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«БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ
ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ»

АНГЛИЙСКИЙ ЯЗЫК

**Учебно-методическое пособие
с терминологическим словарем для студентов
I и II курсов специальности 1-43 01 06
«Энергоэффективные технологии
и энергетический менеджмент»**

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Р е ц е н з е н т ы :
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Пособие включает систему упражнений, способствующих формированию и развитию умений и навыков вести беседу, выступать с сообщениями и участвовать в дискуссии. Материалом для данного издания послужили тексты из энциклопедий и справочников, а также учебных пособий для различных категорий обучаемых. Пособие содержит следующие базовые разделы: «Энергия», «Электричество», «Ископаемое топливо», «Невозобновляемые источники энергии», «Ядерная энергия» и др.

Предназначено для студентов специальности «Энергоэффективные технологии и энергетический менеджмент», а также других энергетических специальностей, может использоваться как в аудиторной работе, так и для организации самостоятельной деятельности.

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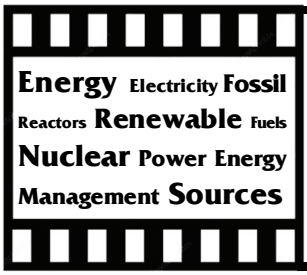


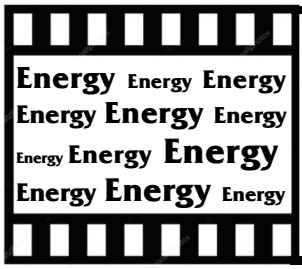
ПРЕДИСЛОВИЕ

В современном мире при подготовке специалистов любого профиля особое значение приобретает овладение иностранным языком. Курс английского языка для неязыковых специальностей учреждений высшего образования носит профессионально ориентированный характер, его задачи определяются профессиональными и познавательными потребностями специалистов соответствующего профиля, а основной целью выступает практическое овладение английским языком.

Данное пособие является органической частью учебно-методического комплекса по английскому языку и предназначено для студентов I и II курсов специальности «Энергоэффективные технологии и энергетический менеджмент». Оно представляет собой комплекс текстов по энергетической тематике из оригинальных англоязычных источников и имеет целью развитие и совершенствование у студентов навыков различных видов чтения специализированной литературы на английском языке с выходом в устную речь, углубление знаний в области лексики.

Методическое пособие состоит из 6 разделов, каждому разделу соответствуют тексты по определенной тематике, а также дополнительных текстов для чтения и перевода и тематического словаря. Каждый текст снабжен предтекстовыми и послетекстовыми фонетическими, лексическими и грамматическими упражнениями, которые позволяют снять трудности при работе с текстами, дают возможность лучше усвоить материал, призваны выработать у студентов навыки правильного произношения, а также подготовить к чтению специальной неадаптированной литературы.

Все тексты носят познавательный характер и могут быть использованы для аудиторной работы со студентами, для самостоятельной домашней работы, для подготовки сообщений по заданной тематике, а также для индивидуальной работы на занятиях.



UNIT 1

A. ENERGY

I. Read and memorize the following words.

Contain – содержать в себе, включать; cookie – домашнее печенье; diesel fuel – дизельное топливо; energy source – источник энергии; fossil fuel – ископаемое топливо; gasoline – бензин; geothermal energy – геотермальная энергия; hydropower – гидроэнергетика; jump shot – бросок в прыжке; non-renewable – невозобновляемый; nuclear fission – ядерное деление, расщепление ядра; radiant energy – энергия излучения; renewable – возобновляемый; soar – парить, высоко летать; split – расщеплять, раскалывать, разрушать; stored (potential) energy – накопленная, потенциальная энергия; thermal – термический, тепловой; ultimately – в конечном счете, в конце концов; uranium – уран; working (kinetic) energy – действительная, кинетическая энергия.

II. Read and pronounce the following words correctly.

Thermal, radiant, mechanical, chemical, nuclear, favourite, astronaut, kinetic, source, renewable, non-renewable, recreate, electricity, hydrogen, solar, geothermal, biomass, fossil, fuel, uranium, fission, ultimately, source, gasoline, propane.

III. Think and express your opinion.

1. In what forms do we use energy every day? 2. Energy and electricity: are these two words synonyms?

IV. Read and translate the text.

Energy

It comes in different forms – heat (thermal), light (radiant), mechanical, electrical, chemical, and nuclear energy. Energy is in everything. We use energy to do everything we do, from making a jump shot to baking our favourite cookies, to sending astronauts into space – energy is there, making sure we have the power to do it all. There are two types of energy – stored (potential) energy and working (kinetic) energy. For example, the food you eat contains chemical energy, and your body stores this energy until you release it when you work or play.

All forms of energy are stored in different ways, in the energy sources that we use every day. These sources are divided into two groups – renewable (an energy source that we can use over and over again) and non-renewable (an energy source that we are using up and cannot recreate in a short period of time). Renewable and non-renewable energy sources can be used to produce secondary energy sources including electricity and hydrogen.

Renewable energy sources include solar energy, which comes from the sun and can be turned into electricity and heat. Wind, geothermal energy from inside the earth, biomass from plants, and hydropower and ocean energy from water are also renewable energy sources.

However, we get most of our energy from non-renewable energy sources, which include the fossil fuels – oil, natural gas, and coal. They are called fossil fuels because they were formed over millions and millions of years by the action of heat from the Earth's core and pressure from rock and soil on the remains (or "fossils") of dead plants and animals. Another non-renewable energy source is the element uranium, which atoms we split (through a process called nuclear fission) to create heat and ultimately electricity.

We use all these energy sources to generate the electricity we need for our homes, businesses, schools, and factories. Electricity "energizes" our computers, lights, refrigerators, washing machines, and air conditioners, to name only a few uses. We use energy to run our cars and trucks. Both the gasoline used in our cars, and the diesel fuel used in our trucks are made from oil. The propane that fuels our outdoor grills and makes hot air balloons soar is made from oil and natural gas.

V. Answer the questions.

1. What is energy? Where does it come from? What types of energy do you know? 2. What is source? What energy sources do you know? 3. What does it mean: renewable? What does it mean: non-renewable? 4. Which energy sources are called renewable (non-renewable)? 5. What for do we use energy sources? (What do they produce?) 6. What is gasoline made of? What is propane made of? Where are they used?

VI. Complete the sentences using a word derivationally related to the word given in brackets.

1. All major energy sources we use today are classified into two broad groups – (renew) and non-renewable.

2. Non-renewable energy sources are the kind they use most in the United States. 3. Coal, petroleum, natural gas, propane, and uranium are non-renewable energy sources. 4. They are used to make (electric), to heat our homes, to move our cars, and to (manufacturer) all sorts of products from candy bars to CDs.

5. These energy sources are called non-renewable because they cannot be (replacement). 6. Petroleum, for example, was formed millions of years ago from the remains of ancient sea life, so we can't replace our (supplier). 7. We could run out of non-renewable sources some day.

8. Renewable energy sources (including) biomass, geothermal, hydropower, solar and wind. 9. They are called renewable (energize) sources because their supplies are replenished. 10. Day after (daily), the sun shines, the wind blows, and the rivers flow. 11. We use renewable energy sources (main) to make electricity.

VII. Match the words below to their definitions.

1. potential energy	a) the capacity of a physical system to do work;
2. kinetic energy	b) relating to or derived from the sun;
3. energy	c) that can not be renewed;
4. renewable	d) nuclear reaction in which a massive nucleus splits into smaller nuclei with the simultaneous release of energy;
5. non-renewable	e) the stored energy;
6. electricity	f) the centre of an object;

7. solar	g) to fly upwards or high in the sky;
8. biomass	h) volatile flammable mixture of hydrocarbons derived from petroleum; used mainly as a fuel in internal-combustion engines;
9. fossil fuels	i) to separate into parts or portions;
10. core	j) energy made available by the flow of electric charge through a conductor;
11. split (v)	k) the mechanical energy that a body has by virtue of its motion;
12. fission	l) capable of being renewed; replaceable;
13. gasoline	m) plant materials and animal waste used as fuel;
14. soar (v)	n) fuel consisting of the remains of organisms preserved in rocks in the earth's crust with high carbon and hydrogen content.

VIII. Choose the best continuation for each of the following sentences.

1. There are two types of energy – … .
a) stored (kinetic) energy and working (potential) energy;
b) stored (potential) energy and working (kinetic) energy;
c) electrical and chemical energy.
2. The food you eat contains … .
a) chemical energy;
b) potential energy;
c) mechanical energy.
3. All forms of energy are stored in different ways, in the … .
a) energy sources that we never use;
b) energy turbines that we use every day;
c) energy sources that we use every day.
4. Renewable source is an energy source that we can … .
a) use over and over again;
b) use from time to time;
c) use once upon a time.
5. Non-renewable source is an energy source that we … .
a) never use;
b) are using up and can recreate in a short period of time;
c) are using up and cannot recreate in a short period of time.

6. Renewable energy sources include … .
a) only hydropower and ocean energy;
b) solar energy;
c) coal and biomass.
7. Another non-renewable energy source is the … .
a) element oxygen;
b) element sodium;
c) element uranium.
8. We use all these energy sources to generate … .
a) electricity;
b) radio waves;
c) x-rays.
9. Both the gasoline used in our cars, and the diesel fuel used in our trucks … .
a) are made from natural gas;
b) are made from oil;
c) are made from coal.
10. The propane that fuels our outdoor grills is made from … .
a) peat and natural gas;
b) natural gas and coal;
c) oil and natural gas.

IX. Match the synonyms.

1. to define	a) need;
2. to transform	b) harm;
3. various	c) very;
4. demand	d) to use;
5. to harness	e) obvious;
6. evident	f) exhaustion;
7. to generate	g) to determine;
8. damage	h) different;
9. depletion	i) to change;
10. extremely	j) to produce.

X. Form the nouns from the following verbs using suffixes -tion, -y, -ment.

To transform, to consume, to generate, to emit, to discover, to move, to define, to pollute, to industrialize, to develop, to concentrate.

XI. Write out the "key" words from each paragraph.

XII. Retell the text using the "key" words.

B. FORMS OF ENERGY

I. Read and memorize the following words.

Application – применение, использование; atom nucleus – ядро атома; bonds of atoms – связи атомов; chemical compound – химическое соединение; compressed spring – сжатая пружина; convert – превращать, преобразовывать; dam – дамба, плотина; embargo – эмбарго, запрет; fission – расщепление, деление; fusion – слияние, соединение; lightning – молния; longitudinal wave – продольная волна, волна сжатия; nuclear power plant – атомная электростанция; power – приводить в движение, давать энергию; recognize – узнавать, распознавать; release – высвобождать; reservoir – водохранилище, запас, накопитель; transverse waves – поперечные волны; wire – провод, проволока; x-rays – рентгеновские лучи.

II. Read and pronounce the following words correctly.

Freezer, ability, recognize, category, store, bond, molecule, gravitational, photosynthesis, release, nucleus, fission, fusion, hydropower, reservoir, neutron, tiny, internal, vibration, molecule, substance.

III. Think and express your opinion.

1. Is it possible to create energy? 2. What form of energy is the most useful for the mankind?

IV. Read and translate the text.

Forms of Energy

Energy does things for us. It moves cars along the road and boats on the water. It bakes a cake in the oven and keeps ice frozen in the freezer. It plays our favorite songs and lights our homes at night so we can read a good book.

Energy helps our bodies grow and our minds think. Energy is a changing, doing, moving, working thing.

Energy is defined as the ability to produce, change or do work, and that work can be divided into several main tasks we easily recognize.

Energy produces light, heat, motion, sound, growth and powers technology.

There are many forms of energy, but they all fall into two categories – potential or kinetic.

Potential energy is stored energy and energy of position – gravitational energy. There are several forms of potential energy, including:

Chemical energy is energy stored in the bonds of atoms and molecules. It is the energy that holds these particles together. Biomass, petroleum, natural gas, and propane are examples of stored chemical energy. Chemical energy is converted into thermal energy when we burn wood in a fireplace or gasoline in a car's engine.

During photosynthesis, sunlight gives plants the energy they need to build complex chemical compounds. When these compounds are broken, the stored chemical energy is released as heat, light, motion and sound.

Mechanical energy is energy stored in objects by the application of a force. Compressed springs and stretched rubber bands are examples of stored mechanical energy.

Nuclear energy is energy stored in the nucleus of an atom – the energy that holds the nucleus together. This energy can be released when the nuclei are combined or split apart. Nuclear power plants split the nuclei of uranium atoms in a process called *fission*. The sun combines the nuclei of hydrogen atoms into helium atoms in a process called *fusion*.

In both fission and fusion, mass is converted into energy, according to Einstein's theory ($E = mc^2$).

Gravitational energy is energy of position or place. A rock resting at the top of a hill contains gravitational potential energy. Hydropower, such as water in a reservoir behind a dam, is an example of gravitational potential energy.

Kinetic energy is motion – of waves, electrons, atoms, molecules, substances, and objects.

Electrical energy is the movement of electrons. Everything is made of tiny particles called atoms. Atoms are made of even smaller particles called electrons, protons, and neutrons. Applying a force can make some of the electrons move. Electrons moving through a wire are called electricity. Lightning is another example of electrical energy.

Radiant energy is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays and radio waves. Light is one type of radiant energy. Solar energy is an example of radiant energy.

Thermal energy, or heat, is the internal energy in substances – the vibration and movement of atoms and molecules within substances. The faster molecules and atoms vibrate and move within substances, the more energy they possess and the hotter they become. Geothermal energy is an example of thermal energy.

Motion energy is the movement of objects and substances from one place to another. Objects and substances move when a force is applied according to *Newton's laws of motion*. Wind is an example of motion energy.

Sound is the movement of energy through substances in longitudinal (compression/rarefaction) waves. Sound is produced when a force causes an object or substance to vibrate – the energy is transferred through the substance in a wave.

People have always used energy to do work for them. Thousands of years ago, cave men burned wood to heat their homes. Later people used the wind to sail ships. A hundred years ago, people used falling water to make electricity.

Today people are using more energy than ever before and our lives are undoubtedly better for it. We live longer, healthier lives. We can travel the world, or at least see it on television.

V. Answer the questions.

1. What kind of things does energy do for us? 2. How is energy defined? 3. What does energy produce? 4. How many forms and categories of energy do you know? 5. What is the difference between potential and kinetic energy? 6. How is chemical energy stored in the bonds of atoms and molecules? 7. What examples of stored mechanical energy can you give? 8. What types of energy does it travel in waves in? 9. When did people begin to use energy to do work for them?

VI. Match the words below to their definitions.

1. sound	a) energy of position or place;
2. thermal energy	b) movement of energy through substances in longitudinal waves;
3. nuclear energy	c) internal energy in substances;

4. radiant energy	d) electromagnetic energy that travels in transverse waves;
5. gravitational energy	e) motion of different objects;
6. motion	f) movement of objects and substances from one place to another;
7. potential energy	g) energy stored in the bonds of atoms and molecules;
8. stored mechanical energy	h) movement of electrons;
9. electrical energy	i) stored energy, the energy of position;
10. chemical energy	j) energy stored in objects by the application of a force;
11. kinetic energy	k) energy stored in the nucleus of an atom.

VII. Complete the sentences using a word derivationally related to the word given in brackets.

What is Energy and what is it Made of?

1. Like many other physical notions, this force is not (visibility). 2. We can only see its effects on objects in the (surround) world. 3. It is everywhere around us: in every motion, in every (act), in what we do, in what other people, animals, or machines do. 4. Even those objects, which seem stable, have it but in its (particularly) form.

5. We can see it when something moves or when a bomb (explosion). 6. We can (observer) it when a piece of magnet sticks to a piece of steel. 7. We can (feeling) it when something heats up or see it when something gives off light. 8. We can hear it when something gives off a (soundless). 9. Since (energetic) is not matter but only a property of everything in this Universe, we cannot say that it is made out of anything. 10. On the other hand, the part of (physical) that is called quantum physics assumes that all the tiny particles of matter we usually call atoms consist of spinning and vibrating energy vortices. 11. This (assume) can shake the ground for those who are used to thinking that the whole Universe and we are primarily material.

VIII. Insert prepositions where necessary.

1. Before the 1970s, Americans didn't think … energy very much. 2. It was just … there. 3. The energy picture changed … 1973. 4. The Organization for Petroleum Exporting Countries, better known as OPEC, placed an embargo … the United States and other countries.

5. The embargo meant that OPEC would not sell its oil … the U.S. and its allies. 6. Suddenly, the supply … oil from the Middle East disappeared. 7. The price … oil … the U.S. rose quickly. 8. Long lines formed at gas stations as people waited to fill their tanks … that precious, hard-to-get liquid that they had taken … granted … so many years.

9. Petroleum is just one … the many different sources … energy used to do work … people.

IX. Choose the best continuation for each of the following sentences.

1. Energy helps our bodies grow … .

a) and our hands work;

b) and our legs move;

c) and our minds think.

2. Energy is defined as the ability … .

a) to collect sunrays;

b) to produce, change or do work;

c) to turn generators and produce electricity.

3. There are many forms of energy, but they all fall into … .

a) three categories – potential, nuclear or kinetic;

b) two categories – potential or kinetic;

c) four categories – chemical, potential, kinetic and mechanical.

4. Chemical energy is energy … in the bonds of atoms and molecules.

a) stored;

b) placed;

c) built.

5. During photosynthesis, sunlight gives plants the energy they need … .

a) to build complex chemical molecules;

b) to build complex physical laws;

c) to build complex chemical compounds.

6. Compressed springs and stretched rubber bands are examples … .

a) of stored mechanical energy;

b) of stored kinetic energy;

c) of electrical energy.

7. Nuclear energy can be released when the nuclei are … .

a) found or lost;

b) combined or split apart;

c) moved or stopped.

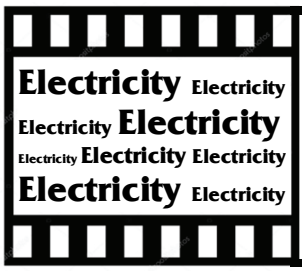
8. Electrons moving through a wire are called … .
a) electricity;
b) lightning;
c) heat.
9. Radiant energy is electromagnetic energy that travels … .
a) in parallel waves;
b) in longitudinal waves;
c) in transverse waves.
10. Thermal energy, or heat, is the internal energy in substances – the vibration and movement … .
a) of atoms and molecules within substances;
b) of protons and electrons within molecules;
c) of radio waves within substances.

X. Transform the sentences, use the appropriate infinitive constructions "too + adjective + infinitive".

1. The weather is so bad that we won't go to the country. 2. The article is so difficult that he can't translate it. 3. The day is so hot that it is impossible to stay in town. 4. The dress is so expensive that it can't be worn every day. 5. The mountain is so high that you won't be able to climb it.

XI. Write a plan of the text.

XII. Retell the text using the plan.



UNIT 2

A. ELECTRICITY

I. Read and memorize the following words.

Arc light – дуговая лампа; balancing force – уравновешивающая сила; be equal to – быть равным; charge – заряд, заряжать; constitute – состоять; conversion – преобразование; electric current – электрический ток; electricity – электричество; flow – поток, ход, течение; gain – получать, присоединять; kite – воздушный змей; light – зажигать; light bulb – электрическая лампочка; movement – движение; particle – частица; primary source – первичный источник; slightly over – чуть более; surround – окружать; the number of something – ряд, много чего-либо; upset – нарушать, расстраивать, опрокидывать.

II. Read and pronounce the following words correctly.

Electricity, electron, atom, nucleus, particle, neutron, proton, current, source, nuclear, natural, power, kerosene, Benjamin Franklin, Philadelphia, principles.

III. Think and express your opinion.

1. What ways of electricity generation can you name? 2. List some of the things that use electricity in our day-to-day life.

IV. Read and translate the text.

What is Electricity?

Electricity is a form of energy. Electricity is the flow of electrons. All matter is made up of atoms, and an atom has a center, called a nucleus. The nucleus contains positively charged particles called protons

and uncharged particles called neutrons. The nucleus of an atom is surrounded by negatively charged particles called electrons. The negative charge of an electron is equal to the positive charge of a proton, and the number of electrons in an atom is usually equal to the number of protons. When the balancing force between protons and electrons is upset by an outside force, an atom may gain or lose an electron. When electrons are "lost" from an atom, the free movement of these electrons constitutes an electric current.

Electricity is also referred to as an *energy carrier*, which means it can be converted to other forms of energy such as mechanical energy or heat. Primary energy sources are renewable or non-renewable energy, but the electricity we use is neither renewable nor non-renewable.

Usage of electricity has dramatically changed our daily life. Despite its great importance in daily life, few people probably stop to think about what life would be like without electricity. Like air and water, people tend to take electricity for granted. However, people use electricity to do many jobs every day – from lighting, heating and cooling homes to powering televisions and computers.

Electricity is a basic part of nature and it is one of our most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Many cities and towns were built alongside waterfalls (a primary source of mechanical energy) that turned water wheels to perform work.

Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Beginning with Benjamin Franklin's experiment with a kite one stormy night in Philadelphia, the principles of electricity gradually became understood. In the mid-1800s, everyone's life changed with the invention of the electric light bulb. Before 1879, direct current (DC) electricity was used in arc lights for outdoor lighting. In the late 1800s, Nikola Tesla pioneered the generation, transmission, and use of alternating current (AC) electricity, which reduced the cost of transmitting electricity over long distances. Tesla's inventions brought electricity into homes to power indoor lighting and into factories to power industrial machines.

V. Answer the questions.

1. What is electricity? 2. What is called nucleus? 3. What are protons and neutrons? 4. What is an electric current? 5. Why is electricity considered to be the secondary energy source? 6. When did the principles of electricity become understood? Why?

VI. Match the words below to their definitions.

1. flow (n)	a) flammable gas, consisting largely of methane and other hydrocarbons, occurring naturally underground (often in association with petroleum) and used as fuel;
2. proton	b) the action or fact of moving along in a steady, continuous stream;
3. movement	c) a place, person, or thing from which something comes or can be obtained;
4. natural gas	d) a stable subatomic particle occurring in all atomic nuclei, with a positive electric charge;
5. generation	e) strength or energy as an attribute of physical action or movement;
6. cool (v)	f) an act of changing physical location or position or of having this changed;
7. force	g) become or cause to become less hot;
8. source	h) the production of something;
9. neutron	i) a minute portion of matter;
10. electron	j) coming after, less important than, or resulting from someone or something else that is primary;
11. secondary	k) a subatomic particle of about the same mass as a proton but without an electric charge;
12. particle	l) a stable subatomic particle with a charge of negative electricity, found in all atoms and acting as the primary carrier of electricity in solids.

VII. Complete the sentences using a word derivationally related to the word given in brackets.

How is Electricity Generated?

1. An electric (generate) is a device for converting mechanical energy into electrical energy. 2. The process is based on the relationship between magnetism and (electric). 3. When a wire or any other

electrically (conduct) material moves across a magnetic field, an electric current occurs in the wire. 4. The (largely) generators used in industry have a stationary conductor. 5. A magnet attached to the end of a (rotate) shaft is positioned inside a stationary conducting ring that is wrapped with a (length), continuous piece of wire. 6. When the magnet (rotation), it induces a small electric current in each section of wire as it passes. 7. Each section of wire constitutes a small, (separation) electric conductor. 8. All the small currents of individual sections add up to one current of (consider) size. 9. This current is what is used for electric (powerful).

VIII. Choose the best continuation for each of the following sentences.

1. All matter is made up of atoms, and an atom has … .

a) a center, called a nucleus;

b) a nucleus, called a center;

c) a center, called a proton.

2. The nucleus contains positively charged particles called … .

a) electrons;

b) protons;

c) neutrons.

3. The nucleus of an atom is surrounded by … .

a) positively charged particles called electrons;

b) negatively charged particles called neutrons;

c) negatively charged particles called electrons.

4. The negative charge of an electron … the positive charge of a proton.

a) is more than;

b) is equal to;

c) is not equal to.

5. When electrons are “lost” from an atom, the free movement of these electrons … .

a) constitutes an electric current;

b) generates heat;

c) gives us light.

6. Electricity is a basic part of nature and it is one of … .

a) our most widely used forms of work;

b) our most widely used forms of energy;

c) our most widely used forms of heat.

7. Electricity is … energy source.

a) the only;

b) a primary;

c) a secondary.

8. Before electricity generation began slightly over 100 years ago, houses were lit … .

a) with paraffin lamps;

b) with kerosene lamps;

c) with incandescent lamps.

9. Beginning with Benjamin Franklin's experiment with a kite one stormy night in Philadelphia, the principles of electricity … .

a) were invented;

b) were written down;

c) gradually became understood.

10. In the mid-1800s, everyone's life changed with the invention of the … .

a) electric light bulb;

b) generator;

c) power station.

IX. Draw the scheme of the text.

X. Retell the text using the scheme.

B. ELECTRICITY EDUCATION

I. Read and memorize the following words.

Alternating current (AC) – переменный ток; comprehend – понимать; demand – спрос, требование; device – прибор, устройство, приспособление; direct current (DC) – постоянный ток; encompass – охватывать, заключать; induce – стимулировать, индуктировать (ток), вызывать; internal combustion engine – двигатель внутреннего сгорания; measure – измерять; pioneer – быть первооткрывателем; rely on – полагаться на; shaft – вал, ось; specify – указывать, точно определять; spin around – вращаться; steam engine – паровой двигатель; steam turbine – паровая турбина; supply with – снабжать,

поставлять; transmit – проводить (электричество), передавать (по радио); unit – единица (измерения), блок, элемент; vital – жизненно важный; wonder – интересоваться.

II. Read and pronounce the following words correctly.

Thomas Edison, Nikola Tesla, pioneer, George Westinghouse, James Watt, kilowatt-hour, magnetism, wire, turbine, combustion, uranium, cylinder, photovoltaic cell, ozone layer, greenhouse gas.

III. Think and express your opinion.

1. Make up a quick list of ways how your everyday life would be affected if there were no electricity? 2. What are the ways to reduce electrical use?

IV. Read and translate the text.

Electricity Education

It is very easy to turn on an electrical device and have it work; but have you ever wondered what powers a television set, a telephone, the lights in your house, the ceiling fan above your bed or the radio in your room? Electricity is the reason that all of these devices work and meet your daily demands each and every day. The force of electricity is relied by all of mankind as a building block for modern society.

Many pioneers have experimented with electricity to better comprehend how it works. Following Benjamin Franklin's notorious kite experiment, the principles of electricity became more understood. Thomas Edison invented the electric light bulb, which was safer inside buildings. Prior to Nikola Tesla's inventions, direct current was used only for outdoor lighting. Tesla pioneered the generation, transmission and beginning of usage of alternating current electricity. Alternating current can be transmitted over greater distances than direct current.

A transformer was invented by George Westinghouse to send electricity over long distances in order to supply customers with electricity that were located far from the generating plant. Transformers change electricity from low voltage to high voltage allowing the electricity to travel more efficiently.

Electricity is measured in units known as watts (W), named for their founder, James Watt. James Watt invented the steam engine also. One watt of power is extremely small; therefore, they are usually designated as kilowatts (kW), which is equal to 1000 watts.

The amount of electricity used over a specified period of time is known as a kilowatt-hour (kW · h).

The basic devices used in the generation of electricity are generators; these generators convert mechanical energy into electrical energy. The method used by generators is based on the relationship between magnetism and electricity. A large magnet is positioned so that when it rotates, a small electric current is induced in each section of wire. All of the currents in each wire, when summed up, equal a current of considerable size. This large current is used for electric power.

Several different types of electrical generating units are operated with a wide range of fuel sources. Electric utility power stations use turbines, engines, or water wheels to convert mechanical or chemical energy to electricity by driving an electric generator. The most common methods of generating electricity is by use of steam turbines, internal-combustion engines, gas combustion turbines, water turbines and wind turbines.

In a turbine, the kinetic energy of a moving fluid is converted into mechanical energy. A wide range of fuel sources are used as a form of force to turn a series of blades mounted on a shaft, which rotates the shaft connected to the generator, thus creating electricity.

Electricity is a secondary source of energy that comes from the conversion of other primary sources. These primary sources include fossil fuels, uranium and renewable sources.

Coal, petroleum and natural gas encompass the use of fossil fuels in electricity generation. These fossil fuels are burned in gas turbine generators where the hot gases produced from combustion are used to turn the turbine blades, which in turn spins the generator to produce electricity. Petroleum is also burned in generating units with internal-combustion engines; these internal-combustion engines are where the combustion occurs inside cylinders of the engine that are connected to the shaft of the generator. The engine drives the generator to produce energy from the mechanical energy provided by the generator.

Another means of electricity generation comes from the method of nuclear power. Nuclear power takes place from a process known as nuclear fission, in which atoms of uranium fuel are hit by neutrons. When this collision of uranium and neutrons occurs fission takes place, releasing heat and more neutrons. This process occurs continuously, forming a chain reaction releasing heat. The heat is used to transform water into steam, which spins the turbine that generates the electricity.

Hydroelectric power units use flowing water to spin a turbine that is connected to a generator. There are two types of hydroelectric systems that produce electricity, the falling water system and the run-of-the-river system. The falling water system uses dams. Flowing water accumulates in reservoirs that release water through a pipe and applies pressure against the turbine blades to drive the generator. The run-of-the-river system uses the forces created by the river's current to apply pressure to the turbine blades to produce electricity.

Geothermal power comes from heat energy trapped beneath the surface of the earth. In geothermal powered units of electricity generation, the underground water is heated to extreme temperatures as it reaches the surface thus, being released as steam. Solar power comes from the energy emitted from the sun. The uses of photovoltaic cells, which generate electric power directly from the light of the sun, have proven to be more costly then fossil fuels. Radiant energy from the sun is used to produce steam to drive turbines in solar-thermal electric generators. Wind power is the conversion of wind-generated energy into electricity with the use of windmills. The burning of biomass materials provides another means of generating electricity. Biomass includes wood, garbage and agricultural waste. These sources are burned in the same manner as fossil fuels, thus creating electricity by producing steam to rotate the turbines.

Electricity is an important aspect of modern society. Think about how often you use and rely on your electrical appliances; now think about the process that goes into producing the electricity that enables you to have the modern comforts that you are so dependent upon. With the ever-increasing prices of electricity and the depletion of the ozone layer by greenhouse gases, a discovery of cleaner burning methods of generating electricity is vital. As many of the resources in use today are being used to supply the world with electricity, technological advances are constantly being realized with the renewable resources and more ecologically safe methods of electricity generation.

V. Answer the questions.

1. What is electricity? 2. What are the primary sources for generating electricity? 3. What is the basic device used in generation of electricity? 4. What is the principle the work of generator based on? 5. What device was invented by George Westinghouse? 6. How do transformers change electricity? 7. In what units is electricity measu-

red? 8. What are the most common methods of generating electricity? 9. What is the process of producing electricity using fossil fuels? 10. How can we use nuclear power to produce electricity? 11. What are the types of hydroelectric systems that produce electricity? 12. What types of power can we use to produce electricity? In what way?

VI. Match the words below to their definitions.

1. comprehend	a) a liquid mixture of hydrocarbons which can be extracted and refined to produce fuels including petrol, paraffin and diesel oil;
2. current	b) a solid geometrical figure with straight parallel sides and a circular or oval section;
3. magnetism	c) a physical phenomenon produced by the motion of electric charge, which results in attractive and repulsive forces between objects;
4. turbine	d) a machine for converting mechanical energy into electricity;
5. combustion	e) quantity or thickness of material, typically one of several, covering a surface or body;
6. shaft	f) a flow of electricity which results from the ordered directional movement of electrically charged particles;
7. petroleum	g) a machine for producing continuous power in which a wheel or rotor is revolved by a fast-moving flow of water, steam, gas, air, or other fluid;
8. cylinder	h) a machine with moving parts that converts power into motion;
9. engine	i) gather together or acquire an increasing number or quantity of something;
10. accumulate	j) a long, cylindrical rotating rod for the transmission of motive power in a machine;
11. layer	k) grasp mentally, understand;
12. greenhouse gas	l) the process of burning something;
13. generator	m) a gas that contributes to the greenhouse effect by absorbing infrared radiation.

VII. Insert prepositions where necessary.

The Science of Electricity

1. In order to understand how electric charge moves … one atom to another, we need to know something … atoms. 2. Everything … the universe is made … atoms – every star, every tree, and every animal. 3. Atoms are the building blocks … the universe.

4. Atoms are made of even smaller particles. 5. The centre … an atom is called the nucleus. 6. It is made … particles called protons and neutrons. 7. The protons and neutrons are very small, but electrons are much, much smaller. 8. Electrons spin the nucleus in shells a great distance … the nucleus.

9. The protons and electrons of an atom are attracted … each other. 10. They both carry an electrical charge. 11. An electrical charge is a force … the particle. 12. Protons have a positive charge and electrons have a negative charge. 13. The positive charge of the protons is equal … the negative charge of the electrons.

14. Electrons usually remain a constant distance … the nucleus … precise shells. 15. The electrons in the shells closest … the nucleus have a strong force … attraction … the protons. 16. Sometimes, the electrons in the outermost shells do not. 17. These electrons can be pushed … of their orbits. 18. Applying a force can make them move … one atom … another. 19. These moving electrons are electricity.

VIII. Fill in the gaps with suitable words given below. Use one word only. Translate the text.

a) turbines;	*f) produce;*	*k) reactor;*	*p) used;*
b) steam;	*g) generator;*	*l) split;*	*q) burnt;*
c) other;	*h) uranium;*	*m) blades;*	*r) common;*
d) oil;	*i) nuclear;*	*n) water;*	*s) electricity.*
e) fission;	*j) gas;*	*o) energy;*	

1. An electric utility power station uses a turbine, engine, water wheel, or … similar machine to drive an electric … or a device that converts mechanical or chemical … to electricity. 2. Steam turbines, internal-combustion … , gas combustion turbines, water turbines, and wind turbines are the most … methods to generate electricity.

3. Coal, petroleum, and natural gas are … in large furnaces to heat water to make steam that in turn pushes on the … of a turbine.

4. Natural … , in addition to being burned to heat water for steam, can also be burned to … hot combustion gases that pass directly through a turbine, spinning its blades to generate … .

5. Petroleum can also be used to make … to turn a turbine. 6. Residual fuel oil, a product refined from crude … , is often the product used in electric plants that use petroleum to make steam.

7. … power is a method in which steam is produced by heating … through a process called nuclear … . 8. In a nuclear power plant, a … contains a core of nuclear fuel, primarily enriched … . 9. When atoms of uranium fuel are hit by neutrons they … , releasing heat and more neutrons. 10. The heat is … to turn water into steam that, in turn, spins a turbine that generates electricity.

IX. Choose the best continuation for each of the following sentences.

1. The force of electricity is relied by all of mankind as … .
a) a wooden block for ancient society;
b) a concrete block for future society;
c) a building block for modern society.
2. Many pioneers have experimented with electricity … .
a) to better comprehend how it works;
b) to make a lot of money;
c) to become famous.
3. Tesla pioneered the generation, transmission and beginning of usage … .
a) of direct current electricity;
b) of alternating current electricity;
c) of alternating and direct current electricity.
4. Alternating current can be transmitted over … .
a) greater distances than direct current;
b) shorter distances than direct current;
c) the same distances as direct current.
5. A transformer was invented by … .
a) Benjamin Franklin;
b) Thomas Edison;
c) George Westinghouse.
6. The method used by generators is based on the relationship … .
a) between magnetism and theory of relativity;
b) between fire and electricity;
c) between magnetism and electricity.

7. In a turbine, the kinetic energy of a moving fluid is converted … .
a) into electrical energy;
b) into mechanical energy;
c) into chemical energy.
8. Electricity is a secondary source of energy that comes from … .
a) the conversion of the sun energy;
b) the conversion of other primary sources;
c) the conversion of renewable energy sources.
9. The run-of-the-river system uses the forces created by … .
a) the current of air;
b) the flow of electrons;
c) the river's current.
10. The burning of biomass materials provides another means … .
a) of generating electricity;
b) of producing power;
c) of generating steam.

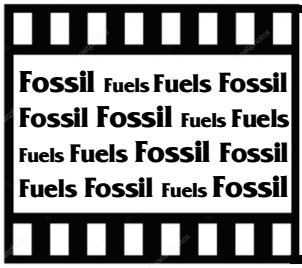
X. Use Participle I Perfect Active.

Example: – As I hadn't phoned him back I had to apologize.
– ***Not having phoned*** *him back I had to apologize*.

1. I left the luggage at the airport and went to the restaurant. 2. As he hadn't found the necessary papers he felt angry. 3. As he hadn't read the book he couldn't discuss it. 4. As they hadn't taken a decision they turned to him for help. 5. She made dinner and decided to have a rest. 6. As he hadn't bought tickets he couldn't join them. 7. As he had broken his car he had to go by bus. 8. He finished the article and went to bed. 9. As he had given up smoking he felt better.

XI. Write out the "key" words from each paragraph.

XII. Retell the text using the "key" words.



UNIT 3

A. OVERVIEW OF FOSSIL FUELS

I. Read and memorize the following words.

Advantage – преимущество, выгода, польза; black rock substance – черное вещество; boiler – паровой котел; coal – уголь (каменный, древесный); creature – живое существо, создание; dig – копать, рыть, выкапывать; direct – прямой, постоянный (ток); disadvantage – недостаток, вред, ущерб; earth's crust – земная кора; expire – иссякнуть, закончиться; grind – перемалывать; heat – тепло, теплота; indirect – косвенный, непрямой; lead to – приводить к; liquid – жидкий, жидкость; non-renewable energy – невозобновляемая энергия; oil – нефть, масло, смазочный материал; peat – торф; pressure – давление; solid – твердое вещество.

II. Read and pronounce the following words correctly.

Due to, char, major, organic, decompose, expire, directly, indirectly, air, charcoal, burn, advantage, rather, vehicle.

III. Think and express your opinion.

1. Identify those things in your life that use fossil fuels. 2. Think of some simple things you can do to conserve fossil fuels.

IV. Read and translate the text, think of its title.

Fossil fuels were formed millions of years ago when plants, animals and other creatures died and were buried under the earth. Their remains gradually changed over the years due to heat and pressure in the earth's crust and formed coal, oil and gas. These are 3 major forms of fossil fuels which were formed from the organic remains of plants

and animals. Since they took millions of years to form that's why they are also called non-renewable energy sources. This means that they cannot be used again once they are expired. Over the years, these decomposed plants and animals were converted into black rock substance called coal and thick liquid called oil or petroleum, and natural gas.

Substances that release energy when burnt are called fuels, and the process of burning is called combustion. Heat is the process that makes the release of energy possible when combustion takes place. A fuel may be a solid, a liquid or a gas and the energy from it may be used either directly, as in warming a house, or indirectly to make steam for driving an engine. Sometimes the fuel is burnt in the engine.

Formation of fossil fuels took millions of years but they disappear within seconds. They are being extracted from all over the world. Coal is one the fossil fuels that is used extensively in the production of electricity. Oil is used to power our vehicles. We all use fossil fuels in our daily life. In some way, like every other thing, fossil fuels have negative effect on our environment too. Carbon dioxide is the byproduct of fossil fuels. When burnt, they release carbon dioxide and some other gases. Carbon dioxide is the primary reason for formation of global warming. We are polluting our environment by extracting these fossil fuels and burning them at fast pace. They can't be utilized again as they are non-renewable. The solution to the above problems is using renewable energy sources including solar, wind and geothermal.

V. Answer the questions.

1. When and how were fossil fuels formed? 2. What are the major forms of fossil fuels? 3. How do you understand "non-renewable sources"? 4. How do we call the process of burning? 5. What are the states of fuel? 6. How often do we use fossil fuels? 7. What is the most widely used fossil fuel? 8. How do fossil fuels affect the environment?

VI. Match the words below to their definitions.

1. pollution	a) material consisting of partly decomposed vegetable matter forming a deposit on acidic, boggy ground, which is dried for use in gardening and as fuel;
2. utilize	b) an air-like substance which expands freely to fill any space available, irrespective of its quantity;

3. byproduct	c) a particular kind of matter with uniform properties;
4. environment	d) fine, dry particles produced by grinding, crushing, or disintegration of a solid substance;
5. coal	e) become blackened as a result of partial burning;
6. oil	f) a hardened layer, coating, or deposit on the surface of something soft;
7. gas	g) the surroundings or conditions in which a person, animal, or plant lives or operates;
8. substance	h) a viscous liquid derived from petroleum, especially for use as a fuel or lubricant;
9. char (v)	i) a combustible black or dark brown rock consisting chiefly of carbonized plant matter, found mainly in underground seams and used as fuel;
10. release	j) make practical and effective use of something;
11. crust	k) allow or enable to escape from confinement; set free;
12. powder	l) an incidental or secondary product made in the manufacture or synthesis of something else;
13. extensively	m) to a great extent;
14. peat	n) the presence in or introduction into the environment of a substance which has harmful or poisonous effects.

VII. Complete the sentences using a word derivationally related to the word given in brackets.

1. Fossil fuels have been serving as the source of energy for almost all (practice) purposes of today's life. 2. They are (vitality) in all domestic purposes like cooking, transportation and have many other advantages. 3. However, these are all non-(renew) sources of energy. 4. This means there is a limited stock of this (fossilize) fuel. 5. With the increase in (populate) and consequently their (consume), the stock of fossil fuel seems to be approaching its end. 6. Every year millions of tons of coal and gallons of oil are (user) to extract energy from them. 7. The (extract) process is done by burning these fossil fuels. 8. Due to the (combust) of these fuels, the environment gets highly polluted.

9. The constituents of fossil fuels are (sulphureous) and nitrogen. 10. They are produced in their oxide forms and cause the (pollute). 11. This led to the global warming and (extinct) of these precious resources. 12. Another effect of this is that when coal is dug from the coal mines, it affects the (surround) ecosystem and pose serious hazard to the health of mine (work). 13. However, they are still popular as they are cheaper than any other (alternate) sources of energy.

VIII. Choose the best continuation for each of the following sentences.

1. There are … which were formed from the organic remains of plants and animals.

a) 5 major forms of fossil fuels;
b) 3 major forms of fossil fuels;
c) 4 major forms of fossil fuels.

2. Substances that release energy when burnt are called … .

a) fuels;
b) energy sources;
c) steam.

3. The process of burning is called … .

a) fire;
b) combustion;
c) lightning.

4. The energy from fuel may be used … .

a) only directly;
b) only indirectly;
c) either directly or indirectly.

5. Formation of fossil fuels took millions of years … .

a) but they disappear within seconds;
b) and they will last forever;
c) but soon people won't need them.

6. Coal is one of the fossil fuels that is used extensively … .

a) in the production of light;
b) in the production of heat;
c) in the production of electricity.

7. In some way fossil fuels have … on our environment too.

a) positive effect;
b) negative effect;
c) no effect.

8. When burnt, fossil fuels release … .
a) only carbon dioxide;
b) carbon dioxide and some other gases;
c) oxygen and some other gases.
9. Carbon dioxide is the primary reason for … .
a) formation of global warming;
b) creation of the ozone layer;
c) pollution of the ocean.
10. Fossil fuels can't be utilized again as they are … .
a) precious;
b) renewable;
c) non-renewable.

IX. Make a plan of the text and retell the text using the plan.

B. NON-RENEWABLE SOURCES OF ENERGY

I. Read and memorize the following words.

Abundant – обильный, широко распространенный, имеющийся в изобилии; degradation – ослабление, упадок, ухудшение; depletion – уменьшение, истощение (ресурсов); deposit – запас, месторождение, залежь; drain – осушать, истощать, расходовать; excessive – чрезмерный, излишний; firsthand experience – личный опыт; impact – влияние, сильное воздействие; inflammable – огнеопасный, горючий, легко воспламеняющийся; oil spill – разлив нефти, утечка нефти; oil well – нефтяная скважина; pace – шаг, темп; require – требовать, нуждаться; reserve – ресурс, запас; result in – приводить к; suffer from – страдать; survive – выживать, выдержать; take into consideration – принимать во внимание, учитывать; underground – подземный; vaporizing oil – тяжелое карбюраторное топливо, лигроин, керосин.

II. Read and pronounce the following words correctly.

Suffer, China, India, require, carbon, Saudi Arabia, Kuwait, Iran, Iraq, UAE, North America, Canada, methane, ethane, propane, butane, Middle East, chemicals.

III. Think and express your opinion.

1. Fossil fuels vs. nuclear power: pros and cons. 2. What will happen to vehicles without fossil fuels?

IV. Read and translate the text.

What are Non-Renewable Sources of Energy?

Non-renewable energy sources are those sources that drain fossil reserves deposited over centuries. This results in depletion of these energy reserves. There are many countries, which have recorded significant reduction of these sources and are currently suffering from the side effects of drilling these energy reserves from deep underground. Examples of these countries include China and India. The environmental impact is so great that just by travelling to these two countries, you can get a firsthand experience on the case studies that are there to be seen by the naked eyes.

There are many places in the world that are experiencing fast degradation in terms of fossil fuels. Soon there will be none left if appropriate measures are not taken into consideration. This is a trend that has to be reversed if the world is to survive the degradation process that is going or happening at a much rapid pace. The main non-renewable energy sources are: coal, oil, natural gas.

Coal. Coal is the most abundant form of fossil fuel available on earth. It was formed by the decay of old plants and animals millions of years ago. Coal is mostly found below the earth and is a major source of fuel for electricity generation as of today. Most power stations on earth require huge reserves of coal to produce electricity continuously without break. When coal is burnt, it produces heat that is used to convert water into steam. The steam is then used to move the turbines which in turn activate generators which produce electricity.

Coal contains a large amount of carbon. When it is burnt to produce power, it mixes up with oxygen to produce carbon dioxide. Carbon dioxide is the gas responsible for global warming. The use of coal and other fossil fuels have only increased since they were discovered. Their excessive extraction and use has resulted in degradation of environment and ecological imbalance. Though coal is still available in big quantity, it is predicted that it won't last for more than 40–50 years if switch is not made to green or clean energy.

Oil. Oil is available in abundance in most of the Middle East countries including Saudi Arabia, Kuwait, Iran, Iraq and UAE while

some limited oil wells are present in North America and Canada. Most of the countries still have their huge dependency on these countries for their oil requirements. Like coal, it was also made out of dead plants and animals that had lived millions of years ago. When plants and animals died they were covered with a thick layer of mud and sand which created huge pressure and temperature. These fossil fuels (coal, oil and natural gas) are result of those conditions only.

Wide usage of oil and oil related products has resulted in massive air pollution. It is a major source of fuel that is used in vehicles. Due to the process of combustion, harmful gases like carbon dioxide are released when oil is burnt. Everyday around 19.7 million barrels of oil is consumed in the United States alone. Oil is transported to other nations using pipelines or ships. Leakage in ships leads to oil spill which affects animals and plants that live inside or around the sea. Just a few years back, a ship containing oil of British Petroleum (BP) caused oil leakage which resulted in killing many whales, fishes and small animals that live inside the sea.

Natural Gas. Natural gas is a mixture of several gases including methane, ethane, propane and butane. It burns completely and leaves no ashes. It causes almost no pollution and is one of the cleanest forms of fossil fuel. Of these gases, methane is highly inflammable. It has no color, taste or odor. This is the reason that some chemicals are added to it before it can be supplied to individual homes so that a leakage can easily be detected. Middle Eastern countries particularly Iran and Iraq hold high reserves of natural gas. The beauty of this source of fuel that it causes almost no pollution, it is cheap and environmentally friendly.

V. Put all types of questions to the text (not less than 10). Discuss the text in pairs.

VI. Insert prepositions where necessary.

Petroleum

1. The most important fossil fuel comes … petroleum, which is natural oil found underground. 2. It is not much used … its natural state but made … fuels such as petrol, paraffin, kerosene, vaporizing oil and diesel oil. 3. These are obtained through the process called … distillation. 4. Benzole is a liquid fuel like petrol obtained when is made … gas. 5. The fuel called natural gas, often found where there is petroleum, is a compound … hydrogen and carbon known as methane.

6. Natural gas was found beneath the North Sea in 1965, and provides … half … all Britain's gas requirements.

7. Petroleum is one … the most commonly used fossil fuels. 8. The word means … "rock oil". 9. Petroleum and its products are … great use … today's life. 10. These products include … motor fuels, kerosene, diesel oil, wax, etc. 11. Petrol, of course is used … motor cars. 12. Kerosene is used … oil lamps, farm tractors, jet engine aircraft, etc. 13. In villages, kerosene has a very important … usage. 14. Diesel oil is used … diesel engine buses, tractors, lorries, ships and many other vehicles. 15. Lubricants are also made … the byproducts … petroleum. 16. This is needed to make machinery … any kind run smoothly and easily. 17. Bitumen is used … asphalt and … water proofing.

VII. Match the words below to their definitions.

1. suffer	a) a supply of something that is available for use when it is needed;
2. abundant	b) continue to live or exist, especially in spite of danger or hardship;
3. excessive	c) a distinct compound or substance, especially one which has been artificially prepared or purified;
4. decay (n)	d) cause the water or other liquid in (something) to run out, leaving it empty or dry;
5. reserve	e) when something such as a dead body, a dead plant, or a tooth is gradually destroyed by a natural process;
6. discover	f) able to be used or obtained; at someone's disposal;
7. global warming	g) more than is necessary, normal, or desirable; immoderate;
8. degradation	h) in science it is the process of breaking down a substance into its separate parts or elements;
9. available	i) a gradual increase in the overall temperature of the earth's atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, chlorofluorocarbons, and other pollutants;
10. significant	j) experience or be subjected to (something bad or unpleasant);

11. result in	k) lead to;
12. drain (v)	l) sufficiently great or important to be worthy of attention; noteworthy;
13. survive	m) find (something or someone) unexpectedly or in the course of a search;
14. leakage	n) existing or available in large quantities; plentiful;
15. chemical (n)	o) the accidental admission or escape of a fluid or gas through a hole or crack.

VIII. Fill in the gaps with suitable words given below. Use one word only. Translate the text.

a) remains;	*e) odor;*	*i) transport;*	*m) inflammable;*
b) heat;	*f) fuel;*	*j) source;*	*n) important;*
c) domestic;	*g) gas;*	*k) drawback;*	*o) formed;*
d) deposition;	*h) coal;*	*l) pollution;*	*p) producers.*

1. Another important and widely used fossil … is natural … . 2. It is chiefly methane, sometimes known as marsh gas. 3. Natural gas is normally found underground along with petroleum and … but sometimes occur by it and are pumped out through pipelines. 4. Once pumped out, it is transported to storage areas or for … use. 5. It has been a … of domestic gas for many years. 6. Many people use this gas to … their homes. 7. It contains a strong … that makes it easy to smell if there is a leak. 8. Natural gas produces comparatively little … as against other fuel sources. 9. Since, it is in a liquid state, it is easy to … it through pipelines. 10. The main … of this fuel is that it is highly … . 11. The greatest … of natural gas are the United States of America and Russia. 12. One more … fossil fuel is coal. 13. It is the poor man's petrol. 14. It has been formed by the … of vegetative … for thousands of years. 15. The fossilized form of the decayed plants and other vegetation has … coal.

IX. Choose the best continuation for each of the following sentences.

1. There are many countries which are currently suffering from … these energy reserves from deep underground.

a) the side effects of drilling;

b) the beneficial effects of drilling;

c) the material effects of drilling.

2. There are many places in the world that are experiencing … .

a) slow degradation in terms of fossil fuels;

b) fast improvement in terms of fossil fuels;

c) fast degradation in terms of fossil fuels.

3. Coal is … of fossil fuel available on earth.

a) the least abundant form;

b) the most abundant form;

c) one of the most abundant forms.

4. Coal is mostly found below the earth and is a major source of fuel … .

a) for electricity generation;

b) for industrial usage;

c) for heat generation.

5. When coal is burnt to produce power, it mixes up with … to produce carbon dioxide.

a) hydrogen;

b) carbon;

c) oxygen.

6. The use of coal and other fossil fuels have only increased … .

a) since they were described;

b) since they were drained;

c) since they were discovered.

7. Oil is available in abundance in … .

a) some of the Middle East countries;

b) most of the Middle East countries;

c) most of the Far East countries.

8. Wide usage of oil and oil related products has resulted … .

a) in massive air purification;

b) in massive air pollution;

c) in massive mind pollution.

9. Leakage in ships leads to oil spill which affects … that live inside or around the sea.

a) animals and plants;

b) animals and people;

c) people and plants.

10. Natural gas is a mixture of several gases including … .

a) methane, ethane, butane and hydrogen;

b) methane, butane, propane and oxygen;

c) methane, ethane, propane and butane.

X. Change the sentence structure using Gerund with preposition.

Example: – He read the letter and hid it. (on).
– ***On reading*** the letter he hid it.

1. She said it and turned red. (on). 2. First read the instruction and then open the box. (before). 3. When I came to London I decided to call all my friends at once. (on). 4. He took a decision and felt better. (after). 5. He entered the room and greeted everybody. (on). 6. First read the book then see the film. (before). 7. He left the house and took a taxi. (on). 8. He did his morning exercises and then took a shower. (after). 9. He arrived at the airport and registered. (on). 10. He took a ticket and got on the train. (on).

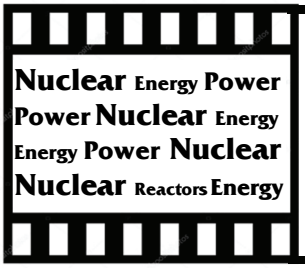
XI. Use Gerund as the subject.

Example: – It's very convenient to go there by car.
– ***Going*** *there by car is very convenient.*

1. It's so uncomfortable to sleep on the floor. 2. It's great to meet old friends. 3. It's impolite to speak in a loud voice. 4. It's always useful to think. 5. It's boring to clean the flat. 6. It's interesting to teach. 7. It's exciting to travel to other countries. 8. It's simple to give advice. 9. It's not always clever to take other people's advice. 10. It's inconvenient to have much luggage. 11. It wasn't easy to follow the man.

XII. Write a plan of the text.

XIII. Retell the text using the plan.



UNIT 4

A. NUCLEAR POWER

I. Read and memorize the following words.

Be buried – быть захороненным; containment vessel – герметизирующая оболочка; contribute to the greenhouse effect – способствовать парниковому эффекту; conventional power station – электростанция обычного типа; die away – исчезать, затухать, угасать; drive – приводить в действие, в движение, управлять; (the) fastest-growing – быстро растущий; leakage – утечка, течь, вытекание; major disaster – крупная катастрофа; nuclear accident – авария ядерной установки; power plant – электростанция, силовая установка; precautions – меры предосторожности, меры безопасности; provide – обеспечивать, снабжать; pump through – прокачивать; reliable – надежный, безотказный, испытанный; small amounts of waste – незначительный объем отходов; smash – сталкиваться, врезаться, ударяться; sustained – непрерывный, устойчивый; turn – вращать; uranium rod – урановый стержень.

II. Read and pronounce the following words correctly.

Nuclear, fission, electricity, generated, uranium, submarine, engine, turbine, except, neutron, reactor, chain reaction, carbon dioxide, percent.

III. Think and express your opinion.

1. What advantages does the building of the power station have? 2. Is it dangerous? Why?

IV. Read and translate the text.

Nuclear Power

Nuclear power is the use of sustained nuclear energy-releasing reactions to generate heat and electricity.

Nuclear power is generated using uranium, which is a metal mined in various parts of the world. The first large-scale nuclear power station was opened at Calder Hall in Cumbria, England in 1956. Some military ships and submarines have nuclear power plants for engines.

Nuclear energy-releasing reaction (fission and fusion) makes heat (i.e. it heats water to make steam), steam turns turbines, and turbines turn generators (i.e. electrical power is sent around country). Nuclear power stations work in pretty much the same way as conventional (fossil fuel-burning) stations, except that a chain reaction inside a nuclear reactor makes the heat instead. The reactor uses uranium rods as fuel, and the heat is generated by nuclear fission or fusion. As a result of nuclear fission neutrons smash into the nucleus of the uranium atoms, which split roughly in half and release energy in the form of heat. Carbon dioxide gas is pumped through the reactor to take the heat away, and the hot gas then heats water to make steam. The steam drives turbines which drive generators. The generators produce electricity. Modern nuclear power stations use the same type of turbines and generators as conventional power stations.

There are endless debates about the use of nuclear energy.

Advantages. Nuclear power costs about the same as coal, so it's not expensive to make. It does not produce smoke or carbon dioxide, so it does not contribute to the greenhouse effect. It produces huge amounts of energy from small amounts of fuel. Nuclear power produces small amounts of waste. It is reliable.

Disadvantages. Although not much waste is produced, it is very, very dangerous. It must be buried for many years to allow the radioactivity to die away. Nuclear power is reliable, but a lot of money has to be spent on safety – if it does go wrong, a nuclear accident can be a major disaster, people are increasingly concerned about this – in the 1990's nuclear power was the fastest-growing source of power in the world. In 2005 it became the second slowest-growing one. In 2018 nuclear power plants provided about 5.7% of the world's energy and 13% of the world's electricity.

V. Answer the questions.

1. What is nuclear power? 2. Is uranium a synthetic substance? 3. What do nuclear power stations produce? 4. What is the main difference

between nuclear power stations and conventional stations? 5. What kind of fuel do conventional power plants use? 6. What kind of fuel do nuclear power plants use? 7. What are the main advantages of nuclear power for the national economy? 8. What are the main disadvantages? 9. Why are there endless debates about the use of nuclear energy?

VI. Complete the sentences using a word derivationally related to the word given in brackets.

1. There's very little (differ) between a nuclear power plant and a (convention) power plant, except for the source of the heat used to create steam. 2. But as that source can emit (harm) levels of radiation, extra precautions are required.

3. A concrete liner (typical) houses the reactor's pressure vessel and acts as a (radiate) shield. 4. That liner is housed within a steel containment vessel. 5. This vessel contains the reactor core as well as the (equip) used to refuel and maintain the reactor. 6. The steel containment vessel serves as a barrier to prevent (leak) of any radioactive gases or fluids from the plant.

7. An outer concrete (build) serves as the final layer (protect) the steel containment vessel. 8. This concrete structure is designed to be (strongly) enough to survive some earthquakes or a crashing jet airliner. 9. These secondary containment structures are necessary to (prevention) the escape of radioactive steam in the event of an accident. 10. The absence of (second) containment structures in Soviet (nucleus) power plants allowed radioactive material to escape in Chernobyl.

VII. Match the words below to their definitions.

1. nuclear power	a) unwanted or unusable material, substance or byproduct;
2. prevent (v)	b) to allow to escape, set free;
3. radioactive	c) to keep something from happening;
4. uranium	d) a condition or circumstance that puts someone in a favorable or superior position;
5. chain reaction	e) emitting radiation or particles;
6. release	f) the self-sustaining fission reaction spread by neutrons which occurs in nuclear reactors;
7. waste (n)	g) to become weaker and finally disappear completely;

8. die away (v)	h) electric power generated by a nuclear reactor;
9. safety	i) an unfavorable circumstance or condition that reduces the chances of success or effectiveness;
10. advantage	j) a dense grey radioactive metal used as a fuel in nuclear reactors;
11. disadvantage	k) the state of being safe from harm or danger.

VIII. Use the following nouns and verbs to describe the electricity generation process in nuclear power plant. Transform infinitives; add articles and conjunctions where it is necessary.

1. The reactor, to use, uranium rods, a fuel, to produce, heat. 2. Heat, to generate, nuclear fission. 3. Neutrons, to smash into, the nucleus of the uranium atoms. 4. The nucleus, to split, to release, energy and heat. 5. Carbon dioxide gas, to pump through, reactor, to take away, heat. 6. The hot gas, to heat, water, to make steam. 7. The steam, to drive turbines, to drive generators. 8. The generators, to produce electricity.

IX. Choose the best continuation for each of the following sentences.

1. Nuclear power is the use of sustained … reactions to generate heat and electricity.

a) nuclear energy-generating;
b) nuclear energy-absorbing;
c) nuclear energy-releasing.

2. Nuclear power is generated using uranium, which is … in various parts of the world.

a) a liquid found;
b) a metal mined;
c) a gas discovered.

3. The first large-scale nuclear power station was opened … .

a) in 1955;
b) in 1965;
c) in 1956.

4. Nuclear power stations work in pretty much the same way as … .

a) fossil fuel-burning stations;
b) tidal stations;
c) hydroelectric stations.

5. The reactor uses uranium rods as … .
a) coolant;
b) fuel;
c) lubricant.
6. Carbon dioxide gas is pumped through the reactor … .
a) to take the heat away;
b) to take the radiation away;
c) to make steam.
7. Modern nuclear power stations use … of turbines and generators as conventional power stations.
a) the similar type;
b) the same type;
c) the different type.
8. It does not produce smoke or carbon dioxide, … the greenhouse effect.
a) so it does contribute to;
b) so it sometimes contributes to;
c) so it does not contribute to.
9. Nuclear power produces … .
a) no waste at all;
b) huge amounts of waste;
c) small amounts of waste.
10. Nuclear power waste must be buried for many years to allow … .
a) the radioactivity to die away;
b) the radioactivity to float away;
c) the radioactivity to fly away.

X. Write out the "key" words from each paragraph and retell the text using the "key" words.

B. NUCLEAR ENERGY – FISSION AND FUSION

I. Read and memorize the following words.

Be dug out – добывать (полезные ископаемые); be harnessed – использовать, управлять, укрощать; be processed into – перерабатывать в (из него делают); be released – высвобождать(ся); be split apart – расщеплять(ся), раскалывать(ся); burn – гореть, сжи-

гать; complacency – самоуспокоенность, халатность; core – ядро, сердцевина; explosion – взрыв, вспышка; give off – испускать, излучать; have trouble – иметь проблемы, затруднения; heat exchanger – теплообменник; hurt (people) – причинять вред (людям); in a contained space – в замкнутом пространстве; instead of – вместо, взамен; let out slowly (all at once) – медленно выпускать, высвобождать (одновременно); reminiscent – напоминающий, вызывающий воспоминания; set of pipes filled with water – совокупность труб, наполненных водой; strong concrete dome – прочный бетонный купол; tiny pellets – крошечные гранулы, шарики.

II. Read and pronounce the following words correctly.

Tremendous, electricity, explosion, chain reaction, strike, atomic, plutonium, shape, nucleus (nuclei), helium, radiation, control.

III. Think and express your opinion.

What type of energy-releasing reactions (fission or fusion) should be mostly used? Why?

IV. Read and translate the text.

Nuclear Energy – Fission and Fusion

An atom's nucleus can be split apart. When this is done, a tremendous amount of energy is released. The energy is both heat and light energy. Einstein said that a very small amount of matter contains a huge amount of energy. This energy, when let out slowly, can be harnessed to generate electricity. When it is let out all at once, it can make a tremendous explosion like in an atomic bomb.

A nuclear power plant uses uranium as a fuel. Uranium is an element that is dug out of the ground in many places around the world. It is processed into tiny pellets that are loaded into very long rods that are put into the power plant's reactor.

The word "fission" means to split apart. Inside the reactor of an atomic power plant, uranium atoms are split apart in a controlled chain reaction.

In a chain reaction, particles released by the splitting of the atom go off and strike other uranium atoms splitting those. In nuclear power plants control rods are used to keep the splitting regulated so it doesn't go too fast.

If the reaction is not controlled, you could have an atomic bomb. But in atomic bombs, almost pure pieces of the element Uranium-235

or Plutonium, of a precise mass and shape, must be brought together and held together, with great force. These conditions are not present in a nuclear reactor.

The reaction also creates radioactive material. This material could hurt people if released, so it is kept in a solid form. The very strong concrete dome keeps this material inside if an accident happens.

This chain reaction gives off heat energy. This heat energy is used to boil water in the core of the reactor. So, instead of burning a fuel, nuclear power plants use the chain reaction of atoms splitting to change the energy of atoms into heat energy.

The water from around the nuclear core is sent to another section of the power plant. Here, in the heat exchanger, it heats another set of pipes filled with water to make steam. The steam in this second set of pipes turns a turbine to generate electricity.

Another form of nuclear energy is called "fusion". Fusion means joining smaller nuclei (the plural of nucleus) to make a larger nucleus. The sun uses nuclear fusion of hydrogen atoms into helium atoms. This gives off heat and light and other radiation.

Also given off in this fusion reaction is energy! Scientists have been working on controlling nuclear fusion for a long time, trying to make a fusion reactor to produce electricity. But they have been having trouble learning how to control the reaction in a contained space. What's better about nuclear fusion is that it creates less radioactive material than fission, and its supply of fuel can last longer than the sun.

V. Answer the questions.

1. When is a tremendous amount of energy released? 2. What does the word "fission" mean? 3. What is used to keep the splitting regulated? 4. What happens if the reaction is not controlled? 5. What is the difference between atomic bombs and nuclear reactors? 6. What keeps the radioactive material inside if an accident happens? 7. What do nuclear power plants use to change the energy of atoms into heat energy? 8. What does the word "fusion" mean? 9. Which process (fission or fusion) is less dangerous? Why?

VI. Complete the sentences using a word derivationally related to the word given in brackets.

1. At the time of the (accidental) – (April 26, 1986) – the Chernobyl nuclear power station consisted of four operating 1.000 megawatt

power (reaction) sited along the banks of the Pripyat River, about sixty miles north of Kiev in the Ukraine. 2. A fifth reactor was under (construct).

3. It was the result of a fatal (combine) of ignorance and complacency. 4. The (radioactively) release was chemical, driven by gases and steam generated by the core runaway, not by nuclear reactions. 5. Flames, sparks, and chunks of (burn) material were flying into the air above the unit. 6. These were red-hot pieces of nuclear (fueling) and graphite. 7. About 50 tons of nuclear fuel were (vapor) and released by the explosion into the (atmospheric). 8. In (add), about 70 tons were ejected sideways from the periphery of the core. 9. Some 50 tons of nuclear fuel and 800 tons of reactor graphite remained in the reactor vault, where they formed a pit reminiscent of a (volcano) crater as the graphite still in the reactor had burned up (complete) in a few days after the explosion.

10. The resulting explosion was (equivalence) to ten Hiroshimas. 11. Many people died from the explosion and even more from the effects of the (radiate) later. 12. Still today, people are (death) from the radiation caused by the Chernobyl accident.

VII. Match the words below to their definitions.

1. atom	a) a sudden violent burst of energy, for example one caused by a bomb;
2. concrete	b) a place where electricity is produced;
3. helium	c) the smallest particle of a chemical element that can exist;
4. heat exchanger	d) the external form or outline of someone or something;
5. power plant	e) a substance used for building which is made by mixing together cement, sand, small stones and water;
6. pipe	f) very great in amount, scale or intensity;
7. mass	g) the chemical element of atomic number 2, an inert gas;
8. shape	h) a tube used to convey water, oil, gas or other fluid substances;
9. plutonium	i) the chemical element of atomic number 94, a dense silvery radioactive metal;
10. explosion	j) at a slow speed, not quickly;

11. tremendous	k) a large quantity or amount of something;
12. slowly	l) a device for transferring heat from one medium to another.

VIII. Choose the best continuation for each of the following sentences.

1. Nuclear energy, when let out slowly, can be … .
a) discovered to generate electricity;
b) harnessed to generate electricity;
c) dug out to generate electricity.
2. Uranium is processed into … that are loaded into very long rods.
a) tiny pellets;
b) small cubes;
c) long sticks.
3. Inside the reactor of an atomic power plant, uranium atoms are … .
a) split apart in a continuous chemical reaction;
b) split apart in a controlled chain reaction;
c) split apart in a fast chain transformation.
4. In nuclear power plants control rods are used … so it doesn't go too fast.
a) to slow down the splitting;
b) to make the splitting faster;
c) to keep the splitting regulated.
5. If the reaction is not controlled, … .
a) you could have an atomic bomb;
b) it doesn't matter;
c) you could control it.
6. The very strong … keeps radioactive material inside if an accident happens.
a) concrete basement;
b) concrete dome;
c) glass dome.
7. The chain reaction … heat energy.
a) absorbs;
b) uses;
c) gives off.
8. The water from around the nuclear core is sent to … .
a) another section of the power generator;
b) another section of the power moderator;
c) another section of the power plant.

9. Fusion means joining smaller nuclei to make … .

a) a larger nucleus;

b) a larger orbit;

c) a small core.

10. Nuclear fusion creates … than fission, and its supply of fuel can last longer than the sun.

a) more radioactive material;

b) less radioactive material;

c) the same amount of radioactive material.

IX. Write a plan of the text.

X. Retell the text using the plan.

C. DIFFERENT TYPES OF NUCLEAR REACTORS

I. Read and memorize the following words.

Boiling water reactor – ядерный реактор кипящего типа; convert into – превращать в, преобразовывать в; coolant – охлаждающая жидкость (хладагент); deuterium – дейтерий, тяжелый водород; efficiently – эффективно, рационально, разумно; gas cooled reactor – реактор с газовым охлаждением; heavy water reactor – тяжеловодный ядерный реактор; moderate – замедлять, сдерживать, ослаблять; moderator – замедлитель (ядерной реакции); ordinary (light) water – обыкновенная (легкая) вода; power output – выходная мощность; pressurized water reactor – реактор, охлаждаемый водой под давлением; separate cycle – отдельный цикл; significantly – значительно, многозначительно.

II. Read and pronounce the following words correctly.

Primary, turbine, efficiently, atmospheric pressure, carbon, deuterium isotope, hydrogen, uranium, formula, equation, key, supply, unenriched.

III. Think and express your opinion.

Read the names of reactors given below.

1. Why do they have these names? 2. What type of nuclear reactor is the most economic?

IV. Read and translate the text.

Different Types of Nuclear Reactors

There is a number of different types of nuclear reactors currently in operation throughout the world. Some of the most common types are described here.

Pressurized water reactors (PWRs) are by far the most common type of nuclear reactor in use today. Ordinary water is used as both neutron moderator and coolant. In a PWR the water used as moderator and primary coolant is separated from the water used to generate steam and to drive a turbine. In order to efficiently convert the heat produced by the nuclear reaction into electricity, the water that moderates the neutrons and cools the fuel elements is contained at pressures 150 times greater than atmospheric pressure.

In a ***boiling water reactor*** (BWR), ordinary light water is used as both moderator and coolant, like the PWR. However unlike the PWR, in a boiling water reactor there is no separate secondary steam cycle. The water from the reactor is converted into steam and used to directly drive the generator turbine. This is the second most commonly used type of reactors.

High temperature gas cooled reactors operate at significantly higher temperatures than PWRs and use a gas as the primary coolant. The nuclear reaction is mostly moderated by carbon. These reactors can achieve significantly higher efficiencies than PWRs but the power output per reactor is limited by the less efficient cooling power of the gas.

Heavy water reactors are similar to PWRs but use water enriched with the deuterium isotope of hydrogen as the moderator and coolant. This type of water is called “heavy water” and makes up about 0.022 parts per million of water found on Earth. The advantage of using heavy water as the moderator is that natural, unenriched uranium can be used to drive the nuclear reactor.

V. Answer the questions.

1. What types of nuclear reactors do you know? 2. What is the most common type of nuclear reactor? 3. What substance is used as primary coolant and moderator in a PWR? 4. Why is the water that

moderates the neutrons and cools the fuel elements contained at very high pressure? 5. What is the difference between a boiling water reactor and a pressurized water reactors? What do they have in common? 6. What is the primary coolant in the high temperature gas cooled reactors? 7. What is the advantage of using heavy water as the moderator?

VI. Fill the gaps in the sentence, using the words below.

a) power;	*e) energy;*	*i) shielding;*	*m) waste;*
b) nuclear;	*f) no;*	*j) rods;*	*n) water.*
c) burn;	*g) reactor;*	*k) turbines;*	
d) dangerous;	*h) robot;*	*l) uranium;*	

1. Is nuclear power renewable? … , it isn't. 2. Nuclear power stations use … as fuel. 3. They need very little fuel compared to a fossil-fuel power station because there is much more ... in nuclear fuel. 4. The … reaction inside the … creates heat, which turns … into steam to drive … which drive generators to make electricity. 5. The fuel … are safe to handle before they go into the reactor, it's only when they come out that you need to handle them with … arms and heavy … . 6. Nuclear … stations do not create atmospheric pollution, because they do not … anything. 7. However, the small amount of … that they do produce is very … .

VII. Do you agree with the following statements?

1. Nuclear power offers a clean energy alternative that frees us from the shackles of fossil fuel dependence.

2. Nuclear power is associated with disaster: quake-ruptured Japanese power plants belching radioactive steam, the dead zone surrounding Chernobyl's concrete sarcophagus.

3. The nuclear power plant stands on the border between humanity's greatest hopes and its deepest fears for the future.

VIII. Read and translate the following text. Express the main idea of the text in 1 or 2 short sentences.

Nuclear power plants do not produce greenhouse gases or PM, SO_2, or NO_x, but they do produce two general types of radioactive waste:

– low-level waste, such as contaminated protective shoe covers, clothing, wiping rags, mops, filters, reactor water treatment residues,

equipment, and tools, is stored at nuclear power plants until the radioactivity in the waste decays to a level safe for disposal as ordinary trash, or it is sent to a low-level radioactive waste disposal site;

– high-level waste, which includes the highly radioactive spent (used) nuclear fuel assemblies, must be stored in specially designed storage containers and facilities.

IX. Transform the sentences from active voice into passive one; write down two variants if it is possible.

1. They sold the ring to the lady yesterday. 2. The principal introduced our new English teacher to us. 3. Haven't you agreed on all the most important details yet? 4. She'll certainly show us her new picture. 5. They report that a dangerous criminal is missing. 6. Did the teacher explain anything new to you at the lesson? 7. She didn't even send me a birthday card! 8. By 5 o'clock the committee hadn't announced the winner yet. 9. Professor Brand always gives these recommendations to his students. 10. We never laugh at his jokes because they aren't funny. 11. Don't disturb him. He's dictating a very important letter to his secretary. 12. She was describing the accident to passers-by when the police arrived. 13. Oh, dear! She's been waiting for me for a quarter of an hour already. 14. What are they looking for? 15. Some stranger offered his help when I fell down in the street. 16. When did he write this book?

X. Write out the "key" words from each paragraph.

XI. Retell the text using the "key" words.

UNIT 5

A. SOLAR ENERGY

I. Read and memorize the following word.

Aquatic life – водная флора и фауна; capture – улавливать, поглощать, захватывать; collection panel – панель накопления; derive – получать, извлекать, происходить; energy demands – энергетические потребности; exploitation – использование, употребление; feasible – осуществимый, реальный, выполнимый; geothermal – геотермический, геотермальный; harness – использовать, связывать; hidden – скрытый, невидимый; maintenance – содержание и техническое обслуживание, уход, текущий ремонт; orbital path – орбитальная траектория; photovoltaic cell – фотоэлектрический (фотогальванический) элемент; pollution – загрязнение; replenish – пополнять, снова наполнять; separation – отделение, разделение; solar panel – солнечная батарея, панель солнечной батареи; trap – улавливать, поглощать; viable – жизнеспособный; widespread – широко распространенный.

II. Read and pronounce the following words correctly.

Category, environmental, alternative, source, considerably, renewable, pollute, biomass, geothermal, aquatic, orbital, variation, galaxy, extract, responsible, photosynthesis, duration, particular, harness, require, potential, maintenance, exploitation, advantageous, hidden.

III. Think and express your opinion.

1. What kind of alternative can give the alternative energy sources? 2. Where would you like to use solar energy?

IV. Read and translate the text.

Solar Energy

Energy comes from several different sources. These sources can be split into two main categories: non-renewable and renewable.

With the growing concerns over the environmental problems today we have to take a closer look at the alternative energy sources. Alternatives to the fossil fuels and nuclear power are renewable sources of energy and they are considerably more attractive in many ways. Renewable sources are derived and replenished quickly from nature and usually do not pollute our environment when used to generate electricity. The five renewable sources used most often include: hydropower (water), solar, wind, biomass, and geothermal.

Solar is the first energy source in the world. It was in use much earlier before humans even learnt how to light a fire. Many living things are dependent on solar energy, such as plants, aquatic life and animals. The solar is mostly used in generating light and heat. The solar energy coming down to the planet is affected by the orbital path of the sun and its variations within the galaxy. In addition, it is affected by activity taking place in space and on the sun. This energy is believed to have been responsible for the breaking of ice during the ice age, for the separation of lands and sea.

Solar energy is the alternative energy source that is used most widely across the globe. About 70% of the sunlight gets reflected back into the space and we have only 30% of sunlight to meet up our energy demands. Solar energy is used for drying clothes, used by plants during the process of photosynthesis and also used by human beings during winter seasons to warm their houses. Solar energy can be extracted either by solar thermal or photovoltaic (PV) cells.

There are two kinds of solar energy: active solar energy and passive solar energy. Passive solar energy basically uses duration, position and sun rays intensity to its advantage in heating a particular area. Active solar energy uses electrical technology and mechanical technology like collection panels in capturing, converting and storing of energy for future use.

Solar energy does not create any pollution and is widely used by many countries. It is a renewable source of power since sun will continue to produce sunlight. Solar panels, which are required to harness this energy can be used for long time and require little or no maintenance. Solar energy proves to be ineffective in colder regions

which don't receive good sunlight. It cannot be used during night and not all the light from sun can be trapped by solar panels. Solar energy advantages are much more than its disadvantages which make it a viable source of producing alternative energy.

Solar energy demand has grown at about 25% per annum over the past 15 years but it has clearly not reached its full potential. The main reason for the lack of mass exploitation of solar power technologies is economic. In order for widespread generation of electricity using solar panels to be feasible it needs to be economically advantageous. In order for solar panels to be an economically viable choice for the production of electricity, production costs must go down and efficiency of the final product must go up. The hidden factor behind the lack of widespread solar power production is the absence of mass consumer demand for solar technologies.

If there is a demand for a product, there will be people that will supply that product at a cost that fulfills that demand. As a result, economic and efficient solar power technologies will be developed and applied more quickly.

V. Answer the questions.

1. What two main categories can be split energy sources into? 2. Why do we have to take a closer look at the alternative energy sources? 3. What are the five renewable sources used most often? 4. What advantages of renewable energy sources can you name? 5. What can you say about solar energy? 6. Why does solar energy prove to be ineffective in colder regions? 7. What is the hidden factor behind the lack of widespread solar power production? 8. Does solar power production have future potential?

VI. Match the words below to their definitions.

1. replenish (v)	a) the quality of being intense;
2. sunlight	b) the process of keeping something in good condition;
3. photosynthesis	c) a man, woman or child;
4. human being	d) to make something full or complete again;
5. intensity	e) the process by which green plants use sunlight to synthesize nutrients from carbon dioxide and water;
6. convert (v)	f) the light that comes from the sun during the day;

7. pollution	g) the state or quality of being efficient;
8. solar panel	h) to change the form, quality or function of something;
9. maintenance	i) a panel designed to absorb the sun rays;
10. viable	j) capable of doing what it is intended to do;
11. efficiency	k) the presence in the environment of a substance which has poisonous or harmful effects.

VII. Complete the sentences using a word derivationally related to the word given in brackets.

1. Solar thermal technologies include solar heat (collect) and solar (concentrate) collectors. 2. Flat-plate collectors are the most (common) used type of collector today. 3. A (type) flat-plate collector consists of a box (contain) a sheet of (metallic) painted black, which absorbs the suns energy. 4. In the most common design, built-in pipes in the box carry (liquefy) that takes the heat from the box and brings it into the (build). 5. This heated liquid, (usual) a water-alcohol (mix) to prevent winter (freeze), is used to heat water in a tank or is put through (radiate) to heat the air. 6. Solar heat collectors sit on the rooftops of buildings and are (general) used in hotels and homes.

VIII. Insert prepositions where necessary.

1. Energy comes … several different sources. 2. These sources can be split … two main categories: non-renewable and renewable. 3. Non-renewable types … energy include the three major types … fossil fuels – coal, oil and natural gas. 4. Fossil fuels supply more than 90% … the world's energy. 5. Oil leads with a share … about 40% … total world energy consumption, followed … coal (24%) and natural gas (22%). 6. All … these are burned to produce … power.

IX. Choose the best continuation for each of the following sentences.

1. Renewable sources are derived and replenished quickly … .

a) from nature;

b) in nature;

c) by nature.

2. Solar energy was in use much earlier before humans even learnt … .

a) how to cook a meal;
b) how to grow crops;
c) how to light a fire.

3. The solar energy coming down to the planet is affected by … .
a) the orbital path of the sun;
b) the eclipse of the sun;
c) the orbital path of the moon.

4. About … gets reflected back into the space.
a) 80% of the sunlight;
b) 70% of the sunlight;
c) 60% of the sunlight.

5. Solar energy is used by … during the process of photosynthesis.
a) animals;
b) plants;
c) insects.

6. Passive solar energy basically uses … to its advantage in heating a particular area.
a) length, duration and sun rays intensity;
b) duration, effectiveness and sun rays intensity;
c) duration, position and sun rays intensity.

7. Active solar energy uses electrical and mechanical … .
a) power;
b) technology;
c) inventions.

8. Solar energy proves … in colder regions which don't receive good sunlight.
a) to be ineffective;
b) to be effective;
c) to be rather effective.

9. The main reason for the lack of mass exploitation of solar power technologies is … .
a) ethical;
b) artistic;
c) economic.

10. Solar energy advantages are much more than its disadvantages which make it … .
a) an ineffective source of producing alternative energy;
b) a viable source of producing alternative energy;
c) a viable source of producing nuclear energy.

X. Form adjectives using the following suffixes: -al, -able, -ive, -ent.

Industry, renew, comfort, produce, enjoy, differ, environment, alternate, technology, reason, effect, intensity, activity, orbit, depend, predict, control.

XI. Write out the "key" words from each paragraph.

XII. Retell the text using the "key" words.

B. RENEWABLE SOURCES OF ENERGY

I. Read and memorize the following words.

Advancement – продвижение, развитие, прогресс; adverse – вредный, враждебный, неблагоприятный; be prone to – иметь предрасположенность к; breakdown – авария, поломка, разрушение; cause – вызывать, быть причиной; combustion – горение, сжигание, сгорание; earthquake – землетрясение; explorer – исследователь, первооткрыватель; greenhouse gas – парниковый газ; havoc – опустошение, разорение; landfill – мусорная свалка, захоронение отходов; light house – маяк; municipal and industrial waste – городские и промышленные отходы; noise disturbance – шумовая помеха; predictable – предсказуемый, прогнозируемый; sailing ship – парусник; scale – масштаб, шкала, степень; tap – улавливать, подсоединяться; tide – прилив и отлив; warning buoy – предупреждающий бакен.

II. Read and pronounce the following words correctly.

Explorer, powering, advancement, experience, disturbance, route, decade, particular, temperature, earthquake, volcano, reservoir, Alaska, Hawaii, totally, utilize, hydroelectric, capture, kinetic, mechanical, huge, havoc, Fahrenheit, conversion, biomass, transportation, combustion, fuel.

III. Think and express your opinion.

1. In what areas of your life can you use renewable sources of energy?
2. What renewable source of energy is the most promising in Belarus?

IV. Read and translate the text.

Renewable Sources of Energy

Wind energy is one of the energy sources that have been in use for a very long time. It was used in powering sailing ships, which made it possible for explorers to sail around their trade routes in distant lands. Wind power is a renewable source of energy. It does not cause any air pollution and have created several jobs in last few decades. Advancement in technologies has brought down the cost of setting up wind power plant. Wind energy can only be used in areas which experience high winds which means that it cannot be used as a source to extract energy anywhere on earth. They sometimes create noise disturbances and cannot be used near residential areas. These disadvantages have restricted the use of wind energy to particular regions only.

Geothermal energy means energy drawn or harnessed from beneath the earth. It is completely clean and renewable. Geothermal energy can be found anywhere on the earth. Most countries tap this energy to generate electricity and power millions of homes. The areas which have high underground temperatures are the ones which are prone to earthquakes and volcanoes. The United States produces more geothermal electricity than any other country in the world. Most hot water geothermal reservoirs are located in the western states, Alaska and Hawaii. Geothermal energy is totally renewable as earth will continue to produce heat as long as we are all here. If these resources are tapped and utilized effectively, they can provide solution to the world's power problems.

Hydroelectric energy is the energy of moving water that can be captured and used. Hydroelectric power stations capture the kinetic energy of moving water and give mechanical energy to turbines. The moving turbines then convert mechanical energy into electrical energy through generators. Dams around the world have been built for this purpose. Hydropower is the largest producer of alternative energy in the world.

There are different types of hydropower plants. The selection of hydropower plant depends mainly on volume and flow of water. Hydropower is renewable, constant, predictable and controllable source of energy. It emits no greenhouse gases and is environment friendly. On the negative side, it may cause adverse effect on aquatic life, reduce flow of water which may affect agriculture, require huge costs to build and may cause havoc if there is a breakdown.

Ocean energy. Due to massive size of oceans, ocean energy can be used on much wider scale than other alternative sources of energy. There are three basic ways to tap the ocean for its energy. We can use the ocean's waves, we can use the ocean's high and low tides, or we can use temperature differences in the water.

Kinetic energy (movement) exists in the moving waves of the ocean. That energy can be used to power a turbine. Most wave-energy systems are very small. But they can be used to power a warning buoy or a small light house.

Tidal power basically involves using kinetic energy from the incoming and outgoing tides. The difference in high tides and low tides are also important in this respect. In short, tidal energy generator captures the kinetic motion of the tides and converts it into electrical energy. The main advantage of tidal energy is that it is completely renewable and much more predictable than wave energy.

Power plants can be built that use the difference in temperature to produce energy. A difference of at least 38 degrees Fahrenheit is needed between the warmer surface water and the colder deep ocean water.

Biomass energy is the process by which an alternative energy is generated through conversion of biological materials and wastes into forms that can be used as energy sources for heating, power generation and transportation. Biomass energy has been around since ancient times when people used to burn wood or coal to heat their homes or prepare food. Wood still remains the most common source to produce biomass energy. Apart from wood, the other products that are used to create biomass energy include crops, plants, municipal and industrial waste, landfills and agricultural waste. Biomass is a renewable source of energy as we would be able to produce it as long as crops, plants and waste exist. It does not create any greenhouse gases and it can be easily extracted through the process of combustion. Another advantage of biomass is that it helps to reduce landfills. Biomass is comparatively ineffective as compared to fossil fuels. It releases methane gases which can be harmful to the environment.

V. Answer the questions.

1. What renewable energy sources have been in use for a very long time? 2. What are the basic advantages of all renewable energy sources? 3. What are the basic disadvantages of all renewable energy

sources? 4. Where is wind energy used? 5. In what way do we use geothermal energy? 6. What can provide solution to the world's power problems? 7. What is the operation principle of hydroelectric power stations? 8. Why can ocean energy be used on much wider scale than other alternative sources of energy? 9. What basic ways to tap the ocean for its energy do you know? 10. How is biomass energy produced?

VI. Match the words below to their definitions.

1. wind energy	a) energy produced using temperature differences in the sea water;
2. biomass energy	b) allowing a choice;
3. ocean energy	c) rise and fall of the ocean surface level;
4. hydroelectric energy	d) to make or put to use;
5. geothermal energy	e) person who travels through unfamiliar territory;
6. power plant	f) place where electricity is generated;
7. tide	g) energy drawn or harnessed from beneath the earth;
8. alternative	h) barrier constructed to control or raise the level of water;
9. dam	i) energy produced by moving air masses;
10. utilize (v)	j) energy of moving water that can be captured and used;
11. explorer	k) energy generated through conversion of biological materials and wastes.

VII. Fill the gaps in the sentences, using the words below.

a) increases;	*e) turbines;*	*i) encompasses;*	*m) earth;*
b) environment;	*f) steam;*	*j) temperature;*	*n) fuel;*
c) consideration;	*g) fossil;*	*k) geothermal;*	*o) continuously;*
d) alternative;	*h) magma;*	*l) pollution;*	*p) boil.*

1. Alternative energy … all those things that do not consume fossil … . 2. They are widely available and … friendly. 3. They cause little or almost no … . 4. There have been several … energy projects running in various countries to reduce our dependence on traditional … fuels. 5. There are many impressive options that you can take into … . 6. One of them is … energy that has been in used since last several years.

7. The earth contains a molten rock called … . 8. Heat is … produced from there. 9. The temperature … about 3 degrees Celsius, for every 100 meters you go below ground. 10. Below 10,000 meters the … is so high, that it can be used to … water. 11. Water makes its way deep inside the … and hot rock boils that water. 12. The boiling water then produces … which is captured by geothermal heat pumps. 13. The steam turns the … which in turn activate generators.

VIII. Insert prepositions where necessary.

Hydrogen Energy

1. Hydrogen is the most abundant element … available … earth but it is rarely alone. 2. Even water contains two thirds … hydrogen. 3. It is usually available … other elements and has to be separated before we can make use … it. 4. Hydrogen has tremendous potential and can be used to power up homes, vehicles and even … space rockets. 5. It takes a lot … energy to separate hydrogen … other elements and therefore it proves to be quite expensive to extract.

6. The main benefit … hydrogen energy is that it is clean source … fuel and does not leave any waste elements behind except water. 7. There are no harmful emissions and it is environment … friendly. 8. It is completely renewable and can be produced over and … again … demand. 9. Hydrogen can also be used to make bombs like the ones used … America on Hiroshima and Nagasaki which makes it highly inflammable. 10. Dependency … fossil fuels still remains as we need them to extract hydrogen from other elements. 11. Also, it is quite … expensive to produce and store.

IX. Choose the best continuation for each of the following sentences.

1. Wind power does not cause any … .

a) water pollution;

b) air pollution;

c) earth pollution.

2. Advancement in technologies has brought down … wind power plant.

a) the cost of setting up;

b) the effectiveness of setting up;

c) the utility of setting up.

3. Geothermal energy can be found … on the earth.

a) nowhere;

b) anywhere;

c) very rarely.

4. The United States produces more geothermal electricity than … .

a) Belarus;

b) all countries in the world;

c) any other country in the world.

5. Hydroelectric power stations capture … and give mechanical energy to turbines.

a) the potential energy of moving water;

b) the chemical energy of moving water;

c) the kinetic energy of moving water.

6. Hydropower is renewable, constant, predictable and … source of energy.

a) controllable;

b) powerful;

c) expensive.

7. Tidal power basically involves using kinetic energy from the … .

a) incoming and outgoing tides;

b) incoming tides;

c) outgoing tides.

8. A difference of … is needed between the warmer surface water and the colder deep ocean water.

a) more than 38 degrees Fahrenheit;

b) at least 38 degrees Centigrade;

c) at least 38 degrees Fahrenheit.

9. Wood still remains the most common source to produce … .

a) chemical energy;

b) biomass energy;

c) mechanical energy.

10. Biomass energy can be easily extracted through … .

a) the process of boiling;

b) the process of combustion;

c) the process of evaporation.

X. Open the brackets in the sentences, use the proper form of the passive voice.

1. What's going on here? What's all that noise? – Sorry! My flat … (to redecorate). 2. If the work … (not/to finish) by evening, you'll be in trouble. 3. By the time I left the problem … (not/to solve) though it … (to discuss) actively for quite a long time. 4. Why … (this information/ever/to use)? It's so interesting! 5. Such clothes … (not/to wear) now. 6. Don't worry. Nobody will notice such a tiny spot. It … (not/to pay attention to). 7. She suddenly realized that she … (to listen to) in complete silence. 8. She … (not/to introduce) by the hostess and felt embarrassed as she herself didn't know anybody. 9. I'll take a picture of you when you … (to give) the prize. 10. What was that book about? – It … (to devote) to the writer's brother who … (to kill) in the war. 11. He … (to offer) several times. – What made him refuse it? 12. I … (to tell) that the problem … (not/to consider) yet but when it was I … (to inform) immediately. 13. They say a new play … (to rehearse) by the school theatre. – Oh, yes, all the parents and teachers. 14. The girl was crying because she … (to made fun of) by her classmates. 15. It was the third time the name … (to mention) and I wondered who the man was. 16. I was sure that if the figures … (to check) properly the mistake … (to find) easily. 17. I'm fed up. I … (to keep) waiting for half an hour! I'm not going to stay here any longer. 18. Now that the situation … (to study) thoroughly what … (to do) to improve? 19. This is the only thing that … (to talk about) for several days. 20. I doubted if the child … (to look after) properly though I … (to promise) complete care.

XI. Write a plan of the text.

XII. Retell the text using the plan.

Energy Management
Conservation Energy
Energy Management
Energy Efficiency Energy

UNIT 6

A. ENERGY EFFICIENCY AND CONSERVATION

I. Read and memorize the following words.

Advancement biomass gasification – газификация биомасс; be in widespread use – широко использоваться; biorefinery technologies – технологии процесса получения топлива, электрической, тепловой энергии и химикатов из биомассы; chase a receding target – преследовать удаляющуюся цель; commitment – принятие финансовых обязательств; energy efficient appliances – устройства с низким энергопотреблением; fluorescent light bulb – лампа дневного света, люминесцентная лампа; household – домашнее хозяйство; impact – оказывать влияние; incandescent bulb – лампа накаливания; likewise – также, таким же образом; long-term energy strategies and policies – долгосрочные стратегии и политика энергопотребления; make deep cuts – сильно сократить; RD&D investments – капиталовложения в исследования, разработки и демонстрацию; rely on wisely – по-хозяйски; serious vision – значительная концепция развития; slow down – замедлить, снизить скорость; solar photovoltaics – солнечное фотоэлектричество; twin pillars – две опоры; utility bill – счет за коммунальные услуги.

II. Read and pronounce the following words correctly.

Foundation, lighting, entertainment, comfortable, productive, require, environment, thermostat, function, fluorescent light bulb, incandescent bulb, key components, concept, focus on, hydroelectricity, industrial revolution, hydropower, biomass combustion, bioenergy, rock geothermal energy, carbon dioxide emissions.

III. Think and express your opinion.

1. Do the terms "energy efficiency" and "energy conservation" mean the same thing? 2. What measures are more economically viable: dealing with "energy efficiency" or "energy conservation"?

IV. Read and translate the text.

Energy Efficiency and Conservation

Energy is more than numbers on a utility bill: it is the foundation of everything we do. All of us use energy every day – for transportation, cooking, heating and cooling rooms, manufacturing, lighting, and entertainment. We rely on energy to make our lives comfortable, productive and enjoyable. To maintain our quality of life we must use our energy resources wisely.

The choices we make about how we use energy – turning machines off when we're not using them or choosing to buy energy efficient appliances – impact our environment and our lives. There are many things we can do to use less energy and use it more wisely. These things involve energy conservation and energy efficiency. Many people think these terms mean the same thing, but they are different.

Energy conservation is any behavior that results in the use of less energy. If you want to conserve energy turn down your thermostat and put on a sweater. Energy efficiency is the use of technology that requires less energy to perform the same function. If you want to become more energy-efficient use a compact fluorescent light bulb that uses less energy than an incandescent bulb to produce the same amount of light. It is an example of energy efficiency. The decision to replace an incandescent light bulb with a compact fluorescent is an example of energy conservation.

Efficiency and conservation are key components of energy sustainability – the concept that every generation should meet its energy needs without compromising the energy needs of future generations. Energy sustainability focuses on long-term energy strategies and policies that ensure adequate energy to meet today's and tomorrow's needs. The term "sustainable energy" includes renewable energy sources such as wind and solar energy as well as non-renewable sources (e.g. nuclear power). But renewable energy technologies are essential contributors to sustainable energy as they generally contribute to world energy security reducing dependence on fossil fuel

resources and providing opportunities for mitigating greenhouse gases. Renewable energy technologies include such sources as hydroelectricity, solar energy, wind energy, wave power, geothermal energy and tidal power.

Conceptually one can define three generations of renewables' technologies, reaching back more than 100 years.

First-generation technologies emerged from the industrial revolution at the end of the 19th century and included hydropower, biomass combustion, geothermal power and heat. Some of these technics are still in widespread use.

Second-generation technologies include solar heating and cooling, wind power, modern forms of bioenergy and solar photovoltaics. These are now entering markets as a result of research, development and demonstration (RD&D) investments since the 1980s. Many of the technics reflect significant advancements in materials.

Third-generation technologies are still under development and include advanced biomass gasification, biorefinery technics, concentrating solar thermal power, hot dry rock geothermal energy and ocean energy. Advances in nanotechnology also play a major role.

Energy efficiency and renewable energy are said to be the twin pillars of sustainable energy. Both of them must be developed in order to stabilize and reduce carbon dioxide emissions. Efficiency slows down energy demand growth so that rising clean energy supplies can make deep cuts in fossil fuel use. If energy use grows too fast renewable energy development will chase a receding target. Likewise, unless clean energy supplies come online rapidly, slowing demand growth will only begin to reduce total emissions; reducing the carbon content of energy sources is also needed. Any serious vision of a sustainable energy economy thus requires commitments to both renewables and efficiency.

V. Answer the following questions to the text.

1. What is energy conservation? Give an example of energy conservation. 2. What is energy efficiency? Give an example of it. 3. What is energy sustainability? 4. What sources do renewable energy technologies include? 5. How many generations of renewables' technologies can be defined? 6. What technics do the first-generation technologies include? 7. When did they appear? 8. What techniques do the second-generation technologies include? 9. When did they appear? 10. What

10. What techniques do the third-generation technologies include? 11. Do energy efficiency and renewable energy technologies have to be developed?

VI. Match the words below to their definitions.

1. energy-efficient	a) a piece of equipment, especially electrical equipment, used in people's homes;
2. appliance	b) a place where rubbish is buried;
3. vehicle	c) the science of making or working with things that are so small that they can only be seen using a powerful microscope;
4. landfill	d) machine which is used for transporting people or goods on land, especially on roads;
5. recycling	e) large enough to be important;
6. conservation	f) prevention of wasteful use of a resource;
7. thermostat	g) when paper, glass, plastic, etc. is put through a process so that it can be used again;
8. nanotechnology	h) using little electricity, gas, etc.;
9. generation	i) a practical exhibition and explanation of how something works;
10. demonstration	j) a device that automatically regulates temperature;
11. significant	k) a single stage in the development of a type of product.

VII. Insert prepositions where necessary.

1. The need to develop … renewable energy is widely seen as a futuristic technological challenge. 2. In reality some … the most effective ways … harnessing power from nature are based … concepts that have existed for many years.

3. The wind turbine is … an obvious example. 4. Another – less well-known, but conceived … almost a century ago – is the solar tower or solar chimney. 5. And if the Australian company "EnviroMission" completes an ambitious solar tower project … the New South Wales desert, the technology could capture not just the sun's rays but … the public's imagination worldwide. 6. The firm is planning … to construct a colossal tower one kilometer high. 7. If built, it will be the world's tallest structure … a huge margin.

8. A large glass enclosure is built … a chimney as its center. 9. The sun heats the enclosure causing expansion … the air inside. 10. … the top of the chimney the lower temperature and lower pressure due … the higher altitude create a pressure differential known as stack effect. 11. This causes air to flow … the chimney. 12. Electricity is generated … turbines … the bottom of the chimney, which are driven … the flow … air.

VIII. Complete the sentences using a word derivationally related to the word given in brackets.

1. Appliances account for about 20% of a (typically) household's energy use, with refrigerators, clothes (wash) and dryers at the top of the list. 2. When (shop) for new appliances, you should think of two price tags. 3. The first one is the purchase (priceless). 4. The second price tag is the cost of (operate) the appliance during its lifetime. 5. You'll be paying that second price tag on your utility bill every (monthly) for the next 10 to 20 years, depending on the appliance. 6. Many energy (efficiency) appliances cost more to buy, but save money in lower energy costs. 7. Over the life of an appliance, an energy-efficient (modeler) is always a better deal.

IX. Choose the best continuation for each of the following sentences.

1. We rely on energy to make our lives … .

a) comfortable, enjoyable and expensive;

b) enjoyable, comfortable and creative;

c) comfortable, productive and enjoyable.

2. To maintain our quality of life we must use our … .

a) energy resources wisely;

b) energy resources carefree;

c) financial resources wisely.

3. Energy conservation is any behavior that results in the use of … .

a) less time;

b) less energy;

c) less space.

4. The decision to replace an incandescent light bulb with a compact fluorescent is … .

a) an example of energy generation;

b) an example of energy conservation;

c) an example of energy usage.

5. Efficiency and conservation are key components of … .

a) energy development;

b) energy research;

c) energy sustainability.

6. Every generation should meet its energy needs … the energy needs of future generations.

a) without compromising;

b) with compromising;

c) compromising.

7. First-generation technologies emerged from the industrial revolution … .

a) at the end of the 19th century;

b) at the beginning of the 19th century;

c) at the end of the 20th century.

8. Second-generation technologies include solar heating and cooling, wind power, modern forms of … .

a) geothermal power and solar photovoltaics;

b) bioenergy and hydropower;

c) bioenergy and solar photovoltaics.

9. Third-generation technologies are still … .

a) under research;

b) under development;

c) under investigation.

10. If energy use grows too fast renewable energy development … .

a) will chase a useless target;

b) will chase a receding target;

c) will chase an approaching target.

X. Form adjectives using the following suffixes: -al, -able, -ive, -ent.

Addition, comfort, commerce, differ, difference, dispose, effect, enjoy, equivalence, essence, fluoresce, globe, incandesce, industry, nature, tide, type, productivity, program, renew, residence, resident, sustain, technology.

XI. Write out the "key" words from each paragraph.

XII. Retell the text using the "key" words.

B. ENERGY MANAGEMENT

I. Read and memorize the following words.

Attainable – достижимый; awareness – осведомленность, понимание; comprehensive plan – комплексный план; continuous improvement – непрерывное совершенствование; elimination – устранение, удаление; energy management – энергетический менеджмент, управление энергосбережением; facilities management – управление оборудованием; greenhouse gas emission – выброс парникового газа; incorporate – вводить, включать, соединять; leased – арендованный, сданный в наем; objective – цель, задача; ongoing monitoring – непрерывный, постоянный мониторинг (контроль); operating costs – эксплуатационные затраты, текущие расходы; procurement – поставка, закупка; purchase – покупка, приобретение; target setting – постановка задачи; unavoidable – неизбежный, неминуемый; wastage – нерациональное использование, потери; with due regard to – с должным вниманием к; work environment – условия труда.

II. Read and pronounce the following words correctly.

Systematic, minimize, procurement, awareness, optimization, appropriate, environmental, comprehensive, emission, incorporate, purchase, unavoidable, variable, achievable, implementation, attainable, surroundings, approximately.

III. Think and express your opinion.

1. Did energy management exist in ancient times? 2. Do you need energy management in your everyday life?

IV. Read and translate the text.

Energy Management

Energy management is the collective term for all the systematic practices to minimize and control both the quantity and cost of energy used in providing a service.

Important components of energy management include:

– staff involvement and awareness;

– minimization of energy wastage;

– ongoing monitoring, target setting and reporting to ensure energy use remains within policy objectives;

– optimization of energy efficiency through passive means and/or the use of appropriate technology;

– use of the most appropriate energy source (e.g. electricity, gas, solar) with due regard to the environmental benefits;

– purchase of energy at the most economical price;

– modification of operations, where possible, to make the best use of energy price structures;

– increasing the use of energy from renewable sources.

Energy management should not be undertaken in isolation but should be a strategic component of a comprehensive business management plan. It is a key part of any philosophy of continuous improvement. Energy management not only makes good financial sense it also protects the environment by reducing the amount of greenhouse gas emissions.

Companies that incorporate an energy reduction strategy under the umbrella of a total business management plan are more likely to achieve greater energy savings. Proper planning at the time of procurement can provide lasting financial and environmental benefits.

Energy management practices should be reflected in the procurement plans for: goods and services, leased accommodation, building and renovation projects, facilities management contracts and energy providers.

Many organizations regard energy costs as unavoidable and fixed. However, energy costs are one of the more controllable variable costs. Generally, all that is required to ensure the success of an energy management program is the commitment of all staff, from the most senior level down to the office floor. Raising the awareness of energy use and potential energy savings is therefore one of the key drivers to a successful program. In most cases a successful energy management policy will only require a small capital investment and over the short to medium term will actually save money.

Benefits of energy management are the following.

Minimizing operating costs. It is estimated that a 5% reduction in operating costs is achievable through good housekeeping practices and the implementation of a comprehensive energy management program. Additional savings of up to 7% should be attainable in the medium to longer term through investment in energy efficient technology upgrades.

Improving process control. Paying close attention to the operation of building controls will usually improve the performance of building systems, including the elimination of systems working against each other (e.g. heating and cooling on at the same time).

Improving work environment. An efficient and better-controlled building leads to an improvement in general working conditions for staff. More comfortable surroundings contribute to a more productive workplace.

Reducing environmental impact. For every kilowatt-hour of electricity consumed, approximately 1 kilogram of greenhouse gas is emitted to the atmosphere. Implementing an energy management program not only saves money, it reduces the environmental impact.

V. Answer the questions.

1. Why is energy management the collective term? 2. What important components of energy management do you know? 3. How should be energy management undertaken? 4. What companies are more likely to achieve greater energy savings? 5. What can you say about energy costs? 6. What are the benefits of energy management? 7. What contributes to a more productive workplace? 8. Why does implementing an energy management program reduce the environmental impact?

VI. Complete the sentences using a word derivationally related to the word given in brackets.

1. Energy (manage) is a (relative) new technique being employed by quick (think) companies who are willing to trade tradition for a new way of thinking.

2. Energy management takes into (count) all areas of the utility supply from the purchasing and supply of (nature) resources such as gas and (electric) to the assistance of meeting (govern) targets of emissions (reduce) and current legislation on pollution (prevent).

3. Energy analysis is the use of energy (inform) provided by electrical equipment. 4. Energy management today has a (signify) impact on customers' net income. 5. Energy costs are (control), and now a user can have a significant cost reducing impact at the plant and business level. 6. With natural gas and (electric) monitoring, customer usage analysis becomes a tool that can enable energy cost productivity savings and price reductions.

VII. Insert preposition where necessary.

1. Energy management is the tendering and negotiation … energy contracts … the supply … electricity and natural gas … single and multiple sites. 2. This includes the administration … contracts to ensure the smooth transfer … supplies, as well as a constantly updated … service where the top suppliers are monitored to ensure the best possible prices are achieved … all times.

VIII. Match the words below to their definitions.

1. consumption	a) irregular, unnatural, not normal;
2. adviser	b) direction or control of the affairs;
3. assessment	c) the act of consuming;
4. abnormal	d) a person who gives an opinion or advises;
5. expertise	e) a part or element of a larger whole;
6. purchase (v)	f) any plan or principle which guides decision making;
7. management	g) keeping for another time in the future;
8. policy	h) to receive by paying money as an exchange;
9. audit	i) all the people employed by a particular organization;
10. saving	j) verification or examination of financial accounts or records;
11. component	k) a specialized knowledge, ability, or skill in a particular area;
12. staff	l) the official determination of value.

IX. Choose the best continuation for each of the following sentences.

1. Energy management should be a strategic component of a … .

a) comprehensive management plan;

b) comprehensive business management plan;

c) comprehensive business plan.

2. Energy management is a key part of any philosophy of … .

a) continuous improvement;

b) stationary improvement;

c) continuous investigation.

3. Energy management protects the environment … of greenhouse gas emissions.

a) by increasing the amount;
b) by reducing the amount;
c) by reducing the area.

4. Proper planning at the time of procurement can provide … .
a) lasting historical and environmental benefits;
b) lasting financial and artistic benefits;
c) lasting financial and environmental benefits.

5. Many organizations regard energy costs as … .
a) unavoidable and fixed;
b) unavoidable and changeable;
c) avoidable and fixed.

6. Raising the awareness of energy use and … is therefore one of the key drivers to a successful program.
a) potential energy expenditure;
b) potential energy savings;
c) potential time savings.

7. In most cases a successful energy management policy will only … .
a) require a small energy investment;
b) require a small capital audit;
c) require a small capital investment.

8. More comfortable surroundings contribute to a … .
a) more productive workplace;
b) more productive worktime;
c) more productive workforce.

9. For every kilowatt-hour of electricity consumed, approximately … is emitted to the atmosphere.
a) 3 kilograms of greenhouse gas;
b) 2 kilograms of greenhouse gas;
c) 1 kilogram of greenhouse gas.

10. Implementing an energy management program … money.
a) saves;
b) earns;
c) collects.

X. Choose the correct variant of translation of the given word combinations.

Comprehensive business management plan (бизнес-управление комплексным планом, комплексный план управления бизнесом), energy reduction strategy (стратегия уменьшения энергозатрат,

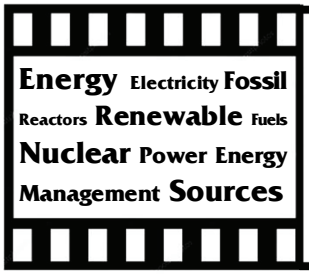
энергозатраты энергетической стратегии), building and renovation projects (планы по строительству и реконструкции, строительство и реконструкция по плану), facilities management contracts (оборудование для контрактов по управлению, контракты по управлению оборудованием), successful energy management policy (успешная политика управления потреблением энергии, успешная энергетика для управления политикой), energy efficient technology upgrade (эффективная технология модернизации энергии, модернизация энергоэкономичной технологии).

XI. Open the brackets, use the particle or the infinitive where necessary.

1. I can't afford … (stay) at such an expensive hotel. 2. I think I'll manage to … (do) the work tomorrow. 3. You'd better … (spend) the evening at home. 4. Who taught you … (skate)? 5. I can't make the child … (go) to bed? 6. They agreed … (help) us. 7. I'd rather … (go) to the cinema. 8. I was let … (visit) the sick man. 9. Tell him … (come) at once. 10. Let him … (have a look) at the photo. 11. The doctor forbade him … (smoke). 12. You'd better ... (help) them now. 13. Make him … (clean) the flat. 14. He failed … (get) Sam on the phone. 15. I can't let you … (go) there alone. 16. The child was made … (learn) the poem. 17. He refused … (work) with us. 18. I advise you … (visit) this exhibition. 19. Jack decided … (not/answer) the letter. 20. The man was made … (pay) the fine.

XII. Write out the "key" words from each paragraph.

XIII. Retell the text using the "key" words.



TEXTS FOR SUPPLEMENTARY READING

I. Read the text and give the most appropriate title.

Electricity is an essential part of modern life and of economy. People use electricity for lighting, heating, cooling, and refrigeration and for operating appliances, computers, electronics, machinery, and public transportation systems. Electricity use in the United States in 2018 was more than 16 times greater than electricity use in 1950.

Total electricity consumption includes retail sales of electricity to consumers and direct use electricity. Direct use electricity is both produced by and used by the consumer. The industrial sector generates and uses nearly all of the direct use electricity. In 2018, retail sales of electricity were about 3.80 trillion kW · h, equal to 96% of total electricity consumption. Direct use of electricity by all end-use sectors was about 0.14 trillion kW · h, or about 4% of total electricity consumption.

The sales of electricity to major consuming sectors and percentage share of total electricity sales in 2018 were:

1) residential – 1.46 trillion Kw · h – 38.5%;

2) commercial – 1.38 trillion kW · h – 36.2%;

3) industrial – 0.95 trillion kW · h – 25.1%;

4) transportation – 0.01 trillion kW · h – 0.2% (mostly to public transit systems).

Cooling accounts for the largest share of annual U.S. residential sector electricity consumption. The U.S. Energy Information Administration (EIA) estimates that electricity use by fans and air-conditioning equipment for cooling the interior space of homes was the single largest use of electricity by the U.S. residential sector in 2018. The major uses of electricity and their shares of total residential sector electricity use in 2018 were:

– cooling/air conditioning – 14.7%;
– space heating – 14.2%;
– water heating – 11.9%;
– lighting – 6.2%;
– refrigeration – 6.0%;
– televisions and related electronic equipment – 4.3%;
– clothes dryers – 4.1%;
– computers and related equipment – 1.8%;
– heating equipment fans and pumps – 1.7%;
– freezers – 1.4%;
– cooking – 1.1%;
– clothes washers (excludes water heating) – 0.7%;
– dishwashers – 0.5%;
– other miscellaneous uses – 31.5%.

The other miscellaneous uses in the list above include the many, mostly small, electrical appliances in U.S. houses, apartments, and related property.

II. Read and translate the following text. Express the main idea of the text in 1 or 2 short sentences.

Electricity use in the United States is projected to grow slowly. Total electricity consumption in the United States increased between 1950 and 2007, with an average annual increase of about 5%. Between 2008 and 2018 growth in total U.S. electricity use was nearly flat, with total electricity consumption in 2018 only 2% greater than consumption in 2008. Retail electricity sales to the industrial sector peaked in 2000 and then generally declined each year through 2018. During the same period, the industrial sector's share of total U.S. electricity retail sales dropped from 30 to 24%. Commercial and residential sector electricity consumption in 2017 was about equal to consumption in 2007. A relatively warm summer and cold winter in most regions of the country in 2018 contributed to an increase of about 6% in total residential electricity consumption in 2018.

Electricity demand growth in the future may be moderate because of various factors such as efficiency improvements associated with new appliance standards in buildings sectors and overall improvements in the efficiency of technologies powered by electricity. It is predicted that the total U.S. electricity use will grow on average less than 1% annually from 2018 through 2050.

III. Read the text and choose the most suitable title from the given variants. Explain your choice.

1. Clean electricity.
2. The Clean Air Act.
3. Environmental effects of electricity generation.
4. Physical footprint of power plants.

Although electricity is a clean and relatively safe form of energy when it is used, the generation and transmission of electricity affects the environment. Nearly all types of electric power plants have an effect on the environment, but some power plants have larger effects than others.

The United States have laws that govern the effects that electricity generation and transmission have on the environment. The Clean Air Act regulates air pollutant emissions from most power plants. The U.S. Environmental Protection Agency (EPA) administers the Clean Air Act and sets emissions standards for power plants through various programs such as the Acid Rain Program. The Clean Air Act has helped to substantially reduce emissions of some major air pollutants in the United States.

All power plants have a physical footprint (the location of the power plant). Some power plants are located inside, on, or next to an existing building, so the footprint is fairly small. Most large power plants require land clearing to build the power plant. Some power plants may also require access roads, railroads, and pipelines for fuel delivery, electricity transmission lines, and cooling water supplies. Power plants that burn solid fuels may have areas to store the combustion ash.

Many power plants are large structures that alter the visual landscape. In general, the larger the structure, the more likely it is that the power plant will affect the visual landscape.

Electricity transmission lines and the distribution infrastructure that carries electricity from power plants to customers also have environmental effects. Most transmission lines are above ground on large towers. The towers and power lines alter the visual landscape. Vegetation near power lines may be disturbed and may have to be continually managed to keep it away from the power lines. These activities can affect native plant populations and wildlife. Power lines can be placed underground, but it is a more expensive option and usually not done outside of urban areas.

IV. Read and translate the following text. Express the main idea of the text in 1 or 2 short sentences.

Fossil Fuel, Biomass and Waste Burning Power Plants

In the United States, about 64% of total electricity generation in 2017 was produced from fossil fuels (coal, natural gas, and petroleum), materials that come from plants (biomass), and municipal and industrial wastes. The substances that occur in combustion gases when these fuels are burned include: carbon dioxide (CO_2); carbon monoxide (CO); sulfur dioxide (SO_2); nitrogen oxides (NO_x); particulate matter (PM); heavy metals such as mercury.

Nearly all combustion byproducts have negative effects on the environment and human health:

– CO_2 is a greenhouse gas, which contributes to the greenhouse effect;

– SO_2 causes acid rain, which is harmful to plants and to animals that live in water. SO_2 also worsens respiratory illnesses and heart diseases, particularly in children and the elderly;

– NO_x contributes to ground-level ozone, which irritates and damages the lungs;

– PM results in hazy conditions in cites and scenic areas and coupled with ozone, contributes to asthma and chronic bronchitis, especially in children and the elderly. Very small, or fine PM, is also believed to cause emphysema and lung cancer;

– heavy metals such as mercury are hazardous to human and animal health.

V. Read the text and express the main idea of it.

In April 2019, U.S. monthly electricity generation from renewable sources exceeded coal-fired generation for the first time. Renewable sources provided 23% of total electricity generation to coal's 20%. This outcome reflects both seasonal factors as well as long-term increases in renewable generation and decreases in coal generation. Statistics includes utility-scale hydropower, wind, solar, geothermal, and biomass in its definition of renewable electricity generation.

In the United States, overall electricity consumption is often low in the spring and fall months because temperatures are more moderate and electricity demand for heating and air conditioning is relatively low. Consequently, electricity generation from fuels such as natural gas, coal, and nuclear is often at its lowest point during these months as some generators undergo maintenance.

Electricity generation from wind and solar has increased as more generating capacity has been installed. In 2018, about 15 gigawatts (GW) of wind and solar generating capacity came online. Wind generation reached a record monthly high in April 2019 of 30.2 million megawatt-hours (MW · h). Solar generation – including utility-scale solar photovoltaics and utility-scale solar thermal – reached a record monthly high in June 2018 of 7.8 million MW · h and is likely to surpass that level in summer.

Seasonal increases in hydroelectric generation also helped drive the overall increase in renewable generation. Conventional hydroelectric generation, which remains the largest source of renewable electricity in most months, totaled 25 million MW · h in April. Hydroelectric generation tends to peak in the spring as melting snowpack results in increased water supply at downstream generators.

U.S. coal generation declined from its peak a decade ago. Since the beginning of 2015, about 47 GW of U.S. coal-fired capacity has retired, and virtually no new coal capacity has come online. Based on reported plans for retirements, it is expected another 4.1 GW of coal capacity to retire in 2019, accounting for more than half of all anticipated power plant retirements for the year.

According to forecasts coal will provide more electricity generation than renewables in the United States for the remaining months of 2019. On an annual average basis, coal will provide more electricity generation in the United States than renewables in both 2019 and 2020, but renewables are expected to surpass nuclear next year.

VI. Read the text and make up the questions to the text.

Canada as a Key Energy Trade Partner to the United States

Canada is the largest energy trading partner with the United States based on the combined value of energy exports and imports. Although the value of bilateral energy trade with Canada has varied over the last decade, the overall energy trade balance has changed relatively little, with U.S. energy imports from Canada consistently exceeding U.S. energy exports to Canada by a large margin.

Energy accounted for $25 billion, or about 8%, of the value of all U.S. exports to Canada in 2018, the highest value since 2014. Canada is the second-largest importer of energy from the

United States. Energy accounted for $84 billion, or 26%, of the value of all U.S. imports from Canada in 2018.

Crude oil imports from Canada accounted for 48% of total U.S. crude oil imports in 2018, averaging 3.7 million barrels per day (b/d), up from 3.5 million b/d in 2017. In 2018, the value of U.S. imports of Canadian crude oil also increased, reaching $61 billion, because of an increase in both oil prices and volume through the first three quarters of the year.

Canada's share of U.S. crude oil exports has been falling since restrictions on exporting U.S. crude oil were lifted in 2015, but Canada remains the largest destination for U.S. crude oil exports. U.S. crude oil exports to Canada are typically light, sweet grades that are shipped to the eastern part of the country. Most Canadian crude oil exports to the United States are heavy oil from oil sands in the western part of the country.

Bilateral petroleum products trade between the United States and Canada is relatively balanced in both volume and value. In 2018, Canada was the destination for 581,000 b/d of petroleum products, which was 10% of all petroleum products exported from the United States. These exports were valued at more than $13 billion in 2018.

Bilateral natural gas trade between Canada and the United States is dominated by pipeline shipments, which made up 97% of all U.S. natural gas imports in 2018. Total natural gas imports from Canada fell to 7.8 billion cubic feet per day (bcf/d) in 2018. Total natural gas imports from Canada were valued at $6 billion in 2018. Most of Canada's natural gas exports to the United States originate in western Canada and are shipped to U.S. markets in the West and Midwest regions.

U.S. natural gas exports to Canada in 2018 averaged 2.3 bcf/d, valued at more than $2 billion, and they mainly went to the eastern provinces. U.S. natural gas exports to Canada were 3.3 bcf/d in February 2019, the highest level on record.

Electricity accounts for a small, though locally important, share of bilateral trade. In 2018, the value of U.S. imports of electricity from Canada was over $2 billion. The United States imported 61 million megawatt-hours (MW · h) of electricity from Canada in 2018, primarily into the Northeast and Midwest, and exported 13 million MW · h, nearly all of which was from the Pacific Northwest, based on data from Canada's National Energy Board.

VII. Read and translate the text, think of its title.

Many nations count on coal, oil and natural gas to supply most of their energy needs, but reliance on fossil fuels presents a big problem. Fossil fuels are a finite resource. Eventually, the world will run out of fossil fuels, or it will become too expensive to retrieve those that remain. Fossil fuels also cause air, water and soil pollution, and produce greenhouse gases that contribute to global warming.

Renewable energy resources, such as wind, solar and hydropower, offer clean alternatives to fossil fuels. They produce little or no pollution or greenhouse gases, and they will never run out.

Solar energy. 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.

Wind energy. 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.

Hydropower. 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 energy. 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 non-renewable fossil fuels.

Hydrogen. 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.

Geothermal energy. 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.

Ocean energy. 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 an important potential energy source for the future.

VIII. Read and translate the following text in a written form. What grammar phenomena can you point out in the text?

Renewable Energy Generation

Solar Energy. Solar energy technologies use the sun's energy and light to provide heat, light, hot water, electricity, and even cooling, for homes, businesses, and industry.

There are a variety of technologies that have been developed to take advantage of solar energy. These include:

Photovoltaic systems – production of electricity directly from sunlight. Solar cells convert sunlight directly into electricity. Solar cells are often used to power calculators and watches. They are made of semiconducting materials similar to those used in computer chips. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through

the material to produce electricity. This process of converting light (photons) to electricity (voltage) is called the photovoltaic (PV) effect.

Solar hot water – heating water with solar energy. The shallow water of a lake is usually warmer than the deep water. That's because the sunlight can heat the lake bottom in the shallow areas, which in turn, heats the water. It's nature's way of solar water heating. The sun can be used in basically the same way to heat water used in buildings and swimming pools.

Most solar water heating systems for buildings have two main parts: a solar collector and a storage tank. The most common collector is called a *flat-plate collector*. Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid – either water or other fluid, such as an antifreeze solution – to be heated. The tubes are attached to an absorber plate, which is painted black to absorb the heat. As heat builds up in the collector, it heats the fluid passing through the tubes.

The storage tank then holds the hot liquid. It can be just a modified water heater, but it is usually larger and very well-insulated. Systems that use fluids other than water usually heat the water by passing it through a coil of tubing in the tank, which is full of hot fluid.

Solar electricity – using the sun's heat to produce electricity. Many power plants today use fossil fuels as a heat source to boil water. The steam from the boiling water rotates a large turbine, which activates a generator that produces electricity. However, a new generation of power plants, with concentrating solar power systems, uses the sun as a heat source. There are three main types of concentrating solar power systems: parabolic-trough, dish/engine, and power tower.

Parabolic-trough systems concentrate the sun's energy through long rectangular, curved (U-shaped) mirrors. The mirrors are tilted toward the sun, focusing sunlight on a pipe that runs down the center of the trough. This heats the oil flowing through the pipe. The hot oil then is used to boil water in a conventional steam generator to produce electricity.

A dish/engine system uses a mirrored dish (similar to a very large satellite dish). The dish-shaped surface collects and concentrates the sun's heat onto a receiver, which absorbs the heat and transfers it to fluid within the engine. The heat causes the fluid to expand against a piston or turbine to produce mechanical power. The mechanical power is then used to run a generator or alternator to produce electricity.

A power tower system uses a large field of mirrors to concentrate sunlight onto the top of a tower, where a receiver sits. This heats molten salt flowing through the receiver. Then, the salt's heat is used to generate electricity through a conventional steam generator. Molten salt retains heat efficiently, so it can be stored for days before being converted into electricity. That means electricity can be produced on cloudy days or even several hours after sunset.

Passive solar heating and daylighting – using solar energy to heat and light buildings. Step outside on a hot and sunny summer day, and you'll feel the power of solar heat and light. Today, many buildings are designed to take advantage of this natural resource through the use of passive solar heating and daylighting.

The south side of a building always receives the most sunlight. Therefore, buildings designed for passive solar heating usually have large, south-facing windows. Materials that absorb and store the sun's heat can be built into the sunlit floors and walls. The floors and walls will then heat up during the day and slowly release heat at night, when the heat is needed most. This passive solar design feature is called *direct gain*.

Many of the passive solar heating design features also provide daylighting. Daylighting is simply the use of natural sunlight to brighten up a building's interior. To lighten up north-facing rooms and upper levels, a *clerestory* – a row of windows near the peak of the roof – is often used along with an open floor plan inside that allows the light to bounce throughout the building.

Of course, too much solar heating and daylighting can be a problem during the hot summer months. Fortunately, there are many design features that help keep passive solar buildings cool in the summer. For instance, overhangs can be designed to shade windows when the sun is high in the summer. Sunspaces can be closed off from the rest of the building. And a building can be designed to use fresh-air ventilation in the summer.

Solar process space heating and cooling. Commercial and industrial buildings may use the same solar technologies – photovoltaic, passive heating, daylighting and water heating – that are used for residential buildings. These nonresidential buildings can also use solar energy technologies that would be impractical for a home. These technologies include ventilation air preheating, solar process heating and solar cooling.

Many large buildings need ventilated air to maintain indoor air quality. In cold climates, heating this air can use large amounts of energy. A solar ventilation system can preheat the air, saving both energy and money. This type of system typically uses a *transpired collector*, which consists of a thin, black metal panel mounted on a south-facing wall to absorb the sun's heat. Air passes through the many small holes in the panel. A space behind the perforated wall allows the air streams from the holes to mix together. The heated air is then sucked out from the top of the space into the ventilation system.

Wind Energy. We have been harnessing the wind's energy for hundreds of years. From old Holland to farms in the United States, windmills have been used for pumping water or grinding grain. Today, the windmill's modern equivalent – a wind turbine – can use the wind's energy to generate electricity.

Wind turbines, like windmills, are mounted on a tower to capture the most energy. At 100 feet (30 meters) or more above ground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a rotor.

A blade acts much like an airplane wing. When the wind blows, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. This is called lift. The force of the lift is actually much stronger than the wind's force against the front side of the blade, which is called drag. The combination of lift and drag causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity.

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid or even combined with a photovoltaic (solar cell) system. For utility-scale sources of wind energy, a large number of wind turbines are usually built close together to form a wind plant. Several electricity providers today use wind plants to supply power to their customers.

Stand-alone wind turbines are typically used for water pumping or communications. However, homeowners, farmers and ranchers in windy areas can also use wind turbines as a way to cut their electric bills.

Small wind systems also have potential as distributed energy resources. Distributed energy resources refer to a variety of small, modular

power-generating technologies that can be combined to improve the operation of the electricity delivery system.

Geothermal Energy. Geothermal energy is the heat from the Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma.

Almost everywhere, the shallow ground or upper 10 feet of the Earth's surface maintains a nearly constant temperature between 50 and 60°F (10 and 16°C). Geothermal heat pumps can tap into this resource to heat and cool buildings. A geothermal heat pump system consists of a heat pump, an air delivery system (ductwork), and a heat exchanger – a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.

Geothermal electricity production – generating electricity from the earth's heat. Most power plants need steam to generate electricity. The steam rotates a turbine that activates a generator, which produces electricity. Many power plants still use fossil fuels to boil water for steam. Geothermal power plants, however, use steam produced from reservoirs of hot water found a couple of miles or more below the Earth's surface. There are three types of geothermal power plants: dry steam, flash steam, and binary cycle.

Geothermal direct use – producing heat directly from hot water within the earth. When a person takes a hot bath, the heat from the water will usually warm up the entire bathroom. Geothermal reservoirs of hot water, which are found a couple of miles or more beneath the Earth's surface, can also be used to provide heat directly. This is called the direct use of geothermal energy.

Geothermal direct use dates back thousands of years, when people began using hot springs for bathing, cooking food, and loosening feathers and skin from game. Today, hot springs are still used as spas. But there are now more sophisticated ways of using this geothermal resource.

Bioenergy. We have used biomass energy or bioenergy – the energy from organic matter for thousands of years, ever since people started burning wood to cook food or to keep warm.

And today, wood is still our largest biomass energy resource. But many other sources of biomass can now be used, including plants, residues from agriculture or forestry, and the organic component of municipal and industrial wastes. Even the fumes from landfills can be used as a biomass energy source.

The use of biomass energy has the potential to greatly reduce our greenhouse gas emissions. Biomass generates about the same amount of carbon dioxide as fossil fuels, but every time a new plant grows, carbon dioxide is actually removed from the atmosphere. The net emission of carbon dioxide will be zero as long as plants continue to be replenished for biomass energy purposes. These energy crops, such as fast-growing trees and grasses, are called *biomass feedstocks*. The use of biomass feedstocks can also help increase profits for the agricultural industry.

There are three major biomass energy technology applications.

Biofuels – converting biomass into liquid fuels for transportation. Unlike other renewable energy sources, biomass can be converted directly into liquid fuels – biofuels – for our transportation needs (cars, trucks, buses, airplanes and trains). The two most common types of biofuels are ethanol and biodiesel.

Biopower – burning biomass directly, or converting it into a gaseous fuel or oil, to generate electricity. Biopower, or biomass power, is the use of biomass to generate electricity. There are six major types of biopower systems: direct-fired, co-firing, gasification, anaerobic digestion, small modular, pyrolysis.

Bioproducts – converting biomass into chemicals for making products that typically are made from petroleum. Whatever products we can make from fossil fuels, we can make using biomass. These bioproducts, or biobased products, are not only made from renewable sources, they also often require less energy to produce than petroleum-based products.

Researchers have discovered that the process for making biofuels – releasing the sugars that make up starch and cellulose in plants – also can be used to make antifreeze, plastics, glues, artificial sweeteners, and gel for toothpaste.

Other important building blocks for bioproducts include carbon monoxide and hydrogen. When biomass is heated with a small amount of oxygen present, these two gases are produced in abundance. Scientists call this mixture *biosynthesis gas*. Biosynthesis gas can be used to

make plastics and acids, which can be used in making photographic films, textiles, and synthetic fabrics.

When biomass is heated in the absence of oxygen, it forms *pyrolysis oil.* A chemical called *phenol* can be extracted from pyrolysis oil. Phenol is used to make wood adhesives, molded plastic and foam insulation.

Hydropower. Flowing water creates energy that can be captured and turned into electricity. This is called *hydroelectric power* or *hydropower*.

The most common type of hydroelectric power plant uses a dam on a river to store water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity. But hydroelectric power doesn't necessarily require a large dam. Some hydroelectric power plants just use a small canal to channel the river water through a turbine.

Another type of hydroelectric power plant – called a *pumped storage plant* – can even store power. The power is sent from a power grid into the electric generators. The generators then spin the turbines backward, which causes the turbines to pump water from a river or lower reservoir to an upper reservoir, where the power is stored. To use the power, the water is released from the upper reservoir back down into the river or lower reservoir. This spins the turbines forward, activating the generators to produce electricity.

A small or micro-hydroelectric power system can produce enough electricity for a home, farm, or ranch.

Hydrogen Energy. Hydrogen is the simplest element. An atom of hydrogen consists of only one proton and one electron. It's also the most plentiful element in the universe. Despite its simplicity and abundance, hydrogen doesn't occur naturally as a gas on the Earth – it's always combined with other elements. Water, for example, is a combination of hydrogen and oxygen (H_2O).

Hydrogen is also found in many organic compounds, notably the *hydrocarbons* that make up many of our fuels, such as gasoline, natural gas, methanol and propane. Hydrogen can be separated from hydrocarbons through the application of heat – a process known as *reforming*. Currently, most hydrogen is made this way from natural gas. An electrical current can also be used to separate water into its components of oxygen and hydrogen. This process is known as *electrolysis*. Some algae and bacteria, using sunlight as their energy source, even give off hydrogen under certain conditions.

IX. Read the text and make up the questions to the text.

Advantages and Disadvantages of Renewable Energy Sources

Wind

Advantages:

1) wind power is very low cost (after the initial production and installation);

2) wind power is clean (no pollution or carbon dioxide after the initial setup, apart from the comparatively minor emissions produced to manufacture, transport, erect and maintain them);

3) wind is a renewable and sustainable resource; we can use as much as we can today and there will still be more tomorrow;

4) wind power will become cheaper than fossil fuel in the next few years (when the price of carbon is added to coal and oil), and in many places already is;

5) wind turbines are self-sufficient, just place them and watch them spin (low maintenance, few moving parts, easy to repair);

6) many people view wind turbines as aesthetically beautiful additions to the landscape;

7) wind prices won't inflate like today's gas prices.

Disadvantages:

– the strength of the wind is not constant and it varies from zero to storm force. This means that wind turbines do not produce the same amount of electricity all the time. Luckily, wind energy isn't produced in isolation. It's added to widely connected energy grids with 24 hour energy markets. It's added to grids that span thousands of kilometers and have many types of generation and demand. Up to about 20% of a grid's generation capacity, it requires very little backup;

– some people see large wind turbines as unsightly structures and not pleasant or interesting to look at. They believe that wind turbines degrade the landscape;

– wind turbines generate noise. A subset of people who live near wind turbines find this noise annoying. A subset of those people get stressed by it. Wind turbine noise does not make people sick;

– birds are killed by wind turbines. Studies show that wind turbines do not threaten the vast majority of bird species populations. Killing birds, in other words, does not threaten birds generally. That said, wind turbines should not be sited on raptor migration routes, as the Altamont wind turbine farm was. The best evidence is that song birds migrate at

2000–4000 feet, far above wind turbines and sea birds avoid them according to radar and thermal studies of North Sea wind farms;

– bats are also killed by wind turbines, due to barotraumic stress (the reduced air pressure behind a wind turbine blade is damaging to bat's lungs and heart). However, bats are not killed in significant numbers compared to their populations by wind turbines. Bats are, however, killed in significant numbers in North America by white noise syndrome (300,000 in one cave alone).

Ocean

Advantages:

1) tidal energy is an alternative energy;

2) the energy produced is clean and nonpolluting;

3) there is no carbon dioxide or any other byproducts released. It produces no greenhouse gases or other waste;

4) it is a renewable energy that will help reduce our reliance on the burning of fossil fuels;

5) there are two tides every day and they can be relied on. The energy is there for the taking;

6) so the electricity supply is constant and efficient;

7) once you've built it, the energy is free because it comes from the ocean's power;

8) it needs no fuel;

9) it produces electricity reliably;

10) not expensive to maintain.

Disadvantages:

– holding back the tide allows silt to build up on the river bed;

– the dams and barrages sometimes interfere with shipping;

– you will need to find a way to connect the electricity to the grid;

– pose same threats as large dams, altering the flow of saltwater in and out of estuaries, which changes the hydrology and salinity and possibly negatively affects the marine mammals that use the estuaries as their habitat;

– turbidity decreases as a result of smaller volume of water being exchanged between the basin and the sea;

– the average salinity inside the basin decreases, also affecting the ecosystem;

– there are few suitable sites for tidal barrages;

– only provides power for around 10 hours each day, when the tide is actually moving in or out.

Sun

Advantages:

1) the power source of the sun is absolutely free;

2) the production of solar energy produces no pollution;

3) the technological advancements in solar energy systems have made them extremely cost effective;

4) most systems do not require any maintenance during their lifespan, which means you never have to put money into them;

5) most systems have a lifespan of 30 to 40 years;

6) most systems carry a full warranty for 20 to 30 years or more;

7) unlike traditional monstrous panel systems, many modern systems are sleeker such as Uni-Solar rolls that lay directly on the roof like regular roofing materials;

8) in 35 states, solar energy can be fed back to the utilities to eliminate the need for a storage system as well as eliminating or dramatically reducing your electric bills;

9) solar energy systems are now designed for particular needs. For instance, you can convert your outdoor lighting to solar. The solar cells are directly on the lights and can't be seen by anyone. At the same time, you eliminate all costs associated with running your outdoor lighting.

Disadvantages. The primary disadvantage to solar energy is the upfront cost. Once installed, you can expect next to nothing on the system during the 40-year lifespan. The installation, however, can be expensive. Outdoor solar lighting will cost you no more than normal lighting, but large solar energy systems for your entire home can run from a minimum of $15,000 to a more likely figure of $25,000 to $35,000. While this isn't cheap, state and federal governments have created significant ways to offset this cost. The federal government wants as many people to covert to solar as possible.

Biomass

Advantages:

– it's a renewable source of energy;

– it's a comparatively less pollution generating energy;

– biomass energy helps in cleanliness in villages and cities;

– it provides manure for the agriculture and gardens;

– there is a tremendous potential to generate biogas energy;

– biomass energy is relatively cheap and reliable;

– it can be generated from everyday human and animal wastes, vegetable and agriculture left-over, etc.;

– recycling of waste reduces pollution and spread of diseases;

– heat energy that one gets from biogas is 3.5 times the heat from burning wood;

– pressure on the surrounding forest and shrubs can be reduced when biogas is used as cooking fuel;

– it is a more cost effective means of acquiring energy as compared to oil supplies. As oil supplies are getting depleted day by day, it is becoming a costly commodity;

– growing biomass crops use up carbon dioxide and produces oxygen.

Disadvantages:

1) cost of construction of biogas plant is high, so only rich people can use it;

2) continuous supply of biomass is required to generate biomass energy;

3) some people don't like to cook food on biogas produced from sewage waste;

4) biogas plant requires space and produces dirty smell;

5) due to improper construction many biogas plants are working inefficiently;

6) it is difficult to store biogas in cylinders;

7) transportation of biogas through pipe over long distances is difficult;

8) crops which are used to produce biomass energy are seasonal and are not available over whole year.

X. Read and translate the text.

Energy Conservation Measures

The way we use energy can be divided into the following categories or sectors – residential/commercial, transportation, and industrial.

Residential/Commercial. Households use about one-fifth of the total energy consumed in the United States each year. The typical U.S. family spends almost $1,500 a year on utility bills. About 60% is in the form of electricity; the remainder comes mostly from natural gas and oil.

Much of this energy is not put to use. Heat pours out of homes through drafty doors and windows, and through ceilings and walls that aren't insulated. Some appliances use energy 24 hours a day, even when they are turned off. Energy-efficient improvements can make a home more comfortable and save money. Many utility companies provide energy audits to identify areas where homes are wasting energy. These audits may be free or low cost.

Heating and cooling. Heating and cooling systems use more energy than any other systems in our homes. Typically 42% of an average family's energy bills are spent to keep homes at a comfortable temperature.

You can save energy and money by installing insulation, maintaining and upgrading the equipment, and practicing energy-efficient behavior. A two-degree adjustment to your thermostat setting (lower in winter, higher in summer) can lower heating bills by 4% and prevent 500 pounds of carbon dioxide from entering the atmosphere each year. Programmable thermostats can automatically control temperature for time of day and season.

Insulation and weatherization. You can reduce heating and cooling needs by investing in insulation and weatherization products. Warm air leaking into your home in summer and out of your home in winter can waste a lot of energy. Insulation wraps your house in a nice warm blanket, but air can still leak in or out through small cracks. Often the effect of small leaks is the same as keeping a door wide open. One of the easiest money-saving measures you can do is caulk, seal, and weather-strip all the cracks to the outside. You can save 10% or more on your energy bill by stopping the air leaks in your home.

Doors and windows. About one-third of a typical home's heat loss occurs through the doors and windows. Energy-efficient doors are insulated and sealed tightly to prevent air from leaking through or around them. If your doors are in good shape and you don't want to replace them, make sure they seal tightly and have door sweeps at the bottom to prevent air leaks. Installing insulated storm doors provides an additional barrier to leaking air.

Most homes have many more windows than doors. Replacing older windows with new energy-efficient ones can reduce air leaks and utility bills. The best windows shut tightly and are constructed of two or more pieces of glass separated by a gas that does not conduct heat well.

If you cannot replace older windows, there are several things you can do to make them more energy efficient. First, caulk any cracks around the windows and make sure they seal tightly. Add storm windows or sheets of clear plastic to the outside to create additional air barriers. You can also hang insulated drapes on the inside – during the winter, open them on sunny days and close them at night. During the summer, close them during the day to keep out the sun.

Landscaping. Although it isn't possible to control the weather, landscaping can reduce its impact on home energy use. By placing

trees, shrubs, and other landscape structures to block the wind and provide shade, people can reduce the energy needed to keep their homes comfortable during heating and cooling seasons.

Electricity & appliances. Appliances account for about 20% of a typical household's energy use, with refrigerators, clothes washers and dryers at the top of the list. When shopping for new appliances, you should think of two price tags. The first one is the purchase price. The second price tag is the cost of operating the appliance during its lifetime. You'll be paying that second price tag on your utility bill every month for the next 10 to 20 years, depending on the appliance. Many energy efficient appliances cost more to buy, but save money in lower energy costs. Over the life of an appliance, an energy-efficient model is always a better deal.

Lighting. We spend about one-quarter of our electricity on lighting. Much of this energy is wasted using inefficient incandescent light bulbs. Only 10% of the energy used by an incandescent bulb produces light; the rest is given off as heat.

If you replace 25% of your light bulbs with fluorescents, you can save about 50% on your lighting bill. Compact fluorescent light bulbs (CFLs) provide the same amount of light and no longer flicker or buzz. CFLs cost more to buy, but they save money in the long run because they use only one-quarter the energy of incandescent bulbs and last 8–12 times longer.

Water heating. Water heating is the third largest energy expense in your home. It typically accounts for about 14% of your utility bill. Heated water is used for showers, baths, laundry, dishwashing and general cleaning. There are four ways to cut your water heating bills – use less hot water, turn down the thermostat on your water heater, insulate your water heater and pipes, and buy a new, more efficient water heater.

Other ways to conserve hot water include taking showers instead of baths, taking shorter showers, fixing leaks in faucets and pipes, and using the lowest temperature wash and rinse settings on clothes washers.

Transportation. Americans make up less than 5% of the world's population, yet own one third of its automobiles. The transportation sector of the U.S. economy accounts for over one-fourth of its energy consumption. America is a country on the move.

The average American uses 500 gallons of gasoline every year. The average vehicle is driven more than 12,000 miles per year today. That

number is expected to increase about 40% during the next 20 years if Americans don't change their driving habits by using public transportation, carpooling, walking or bicycling. You can achieve 10% fuel savings by improving your driving habits and keeping your car properly maintained.

The U.S. imports almost two-thirds of the oil we use. Over the next 20 years, our dependence on foreign oil could be almost completely eliminated if the average fuel economy increases.

When buying a vehicle, you can save a lot by choosing a fuel-efficient model. All new cars must display a mileage performance label, or Fuel Economy Label, that lists the estimated miles per gallon for both city and highway driving. Compare the fuel economy of the vehicles you are considering and make it a priority. Over the 13-year life of the vehicle, you can save thousands of dollars and reduce emissions significantly.

Manufacturing. Manufacturing the goods we use every day consumes an enormous amount of energy. The industrial sector of the U.S. economy consumes one-third of the energy used in the U.S.

In the industrial sector, the market drives energy efficiency and conservation measures. Manufacturers know that they must keep their costs low to compete in the global economy. Since energy is one of the biggest costs in many industries, manufacturers must use energy-efficient technologies and conservation measures to be successful. Their demand for energy-efficient equipment drives much of the research and development of new technologies.

Individual consumers can, however, have an effect on industrial energy use through the product choices they make and what they do with packaging and products they no longer use.

These three Rs of an energy-wise consumer are easy to put into practice. Reducing waste saves money, energy and natural resources, and helps protect the environment.

Reduce. Buy only what you need. Purchasing fewer goods means less to throw away. It also results in fewer goods being produced and less energy being used in the manufacturing process. Buying goods with less packaging also reduces the amount of waste generated and the amount of energy used.

Reuse. Buy products that can be used repeatedly. If you buy things that can be reused rather than disposable items that are used once and thrown away, you will save natural resources. You'll also save

the energy used to make them, and reduce the amount of landfill space needed to contain the waste.

Recycle. Make it a priority to recycle all materials that you can. Using recycled material almost always consumes less energy than using new materials. Recycling reduces energy needs for mining, refining, and many other manufacturing processes.

Recycling a pound of steel saves enough energy to light a 60-watt light bulb for 26 hours. Recycling a ton of glass saves the equivalent of nine gallons of fuel oil. Recycling aluminum cans saves 95% of the energy required to produce aluminum from bauxite. Recycling paper cuts energy usage in half.

XI. Read and translate the text.

Energy Monitoring and Plant Energy Auditing

Energy monitoring is using energy surveys to identify opportunities for improving energy efficiency and cost savings. This can be site-wide or targeted to investigate abnormal or excessive energy consumption and costs. This will enable the end user to understand and interpret the needs of each individual site or even if a particular site is over using or wasting energy.

The monitoring and targeting of energy consumption is now available in the form of portable sub-metering equipment which can be used to undertake an in-depth analysis of energy consumption of a particular area or piece of equipment.

Energy management programs are ongoing programs of assistance to ensure companies achieve major improvements in energy efficiency within defined timescales. This includes helping companies to develop energy policies, gain commitment from top management, develop Action Plans, prioritize investments in energy efficient equipment, and gain access to specialist support networks to drive the program forward and help to achieve cost savings. Energy management advisors can offer advice on sources of finance and funding such as government grants and other associated loans to assist companies' research innovative energy efficiency solutions or purchase energy efficient equipment.

On average, *energy management systems* save about 10% of overall annual building energy consumption. An energy management system (EMS) is a computer that controls the operation of all major

building systems, in order to run the building efficiently and effectively. An EMS can reduce a building's overall energy use by about 10%.

Today, nearly one-third of all U.S. buildings larger than 100,000-square feet have an EMS. Unfortunately, many of these systems are not saving as much energy as they could be saving. In one study, 5 out of 11 energy management systems were found to be "underachievers".

Plant energy auditing. Plant energy audits are comprehensive evaluations of the actual performance of plant's energy using systems and equipment compared against the designed performance level or the industry best practice. The difference between observed performance and "best practice" is the potential for energy and cost savings. Energy Star Partners have found that conducting plant audits is vital to a strong energy management program; without audits it is difficult to continuously improve energy efficiency and demonstrate savings.

Energy audits help managers to identify actions for improving energy performance, to prioritize projects and to track progress.

Regular plant energy audits are most effective when they are part of a strategic corporate energy management program. Corporate energy programs are ideal for replicating the savings opportunities identified through plant energy audits at other facilities. Through the corporate energy network, information can be shared, and savings multiplied.

Conducting audits. Energy audits can be self-assessments conducted by company staff, external audits obtained through energy service professionals, or a combination of both.

Regardless of the type of audit, it is recommended that the audit team represent varied expertise, including: process engineers, maintenance experts, systems managers, energy specialists, etc. Support from outside your company can be helpful and provide missing expertise (e.g. compressed air systems expert).

XII. Divide each text into logical parts and make an oral report on the text according to the plan below.

Plan

1. The Title.

I've read the text (article, story) entitled … .

I'd like to tell you about the text (article, story) entitled … .

2. The Source.

This is an article (story, text) published in the newspaper (magazine, book) … .

3. The Author.

The author of the text is … , a famous writer (journalist, scientist).

4. The Idea.

The main idea of the text (article, story) is to show (to prove, to underline, to convince) … .

5. The Subject.

The text deals with … .

The text describes (gives information about) … .

6. The Content.

The text (story, article) starts with fact (with the description of, with the characteristic of) … .

Then the author describes … .

After that the author touches upon the problem of … .

Next the author deals with the fact (the problem) … .

Besides the author stresses that … .

Finally the author comes to the conclusion that … .

7. Your Attitude.

My attitude to the article (story, text) is contradictory (complicated, simple).

On the one hand I agree that … .

On the other hand I can't agree that … .

I've learned a lot of interesting (important, new) facts (information, things) from the text.

It makes us think of … .

It gives us food for thoughts.

It proves the idea (the theory, the point of view, the opinion) … .

It can help us in self-education (in solving our problems).

I'd like to cite the author (to make a quotation).

8. Your Advice.

So in my opinion it is (not) worth reading … .

GLOSSARY

A

absorb – поглощать, впитывать

abundant – обильный, широко распространенный, имеющийся в изобилии

activate – активировать, приводить в действие, включать

adhesives – адгезивы, связующие вещества

advancement – продвижение, развитие, прогресс

advancement biomass gasification – газификация биомасс

advantage – преимущество, выгода, польза

adverse – вредный, враждебный, неблагоприятный

alternating current (AC) – переменный ток

alternator – генератор переменного тока, синхронный генератор

anaerobic digestion – анаэробное перегнивание

application – применение, использование

aquatic life – водная флора и фауна

arc light – дуговая лампа

atom nucleus – ядро атома

attainable – достижимый

audit – аудит, проверка, ревизия

awareness – осведомленность, понимание

B

balancing force – уравновешивающая сила

barrage – заграждение, плотина, дамба

be buried – быть захороненным

be dug out – добывать (полезные ископаемые)

be equal to – быть равным

be harnessed – использовать(ся), управлять, укрощать

be in widespread use – широко использоваться
be processed into – перерабатывать в (из него делают)
be prone to – иметь предрасположенность к
be released – высвобождать(ся)
be split apart – расщеплять(ся), раскалывать(ся)
best practice – передовой опыт
biorefinery technologies – технологии процесса получения топлива, электрической, тепловой энергии и химикатов из биомассы
black rock substance – черное вещество
blade – лопасть, лезвие
boiler – паровой котел
boiling water reactor – ядерный реактор кипящего типа
bonds of atoms – связи атомов
bounce – подпрыгивать, отскакивать
breakdown – авария, поломка, разрушение
burn – гореть, сжигать

C

capture – улавливать, поглощать, захватывать
caulk – конопатить, заделывать швы
cause – вызывать, быть причиной
charge – заряжать, заряд
chase a receding target – преследовать удаляющуюся цель
chemical compound – химическое соединение
Clean Air Act – закон о контроле над загрязнением воздуха
clerestory – верхний ряд окон
coal – уголь (каменный, древесный)
collection panel – панель накопления
combustion – горение, сжигание, сгорание
commitment – принятие финансовых обязательств, обязательство, охват, приверженность, выбор
complacency – самоуспокоенность, халатность
comprehend – понимать, постигать, охватывать
comprehensive plan – комплексный план
compressed spring – сжатая пружина
compression wave – волна сжатия, сжимающая волна
constitute – состоять, составлять
contain – содержать в себе, включать
containment vessel – герметизирующая оболочка

continuous improvement – непрерывное совершенствование
contribute to – делать вклад
contribute to the greenhouse effect – способствовать парниковому эффекту
conventional power station – электростанция обычного типа
conversion – преобразование, превращение
convert – превращать, преобразовывать
convert into – превращать в, преобразовывать в
cookie – домашнее печенье
coolant – охлаждающая жидкость (хладагент)
core – ядро, сердцевина
cost-effective – рентабельный, прибыльный
cost saving – снижение себестоимости
count on – рассчитывать на, полагаться
creature – живое существо, создание

D

dam – дамба, плотина
daylighting – дневное освещение
degradation – ослабление, упадок, ухудшение
demand – спрос, требование
depletion – уменьшение, истощение (ресурсов)
deposit – запас, месторождение, залежь
derive – получать, извлекать, происходить
design features – особенности конструкции
deuterium – дейтерий, тяжелый водород
device – прибор, устройство, приспособление
die away – исчезать, затухать, угасать
diesel fuel – дизельное топливо
dig – копать, рыть, выкапывать
direct – прямой, постоянный (ток)
direct current (DC) – постоянный ток
disadvantage – недостаток, вред, ущерб
downstream – вниз по течению
drafty – продуваемый сквозняком
drain – осушать, истощать, расходовать
drilling – сверление, бурение
drive – приводить в действие, в движение, управлять
ductwork – система труб, трубопровод

E

earthquake – землетрясение, подземный толчок
earth's crust – земная кора
efficiently – эффективно, рационально, разумно
electric current – электрический ток
electricity – электричество, электроэнергия
elimination – устранение, удаление
embargo – эмбарго, запрет
encompass – охватывать, заключать
energy demands – энергетические потребности
energy efficiency – эффективность использования энергии
energy efficient appliances – устройства с низким энергопотреблением
energy management – управление энергосбережением, энергетический менеджмент
energy needs – энергетические нужды, потребности в электроэнергии
energy source – источник энергии
ensure – гарантировать, обеспечивать
estuary – устье реки, дельта
evaluation – оценка, анализ
evaporation – испарение, выпаривание
excessive – чрезмерный, излишний
expand – расширять(ся), увеличиваться в объеме
expertise – экспертные знания, опыт
expire – иссякнуть, закончиться
exploitation – использование, употребление
explorer – исследователь, первооткрыватель
explosion – взрыв, вспышка

F

facilities management – управление оборудованием
feasible – реальный, выполнимый, осуществимый
feedstock – сырье для промышленности, исходное сырье
finite resource – ограниченные ресурсы
firsthand experience – личный опыт
fission – расщепление, деление
flat plate collector – плоский коллектор
flow – поток, ход, течение

fluorescent light bulb – лампа дневного света, люминесцентная лампа

footprint – опорная поверхность, зона обслуживания, след, отпечаток

fossil fuel – ископаемое топливо

fusion – слияние, соединение

G

gain – получать, присоединять

gas cooled reactor – реактор с газовым охлаждением

gasoline – бензин, газолин, горючее

geothermal – геотермический, геотермальный

geothermal energy – геотермальная энергия

give off – испускать, излучать

government grants – правительственные субсидии

greenhouse gas – парниковый газ

greenhouse gas emission – выброс парникового газа

grind – перемалывать, размельчать

H

harness – использовать, связывать

have trouble – иметь проблемы, затруднения

havoc – опустошение, разорение

hazy – неясный, туманный, смутный

heat – тепло, теплота

heat exchanger – теплообменник

heavy water reactor – тяжеловодный ядерный реактор

hidden – скрытый, невидимый

household – домашнее хозяйство

hurt (people) – причинять вред (людям)

hydrocarbons – углеводороды

hydropower – гидроэнергетика

I

impact – влияние, сильное воздействие, оказывать влияние

in a contained space – в замкнутом пространстве

incandescent bulb – лампа накаливания

incorporate – вводить, включать, соединять

in-depth analysis – углубленный анализ
indirect – косвенный, непрямой
induce – стимулировать, вызывать, индуктировать (ток)
inflammable – огнеопасный, горючий, легко воспламеняющийся
instead of – вместо, взамен
insulation – изоляция, изоляционный материал
internal combustion engine – двигатель внутреннего сгорания

J

jump shot – бросок в прыжке

K

keep out – не позволять, не давать
kinetic energy – кинетическая энергия
kite – воздушный змей

L

landfill – мусорная свалка, захоронение отходов
landscaping – озеленение, проектирование ландшафта, ландшафтная архитектура
lead to – приводить к
leakage – утечка, течь, вытекание
leased – арендованный, сданный в наем
let out all at once – выпускать, высвобождать одновременно
let out slowly – медленно выпускать, высвобождать
lifespan – продолжительность жизни
light – зажигать, освещать, светиться
light bulb – электрическая лампочка
light house – маяк
lightning – молния, грозовой разряд
likewise – также, таким же образом
liquid – жидкий, жидкость
loan – заем, ссуда
longitudinal wave – продольная волна, волна сжатия
long-term energy strategies and policies – долгосрочные стратегии и политика энергопотребления
loop – петля, изгиб, делать петлю

M

maintenance – содержание и техническое обслуживание, уход, текущий ремонт

major disaster – крупная катастрофа

make deep cuts – сильно сократить

measure – измерять, мерить, определять

mileage – расстояние в милях, пробег автомобиля

mitigate – смягчать, уменьшать

moderate – замедлять, сдерживать, ослаблять

moderator – замедлитель (ядерной реакции)

molded plastic – литая пластмасса

molten – расплавленный, жидкий

mount on – устанавливать, монтировать

movement – движение, перемещение

municipal and industrial waste – городские и промышленные отходы

N

noise disturbance – шумовая помеха

non-renewable – невозобновляемый

non-renewable energy – невозобновляемая энергия

non-renewable energy sources – невозобновляемые источники энергии

nuclear accident – авария ядерной установки

nuclear energy – ядерная энергия

nuclear fission – ядерное деление, расщепление ядра

nuclear power plant – атомная электростанция

(the) number of something – ряд, много чего-либо

O

objective – цель, задача

occur – происходить, иметь место

oil – нефть, масло, смазочный материал

oil spill – разлив нефти, утечка нефти

oil well – нефтяная скважина

ongoing monitoring – непрерывный, постоянный мониторинг (контроль)

operating costs – эксплуатационные затраты, текущие расходы

orbital path – орбитальная траектория
ordinary (light) water – обыкновенная (легкая) вода
overall – полный, общий
overhang – выступ, навес; нависать над

P

pace – шаг, темп
particle – частица
particulate matter – твердые частицы
pass through – проходить через
peat – торф, торфяной
photovoltaic cell – фотоэлектрический (фотогальванический) элемент
photovoltaic system – фотоэлектрическая система
pioneer – быть первооткрывателем
piston – поршень, плунжер, клапан
pollution – загрязнение
potential energy – потенциальная энергия
power – приводить в движение, питать электроэнергией, давать энергию
powerful – мощный, крепкий, влиятельный
power output – выходная мощность
power plant – электростанция, силовая установка
precipitation – осаждение, осадки
predictable – предсказуемый, прогнозируемый
preheating – предварительный нагрев, подогрев
pressure – давление, сжатие
pressurized water reactor – реактор, охлаждаемый водой под давлением
price tag – ценник, бирка со стоимостью
primary source – первичный источник
prioritize – отдавать предпочтение, уделять первостепенное внимание
process engineer – инженер-технолог
procurement – поставка, закупка
provide – обеспечивать, снабжать
pump through – прокачивать
purchase – покупка, приобретение

R

radiant energy – энергия излучения

raptor – хищная птица

rarefaction wave – волна разрежения, волна расширения

RD&D investments – капиталовложения в исследования, разработки и демонстрацию

recharge – перезаряжать, добавлять, подпитывать

recognize – узнавать, распознавать

reforming – реформинг (облагораживание нефтепродуктов путем дополнительной обработки)

release – высвобождать, освобождать

reliable – надежный, безотказный, испытанный

rely on – полагаться на, надеяться на

rely on wisely – по-хозяйски

reminiscent – напоминающий, вызывающий воспоминания

renewable – возобновляемый, сменный

replenish – пополнять, снова наполнять

replicate – повторять, копировать

require – требовать, нуждаться

reserve – ресурс, запас

reservoir – водохранилище, запас, накопитель

residue – остаток, осадок

result in – приводить к

retrieve – восстанавливать, отыскивать, возвращать в прежнее состояние

river bed – речное русло

run out of something – исчерпать, израсходовать

S

sailing ship – парусник, парусное судно

satellite dish – спутниковая тарелка

scale – масштаб, шкала, степень

self-assessment – самооценка

separate cycle – отдельный цикл

separation – отделение, разделение

serious vision – значительная концепция развития

set of pipes filled with water – совокупность труб, наполненных водой

shade – заслонять от света, затенять
shaft – вал, ось
shallow area – мелководье
significantly – значительно, многозначительно
silt – ил, осадок, наносы ила
site – место, местоположение
slightly over – чуть более
slow down – замедлить, снизить скорость
small amounts of waste – незначительный объем отходов
smash – сталкиваться, врезаться, ударяться
soar – парить, высоко летать
solar cells – солнечные батареи
solar panel – солнечная батарея, панель солнечной батареи
solar photovoltaics – солнечное фотоэлектричество
solid – твердое вещество, твердый
solution – решение, раствор
sophisticated – сложный, усложненный
specify – указывать, точно определять
spin around – вращаться
split – расщеплять, раскалывать, разрушать
spring – пружина, рессора
steam – пар, испарение
steam engine – паровой двигатель
steam turbine – паровая турбина
storage tank – бак-хранилище, резервуар-хранилище
store – хранить, сохранять
stored energy – накопленная энергия
strong concrete dome – прочный бетонный купол
sub-metering equipment – дополнительное измерительное оборудование
subset – подмножество, подгруппа
suffer from – страдать, подвергаться негативному воздействию
supply with – снабжать, поставлять
surround – окружать, обступать
survey – обследование, наблюдение, осмотр
survive – выживать, выдержать
sustained – непрерывный, устойчивый
system manager – системный администратор

T

take advantage of something – использовать что-либо в своих интересах

take into consideration – принимать во внимание, учитывать

tap – улавливать, подсоединяться

targeting – определение объектов

target setting – постановка задачи

thermal – тепловой, термический

tide – прилив и отлив

tilt – наклонять, поворачивать

timescale – временные рамки

tiny pellets – крошечные гранулы, шарики

transmit – проводить (электричество), передавать (по радио)

transverse waves – поперечные волны

trap – улавливать, поглощать

tremendous – огромный, громадный, потрясающий

tube – труба, трубка

turbidity – мутность, помутнение

turbulent – бурный, бушующий, турбулентный

turn – вращать, вертеть, поворачивать

twin pillars – две опоры

U

ultimately – в конечном счете, в конце концов

unavoidable – неизбежный, неминуемый

underachieve – работать ниже своих возможностей

underground – подземный

unit – единица (измерения), блок, элемент

upset – нарушать, расстраивать, опрокидывать

uranium – уран

uranium rod – урановый стержень

utility bill – счет за коммунальные услуги

utility company – коммунальное предприятие

V

vaporizing oil – тяжелое карбюраторное топливо, лигроин, керосин

variety – разнообразие, многообразие

viable – жизнеспособный
vital – жизненно важный, необходимый

W

warning buoy – предупреждающий бакен
warranty – гарантия (качества продаваемого товара), разрешение
wastage – потери, нерациональное использование
weatherization – устойчивость к атмосферным воздействиям
widespread – широко распространенный
wire – провод, проволока
with due regard to – с должным вниманием к
wonder – интересоваться, удивляться
work environment – условия труда
working energy – действительная энергия

X

x-rays – рентгеновские лучи

ЛИТЕРАТУРА

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