the chemical process *doesn't start/isn't started* until the electrons *flow/are flown* from the negative to the positive terminals through a circuit.

4.4 In the table below the timeline of scientific inventions is presented. Give the short description of the events in the history of electricity using the passive forms.

1752	By tying a key onto a kite string during a storm, Ben Franklin proved that static electricity and lightning were the same.	_____
1800	Alessandro Volta invented the first electric battery.	_____
1808	Humphry Davy invented the first effective 'arc lamp.'	_____
1820	Separate experiments by Hans Christian Oersted, A.M. Ampere, and D.F.G. Arago confirmed the relationship between electricity and magnetism.	_____
1821	Michael Faraday invented the first electric motor.	_____
1826	Georg Ohm defined the relationship between power, voltage, current and resistance in 'Ohm's Law.'	_____
1831	Using his invention, the induction ring, Michael Faraday proved that electricity can be induced by changes in an electromagnetic field.	_____
1832	Hippolyte Pixii built the first 'dynamo,' an electric generator capable of delivering power for industry.	_____

1835	Joseph Henry invented the electrical relay, used to send electrical currents long distances.	
1837	Thomas Davenport invented the electric motor.	
1839	Sir William Robert Grove developed the first fuel cell, a device that produces electrical energy by combining hydrogen and oxygen.	
1841	James Prescott Joule showed that energy is conserved in electrical circuits involving current flow, thermal heating, and chemical transformations.	
1844	Samuel Morse invented the electric telegraph.	
1860s	J.C. Maxwell created a new era of physics when he unified magnetism, electricity and light. Maxwell's four laws of electrodynamics eventually led to electric power, radios, and television.	
1876	Charles Brush invented the 'open coil' dynamo (or generator).	
1879	Thomas Edison invented an incandescent light bulb.	
1883	Nikola Tesla invented the 'Tesla coil', a transformer that changes electricity from low voltage to high voltage making it easier to transport over long distances.	
1884	Nikola Tesla invented an electric generator that produces alternating current (AC). Sir Charles Algernon Parsons	

invented a steam turbine generator. _____

1888 Nikola Tesla demonstrated the first 'polyphase' alternating current electrical system. _____

1897 Joseph John Thomson discovered an electron. _____

1908 J. Spangler invented an electric vacuum cleaner. _____
A. Fisher invented an electric washing machine. _____

1911 W. Carrier developed electric air conditioning. _____

1923 Albert Einstein received the Nobel Prize for his theories explaining the photoelectric effect. _____

1947 The scientists of Bell Telephone Laboratories invented a transistor. _____

1954 World's first nuclear power plant (Russia) started generating electricity. _____

4.5 When there is more than one adjective preceding a noun, they are generally placed in the following order:

What is it like?	*How big?*	*How old?*	*What shape?*	*What colour?*	*Where was it made?*	*What is it made from?*	*What is it used for?*

Put the adjectives in the corresponding column: *circular, investment, metal, wonderful, wooden, big, quiet, difficult, old, flat, red, French, small, cheap, important, plastic, new, lovely, safety, clean, large, black, American.*

Put each group of words in the best order:

1. long-term contract a legal _____
2. fast new sports a car _____
3. clean a(n) source cheap energy _____
4. package new a(n) software amazing _____
5. chips computer Japanese high-quality _____
6. a(n) large machine old-fashioned cutting _____
7. a(n) investment strategy well-planned _____
8. a(n) American new exciting film _____

4.6 Make compound adjectives to describe the following:

1. a building which has six storeys *a six-storey building*
2. a train which moves fast _____
3. a presentation which is made well _____
4. a report which has twenty pages _____
5. an employee who works hard _____
6. a walk that takes fifteen minutes _____

4.7 Many adjectives have suffixes or prefixes. Some of the more common suffixes are:

- -able/ible (able to be)
- -ful (full of, having)
- -less (being without, not having)
- -ive (tending to, having the nature or quality of doing this)

Complete the following sentences with an adjective formed from one of the verbs or nouns, plus a suffix.

act, care, change, comfort, forget, power, rely, tire, truth

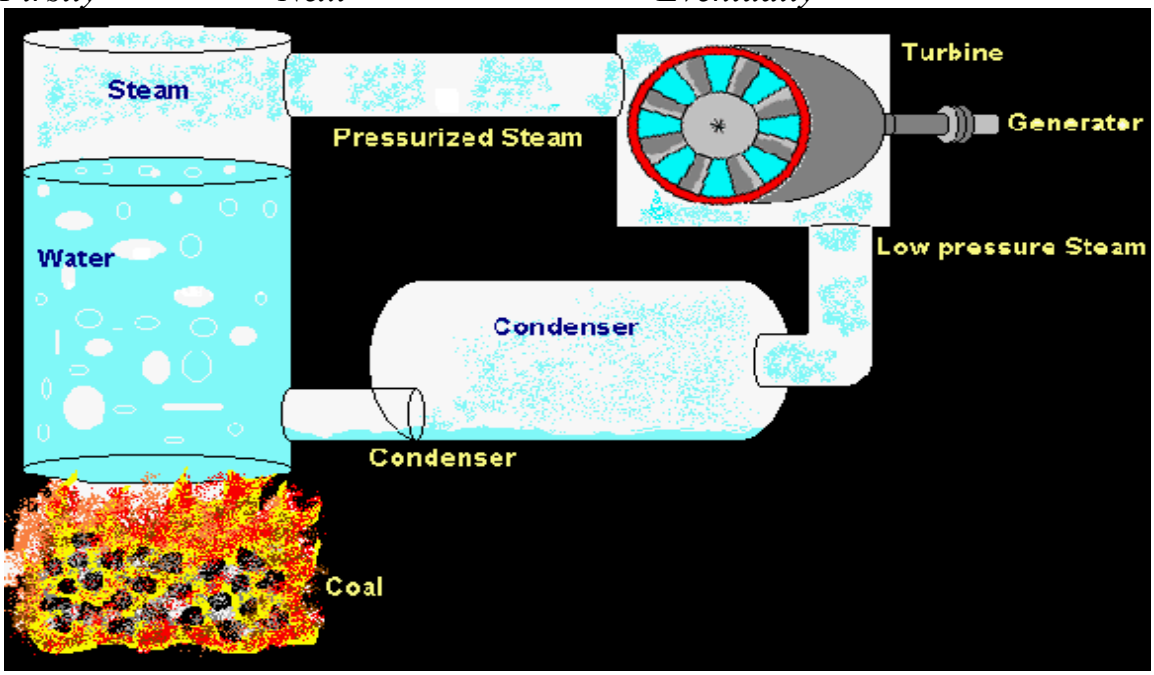
1. He never remembers the deadline; I don't know why he's so …….. .
2. The problem is that there's nothing we can do to help with delivery; we're completely …….. .
3. They never seem to run out of energy; they are completely …….. .
4. I believe what he says because he's always been …….. .
5. Don't worry. He will prepare all documents in time. He's very ……. .
6. You are always missing something. You are so …….. .
7. Don't rely on him. His plans are so …….. . .
8. It's important to keep …….. . after you retire.
9. The seats on the plane were very …….. .

5 SKILLS

5.1 According to the diagram presented below describe the stages of a thermal power station operation. Use passive structures to describe the process where possible.

Useful words to describe the stages of a process:

To begin with	*Secondly, thirdly, etc*	*After that*	*Finally*
First of all	*Then*	*Subsequently*	
Firstly	*Next*	*Eventually*	



water in the boiler evaporates → water becomes high-pressurized steam → steam passes through a conduit → steam forces its way through the turbine → steam rotates the turbine → turbine rotates (from the force of the steam); the turbine is connected to a generator via a coupler; as the turbine is rotating **ELECTRICAL ENERGY IS PRODUCED** → steam passes through the turbine → steam enters a condenser → steam goes through the cooling agent via a pipe → steam thus changes back to its liquid form → water returns to the boiler → water in the boiler evaporates

COAL IS USED AS FUEL → water in the boiler evaporates

UNIT 2

1 LEAD-IN

1. In what forms is energy available in nature?
2. How can other forms of energy be converted into electrical energy?
3. What is the work of electric appliances based on? What energy do they convert into mechanical work?
4. What is the main function of an electric generator?
5. What principle does a generator operate on?
6. Who discovered the principle of electromagnetic induction?

2 READING

Electrical Energy

The electrical energy supplied by a current to an appliance enables it to do work or provide some other form of energy such as light or heat. Electric power is usually measured in Watts, kilowatts (1,000 watts), and megawatts (1,000,000 watts). The amount of electrical energy used by an appliance is found by multiplying its consumed power by the length of time of operation. The units of electrical energy are usually watt-seconds (joules), watt-hours, or kilowatt-hours. For commercial purposes the kilowatt-hour is the unit of choice.

Electrical energy occurs naturally, but seldom in forms that can be used. Generally, practical electric-power-generating systems convert the mechanical energy of moving parts into electrical energy. The generator, in electricity, is a machine which is used to change mechanical energy into electrical energy. It operates on the principle of electromagnetic induction, discovered (1831) by Michael Faraday. When a conductor passes through a magnetic field, a voltage is induced across the ends of the conductor. The generator is simply a mechanical arrangement for moving the conductor and leading the current produced by the voltage to an external circuit, where it actuates devices that require electricity.

While systems that operate without a mechanical step do exist, they are at present either excessively inefficient or expensive because of a dependence on elaborate technology. While some electric plants derive mechanical energy from moving water (hydroelectric power), the vast majority derive it from heat engines in which the working substance is steam. The steam is generated with heat from combustion of fossil fuels or from nuclear fission.

The conversion of mechanical energy to electrical energy can be accomplished with an efficiency of about 80%. In a hydroelectric plant, the losses occur in the turbines, bearings, penstocks, and generators. The basic limitations of thermodynamics fix the maximum efficiency obtainable in converting heat to electrical energy. The necessity of limiting the temperature to safe levels also helps to keep the efficiency down to about 41% for a fossil-fuel plant. Most nuclear plants use low-pressure, low-temperature steam operation, and have an even lower efficiency of about 30%. Nuclear plants have been able to achieve efficiency up to 40% with liquid-metal cooling. It is thought that by using magnetohydrodynamic “topping” generators in conjunction with normal steam turbines the efficiency of conventional

plants can be raised to close to 50%. These devices remove the restrictions imposed by the blade structure of turbines by using the steam or gasses produced by combustion as the working fluid.

2.1 Read the text and mark the statements as true (T) or false (F).

1. The electrical energy can be converted into some other form of energy such as light or heat. **T / F**
2. An appliance can perform work due to the energy supplied by electrical current. **T / F**
3. Electric power is measured in Amperes. **T / F**
4. The amount of energy used (or supplied) depends on the power and the time for which it is used (Energy = Power × Time). **T / F**
5. 1 joule is equivalent to 1 watt-second. **T / F**
6. For commercial purposes the watt-hour unit is used. **T / F**
7. As electrical energy occurs naturally, it is almost always in forms that can be used. **T / F**
8. Electric-power-generating systems convert mechanical energy into electrical energy. **T / F**
9. The generator changes mechanical energy into heat energy. **T / F**
10. The generator operates on the principle of electromagnetic induction. **T / F**
11. The vast majority of electric plants derive mechanical energy from heat engines in which the working substance is water. **T / F**
12. The conversion of mechanical energy to electrical energy is accomplished almost without losses. **T / F**
13. Most nuclear plants have less efficiency than fossil-fuel or hydroelectric plants because the necessity to keep safe level temperatures. **T / F**
14. The efficiency of nuclear plants can be increased by using liquid-metal cooling. **T / F**

3. VOCABULARY

3.1 Match the physical quantities with their characteristics.

1 Current **a**
- the measure of the energy carried by the charge (‘energy per unit charge’), potential difference
- supplied by the battery (or power supply)
- used up in components, but not in wires
- measured with a voltmeter, connected in parallel
- measured in volts, **V**

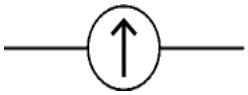
2 Resistance **b**
- the rate of using or supplying energy

			- the symbol for it is **P** - measured in watts, **W**
3	Voltage	**c**	- the rate of charge flow - the symbol **I** is used for it in equations - measured with an ammeter, connected in series - measured in amps (amperes), **A**
4	Power	**d**	- the property of a component which restricts the flow of electric current - the symbol for it is **R** - is measured in ohms, the symbol for ohm is an omega, Ω
5	Capacitance	**e**	- depends on the power and the time for which it is used (Power × Time) - the standard unit for it is the joule (**J**) - it is often measured in kilowatt-hours, **kWh**
6	Energy	**f**	- the measure of a capacitor's ability to store charge; - the symbol for it is **C** - measured in farads , **F**

1- …; 2- …; 3- …; 4- …; 5-……; 6-……

3.2 Label the circuit symbols

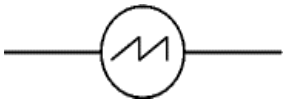
1) _____



2)_____

3)_____

4) _____



5) _____

VOLTMETER (used to measure voltage)
AMMETER (used to measure current)
OSCILLOSCOPE (used to display the shape of electrical signals and it can be used to measure their voltage and time period)

GALVANOMETER (a very sensitive meter which is used to measure tiny currents, usually 1mA or less)
OHMMETER (used to measure resistance)

3.3 Read the passage filling in the right words from the box.

field	*magnets*	*rotates*	*stator*	*alternator*	*attached*	*direct*	*poles*
direction	*commutator*	*dynamo*	*driven*	*circuit*	*alternating*	*coil*	

In the simplest form of generator the conductor is an open **1)** …… of wire rotating between the **2)** …… of a permanent magnet. During a single rotation, one side of the coil passes through the magnetic **3)** …… first in one direction and then in the other, so that the induced current is **4)** …… current (AC), moving first in one direction, then in the other. Each end of the coil is **5)** …… to a separate metal slip ring that **6)** …… with the coil. Brushes that rest on the slip rings are attached to the external **7)** …… . Thus the current flows from the coil to the slip rings, then through the brushes to the external circuit. In order to obtain **8)** …… current (DC), i.e., current that flows in only one direction, a commutator is used in place of slip rings. The **9)**…… is a single slip ring split into left and right halves that are insulated from each other and are attached to opposite ends of the coil. It allows current to leave the generator through the brushes in only one **10)** ……. . This current pulsates, going from no flow to maximum flow and back again to no flow. A practical DC generator, with many coils and with many segments in the commutator, gives a steadier current. There are also several magnets in a practical generator. In any generator, the whole assembly carrying the coils is called the armature, or rotor, while the stationary parts constitute the **11)** ……. . Except in the case of the magneto, which uses permanent **12)** ……, AC and DC generators use electromagnets. Field current for the electromagnets is most often DC from an external source. The term **13)** …… is often used for the DC generator. An AC generator is called an **14)** ……. . To ease various construction problems, alternators have a stationary armature and rotating electromagnets. Most alternators produce a polyphase AC, a complex type of current that provides a smoother power flow than does simple AC. By far the greatest amount of electricity for industrial and civilian use comes from large AC generators **15)** …… by steam turbines.

4 LANGUAGE REVIEW

● Personal/Impersonal Passive Constructions ● Comparative and superlative degrees of adjectives; irregular adjectives; ● *much more, far less,* etc.

4.1 Complete the second sentence so that it has a similar meaning to the first sentence.

1 It is said that nuclear energy is one part of the solution to climate change.

Nuclear energy ***is said to be*** *one part of the solution to climate change.*

2 It is thought that the project of a new electric greed is short of money.
The project of a new electric greed …….. .

3 The power plant is expected to provide sufficient energy for both domestic and commercial lighting, heating, cooking and industrial processes.
It is expected that ……. .

4 They are said to have built new sewage disposal plants.
It is said that ……. .

5 It is known that in many countries electric power companies own the whole infrastructure from generating stations to transmission and distribution infrastructure.
In many countries electric power companies ……... .

6 It is reported that the government has reached a compromise with energy suppliers.
The government …… .

7 Nuclear accidents occurred at the Three Mile Island reactor 2 in the United States and the Chernobyl reactor 4 in the former Soviet Union are thought to be the worst.
It is thought that …… .

8 It is known that the company is developing a new product at the moment.
The company …… .

9 They are reported to have financial problems.
It is reported that …….. .

10 Jim is expected to be given a promotion.
It is expected that ……. .

11 It was thought that the plan had been rejected.
The plan …… .

12 Clean solar energy technologies are said to have huge longer-term benefits.
It is said that ……. .

4.2 Give the comparative and superlative forms of the following adjectives. Use the appropriate form in the sentences offered below.

modern	_____	_____	***flat***	_____	_____
big	_____	_____	***bad***	_____	_____
noisy	_____	_____	***expensive***	_____	_____
good	_____	_____	***common***	_____	_____
simple	_____	_____	***narrow***	_____	_____
long	_____	_____	***far***	_____	_____
sophisticated	_____	_____	***risky***	_____	_____
large	_____	_____	***powerful***	_____	_____

1. This contract was …… we had ever signed.

2. To achieve an agreement was a bit …… than we expected.
3. It is one of ……plant in the region.
4. The project can be even …… than it is supposed to be.
5. The solar power plant in Crimea is …… in Europe.
6. Hydropower is the cheapest way and solar cells are probably …… way to generate electricity.
7. Let's hope there won't be any …… delays.
8. The results of the last experiments were …… than the previous ones.
9. It is …… explanation I have ever heard.

4.3 Rewrite these sentences so they mean the same, using different comparative patterns with the words in brackets: (*much/much more/ far/ a bit/ a lot/ a little/any* + comparative adjective or by far +superlative).

1. She's not nearly as good at problem solving as you.
   You are ……. at problem solving than her. (**much**)
2. His idea is slightly more interesting than yours.
   Your idea is ……. his. (**a bit**)
3. This system is much better than all the other existing systems of electricity transmission in the world.
   This system is…… in the world. (**by far**)
4. Their installation is a lot more powerful than ours.
   Their installation is …… ours. (**much**)
5. It's not quite as important today as it was yesterday.
   It is …… today than it was yesterday. (**bit**)
6. The equipment we are using now isn't quite as expensive as we used last year.
   The equipment we used last year was …… expensive than the equipment we are using now. (**a little**)

4.4 Put the adjectives in brackets into the comparative or superlative form, adding any necessary words.

1. A: Will it take much time?
   B: No, we'll be there soon. It's not much ……(far).
2. A: Do you enjoy your job?
   B: Oh, yes. It's ……(good) job I've ever had.
3. A: It's very noisy here.
   B: Yes, could you speak a little ……(loud)?
4. A: Have they built a new substation?
   B: Yes. The new one is far ……(close) to this district.
5. A: Have you talked to him.
   B: Not yet. He is one of ……(difficult) customers I have ever dealt with.

6. A:You've spent a lot of money.
   B: Exactly so. This system is far ……(expensive) than the old one.
7. A: I think Jane is very talented.
   B: No one in the team has ……(good) communication skills than Jane.
8. A: I'd like to congratulate you.
   B: Thanks! It's by far ……(successful) contract we have ever signed.

5. SKILLS

5.1 According to International Hydropower Association these are the most powerful hydroelectric power stations in the world. Make a short presentation comparing their capacity.

THE MOST POWERFUL HYDROELECTRIC POWER STATIONS IN THE WORLD

Hydroelectric Power Stations	Name	Country	Capacity, Megawatts	Year
	The Three Gorges	China	18,200	2009
	Itaipu	Brazil, Paraguay	12,600	1983
	Guri	Venezuela	10,000	1986
	Grand Coulee	USA	6,494	1942

	Sayano-Shushenskaya, Yenisey river	Russia	6,400	1989
	Krasnoyarsk, Yenisey river	Russia	6,000	1968 - 1972
	Churchill Falls	Canada	5,428	1971

UNIT 3

1 LEAD-IN

1. How does electricity produced at power plants get to the customers using it?
2. Why is electricity transferred at high voltages?
3. What materials are usually transmission lines cables made of? Why?
4. How do transformers change electricity voltage at substations near businesses, factories and homes?

2 READING

Transmission of Electrical Energy

Electrical energy is of little use unless it can be made available at the place where it is to be used. To minimize energy losses from heating of conductors and to economize on the material needed for conductors, electricity is usually transmitted at the highest voltages possible. As modern transformers are virtually loss free, the

necessary steps upward or downward in voltage are easily accomplished. Transmission lines for alternating current using voltages as high as 765,000 volts are not uncommon. For voltages higher than this it is advantageous to transmit direct current rather than alternating current. Recent advances in rectifiers, which turn alternating current into direct current, and inverters, which convert direct into alternating, have made possible transmission lines that operate at 800,000 volts and above. Such lines are still very expensive, however.

Electric utilities are tied together by transmission lines into large systems called power grids. They are thus able to exchange power so that a utility with a low demand can assist another with a high demand to help prevent a blackout, which involves the partial or total shutdown of a utility. Under such a system a utility experiencing too great load, as when peak demand coincides with equipment failure, must remove itself from the grid or endanger other utilities. During periods in which demand exceeds supply a utility can reduce the power drawn from it by lowering its voltage. These voltage reductions, which are normally of 3%, 5%, or 8%, result in power reductions, or brownouts, of about 6%, 10%, or 15%, causing inefficient operation of some electrical devices. The power distribution system, because of its generation of low-frequency electromagnetic fields, has been suggested as a possible source of health problems.

The grid is an electricity network supporting all or some of the following four distinct operations: electricity generation, electric power transmission, electricity distribution and electricity control. It may be used to refer to an entire continent's electrical network, a regional transmission network or may be used to describe a subnetwork such as a local utility's transmission grid or distribution grid.

Electricity in a remote location might be provided by a simple distribution grid linking a central generator to homes. The traditional paradigm for moving electricity around in developed countries is more complex. Generating plants are usually located near a source of water, and away from heavily populated areas. They are usually quite large in order to take advantage of the economies of scale. The electric power which is generated is stepped up to a higher voltage—at which it connects to the transmission network. The transmission network will move (wheel) the power long distances — often across state lines, and sometimes across international boundaries—until it reaches its wholesale customer (usually the company that owns the local distribution network). Upon arrival at the substation, the power will be stepped down in voltage—from a transmission level voltage to a distribution level voltage. As it exits the substation, it enters the distribution wiring. Finally, upon arrival at the service location, the power is stepped down again from the distribution voltage to the required service voltage(s).

This traditional centralized model with its distinctions is breaking down with the introduction of new technologies. For example, the characteristics of power generation can in some new grids be entirely opposite of those listed above. Generation can occur at low levels in dispersed locations, in highly populated areas, and not outside the distribution grids. Such characteristics could be attractive for some locales, and can be implemented if the grid uses a combination of new design

options such as net metering, electric cars as a temporary energy source, or distributed generation.

2.1 Reading comprehension. Answer the following questions to the text.

1. Why is usually electricity transmitted at high voltages?
2. What voltages is alternating current transmitted at?
3. What current is advantageous to transmit for voltages higher than 765,000 volts?
4. What are power grids?
5. What do power grids provide?
6. What happens with a power grid utility when it experiences too great load?
7. What does voltage reduction cause?
8. What operations does a power grid perform?
9. What can the term 'grid' refer to?
10. How is electricity provided in a remote location?
11. What is the traditional way of electricity transmitting?
12. Where are usually electricity generating plants located?
13. How is the traditional centralized power transmitting model changing nowadays?

3 VOCABULARY

3. 1 Find words or phrases in the text which mean the same as the following.

1 an industrial facility for the generation of electric power _____

2 the bulk transfer of electrical energy, from generating power plants to electrical substations located near demand centres _____

3 transmission lines interconnected with each other _____

4 the local wiring between high-voltage substations and customers _____

5 the electrical potential difference or electric tension _____

6 an electrical device that converts alternating current to direct current _____

7 a short- or long-term loss of the electric power to an area _____

3. 2 Fill in the remaining gaps with the corresponding word forms.

noun (person)	noun(phenomenon)	verb	adjective
conductor			
		transmit	

user			
			alternating
	equipment		
		operate	
generator			
		distribute	
	introduction		
		implement	

3. 3 Use the word given in capitals at the end of some of the lines to form a word that fits in the same line.

New Material Could Eliminate Loss in Electrical Power Transmission

1) ..... at Riken Advanced Science Institute and the University of Tokyo have demonstrated a new material that they claim could eliminate loss in electrical power 2) ..... . **RESEARCH** **TRANSMIT**

The team's method for solving this energy problem is based upon the first 3) ..... of an exotic type of magnetic semiconductor first theorised less than a decade ago – a magnetic topological 4) ..... . **REALISE** **INSULATE**

The work is 5) ..... related to the quantum Hall effect, which is known to produce 6) ..... electricity channels but requires large, cumbersome magnets to produce fields 100,000 larger than the earth's 7) ..... field for its operation. **CLOSE** **DISSIPATION** **MAGNET**

To overcome this, the researchers used the exotic type of semiconductor which exhibited a similar effect known as the quantum 8) ..... hall effect. This stems from the semiconductor's own 9) ..... rather than from an external one. **ANOMALY** **MAGNETIZE**

At the heart of this effect is the 10) ..... between magnetic ions and the 11) ..... insulator's current carrying particles, known as Dirac fermions, which are unique because they behave as if they have zero mass. **INTERACT** **TOPOLOGY**

Although the method 12) ..... requires cryogenic conditions, the team hopes that 13) ..... in material design will make 14) ..... possible at higher temperatures. **CURRENT** **IMPROVE** **OPERATE**

4 LANGUAGE REVIEW

• Comparison structures: *as…as, not so …as, the more… the less, the same as; the + comparative*; *so* and *such, enough* and *too* with adjectives. • Adjectives ending in *-ing* and *–ed*

4.1 Use either *as … as* or *not as … as* in the sentences below.

1. This copy is …….. the other one. (bad)
2. Our expectations concerning the possibilities to reduce power consumption …… theirs. (not/optimistic)
3. The airport was …….. ever. (crowded)
4. Silver is …….. gold. (not/heavy)
5. This decision is …….. the previous one. (spontaneous)
6. They are …….. they appear to be. (not/clever)
7. The new production line should be …….. the old one. (profitable)
8. The hotel was …….. they expected. (not/comfortable)
9. The meeting was ……. I thought. (long)
10. This task is …….. it sounds. (not/complicated)

4.2 Complete the sentences with *'the … the'* choosing the appropriate pairs of adjectives.

longer/ more difficult	***more sophisticated/ better***	***more comfortable/ higher***
better/ greater	***more complicated /greater***	***newer/ more valuable***

1. …….. the discussion goes on, …….. will be to find a solution.
2. …….. equipment is used, ……..results you can get.
3. …….. hotel you book, …….. payment will be.
4. …….. problem you have to solve, …….. diversity of options you have to take into consideration.
5. …….. your education is, …….. opportunities you will have in your career.
6. …….. the car is, …….. it is.

4.3 Complete the sentences, using one of the adjectives from the list and *comparative +and + comparative.*

profitable experienced dangerous comfortable tired

1. As I worked at the computer, I got …… .
2. As she works hard, she is becoming …… .
3. They are constantly increasing the load, so the experiment is becoming …….. .
4. Their productivity is increasing, so they are becoming ……... .
5. They changed the layout and bought new furniture, so their office is becoming ……... .

4.4 Complete the sentences with *too* or *enough* and the words in brackets.

1. It was ……. to stop the experiment at the power plant. (late)
2. She was ……. to get such a promotion. (young)
3. They were ……. to pass the test. (smart)
4. He was ……. to talk to the customer. (busy)
5. This is ……. for me to understand. (difficult)
6. The information in the report is ……. to start a new discussion. (interesting)
7. The rent is ……. for me to live here. (expensive)
8. I left the coffee for a minute to cool because it was ……. to drink. (hot)
9. He wasn't ……. to lift that heavy box. (strong)

4.5 Complete the text with an adjective from the list given below, using a comparative form where necessary.

cheap	***fast***	***difficult***	***easy***
clever	***important***	***up-to-date***	***essential***

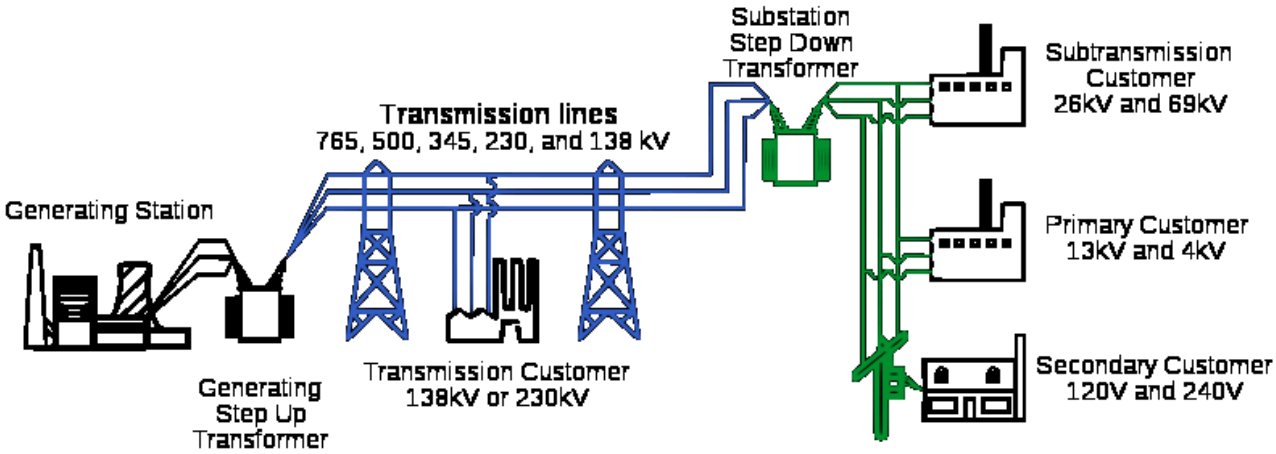
Nowadays using computers is more and more **1)** …… . We can't do without them, and you don't have to be an expert to use one, as using a computer is **2)** …… and …… all the time. You don't need to be reach either, as computers are also becoming **3)** …… and …… as time goes on. Also, if you are studying, the Internet is becoming more and more **4)** …… as a place to find information. This used to take a long time, but the latest machines are a great improvement. The **5)** ……the computer, the …… it works. However, protecting computers from viruses is becoming more and more **6)** …….. as the people who invent viruses are becoming **7)**…… and …… . The Internet has become a dangerous place, so it is more and more **8)** …… to be very careful when we use computers.

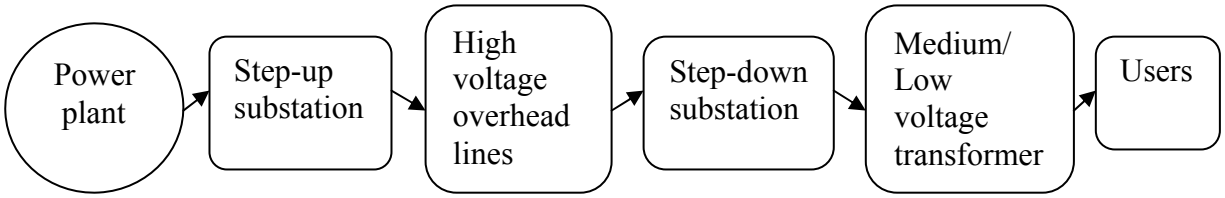
4.6 Adjectives ending –ing describe something we are reacting to, while adjectives ending –ed describe our feelings and reactions. Choose the correct adjective in the following sentences.

1. You look *worrying/worried*. What happened?
2. I don't think our partners like the idea. They look *bored/boring*.
3. The new project seems to be *exciting/excited*.
4. The report is too long. It sounds *bored/boring*.
5. The meeting was very *interested/interesting*.
6. I was particularly *interesting/interested* in what they promised.

5 SKILLS

5.1 Using the diagram, schematic diagram and sentences presenting different stages of electrical energy transmission, describe the transfer of electrical energy from generating power plants to electrical substations located near demand centers.





A power plant produces electrical energy in medium (20,000 V) or low (1,000) voltage.

A step-up substation elevates electrical power energy produced at a power plant to high voltage (up to 400 kV).

Electrical power is transmitted across long distances by high-tension power lines to reduce the energy lost.

A step-down substation converts the high voltage back down to medium voltage and electrical power can then be transported by medium voltage lines to feed medium and low voltage transformers using overhead lines or underground cables.

Most of the users are fed in low voltage, but bigger ones, such as factories, commercial buildings, hospitals and so forth, can be directly fed in medium voltage

USEFUL LINKING WORDS:

to begin: *initially, first, at first, firstly, to start/begin with, first of all*
to continue: *secondly, after this/that, second, afterwards, then, next*
to conclude: *finally, lastly, in the end*

UNIT 4

1 LEAD-IN

1. Comment the quote from the site of Exelon Corporation (the USA) striving for the highest standards of power generation, delivery and wholesale marketing and having a broad range of environmental initiatives.

   '*We're providing energy today, and protecting the environment for tomorrow*.'

2. In groups of 4 make a list of possible environmental impacts that can be the result of electricity generation and transmission. Take into consideration different factors:
   - the effects of obtaining the fuels from mines
   - the effects of using the fuels
   - dealing with the wastes
   - the effects of using renewable energy sources
   - waste heat generated by an electric-power plant and not converted into electrical energy
   - the effects of electricity transmission

2 READING

ENVIRONMENTAL CONCERNS

Environmental Impact of Electricity Generation and Transmission

All energy conversion methods used to produce electricity have some environmental impact. The impact may have an active effect like the emission of airborne pollutants, or may have a passive effect like aesthetics or habitat modification. Even methods considered environmentally friendly, like wind, solar, and hydro, have some impact on the environment. Not only does the final production of electricity have an environmental impact. The transmission of electricity with

concerns over electromagnetic fields, aesthetics, and land use, also impacts the environment.

The whole cycle of electricity generation must be considered when looking at the environmental impact. This includes the production and transportation of fuel for the conversion process. This is especially true of fossil fuel and nuclear power plants, which use large quantities of fuel taken from the earth. Energy system environmental impact consists of fuel recovery and production, fuel transportation, electricity transmission, and spent fuel emissions.

Fossil fuel power plants generally have the most widespread effect on the environment, as the combustion process produces airborne pollutants that spread over a wide area. Nuclear power plants have the most potentially dangerous effect. An operating accident at a nuclear station could allow a large release of radioactive particles to occur. Solar, hydro, and wind power plants generally have smaller effects on the environment.

Fossil fuel power plants produce environmental problems including land and water use, air emissions, thermal releases, climatic and visual impacts from cooling towers, solid waste disposal, ash disposal (for coal), and noise. Due to the need for large amounts of steam, plants can have a great effect on water use. The biggest effect fossil fuel plants have overall is the emission of air pollutants, particularly SOX, NOX , CO, CO2 , and hydrocarbons. Carbon monoxide, CO, carbon dioxide, CO2, and the hydrocarbons are the 'greenhouse gases,' believed to be responsible for global warming. SOX and NOX produce acid when released into the atmosphere, leading to the production of acid rain.

Nuclear power plants have one environmental issue no other form of electrical power plant does. An accident at a nuclear power plant may release large amounts of radioactive particles, possibly resulting in a direct loss of life, and rendering a large land area immediately around the plant unlivable. The largest regular environmental impact is the disposal of the high level nuclear waste contained in spent fuel rods, as this waste must be stored safely for thousands of years. A long term issue is the decommissioning of nuclear power plants. Decommissioning is shutting down a nuclear plant after its operational life is over. At this point the entire reactor vessel becomes a high level radioactive waste that must be disposed. The current methods of decommissioning a plant are to completely remove and dispose of all radioactive components, to entomb the reactor in concrete, or simply to shut the plant down and restrict access until the radioactivity dies out.

The production of electricity from solar energy sources generally has a small effect on the environment. There are no residuals produced in the energy conversion process. The only exception is solar thermal processes, which have an operating fluid that must occasionally be discharged. There are some environmental concerns, however. Bulk solar plants generally require a large land area, and they produce a great deal of heat. An unknown quantity in solar energy is the disposal of photovoltaic cells. The most promising solar cells use gallium arsenide, a toxic substance.

The use of hydropower to produce electricity can have both positive and negative effects on the environment. At some sites, a dam may help with flood control, flow regulation, or the reservoir may provide recreational opportunities. At other sites, the dam may have adverse effects on the hydrological cycle, water quality of the stream, stream ecology, fish migration, and cause the destruction of landscapes and ecosystems. Low-head dams generally have a benign effect on the environment. Dam failures can lead to catastrophic floods.

Wind generators biggest environmental effects come from visual pollution, noise, and TV interference. This is particularly true of wind farms, where 50 or more wind turbines may be mounted at the same site. Wind farms situated on a migratory path may pose major hazards to birds. There is also a safety hazard in case of blade breakage.

Transmission of bulk electricity from the generating station to the load uses wires suspended on large towers, known as transmission lines. Traditionally these lines have been viewed only as an aesthetic nuisance that could cause communications interference and be a hazard to low flying aircraft. Today, there are other issues considered about the effect of transmission lines on the environment. Greater concern is placed on the effect of the lines on the natural habitat. The major new issue is the effect of electromagnetic fields (EMFs) on human health. More than 1,000 studies have been performed since 1979 to assess the relationship between low frequency magnetic fields and human health. Most of the research has focused on the relationship between cancer rates and fields produced in the 50-60 Hertz range used for electricity transmission. The studies generally focus on children with residential exposure to high voltage transmission lines, or workers with high degrees of occupational exposures to EMFs. Most of the studies have failed to establish a statistically significant relationship between cancer and EMFs. One difficulty in the studies is estimating the amount of EMF exposure a person receives.

The heat generated by an electric-power plant that is not ultimately converted into electrical energy is called waste heat. The environmental impact of this waste is potentially catastrophic, especially when, as is often the case, the heat is absorbed by streams or other bodies of water. Cooling towers help to dispose waste heat into the atmosphere.

2.1 Reading comprehension. Complete the following sentences, using your own words.

1. All energy conversion methods used to produce electricity, even those that considered to be environmentally friendly, have ……. .
2. The effect of this environmental impact can be ….. like …… or ….. like …… .
3. Not only the final production of electricity has an environmental impact, but …… .
4. Estimating the environmental impact, we have to take into consideration …… including …… .
5. Energy system environmental impact embraces …… .

6. Fossil fuel power plants are considered to have the most widespread effect on the environment, as …… .
7. The most potentially dangerous effect can be expected from ……, because of …… .
8. Solar, hydro, and wind power plants are supposed to be less …….. .
9. Among environmental problems caused by fossil fuel power plants are …….. .
10. The emissions of some air pollutants like …… are believed to be responsible for …….. .
11. Any accident at a nuclear power plant may release large amounts of radioactive particles that results in …….. .
12. The disposal of the high level nuclear waste is another problem, as …….. .
13. In spite of the fact that the production of electricity from solar energy sources generally has a small effect on the environment, there are some environmental concerns, because …….. .
14. Though the use of hydropower to produce electricity can have some positive effect on the environment, among the adverse ones are …….. .
15. Wind farms environmental effects can come from …….. .
16. Having been viewed traditionally only as an aesthetic nuisance, transmission lines have some adverse effect on the natural habitat, as …….. .
17. Waste heat, that is the heat generated by an electric-power plant and not ultimately converted into electrical energy, can be another problem, because …….. .

3 VOCABULARY

3. 1 Match the following words from the text given above to make word partnerships.

1	energy	**a**	modification
2	environmental	**b**	plants
3	fossil	**c**	pollutants
4	waste	**d**	conversion
5	electricity	**e**	rain
6	global	**f**	friendly
7	fuel	**g**	gases
8	transmission	**h**	effects
9	habitat	**i**	emissions
10	greenhouse	**j**	warming
11	adverse	**k**	lines
12	acid	**l**	impact
13	environmentally	**m**	disposal
14	airborne	**n**	fuels
15	power	**o**	generation

1- …; 2- …; 3- …; 4- …; 5-…; 6-…; 7- …; 8- …; 9- …;
10- …; 11-…; 12-…; 13-…; 14-…; 15-…

3. 2 Use the appropriate word partnerships from 3.1 in the following sentences.

1. Radioactive …… …… practices have changed substantially over the last twenty years. The designs for new facilities and methods must meet environmental protection and pollution prevention standards that are stricter than were foreseen at the beginning of the atomic age.

2. …… …… is the transformation of one type of energy into another.

3. In 2006, about 15% of global …… …… was through nuclear, 16% through hydro, 68% through fossil fuels (coal, oil, natural gas), and less than 1% through renewables (solar, wind, tidal).

4. …… …… such as coal and gasoline provide most of the energy needs of the world today, but because of their diminishing reserves, high prices and most importantly, their damaging effect on the environment, alternative sources of energy and …… …… fuels are now being developed.

5. All modern countries are crisscrossed with high-voltage …… …… , which transport electrical power from generators at power plants to substations and ultimately consumers.

6. The …… …… of electricity generation is significant because modern society uses large amounts of electrical power.

7. Electrical power is normally generated at …… …… that convert some other kind of energy into electrical power.

4 LANGUAGE REVIEW

• Adverbs; formation of adverbs; • order of adverbs; • comparisons of adverbs; • adverbs of degree: *quite – rather*

4.1 Match the types of adverbs to the relevant sentences with adverbs.

1	adverbs of **manner**	**a**	He is **always** coming late.
		b	It was very strange to make changes when **almost** half of the work has been done.
		c	He looked at me **angrily**.
2	adverbs of **degree**	**d**	There is a new factory **nearby**.

		e	It was **slightly** cheaper than we expected.
		f	He **easily** passed all the exams.
3	adverbs of **frequency**	**g**	The accident happened **yesterday**.
		h	They decided to meet **here** again.
		i	The new office will be ready **in two months**.
4	adverbs of **place**	**j**	He did not work hard, **therefore**, he failed.
		k	I came here a year ago. **Previously**, I lived in New York.
5	adverbs of **time**		
		l	**Possibly**, they will give some discount.
		m	We are **eagerly** waiting for signing this contract.
6	adverbs of **opinion**	**n**	They are talking **outside**.
		o	**Consequently** he refused to come.
		p	They **often** go on business abroad.
7	adverbs of **reason**	**q**	**No doubt**, they will increase their profit.

1 - ……..; 2 - ……..; 3 - ……..; 4 - ……..;
5 - ……..; 6- ……..; 7- ……..

4.2 Write the adverbs of the adjectives in the list in the correct box:
surprising, wide, soft, public, good, fast, right, easy, late, careful, quick, heavy, probable, wrong, systematic, noisy, possible, near, straight, lazy, hopeful, energetic, simple, hard.

-ly	*surprisingly,*……
	……
-le → -ly	……
	……
consonant+y →-ily	……
	……
-ic → -ally	……
	……
the same form	……
	……
totally different form	……
	……

Identify the adjective or the adverb in each sentence, as in the example.
1. They *slowly* left the office. (adverb)
2. It is *easy* to make a mistake in calculations if you are in a hurry.
3. The task was very *difficult* and they needed some extra time.
4. They have been working very *hard recently*.
5. The test was *surprisingly easy*.
6. They examined all the drawbacks *carefully*.
8. She is *anxiously* waiting for the reply to her inquiry.
9. They are very *polite* to their clients.
10. He is a *friendly* person.

There is a difference in meaning between the following pairs of adverbs:

hard = *with effort*	***hardly*** = *scarcely*
near = *close*	***nearly*** = *almost*
late = *not early*	***lately*** = *recently*
high = *at a high level*	***highly*** = *very*
free = *without charge*	***freely*** = *without restraint*

Underline the correct item.
1. They live very *near/nearly* to the head office.
2. He *near/nearly* crashed his car last week.
3. There were so many people in the exhibition hall that we could *hard/hardly* hear what the presenter was saying.
4. We tried *hard/hardly* to reduce our expenses, but we couldn't do it. The new installation was very expensive.
5. He came to the meeting *late/lately*.
6. I haven't seen him *late/lately*.
7. They speak English *free/freely*.
8. They got this tester *free/freely* with a magazine.

4.3 Choose the correct item.
1. He *correct/ correctly* defined the terms. The answer sounded *correctly/correct*.
2. She *quickly/quick* adjusted the fees. She adapted *quick/quickly* to any situation.
3. He measured the floor of the assembly shop *exact/exactly*. They proved to be *perfectly/perfect exact/exactly* measurements.
4. It was a *dangerously/dangerous* place to work. The gas smelled *dangerously/ dangerous*.
5. She performed *magnificent/magnificently*. It was a *magnificent/magnificently* beautiful performance.
6. He was a very *sensibly/sensible* person. He acted very *sensible/sensibly*.
7. Mike spoke too *slow/slowly* at the meeting. He is always very *slow/slowly*.
8. Andrea is a *good/well* specialist. She always knows the material very *good/well*.
9. You must send payments *regular/regularly*. We deal on a *strictly/strict* cash basis.

10. The mechanic's tools were *well/good*. The foreman said that his work was *good/ well* done.
11. She always worked *careful/carefully* with people. She was a very *careful/ carefully* employee.
12. It was an *easy/easily* course but he did not pass the course as *easy/easily* as he thought he would.
13. I find this idea very *interesting/interestingly*. It was *interesting/interestingly* presented.

4.4 Rewrite the complete sentence using the adverb in brackets in its usual position.
1. Our partners must reduce the costs. (also)
2. I was trying to explain the reason of our delivery delay. (only)
3. Did you enjoy the flight? (both)
4. They invite any consultants. (hardly) (ever)
5. He drives his car. (carefully)
6. The directors of all departments are discussing a new project. (in the conference room)
7. We signed the contract with a new supplier. (yesterday)
8. John destroyed all the plans. (almost)
9. We change our equipment. (probably)
10. Our head office is moving to Stockholm soon. (definitely)
11. He couldn't stand the noise any longer and decided to leave. (finally)

4.5 Fill in the blank with the correct comparative form of the adverb in brackets.
1. The French delegation arrived ……. than expected. (early)
2. She speaks English ……. than the other presenters. (slowly)
3. They promised to call us ……. . (late)
4. My mother and my sister talked ……. than the other guests. (loudly)
5. Now he is working even ……. than before. (hard)
6. They answered the questions ……. than the other contestants. (fast)
7. The hotel was located …….. from the city centre than that they stayed during their first visit to their subsidiary.(far)
8. She performed her duties ……. than the other executives. (well)
9. The new manager explains the scheme of work …….. . (badly)
10. The new mechanic checked the car ……. than the old mechanic. (thoroughly).

4.6 Complete each sentence using the correct adverb of degree. Sometimes either word is possible. Consult the following scheme.

_____ • _____ •• _____ ••• _____ •••• _____

fairly *quite* *rather/pretty* *very*

1. The film was ……. good but the book was much better.
2. We were …… pleased with the hotel room but …….. disappointed with the service.
3. The examination test was ……. difficult, so we were not able to answer almost half of the questions.
4. I could not believe what had happened. It was ……. amazing.
5. John is a hard worker but he is ……. slow.
6. The people I work with are ……. unfriendly.
7. It is well-paid but it is ……. a hard job.
8. Our guest speaks German ……. well.

5 SKILLS

5.1 The environmental impact of electricity generation is significant because modern society uses large amounts of electrical power. This power is normally generated at power plants that convert some other kind of energy into electrical power. Each such system has advantages and disadvantages, but many of them pose environmental concerns.

In groups of six speculate and debate the issues of electricity generation. Use the facts mentioned in the text above, the prompt ideas below and express your opinion being persuasive and logical. Decide who will insist on pro or against ideas.

POSITIVE	NEGATIVE
• Electrical energy could be considered as the most convenient form of energy. It could be converted from one form into any other form.	• The consumption of fossil fuel resources affects the planet's atmosphere and leads to global warming and climate change.
• The running of the modern industrial structure depends on the low cost and the uninterrupted supply of electricity. A country is developed if per capita consumption of electrical energy is much higher.	• The main concern over hydroelectric power is the environmental effect of building the dam itself. Creating the reservoir in turn creates an ecosystem, but stops the river flowing further downstream.
• The machines or devices which works on electrical energy can easily be controlled with the help of electric devices such as regulators, voltage controllers etc.	• The chief environmental concern is the unknown affects the turbines may have on the marine ecosystem.

- It is very easy to carry electricity from one place to other by using conductors.

- Electrical energy is much cheaper compared to other forms of energy.

- In recent years there has been a trend towards the increased commercialization of various renewable energy sources.

- The transmission efficiency of electrical energy is much higher.

- Rapidly advancing technologies can achieve a transition of energy generation, water and waste management, and food production towards better environmental and energy usage practices.

- Energy conservation can be achieved through increased efficient energy use, in conjunction with decreased energy consumption and/or reduced consumption from conventional energy sources.

- The turbine blades affect the environment on the ground, which is not ideal from a green standpoint.

- Solar power is very expensive and current cell production levels typically are inadequate for modern electricity consumption.

- Nuclear power produces nuclear waste, which is hazardous and hard to dispose of. The main social concern is safety. Although nuclear accidents are incredibly rare, they have the potential to be incredibly damaging.

USEFUL PHRASES

Opinions, preferences:

I think..., In my opinion..., I'd like to..., I'd rather..., I'd prefer..., The way I see it..., As far as I'm concerned..., If it were up to me..., I suppose..., I suspect that..., I'm pretty sure that..., It is fairly certain that..., I'm convinced that..., I honestly feel that, I strongly believe that..., Without a doubt...

Disagreeing:
I don't think that..., Don't you think it would be better..., I don't agree, I'd prefer..., Shouldn't we consider..., But what about..., I'm afraid I don't agree..., Frankly, I doubt if..., Let's face it, The truth of the matter is..., The problem with your point of view is that...

Giving reasons and offering explanations:
To start with, The reason why..., That's why..., For this reason..., That's the reason why..., Many people think...., Considering..., Allowing for the fact that..., When you consider that...

MODULE 2.2

UNIT 5

1 LEAD-IN

1. What are the main two types of energy sources?
2. Group the following energy sources into ***nonrenewable and renewable***:

- Oil (petroleum)
- Biomass
- Geothermal
- Solar
- Coal
- Natural Gas
- Hydropower
- Wind
- Uranium (nuclear)

3. In groups of four discuss the advantages and disadvantages of the energy sources mentioned above. Compare your opinion with the ideas of the other groups.

2 READING

Energy Resources:
Renewable and Nonrenewable Energy Sources

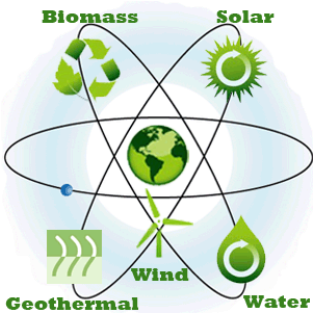
Energy is the vital force powering business, manufacturing, and the transportation of goods and services to serve the world economies. Energy supply and demand play an increasingly vital role in the national security and the economic output of any nation. It is not surprising that governments spend huge amounts of money annually on energy.

Most of our energy comes from fossil fuels. They are fuels formed by natural resources such as anaerobic decomposition of buried dead organisms. The age of the organisms and their resulting fossil fuel is typically millions of years, and sometimes exceeds 650 million years. Fossil fuels range from volatile materials with low carbon: hydrogen ratios like methane, to liquid petroleum

and nonvolatile materials composed of almost pure carbon, like anthracite coal. In fact, the earliest known fossil fuel deposits are from the Cambrian Period about 500 million years ago, before the dinosaurs emerged onto the scene. This is when most of the major groups of animals first appeared on Earth. The later fossil fuels— which provide more substandard fuels like peat or lignite coal (soft coal) — began forming as late as five million years ago in the Pliocene Period. At our rate of consumption, these fuels cannot occur fast enough to meet our current or future energy demands.

Although the supplies of fossil fuels are vast, they are not unlimited. And more important, the earth's atmosphere and biosphere may not survive the environmental impact of burning such enormous amounts of these fuels. Carbon stored over millions of years is being released in a matter of decades, disrupting the earth's carbon cycle in unpredictable ways.

But fossil fuels are not the only source of energy, and burning fuel is not the only way to produce heat and motion. Renewable energy offers us a better way. Some energy sources are 'renewable' because they are naturally replenished, because they can be managed so that they last forever, or because their supply is so enormous that they can never be meaningfully depleted by humans. Moreover, renewable energy sources have much smaller environmental impacts than fossil and nuclear fuels.



Renewable energy is energy which comes from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable (naturally replenished).

The sun is our most powerful source of energy. Sunlight, or solar energy, can be used for heating, lighting and cooling homes and other buildings, generating electricity, water heating, and a variety of industrial processes. Most forms of renewable energy come either directly or indirectly from the sun. For example, heat from the sun causes the wind to blow, contributes to the growth of trees and other plants that are used for biomass energy, and plays an essential role in the cycle of evaporation and precipitation that makes hydropower possible. A twentieth-century technology is photovoltaics, which turns sunlight directly into electricity.

Wind is the movement of air that occurs when warm air rises and cooler air rushes in to replace it. The energy of the wind has been used for centuries to sail ships and drive windmills that grind grain. Today, wind energy is captured by wind turbines and used to generate electricity.

Water flowing downstream is a powerful force. Water is a renewable resource, constantly recharged by the global cycle of evaporation and precipitation. The heat of the sun causes water in lakes and oceans to evaporate and form clouds. The water then falls back to Earth as rain or snow, and drains into rivers and streams that flow back to the ocean. Flowing water can be used to power water wheels that drive mechanical processes. And captured by turbines and generators, like those housed at many dams around the world, the energy of flowing water can be used to generate electricity.

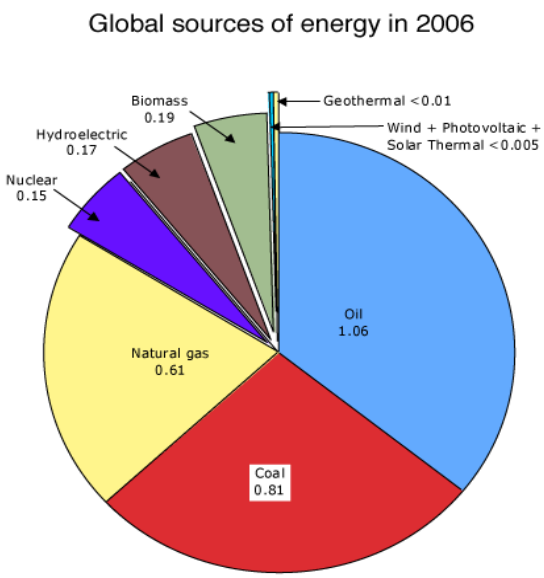
Biomass has been an important source of energy ever since people first began burning wood to cook food and warm themselves against the winter chill. Wood is still the most common source of biomass energy, but other sources of biomass energy include food crops, grasses and other plants, agricultural and forestry waste and residue, organic components from municipal and industrial wastes, even methane gas harvested from community landfills. Biomass can be used to produce electricity and as fuel for transportation, or to manufacture products that would otherwise require the use of nonrenewable fossil fuels.

Hydrogen has tremendous potential as a fuel and energy source, but the technology needed to realize that potential is still in the early stages. Hydrogen is the most common element on Earth—for example, water is two-thirds hydrogen—but in nature it is always found in combination with other elements. Once separated from other elements, hydrogen can be used to power vehicles, replace natural gas for heating and cooking, and to generate electricity.

The heat inside the Earth produces steam and hot water that can be used to power generators and produce electricity, or for other applications such as home heating and power generation for industry. Geothermal energy can be drawn from deep underground reservoirs by drilling or from other geothermal reservoirs closer to the surface.

The ocean provides several forms of renewable energy, and each one is driven by different forces. Energy from ocean waves and tides can be harnessed to generate electricity, and ocean thermal energy—from the heat stored in sea water—can also be converted to electricity. Using current technologies, most ocean energy is not cost-effective compared to other renewable energy sources, but the ocean remains and important potential energy source for the future.

Nuclear power harnesses the heat of radioactive materials to produce steam for power generation. It is generated using Uranium, which is a metal mined in various parts of the world. Nuclear power produces around 11% of the world's energy needs, and produces huge amounts of energy from small amounts of fuel, without the pollution that you'd get from burning fossil fuels.



Despite the promise of alternative energy sources — more appropriately called renewable energy — collectively they provide only about seven percent (7%) of the world's energy needs. This means that fossil fuels, along with nuclear energy — non-renewable energy source — are supplying 93% of the world's energy resources. In most areas, the demand for electricity increases each year but supply often does not match this demand, forcing energy prices to climb. Perhaps the best solution to our growing energy challenges comes from The Union of Concerned Scientists: 'No single solution can

meet our society's future energy needs. The solution instead will come from a family of diverse energy technologies that share a common thread — they do not deplete our natural resources or destroy our environment.' (Eric McLamb)

2.1 Reading comprehension. Answer the following questions to the text.

1. Why does solving the energy problem play so crucial role for any country economy?
2. Where does most of energy come from?
3. What is the diversity of fossil fuels?
4. What are the earliest known fossil fuel deposits?
5. Are fossil fuels able to solve world energy problem? Why?
6. What is considered to be an alternative to fossil fuels?
7. What are the main renewable energy sources?
8. Why is the sun believed to be the most powerful renewable source of energy?
9. How is the wind energy used nowadays?
10. How can the energy of flowing water be used to generate electricity?
11. What are the sources of biomass energy?
12. What is the potential of hydrogen as a fuel and energy source?
13. What is geothermal energy? How can it be used for human purposes?
14. How can the energy of the ocean be used? Is it used in full nowadays?
15. How is nuclear power generated? Is it considered to be of significant potential?
16. What is the share of renewable and nonrenewable energy sources in the world's economy?

3 VOCABULARY

3. 1 Find words or phrases in the text which mean the same as the following.

1	energy which comes from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are naturally replenished	_____
2	fuels formed by natural processes such as anaerobic decomposition of buried dead organisms	_____
3	natural resources which cannot be reproduced, grown, generated, or used on a scale which can sustain their consumption rate, once depleted they are no more available for future needs	_____
4	organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions (their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the	

liquid or solid form of the compound and enter the surrounding air) _____

5 an accumulation of sediments, mineral ores, coal, etc. _____

6 not capable of being predicted _____

7 any form of water that falls to the earth's surface _____

8 providing adequate financial return in relation to outlay _____

3.2 Complete the statements with the appropriate word.

1. *deplete — depletion — depletable — depleted*

Ozone ……. is human destruction of the ozone layer. This can come from greenhouse gases, given off by factories, cars, and electricity usage.

Our supplies of food are rather ……. .

If we continue to ……. the Earth's natural resources, we will cause serious damage to the environment.

Most energy resources currently in use are non-renewable. They are also called ……. resources.

2. *destroy — destruction — destructive*

Changes to water systems may increase the frequency and severity of …… floods.

The Tibetan plateau is at the stage of ecological ……. due to extensive mineral extraction, deforestation and unscientific construction of highways and railways.

Various human activities threaten to disrupt the balance and ……. the world's ecosystems.

3. *solution — solve — unsolved*

We can ……. our energy problems by learning how the world really works.

Technical progress remains the effective ……. to the ecological threats such as global warming and pollution.

The problems of poverty and racism seem to be ……. in many developed countries.

4. *demand(v) — demand(n) — demanding*

They ……. an urgent review of the existing control system.

He has been working at a nuclear power plant for almost ten years. His job is really……. .

I have heard about their ……. for higher pay.

5. *produce — producer(s) — production — productive — productivity*

The ……. forces express people's active relationship with nature.

The selection of electricity ……. modes and their economic viability varies in accordance with demand and region.
Increasing ……. is one of the most critical goals in business.
The ability of major petroleum ……. to withhold the supply reveals the importance of energy independence and price.
Nuclear power plants can ……. a huge amount of power from a single unit.

4 LANGUAGE REVIEW

- **Modal verbs to express prohibition, obligation/duty/necessity, absence of necessity.**

4.1 Match the modal verbs and constructions with their meanings and translate the sentences into your native language.

1	Everyone ***must*** obey the low.	**a**	strong advice
2	We ***have to*** wear uniform at work.	**b**	advice
3	I've made the decision. I ***must*** take all the responsibility.	**c**	prohibition
4	You ***must*** revise for your test.	**d**	lack of necessity
5	You ***needn't/don't need to/don't have to*** attend these meetings.	**e**	necessity (the speaker decides that something is necessary)
6	You ***mustn't/can't*** park here.	**f**	obligation/duty
7	You ***should/ ought to*** be more careful at work.	**g**	necessity(somebody else other than speaker has made the decision)

1- …; 2- …; 3- …; 4- …; 5-……; 6-……; 7-……

Fix the modal verbs meaning you have derived.

must ……
……
……

mustn't/can't ……

have to ……

should/ought to ……

needn't/
don't need to/ ……
don't have to

4.2 Rephrase the following sentences using *must, mustn't, needn't, have to, should/ought to.*

1. I **strongly advise** you to discuss your decision to increase the installation load with the engineer.

……

2. You **aren't allowed** to enter this area.

……

3. Visitors **are obliged** to switch off their mobiles.

……

4. It is getting late and you have been working hard, so I **advise** you to go home.

……

5. It is not necessary to do any more work on this. I'll take care of it myself.

……

6. I **advise** you to think about the consequences before you take the final decision.

……

7. I can't come and see you, because I **am obliged** to go to our factory in Spain because my manager says so.

……

8. It **isn't necessary** for you to attend tomorrow's staff meeting.

……

9. I **don't advise** you to change the time constraints for this project.

……

10. It **is forbidden** to throw litter on the site.

……

4.3 Look through the Personnel Manager's notes and write down the whole sentences to explain the company rules.

Obliged:	be on time at work; leave the building in case of emergency (fire, etc.)
Necessary:	sign the attendance book
Not necessary:	wear formal clothes on Fridays (casual Fridays)
Prohibited:	park cars in front of emergency exit; smoke in the office building
Good idea:	speak to the heads of the departments about excessive hours; give notice to the heads of the departments about holidays; inform the manager if you have to leave work earlier
Bad idea:	take days off very often; leave personal things at working places

4.4 You are given the answer to a question. Make the question using *have to* and the question words provided.

1. – What time ……..?
   – He has to get to the office at 8:00.

2. – Where ……?
– You have to sign your name at the bottom of the last page of your contract.
3. – Who ……?
– He has to get in touch with the General Manager.
4. – Why ……?
– She had to leave early because she had an appointment.
5. – How long ……?
– They have had to wait for the reply to their letter of complaint for two weeks.
6. – Whom ……?
– She had to meet the chief designer at the airport.
7. – When ……?
– I'll have to finish this draft by tomorrow.
8. – How long ……?
– We have had to make corrections for at least a couple of hours.

4.5 Complete the comment on the situation with either *didn't need to* or *needn't have*

1. I worked hard and finished my report on time, but our manager has given us two more days.
……
2. The bus arrived in time last night, so it wasn't necessary for me to take a taxi.
……
3. It was my day off yesterday, that's why it was not obligatory for me to get up early.
……
4. I spent a lot of time using the Internet unnecessarily.
……
5. I managed to finish this work on my own, and I didn't ask for any help.
……
6. I worried about this visit a lot, but this was not necessary.
……
7. When I came to the office on Sunday to prepare the papers for tomorrow meeting I discovered that the secretary had already prepared them.
……
8. We arrived at the airport very early and found out that the plane was late.
……

5 SKILLS

5.1 PROBLEM SOLVING ACTIVITY

'*It's not hard to make decisions when you know what your values are.*'

Roy Disney

OBJECTIVES:

- to understand the reasons of an appropriate nuclear power station location
- to define the advantages and disadvantages of nuclear power

Look through the factors that have to be taken into consideration when a nuclear power plant is to be built and the principal directions of the UK policy as to the perspectives of nuclear energy use. Based on the information of the case study, estimate the reasonability to build a new power plant on the territory. Give arguments to prove your decision.

Nuclear power stations are mainly located

- *in coastal locations (cast amount of cooling water can be extracted from the sea and returned when it has been used);*
- *where the geology can provide firm foundations (reduces the risk of earth movements damaging the reactor and supports the weight of the reactor);*
- *where there is a large amount of low value flat land or where land is easily reclaimed (reduces costs);*
- *away from major centres of population (the public perceives the risk of leaks or accidents to be less and so there is less opposition to the building of power stations)*

The UK relies on atomic energy for nearly 20% of its electricity.
No reactors have been built since the 1980s, due to:

- *concerns about accidents;*
- *spiraling decommissioning costs;*
- *the problem of nuclear waste.*

The government has renewed its support for nuclear power because of:

- *soaring oil and gas prices;*
- *dwindling fossil fuel reserves;*
- *pressure to tackle climate change.*

CASE STUDY: Heysham Power Station, Lancashire

Heysham Power Station is a nuclear power station located in Heysham, Lancashire, England. The site is divided into two separately-managed stations, Heysham 1 and Heysham 2, both of the advanced gas cooled reactor (AGR) type, with two reactors each. On 18 October 2010 the British government announced that Heysham was one of the eight sites it considered suitable for future nuclear power stations.

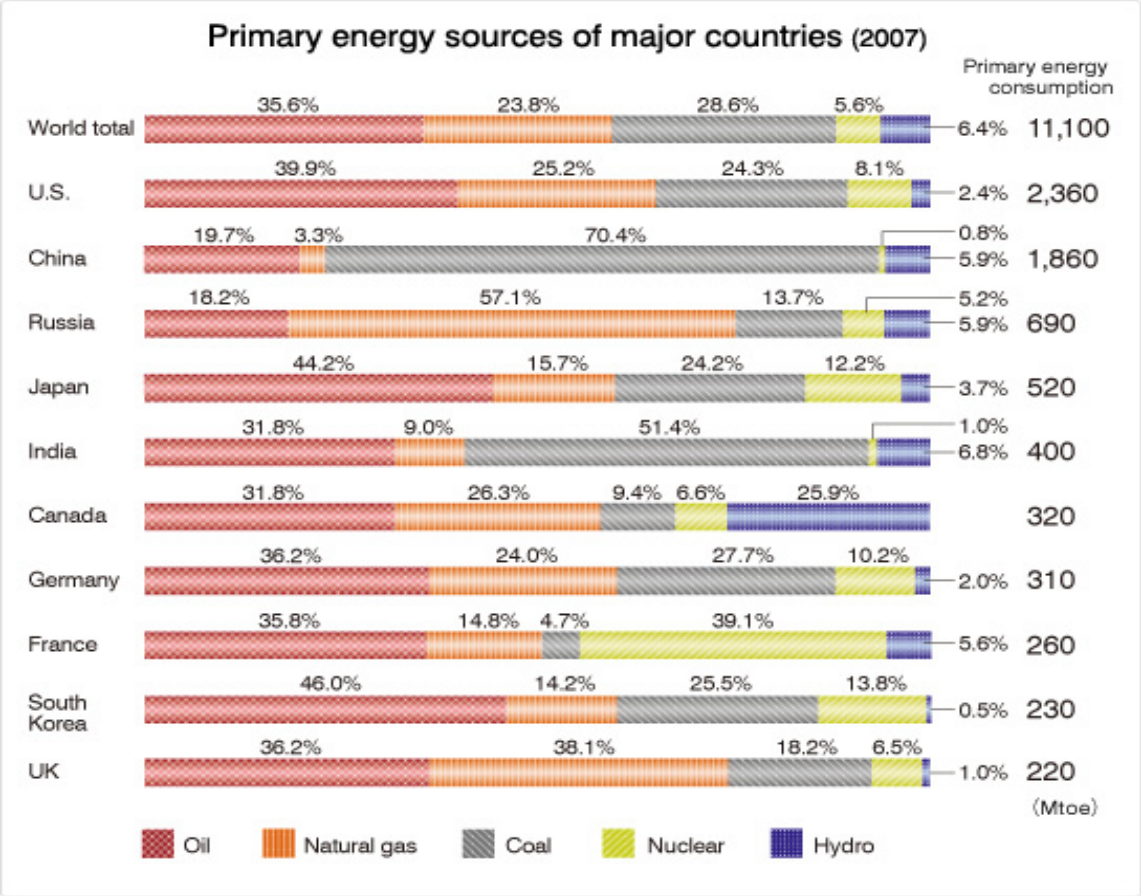
- Morecumber is the nearest largest settlement, opposition was not very strong.
- The site was undeveloped and so therefore cheap (low value land).
- The underlying rock is firm sandstone.
- It has a coastal location where it can extract cooling water and later return it. Heysham is on Morecumber Bay.
- The west coast rail route is close to the power station, so uranium can be transported easily to Heysham and spent fuel rods can be transported to.

(http://www.slideshare.net/tudorgeog/nuclear-power-stations-in-britain-presentation)

UNIT 6

1 LEAD-IN

1. What do you know about the history of fossil fuels use?
2. What do we use fossil fuels for nowadays?
3. Analyse the diagram of primary energy sources of major counties presented in Statistical Review of World Energy 2008 and estimate the role of fossil fuels use in energy generation.



2 READING

Traditional Sources of Energy

By the middle of the 18th century, much of Europe was experiencing an energy crisis due to lack of timber. As a result, coal became the major source of fuel. Coal was a plentiful source of energy. It is still very abundant. At the current rate of use, coal will last another 200 years and represents about 78% of the world's available fossil fuels. It can be found in many countries around the world. One of the main uses of coal is in the generation of electricity. 38% of the world's electricity is generated by coal. Even though coal is a very abundant energy supply there are concerns about its role in pollution.

Oil has been used as a source of energy for thousands of years. Sumerians, Assyrians and Babylonians used crude oil that seeped out of the ground along the Euphrates river for lighting and medicine. The Dead Sea in Israel was once called Lake Asphaltites, and large amounts of gooey petroleum used to wash up on the shores.

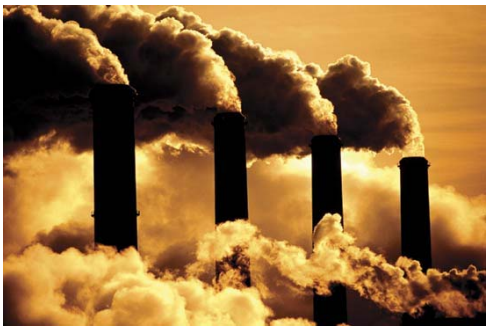
Oil has shaped our global civilisation through its plentiful and cheap supply thus far. Oil and gas together constitute over half of the world's energy supply. But oil supplies are in decline in 33 of the 48 largest oil producing countries.

Natural gas is mostly methane. Again, most scientists agree that natural gas was also created from plant matter, perhaps at the mouths of rivers where this plant matter could not be converted to coal. Some methane gas however originates in the primeval gas cloud that formed the solar system. Therefore it is not solar in origin.
Gas is a cleaner energy source than oil or coal. Its global demand is projected to grow at 2.8% annually up to 2025. This is at greater rate than that for oil. However, the infrastructure for the distribution of gas makes it an expensive form of energy.

People have used fossil fuels as energy sources for a long time. The Aztecs and Romans in Brittania used coal for heating. Unrefined petroleum was already in use around 5,000 years ago. The ancient Persians used it for lighting and medicinal purposes and the Chinese have also long used skimmed oil for lighting. The use of natural gas also stretches into antiquity. Where natural gas seeped to the Earth's surface, lightning strikes would sometimes light these gas flows. Hence the temple of the ancient Greek Oracle of Delphi was built around such a flame. The Chinese, around 500 BC were the first gas entrepreneurs. They used bamboo as pipelines to transport gas. The British first commercialised this resource and by 1785 they used it to light street lamps and homes. The Americans were the first to build the first long pipeline in 1891. It carried natural gas to Chicago from wells in central Indiana.

Nowadays fossil fuels are used for a myriad of purposes, fitting within the following categories: residential use, commercial use, uses in industry, transportation,

generation of electricity. The advantages of fossil fuels as energy sources have been their abundance, a wide variety of derivative products, plastics for example, relatively cheap production costs, ease of distribution and use in various combustion technologies.



Fossil fuels exist, and they provide a valuable service. It is not so much that we use fossil fuels for energy that is problematic, but it is the side effects of using them that causes all of the problems. Burning fossil fuels creates carbon dioxide, the number one greenhouse gas contributing to global warming. Combustion of these fossil fuels is considered to be the largest contributing factor to the release of greenhouse gases into the atmosphere. In the 20th century, the average temperature of Earth rose one degree Fahrenheit (1°F). This was a period that saw the most prolific population growth and industrial development in Earth's history. The impact of global warming on the environment is extensive and affects many areas. In the Arctic and Antarctica, warmer temperatures are causing the ice to melt which will increase sea level and change the composition of the surrounding sea water. Rising sea levels alone can impede processes ranging from settlement, agriculture and fishing both commercially and recreationally. Air pollution is also a direct result of the use of fossil fuels, resulting in smog and the degradation of human health and plant growth.

But there is also the great dangers posed to natural ecosystems that result from collecting fossil fuels, particularly coal and oil. Oil spills have devastated ecosystems and coal mining has stripped lands of their vitality.

In spite of all the factors mentioned above, fossil fuels will probably continue to be significant energy sources for decades to come. Increased demand for them presents huge political, social and environmental problems. Further exploration for fossil fuels is continuing. The growing prices of its products make it feasible to use new technologies to extract oil and gas where cost of doing was prohibitive not long ago. These technologies allow exploration in deep ocean water, previously inaccessible. As prices increase these technologies may also allow the production of hydrocarbons from oil sands and shale. Shale is fine-grained, dark brown or black rock containing oil deposits. After all, it is believed to have greater energy content than all of Saudi Arabia's oil. Until our renewable energy sources become more viable as major energy providers, the only alternative for our global population is for these companies to continue tapping into the fossil fuel reserves to meet our energy needs.

2.1 Read the text, mark the statements as true (T) or false (F). Support your opinion with the ideas mentioned in the text.

1 Coal became the major source of fuel when much of Europe was experiencing an energy crisis because of lack of timber. **T / F**

2	Coal is not a very important source of energy anymore, as it is not substantially used as a fossil fuel.	**T / F**
3	The humanity can use coal as a fossil fuel to generate electricity for not more than 100 years.	**T / F**
4	Oil provides over half of the world's energy supply.	**T / F**
5	Natural gas is considered to be more harmful for environment as the energy source than oil or coal.	**T / F**
6	The demand for natural gas is going to grow.	**T / F**
7	People have used fossil fuels as energy sources since ancient times.	**T / F**
8	Bamboo is used by the Chinese as pipelines to transport gas.	**T / F**
9	The British first built the first long pipeline in the 19th century.	**T / F**
10	Nowadays fossil fuels are used for a wide variety of purposes.	**T / F**
11	The use of fossil fuels has the side effects that cause a lot of problems.	**T / F**
12	Combustion of the fossil fuels is not the largest contributing factor to the release of greenhouse gases into the atmosphere.	**T / F**
13	Further exploration for fossil fuels is going to be reduced in the nearest future, because of alternative energy sources intensive use.	**T / F**

3 VOCABULARY

3. 1 Fill in the following words. Make sentences based on the text, using the phrases.

greenhouse, energy, current, oil, global, fossil, global, energy, natural, plentiful

1.	……. crisis	6.	……. ecosystems
2.	……. source	7.	……. gases
3.	……. rate	8.	……. spills
4.	……. supply	9.	……. civilisation
5.	……. warming	10.	……. fuels

3.2 Choose the right words from the box to fit into the text about fossil fuel resources.

depleted cheaper Throughout consumed burning lack experienced nonrenewable available cleaner However

Fossil fuels are a **1)** …… resource. They are used in the production of energy, and have been **2)** …… at increasing rates in recent history. Fossil fuels include coal, natural gas, and oil. All three of these are **3)** …… in a fixed supply, and are being rapidly **4)** …… .

The first major use of fossil fuels began during the Industrial Revolution in the 18th century. **5)** ……, it took until the beginning of the 20th century for coal to replace wood as the dominant source of fuel for the new industrial economy.

Coal took over because it became much easier and **6)** …… to mine, and it was a better source of energy than wood. Within ten years, oil and natural gas replaced coal. These fossil fuels are **7)** …… than coal, and easier to transport. Also, oil can be used when liquid fuel is needed.

In the 1970s, the world and especially the US **8)** …… serious fossil fuel shortages. When OPEC put an embargo against the United States, many people began to conserve energy and realize the effects of a **9)** …… of fossil fuels.

In 1984, the three major fossil fuels accounted for 82% of the world's commercial energy production. In the US, 91% of the energy supply came from **10)** …… those fossil fuels.

11) …… the history of industrialization, major changes have occurred. In the beginning, the industrializing countries used substances such as wood that were available locally to generate energy. Now, by contrast, the developed countries rely on fossil fuels that are transported to them.

4 LANGUAGE REVIEW

- **Modal Verbs to express ability, lack of ability, logical assumption, probability.**

4.1 Match the modal verbs and constructions with their meanings and translate the sentences into your native language.

1	He ***can/is able to*** work with this application software.	**a**	ability in the past (single past action); managed to do
2	We ***can't/aren't able to*** help you with the delivery.	**b**	negative logical assumption
3	I ***could/was able to*** run fast when I was young.	**c**	ability in the present
4	It was very difficult, but we ***were able to*** find the solution.	**d**	positive logical assumption
5	We ***couldn't/weren't able to*** reach him on the phone.	**e**	ability in the past (repeated past action)
6	They ***can't be*** in the office. I have just seen them leaving.	**f**	didn't manage to do
7	They ***must be*** working out this plan.	**g**	probability, expectation
8	Susan ***should/ought to*** be in New York by now.	**h**	lack of ability at present or future

1- …; 2- …; 3- …; 4- …; 5-……; 6-……; 7-…… ; 8-……

4.2 Complete the sentences with *can, can't, could, couldn't or be able to.*

1. I don't think we'll …… to change the terms of the contract.
2. Sorry, I ……see you next week, but I'll phone you when I come back and we'll make the arrangement.
3. If you …… place your order today, we we'll …… ship by Tuesday.
4. She finds German very difficult. She …… understand it, but she …… speak it.
5. I …… play tennis well when I was in my twenties, but now I'm out of practice.
6. I'm sorry I …… take your invitation, because I'm up to my eyes in work.
7. Will you ……go to the client and sort the problem out.
8. The deal broke down, as we ……agree on the price.

4.3. Study the examples where *must* and *can't* are used to make assumptions and complete the sentences using the appropriate form.

present inf.	I'm sure he is the Chief Executive. I'm sure he isn't a Sales Manager.	He ***must be*** the Chief Executive. He ***can't be*** a Sales Manager.
present cont. inf.	I'm certain they are developing a new electric power grid. I'm sure they won't be discussing this issue tomorrow.	They ***must be developing*** a new electric power grid. They ***can't be discussing*** this issue tomorrow.
perfect inf.	I'm certain they have found a new partner. I'm certain they didn't get in touch with the supplier.	They ***must have found*** a new partner. They ***can't have got*** in touch with the supplier.
perfect cont. inf.	I'm certain they have been waiting for your decision too long. I'm certain he hadn't been trying hard.	They ***must have been waiting*** for your decision too long. He ***can't have been*** **trying** hard.

1. I'm certain they start their working day early on Mondays. - *They **must start** their working day early on Mondays*.
2. I don't think she has been working for this company long. - She …….
……...
3. I'm sure they have spent all their money on this new software. - They ……..

……..
4. Sue is very responsible. - I'm sure Sue wasn't driving carelessly when the accident happened. Sue …….
5. I'm certain they have changed their mind. - They ……..
……
6. I'm certain they hadn't paid the bill for electricity. – They ……..
……
7. I'm sure she has got a pay rise. – She ……
……
8. I'm sure the Production Manager is seeing a new client. – The Production Manager
……

5 SKILLS

5.1 A reporter of a weekly TV news magazine *Energy Now* presenting the critical energy issues is interviewing Mr John Milton, a specialist in the field of traditional energy sources. Complete the interview developing the appropriate questions and applying the interview techniques to make the programme interesting to the viewers.

Interviewer: The guest of our today's programme is Mr John Milton, an expert in the field of traditional energy sources. We really appreciate your coming here today, Mr Milton. Today we are going to talk about energy resource that for years has been referred to as the 'black diamond.'

J.Milton: Yes, Coal has long been a highly exploited resource for basic energy. This is because of the numerous advantages of coal energy.
Interviewer: ……..?
J.Milton: Coal is easily available, easy to transport and store, versatile in use and an economic source of energy.

Interviewer: ……..?
J.Milton: Coal is available in abundance around the globe, unlike oil and natural gas, which are available in only certain pockets of the world.

Interviewer: ……..?
J.Milton: To use coal, you just mine it and use it. That is the biggest advantage of coal over other resources of energy like oil and natural gas, which need a lengthy process of refining before they are available for use by consumers.

Interviewer: ……..?
J.Milton: The abundance of resource, easy accessibility and cheaper mode of transportation makes coal a cheaper form of energy. Electricity or gas produced from

coal turns out to be cheaper than electricity or gas produced from other nonconventional sources such as solar and wind, or even nuclear.

Interviewer: ……..?
J.Milton: Coal based power is not dependent on weather which cannot be said for alternative forms of renewable energy such as wind or solar power.

Interviewer: ……
……?
J.Milton: Transporting coal does not require the upkeep of high-pressure pipelines and there is no requirement for extra security when transporting coal.

Interviewer: ……..?
J.Milton: The coal industry not only uses manpower, right from mining all the way up to distribution, but also creates business for small traders and distributors, who, in turn, create more employment opportunities. Thus, direct and indirect employment created by the coal industry is much larger than any other alternate resource.

Interviewer: ……..?
J.Milton: Coal is nonrenewable, which means more coal cannot be produced once it is used. In addition, mining and burning coal harm the environment by disturbing ecosystems, increasing levels of sulfur dioxides and nitrogen oxides, and releasing mercury into the environment.

Interviewer: ……..?
J.Milton: The major disadvantage of burning all fossil fuels is the release of carbon dioxide into the atmosphere. Increased carbon dioxide levels have been liked to climate change. Coal also releases the largest amount of carbon dioxide into the atmosphere compared to either oil or gas.

Interviewer: ……..?
J.Milton: Another byproduct of burning coal as an energy source is the release of sulfur dioxide into the atmosphere. Sulfur dioxide converts to sulfuric acid through oxidation and becomes a component of acid rain.

Interviewer: ……..?
J.Milton: The coal industry has reduced the amount of impurities released into the environment in the production of coal. Technologies such as scrubbers and catalytic converters have also reduced mercury emissions from coal use.

Interviewer: ……..?

J.Milton: Coal is important resource in the power-generating sector. As of 2004, approximately 40 percent of the world's electricity was made from coal and countries such as the United States and Germany relied on it to produce more than half their electricity. According to the Secondary Energy Infobook, 92.9 percent of all the coal in the United States was used for electricity production in 2008. Other countries such as Australia and China generate more than 75 percent of their electricity needs from burning coal.
Interviewer: These are really interesting facts. Thank you for this interesting conversation. We were happy to see you in our programme today.

UNIT 7

1 LEAD-IN

1. What alternative energy sources do you know?
2. In groups of four make a list of alternative energy sources advantages.
3. Do renewable energy sources cause any pollution when they are used to generate electrical power?

2 READING

Alternative Sources of Energy

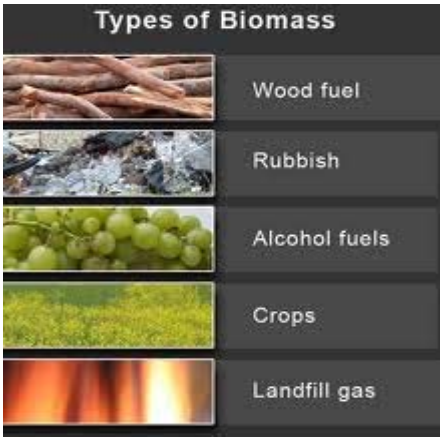
Some estimates say our fossil fuel reserves will be depleted within 50 years, while others say it will be 100 - 120 years. The fact is that neither one of these projections is very appealing for a global community that is so heavily dependent on fossil fuels to meet basic human needs. The bottom line: we are going to run out of fossil fuels for energy and we have no choice but to prepare for the new age of energy production since, most certainly, human demands for energy will not decrease.

Sun, wind and water are perfect energy sources depending on where you are. They are non-polluting, renewable and efficient. They are simple: all you need is sunlight, running water and/or wind. Not only does the use of renewable energy sources help reduce global carbon dioxide emissions, but they also add some much-needed flexibility to the energy resource mix by decreasing our dependence on limited reserves of fossil fuels.

Essentially, these renewable energy sources create their own energy. The object is to capture and harness their mechanical power and convert it to electricity in the most effective and productive manner possible. There’s more than enough renewable energy sources to supply all of the world’s energy needs forever; however, the challenge is to develop the capability to effectively and economically capture, store and use the energy when needed.

Take solar energy for example. The ultimate source of energy is the sun. Its energy is found in all things, including fossil fuels. Plants depend on the sun to make food, animals eat the plants, and both ended up becoming the key ingredients for fossil fuels. Without the sun, nothing on this planet would exist. The sun also provides enough energy that can be stored for use long after the sun sets and even during extended cloudy periods. But making it available is much easier said than done. It would be cost prohibitive to make solar energy mainstream for major world consumption in the near future. The technology is pretty much ready for many business and consumer applications, but it would be too expensive to replace the current energy infrastructure used for fossil fuel energy. Still, according to the European Photovoltaic Industry Association, solar power could provide energy for more than one billion people by 2020 and 26% percent of global energy needs by 2040.

Wind and hydroelectric power, which have been used effectively for generations, are also rapidly growing energy markets. The principle behind both is that the forces of the wind and water currents are passed through turbines which convert their energy into electricity. Commercial wind energy is usually collected by wind 'farms' essentially consisting of hundreds of wind turbines (windmills) spread over large plots of land. But hydroelectric power is harnessed in several different methods. Another form of hydroelectric energy is tidal power. In use since the early 1900s, tidal power stations collect the energy created by the rise and fall of the tides to convert to electricity.



Biomass energy, or energy from burning plants and other organic matter, is one of man's earliest sources of energy. Wood was once the main source of power for heat, and it still is in many developing countries. Most people in developed countries use wood only for aesthetic purposes or secondary heating, limited mainly to fireplaces and decorative woodstoves. Roughly one to two billion people in the developing nations still use wood as their primary source of heat. It is this group that is seen being among the first to convert to solar heating and energy because there is no other existing infrastructure to hinder its development.

Nobody really knows when the last drop of oil, lump of coal or cubic foot of natural gas will be collected from the Earth. All of it will depend on how well we

manage our energy demands along with how well we can develop and use renewable energy sources.

And here is one very important factor: population growth. As the population grows upwards towards nine billion people over the next 50 years, the world's energy demands will increase proportionately. Not only will it be important for renewable energy to keep up with the increasing population growth, but it must outpace not only these demands but begin replacing fossil fuel energy production if we are to meet future energy needs.

By the year 2020, world energy consumption is projected to increase by 50%, or an additional 207 quadrillion BTUs. If the global consumption of renewable energy sources remains constant, the world's available fossil fuel reserves will be consumed in 104 years or early in the 22nd century. Clearly, renewable energy resources will play an increasingly vital role in the power generation mix over the next century.

2.1 Reading comprehension. Complete the following sentences according to the information in the text.

1. It is difficult to estimate precisely fossil fuel reserves because …..... .
2. The only conclusion we have to make about the energy production is that …. .
3. Sun, wind and water are considered to be perfect energy sources, as …… .
4. The main challenge to the use of renewable energy sources is …… .
5. The solar energy is very promising to meet the global energy needs but …….. .
6. According to the European Photovoltaic Industry Association, solar power could provide energy for ……. .
7. The principle of wind and hydroelectric power harnessing is that …… .
8. Biomass energy is the energy …… .
9. The rate of oil, coal and gas depletion will depend on …… .
10. To predict the future of energy consumption and generation it is necessary to take into consideration ……..... .
11. The role of renewable energy resources is vital because …… .

3 VOCABULARY

3. 1 Match these words and phrases with the definitions.

1	estimate	**a**	exhaust (a supply of something)
2	deplete	**b**	bring under control and direct the force of smth
3	run out	**c**	run or move faster than (someone or something else)
4	reduce	**d**	take the place of smth, supersede
5	harness	**e**	calculate roughly
6	capture	**f**	maintain a pace or rate set
7	keep up	**g**	gain control over
8	outpace	**h**	diminish , lower
9	replace	**i**	use up, empty entirely or partially

1- …; 2- …; 3- …; 4- …; 5-…; 6- …; 7-…; 8-…; 9-…

3.2 Choose the right words from the box to fit into the text about renewable energy resources.

derived extracted efficient standpoint important toward replenished environmentally-friendly operate technologies source pollution

What is Renewable Energy?

Renewable energy is energy **1)**…….. from naturally-occurring sources that can be constantly **2)**…….. such as solar, wind and hydroelectric power. This contrasts with energy sources like oil and coal, which rely on burning a material which must be found, **3)**…….. and is not recreated. Renewable energy is often associated with **4)**…….. , or green energy, since it largely involves the use of clean natural resources, though certain types of renewable energy do produce **5)**…….. , and some even argue nuclear power is a renewable energy **6)**…….. . As the global demand for energy increases, renewable energy has become an increasingly **7)**…….. focus around the world, as relying on nonrenewable energy sources is an unsustainable practice in the long run.

Given the increasing population of the human race, the importance of renewable energy is likely to continue to increase in the future, as well as a shift **8)**…….. more cost **9)**…….. energy sources. Currently most of the world's vehicles **10)**…….. on gasoline or diesel fuel derived from crude oil, and renewable substitutes to these fuels, such as ethanol, are not terribly energy efficient. Other clean **11)**…….., such as electric power, hydrogen power cells, compressed air, or new biofuels present possible sources of renewable and efficient fuels for vehicles. From the **12)**……... of electrical power, solar energy has a huge potential, considering the amount of energy the sun produces. It is thousands of times greater than the needs of earth.

4 LANGUAGE REVIEW

- **Modal verbs to express possibility, request, permission.**

4.1 Match the modal verbs with their meanings and translate the sentences into your native language.

1	She ***may/might/could*** still be at work.	**a**	possibility (past)
2	The supervisor doesn't know about the changes. Ann ***may/might/could have forgotten*** to inform him.	**b**	certainty
3	They ***might/could have been killed***.	**c**	possibility (it is likely, perhaps)

4	She ***can't/couldn't*** know about their plans.	**d**	possibility (things were possible but did not happen)
5	He ***can*** win the race. (90%)		

1- …; 2- …; 3- …; 4- …; 5- …

4.2 Rephrase the following sentences in as many ways as possible.

1. It's likely she has forgotten about the arrangement.
She …….
2. Perhaps he will come soon.
He ……..
3. Mary is looking a bit tired. Perhaps she is working too hard.
Mary …….
4. That's definitely not the General Manager. He is far too young.
He …….
5. You seem very familiar. Perhaps we've met before.
We ……
6. I don't know why he didn't tell me that he had left his job. It's possible he thought I would be angry.
He …….
7. It's likely we'll get in touch with them today.
We …….
8. Perhaps she is visiting our factory in France.
She ……
9. I'm certain he didn't call us.
He …….
10. Yesterday I didn't lock the documents in the safe. Luckily they were not been stolen.
The documents ……

4.3 Match the modal verbs and constructions with their meanings and translate the sentences into your native language.

1	***Can*** I take this document? – Yes, of course.	**a**	giving permission (everyday speech)
2	***Could*** I talk to you? – Certainly.	**b**	asking permission (informal)
3	***May/Might*** I ask you another question? – Yes, of course.	**c**	asking permission (informal) (more polite)
4	You ***can*** ask to change the shifts.	**d**	giving permission (written notice)
5	You ***may*** take only one item of hand luggage.	**e**	permission to do something in a particular situation in the past
6	***May/Can/Could*** I have your pen, please? – Here you are.	**f**	asking permission (informal) when you don't know the other person very well

7	All the citizens over the age of 18 ***can/are allowed to*** vote.	**g**	permission (lows, regulations)
8	I ***was allowed to*** miss this meeting yesterday.	**h**	general permission to do something in the past
9	I ***could/was allowed to*** go to parties when I was young.	**i**	request

1-…; 2- …; 3- …; 4- …; 5- … ; 6- … ; 7- …; 8- … ; 9- …

4.4 Make the right choice.

1. – Might I use your calculator?
   – Of course you ***may/might***.
2. – ***May I/Am I allowed to*** park in the company park?
   – Of course you are.
3. – I ***could/was allowed to*** attend the seminar yesterday.
   – Was it interesting?
4. – ***Can/Might*** I have this biscuit, Ann?
   – Of course. Help yourself.
5. – Excuse me. ***May I/Am I allowed to*** leave the office?
   – Yes, but don't be too long.
6. – Could I leave earlier?
   – No, you ***couldn't/can't***.
7. – ***Can/Might*** I turn the TV off?
   – Of course.
8. – ***Must/Might*** I borrow these files, sir?
   – Yes. Take whatever you need.

4.5 Complete the telephone conversation using the phrases from the list below.

Could you tell me	***can't see***	***could you speak***
Can I call you	***Could I speak to***	***I can't tell***
can you hear	***can I help you***	***Could you repeat***
can you send	***Could you hold***	

Operator: Good morning, the Murray Feiss Store, this is David speaking.

Customer: **1)**…….. someone in Customer Services, please?

Operator: Yes, of course, I'll put you through.

Department manager: Customer Services, Mark speaking, how **2)**…….?

Customer: I'm calling about your Kovacs torchiere lamps (GK P256). **3)** ……. if you have any in stock?

Department manager: I'll just go and see. **4)**…… the line, please?

Customer: Yes, no problem, I'll wait.

Department manager: Hello? I **5)**……. any on the shelves. I'll need to check the order status on the computer.
6) …… back?
Customer: Certainly. My name is Mary Smith and my telephone number is 0786 1967.
Department manager: Sorry, **7)** ……. up? It's a terrible line.
Customer: Is that better? **8)** ……. me now?
Department manager: Yes, that's much better. **9)** ……. the number please?
Customer: Of course. It's 0786 1967. I'll be on this number all morning.
Department manager: Sorry, **10)** ……. You if we've got any Kovacs GK P256 in stock right now, but I'll get back to you as soon as I have the information.
Was there anything else?
Customer: Er, yes, **11)** ……. me a copy of your latest catalogue?
Department manager: Of course, I'll put one in the post to you today. What's your address?
Customer: It's 15 Station Road, London N6.

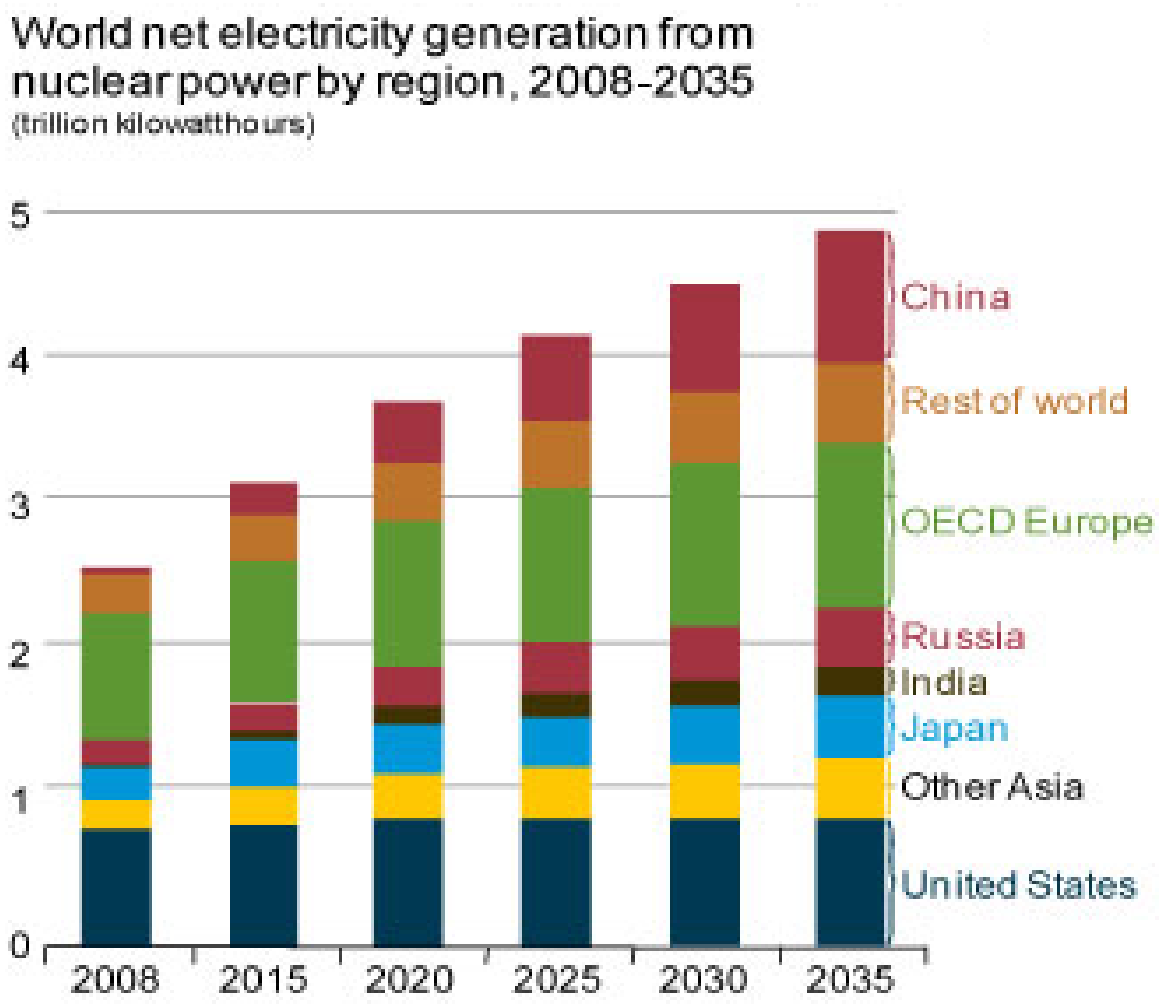
5 SKILLS

5.1 *To address the uncertainty inherent in projections of nuclear power growth over the long term, a two-step approach is used to formulate the outlook for nuclear power. In the short term (through 2020), projections are based primarily on the current activities of the nuclear power industry and national governments. There is general agreement among analysts that nuclear projects are likely to become operational in the short term. After 2020, the projections are based on a combination of announced plans or goals at the country and regional levels and consideration of other issues facing the development of nuclear power, including economics, geopolitical issues, technology advances, environmental policies, supply chain issues, and uranium availability. Generally, it is supposed that nuclear generation worldwide will increase by 2.4 percent per year.*
http://www.alternativeenergysource.org/pros_cons.htm

Using the bar chart presented below, compare the electricity generation from nuclear power in different regions in the world.

USEFUL PHRASES

Presenting Visuals	Commenting trends
As you can see from this bar chart... *I'd like to show you ...* *Let me draw your attention to ...* *Let's look more closely at ...* *These figures refer to...* *This bar chart shows ...* *As you can see, the main ...* *The bar chart represents ...* *Here you can see a comparison between ...* *On the bar chart you will note ...* *We must focus our attention on ...*	*A slight/constant/marked/substantial/increase in* *an increase of about/roughly/approximately...* *an overall increase in ...* *an upward trend in ...* *... reached record levels / reached a peak in* *a slight / notable / significant decrease in ...* *the downturn began in ...* *an initial upward trend was followed by ...*



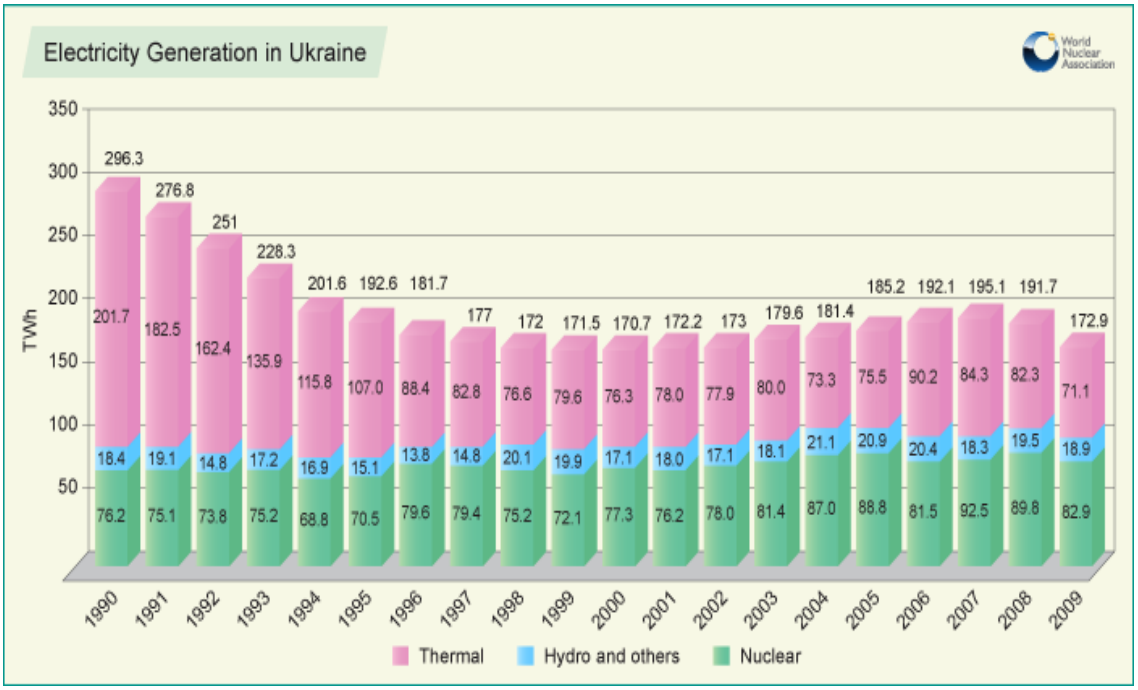
http://www.learn-english-today.com/business-english/graphs-charts.html

UNIT 8

1 LEAD-IN

Analyse the bar chart presenting information on the electricity generation in Ukraine.

Define the main tendencies in different energy sources use.



2 READING

Ukraine Energy Profile
(Nonrenewable and Renewable Energy Sources in Ukraine)

Three types of generation facilities operate in Ukraine: thermal power plants (steam turbine and diesel types), hydroelectric plants (hydroelectric proper and hydroelectric accumulating plants) and nuclear power plants. The role of wind and helium power plants is minor; though it is increasing gradually.

At present, the situation in the electricity sector is characterized by the following parameters: total capacity of all Ukrainian power plants is 52 GW, including 33.5 GW (64.4%) at thermal plants, 13.8 GW (26.5%) at nuclear plants and 4.7 GW (9.0%) at hydroelectric plants.

The priority energy resource in Ukraine is the natural gas which part in primary energy resources consumption makes up 41 %.Ukraine belongs to the countries with deficiency of own natural hydro carbonic resources: domestically produced gas fulfills only 20 – 25% of total gas demand, while Ukrainian oil production meets only

10 to 12% of oil requirement. The oil and gas share in the general balance of use of primary energy resources of Ukraine makes up 59.4 %.

In 1991 gas consumption made up 118.1 billion cubic meters and the country occupied the third place in the world after the USA and Russia. For the last 15 years natural gas consumption in Ukraine has decreased and in 2007 it made up 73.4 billion cubic meters. The consumption of oil and petroleum product in Ukraine for the last years has decreased from 29 to 25 million tons. The extraction of natural gas in the country had been declining over a long period; in 1997-2000 it was stabilized at the level of 18 billion cubic meters for a year, and in 2007 it made up 20.7 billion cubic meters. The extraction growth was reached by drilling of new oil wells, effective utilization of operating fund of wells, introduction of secondary and tertiary oil and condensate recovery methods.

Coal is the only energy carrier, which reserves are sufficient to cover the needs of the national economy for over 300 years. Ukraine is No 8 country in the world in terms of coal reserves. Coal constitutes 95% of all organic fuel reserves in the country. The total estimated coal reserves are 117.3 billion tons. Most of the coal resources are found in two coal basins: the Donetsk and Dnieper basins. The domestic coal reserves count for 177 billion tons. The Donetsk basin contains most of the country's hard coal resources. The Dnieper basin contains brown coal reserves and currently is of relatively minor importance. Ukrainian coal mines are the oldest in CIS: 30% of mines have been in operation for more than 50 years. Most coal mines have inefficient and outdated equipment and technologies. The main efforts must be oriented into the introduction of new energy efficient technologies and highly technological mining equipment, the improvement of the coal sector safety, the development of the state concept aimed at the attraction of investments into the industry.

Ukrainian oil transportation system which operation is carried out by OJSC Ukrtransnafta consists of 19 oil-trunk pipelines having a total length of 4,766.1 km. The annual capacity of the system for oil transit from the Russian Federation is 114 million tons at the point of entry, and 56.3 million tons at the exit point. If necessary, the oil pipeline system is capable of fully meeting the needs of the refineries given their maximum design refining capacity of over 50 million tons per year. The oil pipeline system operation is ensured by 51 oil pumping stations with 176 pumping units having an aggregate capacity of 356,500 kW. The tank battery has an aggregate capacity of 1,085,000 cubic meters.

The oil pipelines have been in operation for 20 – 44 years and 90% of them have exceeded their depreciation period. The oil transport system equipment is maintained in a reliable condition, but is obsolete and requires replacement or upgrading, and additional operational costs. It is necessary that the condition of the existing oil pipeline system be made compatible with international standards, which

requires introduction of new processes and technologies: energy-efficient electric motors and variable-frequency electric drive, high-efficiency pumps, state-of-the-art tank battery equipment, introduction of advanced automatic and remote control systems, turbulence-resistant additives, effective pipeline anticorrosive coating and pipeline electrochemical protection systems, efficient processes for cleaning pipelines and tanks from bottom water and paraffin sediments, oil volume and quality accounting system, advanced oil pipeline diagnostics and maintenance systems, information analysis systems for optimizing the oil transport system operating modes.

Ukraine Energy profile is characterized by a high level of dependency on imported fossil fuel with about 80 – 90 % of oil and 75 – 80 % of gas being imported to the country, primarily from Russia. The recent events of Ukraine facing gas price surge makes Ukraine more aware of using renewable energy and implementing energy conservation measures as a national strategy as Ukraine having population of about 47 million appears to be the sixth largest gas consuming country in the world. At the same time Ukraine is rated as the sixth biggest carbon dioxide emitting country in the world. Another fact that increases Ukraine's interest in renewal energy is sadly-known Chernobyl Nuclear Power Plant catastrophe which still echoes in high-public awareness regarding use of atomic power plants in Ukraine.

Ukraine's use of renewable energy sources accounts for about 8 % of its electricity generation but less than 3 % of the total energy consumption with the main part of about 75 % being contributed by large hydro-power plants. Meanwhile Ukraine has a huge potential of renewal energy resources of almost all the types (solar, wind, biomass, biofuel, geothermal and micro hydropower). Tapping this resource promises a great potential in accordance with the world's trend for using renewal energy and in consideration of Kyoto protocol, which was signed by Ukraine among other countries.

Ukraine government has made several crucial steps to recognize the renewal energy potential by declaring in 1996 a program targeted at achieving by 2010 10% of total Ukraine energy consumption being produced by means of renewal and 'non-traditional' energy. Following it there was a presidential edict signed in 2001 providing taxation rebate for the companies developing solar, wind and geothermal projects. The current national program envisions achieving the use of renewal energy sources at the rate which is comparable with targets set by some of European countries. The total installed capacity of alternative energy facilities in Ukraine is 411 megawatts (107 operating facilities – 76 hydroelectric power plants, 18 solar power plants, 11 wind farms and two bio-energy facilities) or 0.8% of the power generating capacity of the country. In 2011, 257 megawatts of alternative energy facilities were commissioned, and it is expected that in 2012 wind farms with a total capacity of 252

megawatts and solar power plants with the total capacity of 290 megawatts will be launched.

2.1 Reading comprehension. Answer the following questions to the text.

1. What types of energy generation facilities operate in Ukraine?
2. What is the current role of wind and solar power plants in the country economy?
3. What is the total capacity of all Ukrainian power plants and how it is distributed between thermal plants, nuclear plants and hydroelectric plants?
4. What is the main energy resource in Ukraine?
5. How has the consumption of natural gas and oil changed in Ukraine over the recent years?
6. How was it managed to reach the oil extraction growth?
7. How sufficient are considered to be coal reserves in Ukraine?
8. What are the main coal basins?
9. What must the main efforts in Ukrainian coal industry be oriented to?
10. How efficient is Ukrainian oil transportation system?
11. What measures must be taken to support and renew the old pipelines system?
12. What are the main features of the energy profile of Ukraine?
13. How important is the development of renewable energy sources in the country?
14. Does Ukraine have some potential of renewable energy resources?
15. What strategy does Ukrainian government keep on concerning the renewal energy sources?
16. What is the total capacity of alternative energy facilities installed in Ukraine?

3 VOCABULARY

3. 1 Match the following words from the text given above to make word partnerships.

1	power generation	**a**	capacity
2	steam	**b**	fund
3	total	**c**	economy
4	energy	**d**	turbine
5	resources	**e**	basin
6	remote	**f**	costs
7	operating	**g**	facilities
8	coal	**h**	carrier
9	national	**i**	consumption
10	operational	**j**	control
11	depreciation	**k**	period

1- …; 2- …; 3- …; 4- …; 5-…; 6-…; 7- …;
8- …; 9- …; 10- …; 11- …

3. 2 Use the partnerships from 3.1 to complete the following sentences.

1. …… …….. is a part of the earth's surface consisting of coal strata that slope down to a common centre.
2. A …… …….. is a device that extracts thermal energy from pressurized steam and uses it to do mechanical work on a rotating output shaft.
3. The South Ukraine Nuclear Power Station has three VVER-1000 reactors and a …… …….. of 2,850 megawatts (MW).
4. The continued trend toward greater …… …….. and wider environmental impacts is apparent in developed and developing countries.
5. The…… …….. includes the sectors of the production sphere, where material social product is created, and sectors of the nonproduction sphere, where non-material services are performed.
6. A …… …….. is a component of an electronics device originally used for operating the device wirelessly from a short line-of-sight distance.

3.3 Choose the right words from the box to fit into the text about the Chernobyl disaster in Ukraine.

accident occurred facility challenge mortality government causing error worst reactors estimated produced releasing radiation

The Chernobyl disaster was a nuclear **1)** …….. that occurred on 26 April 1986 at the Chernobyl Nuclear Power Plant in Ukraine. It is considered the **2)** …….. nuclear power plant accident in history, and is one of only two classified as a level 7 event on the International Nuclear Event Scale (the other being the Fukushima Daiichi nuclear disaster).

The Chernobyl Nuclear Power Station included four nuclear **3)** ……, each capable of producing one gigawatt of electric power. At the time of the accident, the four reactors **4)** …….. about 10 percent of the electricity used in Ukraine.

The construction of the Chernobyl power station began in the 1970s. The first of the four reactors was commissioned in 1977, and Reactor No. 4 began producing power in 1983. When the accident **5)** …….. in 1986, two other nuclear reactors were under construction.

On April 26, 1986, the operating crew planned to test whether the Reactor No. 4 turbines could produce enough energy to keep the coolant pumps running until the emergency diesel generator was activated in case of an external power loss. During the test, power surged unexpectedly, **6)** …….. an explosion and driving temperatures in the reactor to more than 2,000 degrees Celsius—melting the fuel rods, igniting the reactor's graphite covering, and **7)** …….. a cloud of **8)** …….. into the atmosphere.

The precise causes of the accident are still uncertain, but it is generally believed that the series of incidents that led to the explosion, fire and nuclear

meltdown at Chernobyl was caused by a combination of reactor design flaws and operator 9) ……... .

After the accident, Reactor No. 4 was sealed, but the Ukranian **10)** …… allowed the other three reactors to keep operating because the country needed the power they provided. Reactor No. 2 was shut down after a fire damaged it in 1991, and Reactor No. 1 was decommissioned in 1996. In November 2000, the Ukranian president shut down Reactor No. 3 in an official ceremony that finally closed the Chernobyl **11)** …….. .

Estimates of the eventual death toll from Chernobyl vary widely. A 2005 report by the Chernobyl Forum—eight U.N. organizations— **12)** …….. the accident eventually would cause about 4,000 deaths. Greenpeace places the figure at 93,000 deaths, based on information from the Belarus National Academy of Sciences. The Belarus National Academy of Sciences estimates 270,000 people in the region around the accident site will develop cancer as a result of Chernobyl radiation and that 93,000 of those cases are likely to be fatal. Another report by the Center for Independent Environmental Assessment of the Russian Academy of Sciences found a dramatic increase in **13)** …….. since 1990—60,000 deaths in Russia and an estimated 140,000 deaths in Ukraine and Belarus—probably due to Chernobyl radiation. The biggest **14)** …….. facing communities still coping with the fallout of Chernobyl is the psychological damage to 5 million people in Belarus, Ukraine and Russia.

4 LANGUAGE REVIEW

- **Modal verbs to express offer, suggestions, advice, criticism.**

4.1 Match the modal verbs with their meanings and translate the sentences into your native language.

1	***Shall/Can/Could*** I help you prepare the presentation?	**a**	asking for suggestions or instructions
2	***Shall/Can/Could*** we employ a new designer? – I'd rather not.	**b**	criticism
3	Where ***shall*** we go on Sunday? – We can/could go to the theatre.	**c**	offer
4	***Will/Would/Can/Could*** you send me this information? - Of course.	**d**	advice
5	You ***should/ ought to*** be more careful.	**e**	suggestion
6	You ***should/ ought to have*** prepared the drafts in advance.	**f**	request

1-…; 2- …; 3- …; 4- …; 5- … ; 6- …

4.2 Use *shall* or *will* in the following sentences.

1. …… you give me a hand with these suitcases?
2. …… I make a copy of this document for you?

3. What …… we select for the next exhibition?
4. …… you answer the phone please?
5. Where …… we sit in the conference room?
6. …… we have a short break now?
7. …… I do that or …… you?
8. …… I open a window?

4.3 Use *should/ought to* or *should/ought to have* with the verbs in brackets.

1. Sarah ……. (be) late so often. That's what caused her problems at work.
2. You ……. (phone) them and cancel the order. The prices are very high and we won't be able to pay for these electrical appliances.
3. He ……. (not/refuse) if he was offered such an interesting job.
4. You ……. (get) a laptop. They are so convenient if you often travel on business.
5. You ……. (buy) a travel guide if you didn't know the city well.
6. They lost a lot of money on their investment. They ……. (be) more careful.
7. You ……. (worry) so much. We'll be able to finish the work in time.
8. They ……. (mention) that earlier. We could have taken some measures.

4.4 Choose the right word(s).

1. A: **Could/May/Shall** you tell me the time, please?
   B: It's half past ten.
2. A: **May/Should/Would** I help you?
   B: Yes, please. **Can/Shall/Would** I have some information about this new model?
3. A: **Would/ Should/ Shall** I send you our new brochure?
   B: No, thank you. We have already have it.
4. A: **Can/Shall/May** you give me the details of this project, please?
   B: Certainly. I'll send you all the files in a couple of minutes.
5. A: **Shall/May /Could** you help me with my report?
   B: Yes, of course.
6. A: **Couldn't/May/Can** I speak to Tim Wail, please?
   B: Just a moment, please. I am putting you through.
7. A: **Could/Would/Will** I use your telephone, please?
   B: Yes, of course.
8. A: **Should/ May/ Will** I sit down, please?
   B: Yes, of course. Make yourself at home.

4.5 Match the items in column A to their synonyms in column B

	A		B
1	You should/ought to …	**a**	You aren't allowed to …
2	You must …	**b**	It wasn't necessary for us to... (but we did)
3	Shall we …?	**c**	Why don't we …?
4	You needn't …	**d**	He managed to …
5	We needn't have …	**e**	It wasn't necessary for us to …
6	We didn't need to …	**f**	You had better …
7	You mustn't …	**g**	I'm sure she's …
8	He was able to …	**h**	Do you mind if I …?
9	She must be …	**i**	You are obliged to …
10	He can't be …	**j**	It isn't necessary for you to …
11	Could I …?	**k**	I'm sure he isn't …
12	He may be …	**l**	Perhaps he's …

1-…; 2- …; 3- …; 4- …; 5- … ; 6- …; 7-…; 8- …; 9- …; 10- …; 11- … ; 12- …

4.6 Rewrite each of the sentences starting with the words given and using one of the modal verbs.

1. Our company will possibly buy new equipment to meet the customers' demands.
   Our company ……
2. It is not necessary for you to stop the assembly line to do the maintenance work.
   You ……...
3. It is very important to follow the instructions closely.
   You …….
4. The workforce is allowed to have a short break twice a day.
   They ……
5. I'm sure the General Manager is not in the office, he went to the factory a couple of hours ago.
   The General Manager …….
6. They managed to increase the productivity.
   They ……....
7. You are forbidden to enter this area.
   You …….
8. You ought to have signed all these documents before you left the office.(BUT you didn't)
   You ……
9. They are obliged to wear a uniform at work.
   They ……...
10. Why did you change the terms of delivery? It wasn't necessary.
    You ……
11. I advise you to spend more time learning the international experience in this field.
    You ……

5 SKILLS

5.1 In your business career you will have to give some formal presentations at conferences or other events.

In this unit you are going to prepare a presentation of the renewable energy sources potential in Ukraine. Use the information given in the text, surf the Internet to find out more about the subject under consideration and look through some recommendations to the structure and useful language highlighted below.

- At the beginning, you should introduce yourself and state the purpose of your presentation.
  Right then, let's get started. For those of you who don't know me, I'm ……, the representative of …… . Today, I'm going to be showing you …… (informal)
  Good morning, ladies and gentlemen. Let me first introduce myself, my name is …… and my role in …… is …… . This morning my objective is to ……(more formal)
- Once you have greeted the audience and introduced yourself, you must then explain the content of your presentation. You can do this in a variety of ways, but the most common method is to outline briefly the structure. To do this you should use some connectors or signaling language. Unlike writing, a presentation has no paragraphing to help an audience know when the speaker is changing subject or concluding his remarks. So this signaling language is crucial in the main part of the presentation too, and will help the audience understand and appreciate your presentation.

INTRODUCTION

State what you will do	State how you will do it
What I'd like to do is to discuss …	I'm going to deal with three aspects of the subject …
What I intend to do is to explain …	I'm going to divide my presentation into … sections.
In my talk today, …	I've divided my presentation into … sections.
My topic today is …	I thought it would be useful to divide my talk into … sections.
Today, I'm going to talk about …	This subject can be looked at under the following headings: …
I'm going to talk to you about …	I'll take about ... minutes.
My colleagues and I are going to give a short presentation on …	The talk should last about ... minutes.
Today I want to consider …	I'll be happy to answer questions at the end.
In this talk, I would like to concentrate on …	If you have any questions, I'll try to answer them afterwards.
The subject of this talk is …	If you have any questions, please feel free to interrupt.
The purpose of this talk is to …	
This talk is designed to …	

MAIN BODY

Ordering points
Firstly
To start with,
First of all,
Secondly
Next
Then
Thirdly
Lastly
Finally

Giving examples
For example, …
For instance, …
And as proof of that, …
Remember …
You only have to think of …

Emphasising
Furthermore …
What's more, …
This supports my argument that …
It follows, therefore, that …

Referring back to what you have said
As I said at the beginning,...
In the first part of my talk, I said …
As I mentioned earlier, …
I told you a few minutes ago that …

Putting it in other words
In other words, …
That is to say, …
To put it another way, …
The point I'm making is …
What I'm suggesting is …
Let me put it another way…

Using visuals
On this graph, …
Take a look at this.
Let's have a look at this.
I'd like you to look at this.
I'd like to draw your attention to …
Here we can see …
The … represents …
The graph illustrates …
As you can see, …
If you look closely, you'll see …

Moving on

I'd like now to move on to …
Turning now to …
Moving on now to …
Having looked at …, I'd now like to consider …
Now, let's turn to ...
I now want to turn to …
The next point is …
Another interesting point is …
The next aspect I'd like to consider is …
I'd now like to turn to …

CONCLUSION

Concluding
So …
We've seen that …
First we looked at … and we saw that .
Then we considered … and I argued …
In short …
In brief, we have looked at ...
To sum up …
In conclusion, I'd like to emphasise that …
I think that covers most of the point.
That completes my presentation.
Thank you for your attention.

Invite questions
That covers the main points. If you have any comments or questions, I'll be happy to hear them.
So that explains my main point. Does anyone have any comments or questions?
I'd be glad to try and answer any questions.

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