Key to Exercises

Unit 1 Text A

I Critical Thinking.

1. Why is it easy for us to take the energy that powers your world for granted?

With the development and progress of energy civilization, modern people have the condition to sit in a climate-controlled room, light available at the flip of the switch, eyes roaming the page, lungs breathing in and out, heart beating, and electrical pulses of your brain contemplating the words on this page. Therefore, it is easy for us to take the energy that powers your world for granted.

2. Why is it said that wood and living organisms warmed the cradle of civilization?

Energy's history on earth starts with the sunlight that helped form wood and living organisms. Wood and living organisms are the raw materials stored by nature and transformed by geological processes over millions of years to give us human beings coal, petroleum, and natural gas, which were capable of meeting the basic energy needs of the primitive population in the life of humanity, leading to an important guarantee for the continuous development of human civilization history. Therefore, wood and living organisms warmed the cradle of civilization.

3. The last paragraph of this text says "*We have options on where we can tap into energy's journey to power our modern machines. But one thing is certain, all the energy around us came from the atomic energy of atoms formed at the birth of the universe. The energy is abundant and attainable.*" **Then can we come to a conclusion that the universe is able to ensure an abuntant supply of sustainable energy for us human beings?**

No. Machines powered by petroleum or electricity now perform work once done by people and animals. Both the quality and duration of life have improved. An overreliance on natural energy provided by the universe may quickly climax with economic turmoil as nations have limited resources. So, the creative and inventive use of energy such as renewable energy and energy efficiency is the foundation of modern society, which may help us meet the challenges of providing an abundant supply of sustainable energy, and ensure energy access and security for sustainable development.

II Match Column A with Column B.

1 G 2 I 3 E 4 H 5 B 6 A 7 D 8 F 9 J 10 C

III True （T） or False （F） according to the passage.

1 F 2 T 3 T 4 F 5 T 6 F 7 T 8 T 9 T 10 **T**

IV Complete the passage with the words or expressions from the text.

1 J 2 H 3 A 4 B 5 F 6 O 7 G 8 L 9 I 10 E 11 K 12 D 13 M 14 N 15 C.

V Translate the following sentences into Chinese or English.

1. 你很容易认为为你的世界提供动力的能量是理所当然的。
2. 你的身体是由储存在你所吃食物中的化学键的能量提供动力的。
3. 最后，你的身体和火都使用储存在面包淀粉分子中的化学能。
4. 食物化学键中的能量来自光合作用。

5. 如果没有源源不断的来自太阳的能量，我们的星球将毫无生机。
6. All forms of energy on earth originated from the birth of the universe.
7. Nuclear fusion in the sun releases massive amounts of energy.
8. The sun's radiant energy loss tends to decrease the sun's temperature at the same rate as the sun's nuclear fusion tends to increase the sun's temperature.
9. After a sufficiently long time, the vegetation rearranged into more stable deposits we call coal. Different types of coal developed depending upon the depth, temperature, and moisture of the deposits.
10. In the seas, much of the surface was inhabited by bacteria called phytoplankton.

VI Please put the following terms into their corresponding English or Chinese.

1.electrical pulses
2. unravel the history of energy
3. chemical bonds
4. electrical energy
5. starch molecules
6. photosynthesis
7.vegetation
8. the sun's radiation
9. nuclear reaction
10. Equation
11. 更好地利用资源
12.储存能量
13.能量输出
14. 核聚变
15. 太阳的辐射能损失
16. 消耗能量
17. 地热
18. 高海拔
19. 能源消耗
20. 宇宙大爆炸

VII Translate the following passage into English.

The geothermal heat of the earth originated at the birth of the universe. In part, the great velocities created by the Big Bang were released in the form of heat and molten rock during the collisions that ultimately formed this big rock called earth. However, if the heat were left unreplenished the core of the earth would have long since cooled. Adding to the heat of colliding masses, uranium and other larger molecules are constantly undergoing fission from earth's surface to its core. This fission energy release occurs one atom at a time, but the energy adds up.

Unit 1 Text B

I Critical Thinking: work in groups and discuss the following questions.

1. How is electricity delivered in quantities to areas that need electricity?

It is delivered through a grid connection.

2. What do end-users of electricity possibly opt for in the countries where electricity provision is deregulated?

They may opt for more costly green electricity.

3. What are becoming more viable in economic terms?

Renewable energy and distributed generation in economic terms.

4. Say something about the history of electricity in English.

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II Match Column A with Column B.

1 h 2 f 3 e 4 a 5 j 6 c 7 i 8 d 9 g 10 b

III True (T) or False(F) according to the passage.

1 F 2 T 3 T 4 F 5 F 6 T 7 T 8 F 9 T 10. T

IV Fill in the blanks in the following sentences with the words given.

1. H 2. I 3. J 4.A 5. B 6. C 7. D 8. E 9. F 10. G

V Translate the following sentences into Chinese or English.

1.电，像自然资源一样，一直都在世界上自然存在。

2.1831年，迈克尔·法拉第发明了一种通过旋转运动发电的机器, 但这种技术达到商业化阶段用了近50年的时间。

3.该供电系统的电源来自于威河的水车，水车转动一个西门子交流发电机，为镇上的电弧灯提供电源。

4.正是由于爱迪生没有办法进行电压转换这个原因，电能的生产只能接近或就在消费者的住所。

5.曾为爱迪生短期工作过的尼古拉·特斯拉对电理论的理解与爱迪生不同，他发明了交流电系统。

6. The electric power industry provides the production and delivery of electric energy to the areas that need electricity.

7. The demand of electricity is usually scarce in developing nations.

8. In many countries, electric power companies own the whole electrical infrastructure.

9. A diverse mix of generation sources reduces the risks of electricity price spikes.

10. People have found that renewable energy and distributed generation have a brighter future.

VI Please put the following terms into their corresponding Chinese or English.

1. 电力发电史

2. 在世界上自然存在
3. 通过旋转运动发电
4. 化学反应的结果
5. 商业化实施阶段
6. 气体照明和取暖
7. 公共电力供应
8. 大量的电弧灯
9. 蒸汽发电站
10. 供路灯照明
11. the required insulation thickness
12. the electrical theory
13. efficient high voltages
14. fairy safe voltage
15. delivering electrical energy to consumers
16. adjacent asynchronous power systems
17. domestic appliances
18. industrial processes
19. public utility
20. electricity distribution

Unit 1 Text C

I Critical Thinking: work in groups and discuss the following questions.

1. Say something about energy consumption in human history.Why should we actively promote energy transformation in modern society?

We eat with energy. We travel with energy. We work with energy and we even flirt with energy. But where does all of this energy come from? Today we gather most of our energy from coal, oil and natural gas, also known as fossil fuels. Additionally we gather energy from biomass, nuclear and renewables. Fossil fuels cost more than what we pay at the pump and impact our environment in many ways. These impacts include global warming, air quality deterioration, oil spills and acid rain. Besides, fossil fuels are a one-time-use resource in the human time scale. It's projected that fossil fuel resources will be depleted within the next 50 to 100 years.

Biomass converts plants into biometric materials to produce energy. Nuclear energy is released during nuclear fusion. Lastly, renewable energy comes from a source that's not depleted when used. It naturally replenish in our lifetime, which include sunlight, wind, rain, tides, waves and geothermal heat. The best part is that we don't need to compromise our planet to harness it. Besides, presently we have the technology to be 100% renewable reliant.

So, we should actively promote energy transformation in modern society.

2. Say something about how the First Energy Transition came about.

Before the Industrial Revolution, people burned wood and dried manure to heat homes and cook food, while relying on muscle power, wind, and water mills to grind grains. Transportation was aided by using carts driven by horses or other animals.

In the 16th and 17th centuries, the prices of firewood and charcoal skyrocketed due to shortages. These were driven by increased consumption from both households and industries as economies grew and became more sophisticated.

Consequently, industrializing economies like the UK needed a new, cheaper source of energy. They turned to coal, marking the beginning of the first major energy transition.

3. Why is energy a hot topic today?

Energy is a hot issue these days. Primarily, this is because it is at the top of the list of concerns over the climate and the environment, the supply security, the price and economic growth. This is with good reason. Energy is an indispensable element in modern life, and if we look at the period after World War II, energy has increasingly become an essential part of everyday life. It has become one of the raw materials of human life, not the only one, but one of the most important. Everyday life is unthinkable without energy. The culture of the modern world involves sizeable and continuous consumption of energy.

4. Why do we need to study the history of energy?

Energy is a hot issue these days. Primarily, this is because it is at the top of the list of concerns over the climate and the environment, the supply security, the price and economic growth. Energy is an indispensable element in modern life. It has increasingly become an essential part of everyday life. Everyday life is unthinkable without energy. The culture of the modern world involves sizeable and continuous consumption of energy. But where does all of this energy come from? Today we gather most of our energy from coal, oil and natural gas, also known as fossil fuels. Additionally we gather energy from biomass, nuclear and renewables. Fossil fuels impact our

environment in many ways, which includes global warming, air quality deterioration, oil spills and acid rain. Besides, fossil fuels are a one-time-use resource in the human time scale. It's projected that fossil fuel resources will be depleted within the next 50 to 100 years. So, it is the general trend to actively promote the transformation of renewable energy. To promote the renewable energy transition, we must study the history of energy, the history of energy transition. Confucius said, "Study the past if you would divine the future."

II True （T） or False （F） according to the passage.

1 T 2 T 3 T 4 T 5 F　　6 T 7 T 8 T 9 T 10 F

III Please put the following expressions into their corresponding Chinese or English.

1. 内燃机
2. 大规模用电
3. 减少温室气体排放
4. 气候变化的灾难性影响
5. 由于短缺
6. 木柴和木炭的价格飞涨
7. 依靠肌肉力量、风力和水车来研磨谷物
8. 一种新的、更便宜的能源
9. 标志着第一次重大能源转型的开始
10. 由于规模经济
11. the Industrial Revolution
12. be heavily reliant on coal
13. Coal's share of the global energy mix
14. the mass production of automobiles
15. Oil demand from internal combustion engine vehicles
16. a major source of energy for home heating, cooking, water heaters, and other appliances
17. at the center of the ongoing energy transition
18. ramp up their efforts to curb emissions
19. solar and wind energy capacities
20. unprecedented in both scale and speed

Unit 2 Energy Sustainability (I)
Text A. Wind Power Technology
I Critical Thinking.
1. What is the relationship between energy and sustainable development?
Reference answer: Energy development is closely related to the sustainable development. If fossil fuel is used to generate electricity, there will be more pollutants released into the atmosphere than using renewable energy sources. If green energy sources are used to generate electricity, the world can achieve sustainable development. Renewable energy sources play an important part in world sustainable development. The green power sources include solar energy, nuclear energy, hydroelectricity, wind energy, wave energy, tidal power, bioenergy, geothermal energy, magnetic hydro dynamic energy and so on.
2.How is wind formed?
Reference answer: Wind – the movement of the air – is the result of temperature differences in different places. Uneven heating results in a difference in atmospheric pressure, which causes the air to move.
3. How is wind energy harnessed to generate electricity?
Reference answer: The **kinetic** energy of the moving air (or wind) is transformed into electrical energy by wind turbines or wind energy conversion systems. Wind turbines capitalize on electromagnetic effect to harvest wind energy through the conversion of kinetic energy into mechanical torque to drive the generators, which in turn, convert the energy in the form of electricity.
The blades capture and convert the wind's energy to rotational energy. The rotor hub transfers the rotational energy to the rotor shaft, which is fixed to the rotor hub. The other end of the rotor shaft is connected to the gearbox, which changes the low rotating speed from the blades to a high rotating speed for input to the generator. The high-speed rotating shaft connected to the gearbox forces the shaft of the generator to rotate, converting the rotational energy to electricity through the use of electromagnetic induction.
4. What are the important factors that determine the wind power system configuration?
Reference answer: The specific system configuration is determined mainly by the wind condition (especially wind speed), land availability (or where the plant is sited), grid availability, turbine size and height, and blade size.
5. What is the future of wind energy?
Reference only: Because of the global availability of the resource, wind power has huge potential. Some countries have introduced financial supports for wind power, such as *feed-in tariffs*, to secure income and to reduce investor risk.

Rapid enhancements in different aspects of wind energy related techniques and technologies have revealed promising potential in wind energy conversions under low wind profiles. Emerging enabling technologies have **boost**ed the **feasibility** of wind energy conversions in urban areas. With more attention from researchers and policy makers, it is not **far-fetched** to say that in time to come, urban-area wind energy conversion systems can be widely implemented and commercialized.

One way to achieve a higher share of wind generation in a grid system is to operate wind turbines or wind farms using *integrated transmission systems* and power output prediction systems, including weather forecasting.
II. Match A with B

1 B
2 D
3 F
4 A
5 H
6 C
7 J
8 E
9 G
10 I

III. True or False:
1.F 2. F. 3. T. 4. F 5. T 6. F 7. T 8. T 9. F 10. T

IV. Fill in the blanks:
1 B. capitalize on
2 A kinetic energy
3 E convert
4 H extracted
5 C blades
6 J proportional
7 D cube
8 I increase
9 F renewable
10 G performance
11. O
12. K
13. N
14. M
15.L

V. Term translation:
1. the sweep area of the blade 叶片的旋转幅度
2. the rotor hub 旋翼毂
3. the rotor shaft 转轴
4. floating foundations for offshore wind 海上风力漂浮基地
5. mechanical power 机械能
6. installation characteristic 安装特点
7. be vertical to 垂直于
8. a yaw mechanism 偏航机制
9. market share 市场份额
10. a starting device 启动装置
11. 电压 electricity voltage
12.联合输电系统 integrated transmission systems
13. 激发功率，激励功率 excitation power

14. 感应（或异步）发电机 induction (or asynchronous) generators
15. 陀螺仪作用力 gyroscopic forces
16. 节距控制 pitch control
17. 转动能 rotational energy
18. 叶片振动频率 vibration frequency of blade
19. 水平轴涡轮机 horizontal-axis turbines
20. 风速的立方 the cube of wind speeds

VI. Sentence translation:

1. There was worrying acceleration in carbon emissions related to the growth in energy demand.与能源需求相关的碳排放加速增长令人担忧。

2. Renewable energy sources play an important part in world sustainable development.
可再生能源在世界可持续发展中起重要作用/可再生能源是世界可持续发展的重要组成部分。

3. With the global adoption of renewable energy technologies, enhancements have been designed and tested in order to improve the performance of wind energy conversions.
随着可再生能源技术的全球采用，为了提高风能转换的性能，提高风能的增强功能已设计并通过了测试。

4. However, vertical-axis turbines are less efficient at turning wind energy into mechanical power, and some require a starting device.
然而，垂直轴涡轮机在将风能转化为机械动力方面效率较低，而且有些涡轮机需要启动装置。

5. The advantage of up-wind turbines is that they are hardly influenced by the turbulence caused by the tower.
逆风涡轮机的优点是它们几乎不受塔架引起的湍流的影响。

6. 典型的大型涡轮机是逆风的水平轴涡轮机，有三个叶片转子。
Typical large turbines are up-wind, horizontal-axis turbines with three rotor blades.

7. 无齿轮涡轮机的优点包括结构紧凑、故障风险低及维护简单。
Advantages of gearless turbines include their compact structure, lower risk of breakdown and simpler maintenance.

8. 管理电力系统的一个重要问题是大型集约风能的输出功率具有可变性。
An important issue for managing power systems that integrate large amounts of wind energy is the variability of the power output.

9. 与齿轮箱相连的高速转轴迫使发电机的轴转动，利用电磁感应将转动能转化为电能。
The high-speed rotating shaft connected to the gearbox forces the shaft of the generator to rotate, converting the rotational energy to electricity through the use of electromagnetic induction.

10. 许多风塔是由钢管制成的，这样，即使在恶劣天气下，也可以进入塔内的机舱。
Many towers are made from steel tubes which allow access to the nacelle inside the tower, even in bad weather.

VII. Passage translation:

Wind turbines incorporate a control system to prevent excessive rotation speeds in high wind, which could otherwise break the blades or other components. The two methods for controlling the speed of the blade, or delivering the power output from the blade to the rotating shaft, are pitch control and stall control. A pitch control system actively adjusts the angle of the blades to the wind speed. The rotor hub includes a pitch mechanism, and the control system features a brake. A stall system decreases the rotational speed by using the aerodynamic effects of the blades when the wind speed is too high, lowering the efficiency to protect the turbine from damage.

Text B Solar energy

I Critical Thinking.

1. What do you think is the application of solar energy, esp. in China?

Human beings have applied solar energy in many aspects since ancient time. In recent years, solar energy has played a major role in the global energy transformation trend. Solar energy utilization is expected to be increasingly important in order to meet future energy needs and limit CO_2 emissions to the atmosphere.

Solar energy is radiant light and heat from the Sun harnessed by using a range of ever-evolving technologies such as solar heating, **photovoltaics**, solar thermal energy, solar architecture and *artificial photosynthesis*.

At present, most of the ways of utilizing solar energy in China are solar photovoltaic conversion, such as solar water heater, solar oven, solar room, solar drying, solar greenhouse, solar refrigeration and air conditioning, solar power generation and photovoltaic power generation system.

2. What is the working principle of solar panels? Please describe it according to the picture in the passage.

When light in **proton** form hits the solar cell, the energy results in dividing the hole-electron couples. Each photon carrying sufficient amount of energy will usually be able to free just a single electron, leading to a free opening as well. If this occurs very close to the field of electricity, or if free opening and free electrons tend to flow into influence range, the field is likely to shift the electron to side N and the hole to side P. This results in even more **disruption** of neutrality of electricity, and if an external charged path is presented, electrons make use of the path to travel to the P side to combine with openings sent by the electric field, carrying on work in the process. The flow of electron results in the current and the electric field of the cell results in the formation of a voltage. Power is formed as a product of both voltage and current.

3. Why is solar energy considered as a green energy source?

It is environmentally friendly. Solar energy is a green energy source and environmentally friendly. It does not emit any carbon, **nitrogen oxide**, sulfur gas, mercury, or any gas that is harmful to the environment. Especially it is 100% safe to human work when generating electricity. So solar energy generation does not contribute to global warming, acid rain or fog. In fact, it contributes to reducing harmful greenhouse gas emissions. Since solar energy does not use any fuel in the electricity generation process, there are no storage, transportation or retrieval of fuel. It can be said that this is considered the best source of clean energy that nature gives us. Solar energy does not

create much noise. Compared with other energy sources, solar panels are silent producers.

4. What is the special material used in solar panels and why is it used?

Photovoltaic cells are composed of a unique material known as silicon.

Reason: Two individual pieces of silicon happen to be electrically neutral. But when two impure silicon pieces —— the P-type and N-type—— are brought in contact with each other, an electric field is formed. The free electrons present on the N side seeing all the holes on the P side rush to fill them fast. All free electrons are unable to fill the free openings. The entire arrangement would, in fact, be wasted if they had. But, exactly at the opening point, they mix successfully to form a kind of barrier which makes it increasingly tough for electrons located on the N side to make the move to side P. Gradually, the process reaches a point of **equilibrium** and there exists an electric field dividing the different sides. This field serves as a kind of **diode**, permitting and even forcing electrons to drift from the P to the N side, instead of the other way round.

5. What is your opinion to avoid the disadvantages and try to make the best of solar energy?

Open question. The following is for reference only.

Try to put the solar panels in a sunlight-abundant area, so it can capture as much sunlight as possible and make the best use of solar panels. Develop new methods to make the best of solar panels to improve the efficiency. Make good use of the desert area and set up solar panel plants so as to generate green energy.

II. **Match the expressions in Column A with those having similar meanings in Column B.**

1. disperse B. to move apart and go away in different directions

2. charge E. the amount of electricity that is put into a battery or carried by a substance

3. semiconductor A. a solid substance that conducts electricity in particular conditions, better than insulators but not as well as conductors

4. electron I. a very small piece of matter (= a substance) with a negative electric charge, found in all atoms

5. equilibrium G.a state of balance, especially between opposing forces or influences

6. diode J. an electronic device in which the electric current passes in one direction only, for example a silicon chip

7. proton C. a very small piece of matter (= a substance) with a positive electric charge that forms part of the nucleus (= central part) of an atom

8. disruption H. an act of delaying or interrupting the continuity

9. nitrogen oxide F. any of several oxides of nitrogen formed by the action of nitric acid on oxidizable materials

10. solar panel D. a piece of equipment on a roof that uses light and heat energy from the sun to produce hot water and electricity

III. True or False.

1. F. Human beings have applied solar energy in many aspects since modern time.

2. T. Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy.

3. T. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.
4. F. Photovoltaic cells are composed of a unique material known as sulfur.
5. T. All photovoltaic cells possess one or several electric fields that force the loosely flowing electrons to drift in a particular direction.
6. F. The free electrons present on the P side seeing all the holes on the N side rush to fill them fast.
7. F. This field serves as a kind of **diode**, permitting and even forcing electrons to drift from the N to the P side, instead of the other way round.
8. T. When light in **proton** form hits the solar cell, the energy results in dividing the hole-electron couples.
9. T. Each photon carrying sufficient amount of energy will usually be able to free just a single electron, leading to a free opening as well.
10. T. The flow of electron results in the current and the electric field of the cell results in the formation of a voltage.

IV. **Complete the passage with the words or expressions from the text.**

1. D. form
2. F. for
3. A. applications
4. E. include
5. B. divided
6. H. grid
7. C. system
8. G. power
9. L. meet
10. O. zero
11. K. utilizing
12. N. conversion
13. J. heater
14. M. solar
15. I. air

V. **Please put the following terms into their corresponding English or Chinese.**

1. conventional power stations 传统发电站
2. electrically neutral 不带电
3. influence range 影响范围
4. sustainable development 可持续发展
5. global warming 全球变暖
6. acid rain 酸雨
7. Low maintenance costs 低维护成本
8. Diverse applications 各种用途
9. photovoltaics 光伏（发电）
10. disperse 驱散
11. 电荷 charge
12.半导体 semiconductor

13.质子 protons
14.平衡 equilibrium
15.二极管 diode
16.氧化氮 nitrogen oxide
17.太阳能电池板 solar panel
18.人工光合作用 artificial photosynthesis
19.电流 electron flow
20.磨损;损耗 wear and tear

VI. **Translate the following sentences into English or Chinese.**

1. Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy.
主动式太阳能技术包括使用光伏系统、集中太阳能和太阳能热水器来利用太阳能。

2. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.
被动式太阳能技术包括将建筑物朝向太阳，选择具有良好热质量或光散射特性的材料，以及设计一个空间让空气自然循环。

3. Solar cells, also popularly known as photovoltaic cells, help convert the energy derived from the sun directly into charge.
太阳能电池，也被普遍称为光伏电池，帮助将来自太阳的能量直接转化为电荷。

4. Electrons get knocked loose due to the energy and this gives them the ability to drift freely.
电子由于能量击打而松动，这使它们能够自由漂移。

5. All photovoltaic cells possess one or several electric fields that force the loosely flowing electrons to drift in a particular direction.
所有的光伏电池都具有一个或多个电场，迫使松散流动的电子向特定方向漂移。

6. Together with the voltage of the cell, this current defines the amount of power that the photovoltaic cell is capable of emitting.
该电流与电池的电压一起决定了光伏电池能够发射的功率大小。

7. The free electrons present on the N side seeing all the holes on the P side rush to fill them fast.
存在于 N 侧的自由电子看到 P 侧的所有空穴于是迅速冲去填充它们。

8. Each photon carrying sufficient amount of energy will usually be able to free just a single electron, leading to a free opening as well.
每个携带足够能量的光子通常只能释放一个电子，从而产生自由开口。

9. The flow of electron results in the current and the electric field of the cell results in the formation of a voltage.
电子的流动产生电流，电池的电场形成电压。

10. If solar energy can meet the energy demand of buildings, it can be called "zero energy house".
如果太阳能能够满足建筑的能源需求，它可以被称为“零能耗住宅”。

Text C Bioenergy

I. **Critical thinking:**

1. What is Bioenergy?

Bioenergy is a renewable energy made available from materials derived from biological sources. Biomass is any organic material which has stored sunlight in the form of chemical energy.

2. Can you list the biomass types?

As a fuel it may include wood, wood waste, straw, **manure**, **sugarcane**, and many other by-products from a variety of agricultural processes. Many plants are used to produce the biomass, such as corn, willow, and sugarcane and hemp palm. Dead animals, waste oils, rubbish can also produce the energy. To be specific, biomass includes the following:

Agriculture waste
Forest resources
Livestock
Municipal solid waste
Sanitary sewage & industrial organic wastewater
And so on.

3. What do you think is the future of bioenergy?

Bioenergy can make use of the waste in our life to generate electricity, so it is green energy source and contributes to the sustainable development strategy. Research should be done on the efficient usage of bioenergy in the future.

II. True or false:

1. F. Biomass is any organic material which has stored sunlight in the form of physical energy.
2. T. Biofuel includes biomass, the biological material used as a biofuel, as well as the social, economic, scientific and technical fields associated with using biological sources for energy.
3. T. Biomass can be used as a source of energy and it most often refers to plants or plant-based materials which are not used for food or feed, and are specifically called lignocellulosic biomass.
4. F. As an energy source, biomass can either be used indirectly via **combustion** to produce heat, or directly after converting it to various forms of biofuel.
5. F. Industrial activities generate large amounts of biomass residues.
6. T. Rural communities could become entirely self-sufficient when it comes to energy, using locally grown crops and residues to fuel cars and tractors and to heat and power homes and buildings.
7. F. Several billion dollars of federal incentives are available through the 2002 Farm Bill to develop advanced technologies and crops to produce energy, chemicals, and other products from biomass.
8. T. Many plants use sunlight and nutrients to create biomass, which contains key components—including lipids, proteins, and carbohydrates— that can be converted and upgraded to a variety of biofuels and products.
9. T. Distorted motives and measures of support and protection put great pressure on food security in the World.

10. F. There is an added incentive to develop the bioenergy sector which is to increase the development of the urban sector in China.

III. **Please put the following terms into their corresponding English or Chinese.**

1. bioenergy 生物能
2. biofuel 生物燃料
3. biomass 生物（质）量
4. combustion 燃烧
5. ethanol 乙醇
6. municipal solid waste 城市固体废弃物
7. biomass residues 生物质残留物
8. federal incentives 联邦激励措施
9. Sanitary sewage 生活污水
10. organic material 有机材料
11. 综合森林生物精炼厂 Integrated Forest Biorefinery
12. 长期发展计划 long term development plan
13. 沼气 methane gas
14. 可持续发展战略 the sustainable development strategy
15. 绿色电力证书制度 Green Electricity Certificates System
16. 振兴农村经济 revitalizing rural economies
17. 农业生产过程的副产品 by-products from agricultural processes
18. 减少侵蚀 reduce erosion
19. 微咸水 brackish water
20. 食品安全 food security

Unit 3 Energy Sustainability (II)

Text A Geothermal Energy

I Critical Thinking.

1. What is the relation between geothermal energy and the environment?

The environmental impact of geothermal energy may not be as extensive as that of other sources of energy, but it can be considerable. When geothermal energy is developed at a particular site, environmental problems include on-site noise, emissions of gas, and disturbance of the land at drilling sites, disposal sites, roads and pipelines, and power plants. Development of geothermal energy does not require large-scale transportation of raw materials or refining of chemicals, as development of fossil fuels does. Furthermore, geothermal energy does not produce the atmospheric pollutants associated with burning fossil fuels or the radioactive waste associated with nuclear energy. However, geothermal development often does produce considerable thermal pollution from hot waste-waters, which may be **saline** or highly **corrosive**, producing disposal and treatment problems.

2. What are the heat transfer processes in the Earth?

Heat in the Earth can be transferred by three processes: conduction, **convection**, and radiation. Conduction governs the thermal conditions in almost entire solid portions of the Earth and plays a very important role in the **lithosphere**. Convection dominates the thermal conditions in the zones where large quantities of fluids (molten rocks) exist, and

thus governs the heat transport in the fluid outer core and the mantle. On a geological time scale, the mantle behaves as a **viscous** fluid due to the existence of high temperatures. Convection involves transfer of heat by the movement of mass, which is a more efficient means of heat transport in the Earth compared to pure conduction. In several processes of the Earth's interior, both conductive as well as convective heat transfer play important roles. Radiation is the least important mode of heat transport in the Earth. The process of heat exchange between the Sun and the Earth, through radiation, controls the temperatures at the Earth's surface. Inside the Earth, radiation is significant only in the hottest parts of the core and the lower mantle.

3. Can you explain the origin of the term geothermal energy?

Geothermal energy is natural energy in the form of heat that is produced and preserved within the Earth. The term “geothermal energy” is taken from the Greek words, “geo” and “thermo”—earth and heat respectively—whereas “energos” means active. Hence, the overall term may be referred to as the movement of active heat energy within the Earth. The temperature of the Earth increases with its depth and this geothermal gradient allows continuous heat conduction from the Earth’s core to the surface. This is also called “terrestrial heat-flow.” If the heat flow rate is high and energy extraction is economical, then humans can utilize this heat for multiple purposes, that is, electricity generation, heating, and agriculture use.

4. What are the features of geothermal electricity generation?

Geothermal energy is considered renewable if it can supply energy according to demand. Its high energy density and continuous availability make it highly desirable and give it an advantage over solar and wind. However, it has its limitations, like transportation constraints, unlike fossil fuels. It can be used directly to extract any advantage out of it. The distribution of geothermal energy resources follows an irregular pattern due to the unequal distribution of water **geysers**, hot springs, **fumarole**s, **silica sinter terrace**, **alga mat**, lava flows, hot pools and lakes, steaming pools, and volcanoes. These resources are highly associated with geological and hydrological patterns. The rich resources of heat energy are considered to be the areas located near volcanic chains or rings of fire where **tectonic plates** meet and frequent volcanic activities can be observed.

5. What are the handicaps of developing geothermal energy? Can you generalize from the text?

(1) It is limited to the volcano area and can’t be developed in other places. (2) Geothermal power is not very popular in some locations among some people. For instance, geothermal energy has been produced for years on the island of Hawaii, where active volcanic processes provide abundant near-surface heat. There is controversy, however, over further exploration and development. Native Hawaiians and others have argued that the exploration and development of geothermal energy degrade the tropical forest as developers construct roads, build facilities, and drill wells. In addition, religious and cultural issues in Hawaii relate to the use of geothermal energy. For example, some people are offended by using the "breath and water of **Pele**" (the volcano goddess) to make electricity. This issue points out the importance of being sensitive to the values and cultures of people where development is planned. (3) Geothermal development often produces considerable thermal pollution from hot waste-waters, which may be saline or highly corrosive, producing disposal and treatment problems. (4) The geothermal exploring and producing technology needs to be further developed.

II. Match A with B

1. permeability
C. the property of something that can be pervaded by a liquid
2. viscous
E. thick and sticky
3. fumarole
B. an opening in or near a volcano through which hot gases escape
4. granite
A. a type of hard grey stone, often used in building
5. seismicity
D. connected with or caused by earthquakes
6. fracture
G. a break in a bone or other hard material
7. saline
I. containing salt
8. corrosive
F. tending to destroy sth slowly by chemical action
9. geysers
J. a natural spring that sometimes sends hot water or steam up into the air
10. lithosphere
H. the layer of rock that forms the outer part of the earth

III. True or False

1. F. Geothermal energy is natural energy in the form of heat that is produced and preserved at the surface of the Earth.
2. F. The temperature of the Earth increases with its depth and this geothermal gradient allows continuous heat conduction from the Earth's surface to the core.
3. T. Humans can utilize this heat for multiple purposes, that is, electricity generation, heating, and agriculture use.
4. T. It is the only source of energy that can be used to supply baseload or dispatchable power without weather constraints.
5. F. A geothermal reservoir contains heat only in the fluids that fill the fractures and pore spaces within the rock.
6. T. A geothermal resource is distinct from a geothermal reserve, which refers to the part of a resource that can be extracted economically at the present price level.
7. F. Geophysical surveys have been unsuccessful in exploration and assessment of geothermal prospects over the past several decades.
8. T. Projects exploring superhot geothermal resources have been conducted in Iceland, Italy, Japan, Mexico, and the United States.
9. T. The project in Iceland was extremely beneficial because it demonstrated the existence of geothermal reservoirs, which produce water with high specific enthalpy, exceeding 2 MJ/kg.
10. F. During fracturing and energy extraction, the fracture networks are exposed to cooling due to the injection of hot fluid into the reservoirs.

IV. Fill in the blanks

1. L. reservoirs

2. F. microfractures
3. C. geothermal
4. E. suitability
5. H. exposed
6. J. fluid
7. G. permeability
8. B. decreased
9. I. unclear
10. K. consist
11. N. possibility
12. A. results
13. O. emissions
14. D. temperature
15. M. drop

V. Term translation

1. alga mat 藻类垫
2. thermo-elastic deformation 热弹变形
3. silica sinter terrace 二氧化硅烧结阶地
4. geothermal energy 地热能
5. heat conduction 热传导
6. tectonic plates 构造板块
7. in situ triaxial stress 原位三轴应力
8. fossil fuel 化石燃料
9. geothermal resources 地热资源
10. 被认证 be verified
11. 热压裂 thermal fracturing
12. 注入 inject…into…
13. 渗透率增强 permeability enhancement
14. 热对流 heat convection
15. 蒸汽主导地热系统 vapor-dominated geothermal systems
16. 火山链 volcanic chains
17. 被分配 be allocated
18. 近地表热 near-surface heat
19. 宗教和文化问题 religious and cultural issues
20. 对…敏感 be sensitive to

VI. Sentence translation

1. The temperature of the Earth increases with its depth and this geothermal gradient allows continuous heat conduction from the Earth's core to the surface.
地球的温度随着深度的增加而增加，这种地热梯度使得热传导从地核连续传到地表.
2. The countries with the greatest total installed capacity are the United States, Indonesia, the Philippines, and Turkey.

总装机容量最大的国家是美国、印度尼西亚、菲律宾和土耳其。

3. Due to the increasing demand for switching to clean energy production, the need for research and development in engineered geothermal systems (EGS) is becoming critical.
由于转向清洁能源生产的需求不断增加，对工程地热系统（EGS）的研发需求变得至关重要。

4. Results showed that permeability increased with increasing temperature drop at relatively low stress levels.
结果表明，在相对较低的应力水平下，渗透率随温度下降的增加而增加。

5. The distribution of geothermal energy resources follows an irregular pattern due to the unequal distribution of water geysers, and volcanoes.
由于间歇泉和火山的分布不均，地热能资源的分布呈不规则模式。

6. A geothermal reservoir contains heat both in the solid rock as well as in the fluids that fill the fractures and pore spaces within the rock.
地热储存层既包含固体岩石中的热量，也包含填充岩石内裂缝和孔隙的流体中的热量。

7. Once a geothermal region is identified, the next step is to use different available exploration techniques to localize potential geothermal resource areas and identify suitable drilling targets for production.
一旦确定了地热区域，下一步就是使用不同的可用勘探技术来定位潜在的地热资源区域，并确定合适的开采目标。

8. Utilization of superhot geothermal resources will play a key role in improving the productivity and sustainability of geothermal energy generation.
超高温地热资源的利用将在提高地热发电的生产力和可持续性方面发挥关键作用。

9. During fracturing and energy extraction, the fracture networks are exposed to cooling due to the injection of cold fluid into the reservoirs.
在压裂和能量提取过程中，由于向储存层注入冷的流体，网格裂缝暴露在外并冷却。

10. Geothermal energy is considered renewable if it can supply energy according to demand.
地热能如果能根据需求提供能源，就被视为可再生能源。

VII. Passage translation

地球的热传递过程

地球上的热量可以通过三个过程传递：传导、对流和辐射。传导控制着地球几乎整个固体部分的热条件，在岩石圈中发挥着非常重要的作用。对流控制着存在大量流体（熔融岩石）的区域的热条件，从而控制着流体外核和地幔中的热传输。在地质时间尺度上，由于高温的存在，地幔表现为粘性流体。对流涉及通过质量运动传递热量，与纯传导相比，这是地球上更有效的热传输方式。在地球内部的几个热传递过程中，传导和对流都起着重要作用。辐射是地球上最不重要的热传输方式。太阳和地球之间通过辐射进行热交换的过程控制着地球表面的温度。在地球内部，辐射只有在地核和下地幔最热的部分才是重要的。

Text B. Basics of Nuclear Energy

I Critical Thinking.

I. Please work in groups and discuss the following questions:

1. What is nuclear power?

Nuclear power is the energy released from the nucleus through nuclear reactions.

Nuclear power plants are the facilities responsible for converting the nuclear energy contained in the uranium atoms into electricity. The process to obtain this conversion is the result of a thermodynamic and mechanical process.

2. What is the working process of nuclear power?

Nuclear power can be obtained from nuclear fission, nuclear decay and nuclear fusion reactions.

Generation of fusion energy for practical use relies on fusion reactions between the lightest elements that burn to form helium.

In nuclear fission， the nucleus of an atom breaks up into two lighter nuclei. The process may take place spontaneously in some cases or may be induced by the excitation of the nucleus with a variety of particles (e.g., neutrons, protons, deuterons, or alpha particles) or with electromagnetic radiation in the form of gamma rays.

Nuclear Decay

When an atom decays, it can do so via one of three natural methods. These methods are known as alpha, beta, and gamma.

In alpha decay, the unstable nucleus ejects an alpha particle, which is composed of two neutrons and two protons. Another way of stating this is that the nucleus decays by ejecting a helium-4 nucleus.

In beta decay, the nucleus ejects a beta particle, which is either an electron (beta minus) or a positron (beta plus).

Gamma decay occurs when electromagnetic radiation is given off by the nucleus as the protons and neutrons become more tightly bound.

3. What is the application of nuclear power?

(General answer) Nuclear power is widely used in the world. It is used in many fields. Apart from nuclear weapons, the most important and well-known use of nuclear energy is the generation of electricity. Moreover, it is used in industry, agriculture, hydrology, mining and the space industry.

(Specific answer) The generation of electricity: After the Second World War, the main use of nuclear energy was the generation of electric power. Nuclear power made a significant contribution to electricity generation, providing 10% of global electricity supply in 2018. In advanced economies, nuclear power *accounts for* 18% of generation and is the largest low-carbon source of electricity. However, its share of global electricity supply has been declining in recent years. That has been driven by advanced economies, where nuclear fleets are ageing, additions of new capacity have dwindled to a trickle, and some plants built in the 1970s and 1980s have been retired. This has slowed the transition towards a clean electricity system. Despite the impressive growth of solar and wind power, the overall share of clean energy sources in total electricity supply in 2018, at 36%, was the same as it was 20 years earlier because of the decline in nuclear. **Halt**ing that slide will be vital to stepping up the pace of the decarbonization of electricity supply.

The use in industry: Nuclear power is used in the development and improvement of processes, for measurements, automation and quality control. It is used as a prerequisite

for the complete automation of high-speed production lines, and is applied to process research, mixing, maintenance and the study of wear and corrosion of facilities and machinery. Nuclear technology is also used in the manufacture of plastics and in the sterilization of single-use products.

The use in agriculture: Nuclear technology is very useful in the control of insect pests, in the maximum use of water resources, in the improvement of crop varieties or in the establishment of the necessary conditions to optimize the effectiveness of fertilizers and water.

4. What do you think is the future of nuclear power, especially in China?

The future of nuclear power varies greatly between countries, depending on government policies. Some countries, many of them in Europe, such as Germany, Belgium, and Lithuania, have adopted policies of *nuclear power phase-out*. At the same time, some Asian countries, such as China, South Korea, and India, have committed to rapid expansion of nuclear power. Many other countries, such as the United Kingdom and the United States, have policies in between. Japan was a major generator of nuclear power before the Fukushima accident, but as of August 2016, Japan has restarted only three of its nuclear plants, and the extent to which it will resume its nuclear program is uncertain.

5. How to avoid the adverse impact of nuclear power?

Develop the technology related to nuclear power generation. Nuclear power plants have high start-up costs. Plants must invest heavily in containment systems and emergency plans. Extensive backup systems must be built and contingency plans must be developed to handle the rare threat of core meltdown.

Control the harm of nuclear waste. A nuclear power plant accident is capable of releasing dangerous radiation that harms people and the environment.

II. Match the expressions in Column A with those having similar meanings in Column B.

1. uranium C. a chemical element, a heavy, silver-white, radioactive metal, used mainly in producing nuclear energy
2. thermodynamic A.of or concerned with thermodynamics
3. halt J. an act of stopping the movement or progress of sb/sth.
4. decarbonization D.to get rid of the carbon from sth.
5. fission F. the act or process of splitting the nucleus
6. decay I. the gradual destruction of a society, an institution, a system, etc.
7. tritium H. an isotope of hydrogen with a mass that is three times that of the usual isotope
8. nucleosynthesis E. the cosmic synthesis of atoms more complex than the hydrogen atom
9. helium G. (symb He) a chemical element
10. trajectory B. the curved path of sth. that has been fired, hit or thrown into the air

III. True or False.

1. F. Presently, the vast majority of electricity from nuclear power is produced by nuclear fusion of uranium and plutonium.
2. T. Nuclear power can be generated through fission of heavy elements, such as uranium and the fusion of light elements, such as deuterium, tritium, and so on.
3. T. Hydrogen (H) “burning” initiates the fusion energy source of stars and leads to the formation of **helium** (He).

4. F. Generation of fusion energy for practical use also relies on fusion reactions between the heavy elements that burn to form helium.
5. T. The heavy **isotopes** of hydrogen —deuterium (D) and tritium (T)—react more efficiently with each other, and, when they do undergo fusion, they yield more energy per reaction than do two hydrogen nuclei.
6. T. The hydrogen nucleus consists of a single proton; the deuterium nucleus has one proton and one neutron, while tritium has one proton and two neutrons.
7. T. In the fission process, a large quantity of energy is released, radioactive products are formed, and several neutrons are emitted.
8. F. When an atom decays, it can do so via three natural methods.
9. F. The use of nuclear energy has a high greenhouse emission.
10. T. A nuclear power plant accident is capable of releasing dangerous radiation that harms people and the environment.

IV. Complete the passage with the words or expressions from the text.

Nuclear fission

Nuclear fission is subdivision of a heavy 1. nucleus, such as that of uranium or plutonium, into two fragments of roughly 2. mass. The process is accompanied by the release of a large amount of 3. .

In nuclear fission the nucleus of an atom breaks up into two 4. nuclei. The process may take place 5. in some cases or may be induced by the excitation of the nucleus with a variety of 6. (e.g., neutrons, protons, deuterons, or alpha particles) or with electromagnetic radiation in the form of gamma rays. In the fission process, a large 7. of energy is released, radioactive products are formed, and several 8. are emitted. These neutrons can 9. fission in a nearby nucleus of fissionable material and release more neutrons that can 10. the sequence, causing a 11. reaction in which a large number of nuclei 12. fission and an enormous amount of energy is released. If controlled in a nuclear 13. , such a chain reaction can provide power for society's 14. . If uncontrolled, as in the case of the so-called atomic bomb, it can lead to an explosion of awesome 15. force.

1. G. atomic
2. I. equal mass
3. H. energy
4. K. lighter
5. A. spontaneously
6. F. particles
7. N. quantity
8. B. neutrons
9. J. induce
10. O. repeat
11. C. chain
12. L. undergo
13. E. reactor
14. M. benefit
15. D. destructive

V. Please put the following terms into their corresponding English or Chinese.

1. disrupting the balance of nature 打破自然平衡

2. a thermodynamic and mechanical process 热动力机械过程
3. nuclear reactor 核反应堆
4. the radio radiation 无线电辐射
5. nuclear fission 核裂变
6. be vital to 对……致命
7. steam turbines 蒸汽涡轮机
8. nuclear decay 核衰变
9. radioisotope thermoelectric 放射性同位素热电
10. heavy element 重元素
11.连锁反应 a chain reaction
12.核电逐步淘汰 nuclear power phase-out
13.核聚变反应 nuclear fusion reaction
14.提升农作物种类 the improvement of crop varieties
15.伽马射线 gamma rays
16. β衰变 beta decay
17. 太空产业 the space industry
18.国际原子能机构 International Atomic Energy Agency
19.α粒子 alpha particles
20. 核堆芯熔化 core meltdowns

VI. Translate the following sentences into English or Chinese.

1.Nuclear power can be used to generate enormous energy if used properly.
如果使用得当，核能可以用来产生巨大的能量。

2.The release of nuclear waste water to the sea can disrupt the balance of nature.
向海洋排放核废水会破坏自然平衡.

3.Nuclear power plants are the facilities responsible for converting the nuclear energy contained in the uranium atoms into electricity.
核电站是负责将铀原子中的核能转化为电能的设施。

4.Nuclear power can be obtained from nuclear fission, nuclear decay and nuclear fusion reactions.
核能可以从核裂变、核衰变和核聚变反应中获得。

5.Fission of heavy elements techniques has had practical application, and light elements in fusion technology, is also being actively developed.
重元素裂变技术已经有了实际应用，轻元素聚变技术也在积极发展中.

6.氢的“燃烧”启动了恒星的聚变能源，并导致氦的形成。
Hydrogen “burning” initiates the fusion energy source of stars and leads to the formation of helium.

7. 氢的重同位素氘（D）和氚（T）相互反应更有效，当它们发生聚变时，每次反应产生的能量多于两个氢原子核反应产生的能量。
The heavy isotopes of hydrogen —deuterium (D) and tritium (T)—react more efficiently with each other, and, when they do undergo fusion, they yield more energy per reaction than do two hydrogen nuclei.

8. 核裂变是将铀或钚等重原子核切分为两个质量大致相等的部分。

Nuclear fission is subdivision of a heavy atomic nucleus, such as that of uranium or plutonium, into two fragments of roughly equal mass.
9. 这些中子可以在附近的可裂变材料核中引发裂变，并释放出更多的中子，这些中子可以重复这一序列过程，从而引发连锁反应。
These neutrons can induce fission in a nearby nucleus of fissionable material and release more neutrons that can repeat the sequence, causing a chain reaction.
10. 如果原子核被来自原子核外部的粒子撞击，它可能会被迫分裂。
A nucleus can be forced to break apart if it is hit by particles from outside of the nucleus.

Text C. Hydropower, Ocean Energy and Hydrogen
I Critical Thinking.
1. What are the technologies to harness wave energy?

Four main technologies exist to harness wave energy. Some work near the shore, some offshore and some in the deep sea. *Wave energy converters* (WECs) are designed to remain on the surface of the water, but they differ in the orientations of the collectors to the movement of the waves and in the methods used to generate electricity. Some devices generate the electricity on the spot and transmit it via undersea cables to shore, while others pass the mechanical energy of the wave along to land before turning it into electrical energy. The four types of wave electricity generators currently existing include: point absorbers, terminators, overtopping devices and attenuators.
2. What is the hydropower generation technology?

Aside from a plant for electricity production, a hydropower facility consists of a water reservoir enclosed by a dam, which captures energy from the movement of a river. The gates in the dam can open or close depending on how much water is needed to produce a particular amount of electricity. Reservoirs can be used for recreation, wildlife sanctuaries, and sources of drinking water. The following picture illustrates the process of hydroelectricity generation.

Hydroelectric power derives from transfers of kinetic energy when a volume of water flows down from a high elevation source, such as a reservoir, through a generator turbine and out to the stream-bed below.

Water flows down a pipe called a penstock, through a water turbine and drives the turbine blades to rotate. The turbine drives an electrical generator through the shaft which turns and makes the generator work to generate electricity. The energy extracted depends on water volume of the reservoir and the height differential. The water finally flows downstream. The whole process makes no waste of water.
3. How is tidal energy generated?

There are currently three different ways to get tidal energy: tidal streams, barrages, and tidal lagoons.

(1) Stream

For most tidal energy generators, turbines are placed in tidal streams. A tidal stream is a fast-flowing body of water created by tides. A turbine is a machine that takes energy from a flow of fluid. That fluid can be air (wind) or liquid (water). Because water is much more dense than air, tidal energy is more powerful than wind energy. Unlike wind, tides

are predictable and stable. Where tidal generators are used, they produce a steady, reliable stream of electricity.

(2) Barrage

Another type of tidal energy generator uses a large dam called a barrage. With a barrage, water can spill over the top or through turbines in the dam because the dam is low. Barrages can be constructed across tidal rivers, bays, and estuaries.

Turbines inside the barrage harness the power of tides the same way a river dam harnesses the power of a river. The barrage gates are open as the tide rises. At high tide, the barrage gates close, creating a pool, or tidal lagoon. The water is then released through the barrage's turbines, creating energy at a rate that can be controlled by engineers.

(3) Tidal Lagoon

The final type of tidal energy generator involves the construction of *tidal lagoon*s. A tidal lagoon is a body of ocean water that is partly enclosed by a natural or man-made barrier. Tidal lagoons might also be estuaries and have freshwater emptying into them.

A tidal energy generator using tidal lagoons would function much like a barrage. Unlike barrages, however, tidal lagoons can be constructed along the natural coastline. A tidal lagoon power plant could also generate continuous power. The turbines work as the lagoon is filling and emptying.

4. How is hydrogen sources classified in view of the production pathways?

In view of the different hydrogen production pathways, hydrogen sources can be divided into “gray hydrogen”, “blue hydrogen” and ‘‘green hydrogen”. ‘‘Gray hydrogen” mostly results from industrial by-products. Its energy source is mainly fossil fuels, and the hydrogen production process is accompanied by the production and emission of carbon dioxide. In a modification of the ‘‘gray hydrogen” production method, if the by-product carbon dioxide can be captured, used, or stored, preventing pollution, then the resultant process is termed ‘‘blue hydrogen” production. If it is obtained through renewable energy sources, such as wind energy, solar energy, biomass energy and other green sources, then it is classified as ‘‘green hydrogen”.

5. What is the relation between hydropower, ocean Energy and hydrogen?

From the definition of them, the relation is clear. Hydropower is the production of electrical power through the use of the gravitational force of falling or flowing water. Ocean energy includes ocean wave energy, ocean tide energy, and offshore wind energy. At present, the most promising hydrogen production technology involves the electrolysis of water. In addition, hydrogen production fueled by renewable energy (wind and solar) and biomass are also potential approaches in the zero-carbon pathway.

Hydrogen is a broad concept and includes the other two.

II. True or false:

1. F. Tidal energy is the most widely used form of renewable energy.
2. T. Water flows down a pipe called a penstock, through a water turbine and drives the turbine blades to rotate.
3. T. Water withdrawal is the act of removing water from a local water source; the withdrawn water may or may not get returned to its source or made available for use elsewhere.

4. F. The mass and quality of the energy contained in the waves are negatively correlated with the movement period of the waves, the width of the wave surface and the square of the wave height.
5. F. Wave power is another form of wind energy.
6. T. The four types of wave electricity generators currently existing include: point absorbers, terminators, overtopping devices and attenuators.
7. T. There are currently three different ways to get tidal energy: tidal streams, barrages, and tidal lagoons.
8. F. Turbines are least effective in shallow water.
9. F. The combination of hydrogen with zero-carbon technology and positive-carbon technology is more meaningful.
10. T. Hydrogen has the advantages of being clean, non-polluting, renewable, storable and versatile.

III. **Please put the following terms into their corresponding English or Chinese.**

1. hydropower 水电
2. gravitational force 引力，重力
3. water withdrawal 取水
4. the height differential 落差
5. wave energy 波浪能
6. kinetic energy 动能
7. Wave energy converters 波浪能转换器
8. point absorbers 点吸收器
9. terminators 终端器
10. 漫顶装置 overtopping devices
11. 衰减器 attenuators
12. 潮汐泻湖 tidal lagoons
13. 倾倒进 to empty into
14. 单位热值 unit calorific value
15. 零碳技术 zero-carbon technology
16. 负碳技术 negative-carbon technology
17. 电解水 the electrolysis of water
18. 环境影响 the environmental impact
19. 野生动物保护区 wildlife sanctuaries
20. 抽水蓄能水电 pumped-storage hydroelectricity

Unit 4 Text A

I Critical Thinking.

1. Talk about the impacts caused by fossil fuel consumption.

Fossil fuels cost more than what we pay at the pump and impact our environment in many ways. These impacts include global warming, air quality deterioration, oil spills and acid rain.

2. We cannot survive without energy. Where does all of the energy come from?

Today we gather most of our energy from coal, oil and natural gas, also known as fossil fuels. Additionally we gather energy from biomass, nuclear and renewables.

Fossil fuels consist of extracted decomposed organisms and plants that existed millions of years ago. Biomass converts plants into biometric materials to produce energy. Nuclear energy is released during nuclear fusion. Lastly, renewable energy comes from a source that's not depleted when used, such as wind or solar power.

3. Why should we actively promote the use of renewable energy in modern society?

Resources for renewable energy include sunlight, wind, rain, tides, waves and geothermal heat. The best part is that we don't need to compromise our planet to harness it, nor do we have to rely on other nations for these resources, which history has shown to be a contributor to war, famine and political instability. Besides, presently we have the technology to be 100% renewable reliant.

4.Why is it said that global conditions are further endangered?

Global conditions are further endangered because these resources are not distributed evenly. One quarter of the population, those that live in the developed nations, use nearly 80 percent of the resources consumed by humankind in any one year. The other three quarters of the population consume only about 20 percent of the resources used in a year. The gap between the haves and the have-nots is growing wider. Today, when transistor radios are to be found even in the most remote African villages, the world's poor know how underprivileged they are. This knowledge produces political instability. Years ago, political upheaval in one nation meant little to the rest of the world. But times have changed, because modern technology ensures that nearly all nations possess weapons that can wreak havoc far beyond their own borders. As a result, no nation can afford to ignore the problems of another.

5. Why are environmental problems always interrelated?

Sometimes a solution to one problem actually creates another problem. For example, when people are sick and dying from disease, it is natural to want to improve human health. When health is improved and infant mortality is reduced, a population explosion may result. To feed this growing population, natural habitats are often destroyed by turning them into farmland. As natural habitats are destroyed, the wild plants, predatory animals, and parasites that once lived there are killed as well. Because of the lack of predators and parasites, outbreaks of insect pests become more common. Farmers use pesticides to control the pests and protect the crops, but in the process the environment becomes polluted. The development of this entire cycle in itself consumes fossil fuel supplies that are becoming scarce. In addition, when fuels are burned, air pollutants are generated.

II Match Column A with Column B.

1 C 2 I 3 E 4 H 5 B 6 A 7 D 8 F 9 J 10 G

III True （T） or False （F） according to the passage.

1 T 2 T 3 T 4 F 5 T　　6 F 7 T 8 T 9 T 10 **T**

IV Complete the passage with the words or expressions from the text.

1 C 2 H 3 A 4 B 5 F　　6 O 7 G 8 L 9 I 10 E　11 K 12 D 13 M 14 N 15 J.

V Translate the following sentences into Chinese or English.

1. 医学、农业和工业技术的快速进步似乎预示着每个人都可能很快享受长寿、体面的食物、令人满意的就业和充足的住房。
2. 水道中的污水或有毒杀虫剂、烟雾弥漫的空气以及街道或公园中的垃圾都会降低每个人的生活水平，无论他们多么富有。
3. 随着自然栖息地的破坏，曾经生活在那里的野生植物、食肉动物和寄生虫也被杀死。
4. 污染是由于杂质的引入而使环境质量下降。
5. 尽管许多天然化合物已经存在了数十亿年，但人们最近学会了制造新的化合物，称为合成化学品。
6. More than one third suffered from malnutrition and hunger.
7. Most of the people who starve to death live in poverty-stricken developing nations.
8. Even the wealthiest nations are running out of fuel, hardwoods, and some minerals.
9. Environmental problems are always interrelated.
10. If industrial or agricultural wastes are discharged into a stream, or if they percolate down through soil and porous rock to reach a supply of groundwater, then these water resources become less fit for drinking.

VI Please put the following expressions into their corresponding English or Chinese.

1.at the beginning of the twentieth century
2.life expectancy
3.suffer from malnutrition and hunger
4.starve to death
5.the average standard of living
6. smog-laden air
7. political instability
8. infant mortality
9. natural habitats
10. population explosion
11. 政治动荡
12. 造成破坏
13. 砍伐树木
14. 在我们优先事项清单上
15.有机废物的自然分解
16.天然化合物
17. 合成化学品
18. 阻燃剂

19. 腐烂和回收的传统模式
20. 迅速分解

VII Translate the following passage into English.

Many compounds, however, do not disappear so readily. Synthetic plastics, for example, remain in the environment for a long time because organisms that feed on them and break them down are rare. Plastic shampoo bottles may produce unsightly litter, but they are not biologically active. Many other synthetic chemicals, however, are harmful. For example, DDT was developed as an insecticide, but experience with it has shown that it has undesirable environmental effects as well.

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Unit 4 Text B

I Critical Thinking: work in groups and discuss the following questions.

1.What is NIMBY? Why is it said that it offers an attractive policy option for meeting such targets although offshore wind does not have a specific mention in those documents?

NMBY is an acronym for "not in my backyard", the practice of claiming to be in favour of a new development or project, but objecting to it if it is too near their home and will disturb them in some way.

Offshore wind does not have a specific mention in those documents, but it offers an attractive policy option for meeting such targets. One reason is that offshore wind farms can avoid to a large extent the "not in my backyard"(NIMBY*) concerns that often plague terrestrial projects. Further offshore a wind farm is located, the lower such concerns are likely to become. Opposition is often strongly linked to a sense of place, and visual or amenity impacts are most likely to give rise to NIMBYism. This has certainly proved the case in the United Kingdom, the United States, other parts of Europe and New Zealand, despite broad public support for wind power as an industry. People want it, but not near them.

2. What can policy makers do to ease the local people's NIMBY concerns over the construction of such projects?

In the exclusive economic zone, such problems are likely to be minimal. Yet projects closer to shore and visible from the coast may arouse similar negative feeling. To be effective, large numbers of turbines must be dispersed along a relatively wide coastal area, and while proximity to the coast may reduce costs, it may increase objections. There is no silver bullet management solution to such tensions. An individual coastal landowner, for example, should not be accorded a right to veto a proposal in which the wider public has a substantial interest. However, genuine objections to amenity impacts should not be dismissed; this is particularly so if they are culturally-based. Consultation and real consideration of local views are important in a participatory system of environmental law, although not necessarily determinative of an outcome. International experience shows that the best route may be extra-legal; public education concerning the bencfits of wind, early consultation on specific projects, and direct community benefits are valuable to allay NIMBY concerns and smooth a path for deployment. If terrestrial learnings are transferable, it may be that incentives for substantial local ownership and management of farms could accelerate public acceptance. In this light, some

commentators have applied a Danish proverb:" your own pigs don't stink". One's own windmills may not look all that bad.

3. Discuss the effects of offshore windfarms on people and the environment.

略

II Match Column A with Column B.

1 b 2 f 3 e 4 a 5 j 6 c 7 i 8 d 9 g 10 h

III True (T) or False(F) according to the passage.

1 T 2 T 3 T 4 T 5 T 6 F 7 T 8 T 9 T 10. T

IV Fill in the blanks in the following sentences with the words given.

1. H 2. I 3. J 4.A 5. B 6. C 7. D 8. E 9. F 10. G 11. L 12.K
13. O 14. N 15.M

V Translate the following expressions into Chinese or English.

1.海上风力发电场
2.环境影响
3.对特别脆弱的生态系统的破坏
4. 涡轮机遭遇鸟撞的风险
5. 大量的噪音和震动
6. 向水柱中排放一些污染物
7. 涡轮机和电缆的占地面积
8. 温室气体排放
9. 占很大比例
10. 减轻发电对环境的更广泛影响
11. recognised the perils of fossil fuel reliance
12. diversify national energy portfolios.
13. make great strides
14. exploitation of offshore wind
15. marine environmental law and policy
16. at any cost
17. a key consideration for regulators
18. realise the substantial energy security benefits
19. provide a stable price for electricity
20. offers an attractive policy option for meeting such targets

VI. Translate the following passage into English.

In the exclusive economic zone, such problems are likely to be minimal. Yet projects closer to shore and visible from the coast may arouse similar negative feeling. To be effective, large numbers of turbines must be dispersed along a relatively wide coastal area, and while proximity to the coast may reduce costs, it may increase objections. There is no silver bullet management solution to such tensions.

Unit 4 Text C

I Critical Thinking: work in groups and discuss the following questions.

1. **What can college students do to reduce the amount of waste and protect our environment?**

略

2. *How can we reduce the amount of waste that is produced? And how can we close the loop by redirecting spent materials and products into programs of recycling? All of these questions must be answered through careful research in the coming years as we strive to keep civilization in balance with nature.*

How do you think about " strive to keep civilization in balance with nature" after we read the above text?

略

II True （T） or False （F） according to the passage.

1 T 2 T 3 F 4 T 5 T　　6 T 7 T 8 T 9 T 10 F

III Please put the following expressions into their corresponding Chinese or English.

1.环境影响最小
2.构成对自然资源的潜在浪费
3.聚焦有害物质的排除
4.有害的副产品
5. 有前途的替代策略
6. 更有效地利用能源和原材料
7. 简化了建筑材料的选择
8. 避免产生不需要的副产品
9. 对国家做出重大贡献
10. 在可再生能源发展中发挥着关键作用
11. without the generation of massive volumes of waste products
12. environmentally friendly products
13. design "greener" products
14. reduce the use of insecticides
15. make them resistant to the cotton bollworm
16. interrupt its digestive processes
17. increase interest in recycling
18. present greater technical challenges
19. require more complex treatment
20. successfully develop the needed recycling technologies

IV. Put the following into English

1. Scientists have turned to nature for help in destroying toxic substances.
2. Researchers are now attempting to coax even higher levels of performance from these gifted microbes by carefully determining the optimal physical, chemical, and nutritional conditions for their existence.
3. Their efforts may lead to the design and operation of a new generation of biological waste treatment facilities.

4. A major advance in recent years is the immobilization of such microorganisms in bioreactors.
5. Development of these processes will require extensive research to obtain a fundamental understanding of the chemical phenomena involved.

Unit 5 Text A

I Critical Thinking.

1. Why do we use ultra-high voltages as far as you know?

If our offices and homes using computers, photocopiers, washing machines and electric shavers rated at 110-250 volts, why don't power station simply transmit electricity at that voltage? Why do they use such high voltages? To explain that, we need to know a little about how electricity travels.

As electricity flows down a metal wire, the electrons carry its energy through the mental structure, bashing and crashing about and wasting energy like naughty children running down a corridor. That's why wires get hot when electricity flow through them. It turns out that the higher the voltage you use, and the lower the current, the less energy is wasted. So the electricity that comes from power plants is sent down at extremely high voltages to save energy.

But there's another reason too. Factories have huge machines that are much bigger and more energy-hungry than you have at home. The energy an appliance uses is directly related （proportional） to the voltage it uses. Power-hungry machines might use 10,000-30,000 volts. It makes sense to carry high-voltage electricity from the power station and then transform it to lower voltages when it reaches its various destinations.

2. With what methods does China focus on expanding T&D (transmission and distribution) capacity?

a. Deploying long-distance Ultra-High Voltage AC and Ultra-High Voltage DC transmission

b. Installing high efficiency amorphous metal transformers.

3. What issues are mentioned in the text?

However, there are four issues presented.

Security and reliability issues: If there is an accident happening in one line, the influence is difficult to be limited in a small area. The chances of Blackout are getting higher. Also it may be more vulnerable to terrorism.

Market issue: All other UHV transmission lines around the world are currently operating at lower voltage because there is not enough demand. The potential of long distance transmission needs more deep research.

Environmental and efficiency issues: Some experts argue that UH lines won't save land than building extra rail roads. They may also harmful to human bodies.

Economic issue: The total investment is estimated to be 270 billion RMB （around 40 billion USD）. It is much expensive building new rail road for coal transportation.

4. How does SGCC serve for the building of new socialist countryside according to the text?

By the end of 2005, SGCC had reached the target that all categories of power consumption within the business area of SGCC pay the same tariff, practically relieving farmers' burden. SGCC takes the strategy of "new countryside, new power, new services" for rural power development, implements the project of "Power For All". By means of

maximum extension of power grid, SGCC strives to realize the target of "Power For All" for 1.4 million non-connected families within the service area of SGCC in 2010.

5. What does SGCC do for the construction of a conservation and environment friendly society?

SGCC commits to taking proper steps to support the Central Govemment's arrangements on a conservation and environment friendly society. The concept of protecting the environment and conserving natural resources serves as its guideline to direct strategy-setting, planning and design, installation and construction, production and operation, customer services, etc. SGCC is an active sponsor to support the development of new and renewable energy resources, such as promotion of bio-energy generation technology and commercial operation, which is conducive to alleviating environment impact.

II Match Column A with Column B.

1-5:g j c h i **6-10**: b a d e f

III True （T） or False （F） according to the passage.

1 T 2 T 3 F 4T 5 T 6 F 7 T 8 T9 T 10 T

IV Complete the passage with the words or expressions from the text.

1 H 2 C 3 B 4 F 5 G 6 A 7 L 8 J 9 I 10 E 11 K 12 D 13 M 14 N 15 O.

V Translate the following sentences into Chinese or English.

1. 由于经济的快速增长，这个地区的用电量以前所未有的速度增长。
2. 国家在电力供应方面进行了非常积极的投资，以确保经济发展需要。
3. 为了将输电损耗降低到可控水平，特高压输电是一个合乎逻辑的选择。
4. 我们怎样才能把电力从偏远地区输送到用电中心而不造成长距离传输所造成的巨大损耗呢?
5. 更重要的是，这意味着我们可以认真考虑将太阳能、风能和水力发电大规模纳入主电网。
6. With the economic development of the western region of China, the demand of electricity has been booming these years.
7. All measures are aimed at serving for the building of new socialist countryside.
8. SGCC takes the strategy of "new countryside, new power, new services" for rural power development, implements the project of "Power For All".
9. This mechanism is conducive to alleviating environment impact.
10. Following its international development strategies, SGCC has collaborated with neighboring countries to jointly develop energy resources.

VI Please put the following expressions into their corresponding English or Chinese.

1. serious supply shortage
2. electricity consumption
3. Ultra-High Voltage DC
4. installed generation capacity
5. On the transmission and distribution side

6. State Grid Corporation of China
7. International Conference
8. security and reliability issues
9. coal power plants
10. a scarce resource
11. 可持续的电力能源
12. 输电系统
13. 大容量输电系统
14.《财富》世界 500 强
15. 创新人才管理机制
16. 工作机制
17. 内部分配制度
18. 绩效评估
19. 电力普及；全民电力
20. 优质服务常态化机制

VII Translate the following passage into English.

To Establish a Unified Brand of "State Grid"

To integrate the internal resources to a unified brand of "State Grid", SGCC reflects its achievement in the aspects of conglomerate operation, consolidated development and streamlined management. As a direct reflection of the quality of work, the brand "State Grid" will be widely popularized and the customers's service system 95598 will be continuously optimized.

To Improve the Regular Mechanism of Quality Services

SGCC has announced the "10 Prohibitions on Providing Services", "Dispatching Principle and 10 Measures" and "10 Promises on Power Supply Service" to the public, optimized service procedures, improved service standard, standardized service conduct, intensified supervision and examination, and completed regular mechanism for quality services.

Unit 5 Text B

I Critical Thinking: work in groups and discuss the following questions.

1. What are smart homes as far as you know?

A smart home, or smart house, is a home that incorporates advanced automation systems to provide the inhabitants with sophisticated monitoring and control over the building’s functions. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things. A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses either wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet.

2. How do you understand smart meters?

Smart meters are digital meters used in homes to record electrical usage. Digital meters can transmit energy consumption information back to the utility on a much more frequent schedule than analog meters.

3. How does a home smart camera benefit residents?

The smart camera can let parents at work know that their children have returned home from school, or that a package has been delivered at their door. It can also let them know if an unknown person has trespassed on their property. When family members enter the home, the smart camera "recognizes" them and sends information to the owner's smartphone. The owner can check the information at a convenient time. But if an intruder enters the home, the camera will send an alert that will sound an alarm on the owner's smartphone.

4. What does the success or failure of an automation program hinge on?

The success or failure of an automation program hinges on proper selection of equipment and communications to seamlessly integrate data into the utility control room.

5. What can utilities using DA achieve?

• Significant reduction outage time for customers, with minimal circuit reconfiguration resulting in improved reliability indices.

• Automatic/semi-automatic feeder tie switches.

• Reduction in travel time to remote locations, reducing fuel and labor costs.

• Reduction in feeder patrol time to isolate faults.

• Information reported back to the office immediately, providing a clearer picture of what is happening in the field.

II Match Column A with Column B.

1 h 2 e 3 f 4 a 5 c 6 j 7 i 8 d 9 b 10 g

III True (T) or False(F) according to the passage.

1F 2 T 3 T 4 T 5 T 6 T 7 T 8 T 9 T 10. F

IV Fill in the blanks in the following sentences with the words given.

1. J 2. I 3. H 4. A 5. B 6. C 7. D 8. E 9. F 10. G 11. L 12.K
13. M 14. O 15.N

V Translate the following expressions into Chinese or English.

1. 低压配电线路
2. 现代配电系统
3. 初级电路
4. 配电线路
5. 架空杆线
6. 三相系统
7. 配电压
8. 高压导体
9. 导电物体
10. 高压配电网
11. customer complaints

12. urban utilities
13. communication media
14. operating expenses
15. patrol time
16. grounding system
17. electric shock
18. objectionable voltages
19. neutral wire
20. distribution transformer

VI. Translate the following sentences into Chinese or English.

1. 当今，在物联网的帮助下，你比以往任何时候都能更好地控制自己的家庭能源消耗。
2. 然而，对于一些人来说，智能恒温器只是让他们的家变得更智能、更舒适、更高效的起点。
3. 在你的家之外，物联网正在彻底改变我们与当地社区的互动方式。
4. 智能城市应用程序还包括智能垃圾箱等。
5. 许多城市已经在使用节能的 LED 路灯。
6. IoT is also revolutionizing how power is delivered from a power plant and used throughout your community.
7. The smart grid is foundational to the smart city and essential in creating more livable and efficient cities in the future.
8. Back at your smart home, IoT allows you to charge your electric vehicle (EV) at times when the price of electricity is at its lowest.
9. There is an abundance of possibilities for IoT technology in energy
10. Ultimately, this means more convenience in your life.

Unit 5 Text C

I. Critical Thinking: work in groups and discuss the following questions.

1. Say something about how you understand smart grid and the role it plays in smart energy management.

Smart grid entails a "fully automated power delivery network that monitors and controls every consumer and node, ensuring a two-way flow of electricity and information". Smart grid plays an important role in smart energy management, which is the energy price and consumption trend which describes the daily energy use of a regular household in a near future. As is known, energy is mostly consumed during the daytime. Since the demand of consumption during the daytime is high, the price of the energy during the daytime rises eventually while the demand of electricity at night is low, the price of the energy at night falls. The energy is supplied to each household from the external power. With the help of smart energy management system, we are able to balance our energy consumption and reduce the electricity charge. If we rely more on the

external power only, we would have to pay more. Of course, energy can also be created by using solar or wind energy. This energy can be used to run various household appliances instead of external power. We can work on all the laundries and enjoy cool air generated from a smart air conditioner without worrying about electrical bills. Since we have saved enough energy to support our appliances, we don’ t need any help from the external power. In addition, we can either store our energy or sell the excessive energy to an electric power company. Besides, if we make the best use of the cheap midnight power service, we can store energy more stably, and we can even recharge our car more efficiently.

To sum up, with smart energy management system we can cut the consumption in half and earn an extra money by selling the stored energy to the power company. How does that sound? Isn’t it wonderful? Smart energy management system, in the morning, noon, night, even until after midnight, will give a resident economical affluence while protecting our precious Earth.

2. What were the three fields that Bill Gates mentioned in an essay online written to college students graduating worldwide in 2017?

One is artificial intelligence （AI）. We have only begun to tap into all the ways it will make people’s lives more productive and creative. The second is energy, because making it clean, affordable, and reliable will be essential for fighting poverty and climate change."The third field he mentioned was biosciences.

3. Does AI have anything to do with energy? Why?

Yes. Al and energy are not mutually exclusive career paths. In fact, they are becoming increasingly interconnected as computing power, data collection, and storage capabilities scale exponentially on an annual basis.

Although AI is in its early stages of implementation, it is poised to revolutionize the way we produce, transmit, and consume energy. At the same time, AI is also limiting the industry's environmental impact at a time when demand is steadily growing, our energy production portfolio is diversifying, and we are witnessing the ramifications of fossil fuel consumption on biodiversity, air quality, and quality of life.

4. Breakthroughs in energy technology are happening all over the world. Do you know any breakthrough? Please name some of them.

a. Energy storage.

In less than five years, we will see a revolution in storage technology that will change the way the electricity business is done. If we can overcome the challenge of effectively storing variable renewable energy - such as solar and wind, which are not constant all day every day - and do so in a way that competes on cost with fossil fuel generation, we are talking a major game-changer. We are already seeing the development of longer-lasting liquid metals, which can make grid-scale batteries a reality (even comparable to the capability of pump storage). We’e also seeing many promising projects focused on converting surplus electricity (from wind, for example) to hydrogen, which can be stored and fed into natural gas grids for subsequent power or heat generation.

b. Smart grids.

Just as mobile phones have dramatically changed in capacity and performance over the years, today's power grids won't be able to support the energy goals of the future. The conventional power grid is now faced with various challenges: the integration of large amounts of variable renewable energy, improvements in the reliability of service, and

higher energy efficiency. The future calls for grids that are "smarter" and able to react faster. Upgrading and modernizing grids is a major challenge. New technologies are increasing grid reliability and improving performance measurement through data analysis - from smart sensors to hardware and software. The application of information and communications technologies (ICT) to smart grids is revolutionizing the way consumers react to information and markets, and will have a profound effect on how systems operate and resources are deployed. In this new environment, the value of variable renewable energy is maximized. Solar and wind are permanent parts of the energy mix.

c. Mini-grids

For developing countries seeking to connect the unconnected, we see a lot of innovation ahead in the area of mini-grids. Mini-grids, based on renewable or hybrid systems, will play a critical role in meeting the UN-led Sustainable Energy for All （SEforALL） goal of universal energy access by 2030. While mini- grids have been around for a while, especially in Asia, they are now proliferating all over the world and becoming an important factor in the expansion of energy services in areas of low access, like sub-Saharan Africa and parts of South Asia. As renewable energy costs - particularly for solar panels – continue to come down, independent power producers will find innovative ways to bring electricity services to customers who'd otherwise be waiting years for grid connections. National utilities will have to quickly adapt in this new environment or find themselves outplayed by independent operators.

5. Please discuss the significance of technological breakthroughs in energy storage.

Technological breakthroughs in energy storage will be a major game-changer in the electricity business. One of the biggest problems with producing electrical power is that we essentially have to use it or lose it. Renewable technologies like solar and wind depend on the environment itself to generate energy. When the wind dies down or there's heavy cloud coverage, less power can be generated; and when conditions are perfect, we often generate more than we can use. The same problem exists in more traditional forms of energy, whether it's nuclear power, hydroelectricity, or fossil fuels. Breakthroughs in energy storage can help solve this problem.

Technological breakthroughs in energy storage will promote the development of electric cars as well. The heart of an electric car is its battery. Unlike the batteries in most cars, which primarily serve to start the engine and run accessories like the radio or air conditioner, the battery in an electric car runs everything. Most importantly, it runs the electric motor, so it needs to be powerful and long-lasting enough. Until recently, no reliable, mass-producible batteries have been manufactured that could make electric cars competitive with gas-powered cars. However, that will change with breakthroughs in energy storage.

II. True （T） or False （F） according to the passage.

1 T 2 T 3 F 4 T 5 T 6 F 7 T 8 T 9 T 10 T

III. Please put the following expressions into their corresponding Chinese or English.

1. 子孙后代
2. 相互排斥的
3. 按年度基准
4. 呈指数级增长

5. 新兴技术
6. 客户群
7.特别工作组
8.传输线
9.高分辨率
10.能源网
11. power transformer
12. cascading effect
13. photovoltaic cell
14. fibre optics
15. carbon footprint
16. greenhouse gas
17. reduce emissions
18. monitor temperatures,
19. pool resources
20. cloud computing

Unit 6 Text A

I Critical Thinking.

1. What is the way to realize global sustainable development?

Reference answer:

Protecting the environment and countering climate change are the common responsibilities of all countries. Only when all countries unite and work together to promote green and sustainable development can we maintain the overall balance in the earth's ecology and protect humanity's one and only home. China has shouldered its responsibilities, actively participated in global environmental governance, and pledged to reach **carbon emissions peak by 2030** and **carbon neutrality by 2060**. It will advance the green transition with these goals as the lead, play a more active part in bilateral and multilateral international cooperation on green development, promote a fair and equitable system of global environmental governance, and contribute its wisdom and strength to global sustainable development.

2. Is the current progress sufficient to achieve the United Nation's Sustainable Development Goal 7 by 2030, which is about ensuring energy access?

Reference answer:

No.The United Nation's Sustainable Development Goal 7 is to "ensure access to affordable, reliable and modern energy for all by 2030," including universal access to electricity and clean cooking, a greater share of renewables in the energy mix, and a doubling of the rate of improvement of energy efficiency. Nevertheless, the current pace of progress is insufficient to achieve Goal 7 by 2030. Huge disparities in access to modern sustainable energy persist.

At the current pace, only 92 per cent of the world's population would have access to electricity in 2030, leaving 670 million people unserved. The proportion of people with access to clean cooking fuels and technologies increased from 57 per cent to 69 per cent between 2010 and 2020, 4 billion people still relying on inefficient and polluting cooking systems in 2020. In Sub-Saharan Africa and Asia, 20 countries have the largest gaps in electricity and clean cooking access. Without access to clean, modern energy, it is impossible to achieve Sustainable Development Goals (SDGs) to reduce poverty, broaden education and improve public health.

3. What is critical in sustainable rural development?

Reference answer:

Strategies for sustainable rural development should take into consideration the remoteness and potentials in rural areas as well as differentiated approaches and targets. Environmental protection, rural infrastructure, rural health and education are critical.

Green development is a new driver of rural revitalization in China. China is exploring new paths for sustainable rural development. China is actively developing new industries and new forms of business such as eco-agriculture, rural e-commerce, leisure agriculture, rural tourism, health, and elderly care, while advancing projects to protect and restore ecosystems. These efforts allow China to approach its goal of having strong agriculture and a beautiful and revitalized countryside. China is continuing to redevelop the whole rural living environment and steadily advancing the construction of modern

and livable homes with sanitary toilets in rural areas, strengthening the treatment and recycling of domestic waste and sewage. As a result, more and more rural areas have access to safe and clean water, paved roads, streetlights, and clean energy.

China has developed a circular agricultural economy by promoting circular agricultural production modes — integrating planting and breeding with processing, farming and animal husbandry with fishing, and production and processing with marketing.

4. What has China achieved in realizing the UN 2030 Agenda for Sustainable Development?

Reference answer:

China has **ended extreme poverty** and securing the right to an adequate standard of living, according to the white paper titled "Moderate Prosperity in All Respects: Another Milestone Achieved in China's Human Rights" released by the State Council Information Office of the People's Republic of China in 2021.

Poverty is the biggest obstacle to human rights. The CPC and the Chinese government have directed extra attention to rural poverty, furthering development-driven poverty alleviation, and achieving a series of important breakthroughs. The 18th CPC National Congress in 2012 made ending extreme poverty China's benchmark task in achieving moderate prosperity in all respects. By eliminating extreme poverty China has won the biggest and toughest battle against poverty in human history, to the benefit of the largest number of people.

By the end of 2020, by China's current poverty threshold of RMB2,300 per person per year (based on the 2010 price index), all of the 99 million rural poor, as well as the 832 counties and 128,000 villages classified as poor, had emerged from poverty, and regional poverty was eliminated.

Since the launch of reform and opening up in 1978, 770 million rural poor living below China's poverty line have been raised from poverty; against the World Bank's international poverty line, the number of people lifted out of poverty in China accounts for more than **70 percent of the world total** during the same period. China realized its poverty reduction goal from the UN 2030 Agenda for Sustainable Development **10 years ahead of schedule**, representing a significant contribution to global poverty reduction and human progress.

5. What is China's wisdom and contribution to global poverty reduction and human progress?

Reference answer:

China takes the "**Strategy of Targeted Poverty Alleviation**", according to the white paper titled "Poverty Alleviation: China's Experience and Contribution" released by the State Council Information Office of the People's Republic of China in 2021.

Identifying those truly in need is a universal problem in countries with a large population in poverty. Accurate identification of the poor and targeted measures is central to any effort to eradicate poverty. In its poverty elimination effort, China has actively learned from international experience, fully considered its actual conditions, and launched a series of guidelines and measures to increase efficiency, summarized as **accomplishing** "**Targeted Efforts in Six Areas**"[This refers to efforts to identify the poor accurately, arrange targeted programs, utilize capital efficiently, take household-based measures, dispatch first Party secretaries based on village conditions,

and achieve the set goals.], **taking** "**Five Measures for Poverty Eradication**" [The measures include: boosting the economy to provide more job opportunities, relocating poor people from inhospitable areas, compensating for economic losses associated with reducing ecological damage, improving education in impoverished areas, and providing subsistence allowances for those unable to shake off poverty through their own efforts alone.], and **addressing "Five Questions in Poverty Alleviation"** [This refers to these questions: who should help, who should be helped, how to help, how to evaluate whether someone has emerged from poverty, and how to ensure those people stay free from poverty.].

Removing the label of extreme poverty is not the end, but the beginning of a new life and a new journey. The CPC will always remain committed to its founding mission, striving for the **people's wellbeing** and **the rejuvenation of the Chinese nation**. It will always put the people before everything else, and continue to work for people's all-round development, and **common prosperity** and a better life for all.

There will be no national rejuvenation without a thriving countryside. Following the victory in the final battle against extreme poverty, China will continue to **consolidate the results of poverty elimination**, dovetail new measures with rural revitalization, and shift its focus in work related to agriculture, rural areas and rural people. In the new era, China will act on its new development philosophy and build on its new development paradigm. It will prioritize affairs related to agriculture, rural areas and rural people, and follow a socialist path with Chinese characteristics in revitalizing the countryside by introducing more vigorous measures and pooling more resources.

II Match Column A with Column B.

1 G 2 I 3 E 4 H 5 B 6 A 7 D 8 F 9 J 10 C

III True or False.

1 F 2 T 3 T 4 F 5 T 6 F 7 T 8 T 9 T 10 F

IV Complete the passage with the words or expressions from the text.

1 J 2 H 3 A 4 B 5 F 6 O 7 G 8 L 9 I 10 E 11 K 12 D 13 M 14 N 15 C.

V Translate the following sentences into English or Chinese.

1. 预计到 2030 年还会有十亿人用不上电，其中大部分人居住在撒哈拉沙漠以南的非洲地区，还有相当一部分人在亚洲的发展中国家和地区。

2. 缺乏现代基础设施和服务直接导致对气候变化潜在灾难性影响的抵御能力低下。

3. 在低收入国家，烹饪燃料的低效燃烧是一个重大的健康挑战，导致人们因室内空气污染引起的疾病而遭受痛苦和过早死亡。

4. 满足用水、能源和交通需求的基础设施是相互依存的，因此决策者在提供服务时需要采用系统思维。

5. 因此，鉴于发展中国家能源系统的双重性质，即传统和现代能源系统和使用并存，能源获取和能源安全问题始终存在。

6. Energy is a critical enabler of economic transformation and social wellbeing.

7. Education may be enhanced by increased access to information (through radio and ICT), and more hours with lighting for children to study.

8. For those living in poverty, lack of access to services from electrification undermines health outcomes.
9. The impact of energy on gender (in)equality has gained significant momentum in recent years in public and private spheres.
10. It is argued that access to a range of energy services suitable to women's enterprise would provide women with building blocks to operate their enterprise.

VI Please put the following terms into their corresponding English or Chinese.
1. 平等公正的能源获取
2. 一个重要的 / 关键的促进因素
3. 性别平等 / 性别不平等
4. 高碳电力系统；碳密集电力系统
5. 能源贫困与能源使用不平等
6. 低碳发电
7. 生物质燃料
8. 越来越清洁的能源需求
9. 技术创新
10. 一项乡村电气化政策
11. Information and Communication Technology (ICT)
12. Human Development Index (HDI)
13. net GHG (Greenhouse Gas) emission
14. Liquefied Petroleum Gas (LPG)
15. industrialized economies
16. renewable energy
17. energy efficiency
18. fuel stacking
19. sustainable development
20. energy security

VII Translate the following passage into English.

The energy system in developing countries is inherently complex. It comprises of demand-side issues ranging from heat for household cooking to heavy industrial heat and electricity; supply side issues from RE resources to liquid oil and gas resources; and distribution systems deployed to meet demand at different scales, involving centralized and decentralized systems. Hence, questions of energy access and energy security are ever present given the dual nature of the energy system in developing countries where the traditional and modern energy systems and practices co-exist. This duality is often dynamic with significant levels of inter-fuel substitution and fuel stacking to meet particular energy services.

Unit 6 Text B
I Critical Thinking.
1. What is the role of renewable energy?

Reference answer:

Renewable energy, as a kind of green and low-carbon energy, plays an important role in the adjustment of industrial structure and the transition of economy and society.

China has made remarkable progress in promoting the green and low-carbon energy, with proportion of clean energy sources increasing, according to the white paper, titled "China's Green Development in the New Era" and released by the State Council Information Office in 2023.

The proportion of clean energy sources in total energy consumption increased from 14.5 percent in 2012 to 25.5 percent by the end of 2021, and the proportion of coal decreased from 68.5 percent to 56 percent over the same period, as per the white paper.

By the end of 2021, the installed capacity of renewable energy was more than 1 billion kilowatts, accounting for 44.8 percent of China's overall installed capacity. The installed capacity of hydropower, wind power, and photovoltaic power each exceeded 300 million kilowatts, all ranking the highest in the world.

2. What do you think about the unconventional threat of cyberwarfare?

Reference answer:

Cyberwarfare typically refers to a set of actions by a nation or organization to attack computer network systems of the target country, involving either the destabilization or destruction of critical systems including infrastructures (such as financial infrastructure, public infrastructure like dams or electrical systems, and military resources) by computer viruses or denial-of-service attacks.

Since China was fully connected to the internet in 1994, it has committed itself to law-based cyberspace governance to build up its strength in cyberspace. Upholding cyber sovereignty, China has drawn from the experience of other countries in cyberspace governance, planning internet development in a global context and pioneering a distinctively Chinese model of internet governance in line with international best practice.

Cyberspace is a shared space for human activities; it must be developed and managed by all countries. China has formed its own approach to law-based cyberspace governance by advancing legislation, law enforcement, judiciary work, and programs to spread knowledge about cyber laws, and has shared its experience with the world. It has taken an active part in global internet governance, promoting the G20 Digital Economy Development and Cooperation Initiative and the Global Data Security Initiative, and other proposals and declarations. It raised the principle of cyber sovereignty, and advocates that the principle of sovereign equality established by the UN Charter be applied to cyberspace, thereby contributing ideas and solutions to cyberspace governance.

In 2021, China released the Regulations on the Security and Protection of Critical Information Infrastructure, with provisions defining what constitutes critical information infrastructure and the principles and goals of protection. China stands firm against the threat of cyberterrorism. The Counterterrorism Law promulgated in 2015 has separate provisions on the targets, measures and mechanisms for combating terrorism in cyberspace.

3. What can be done to improve energy efficiency?

Reference answer:

The efficiency of energy use can be improved with different approaches, such as technical innovation, management enhance and structural adjustment.

China is exercising better control over the amount and intensity of energy consumption, particularly the consumption of fossil fuels. It has vigorously promoted **technical, managerial, and structural** energy conservation, to constantly improve the efficiency of energy use. It has initiated campaigns for all industrial enterprises, especially the big consumers of energy, to save energy, reduce carbon emissions, and improve the efficiency of energy use. The "forerunners" have been encouraged to play an exemplary role for other enterprises. China has organized the transformation of energy-intensive industries such as steel, power generation, and chemicals, to help them save energy and reduce carbon emissions. It has also strengthened the **energy-saving management** of key energy consumers, to enable large and medium-sized enterprises in key industries to reach advanced international levels in energy efficiency.

Since 2012, China's average annual economic growth of 6.6 percent has been supported by an average annual growth of 3 percent in energy consumption, and the energy consumption per RMB10,000 of GDP in 2021 was 26.4 percent lower than in 2012.

4. What are the elements involved in energy security?

Reference answer:

There are seven elements involved in energy security:

(1) development of flexible, transparent, and competitive energy markets, including gas markets;

(2) diversification of energy fuels, sources and routes, and encouragement of indigenous sources of energy supply;

(3) reducing greenhouse gas (GHG) emissions, and accelerating the transition to a low carbon economy, as a key contribution to enduring energy security;

(4) enhancing energy efficiency in demand and supply, and demand response management;

(5) promoting deployment of clean and sustainable energy technologies and continued investment in research and innovation;

(6) improving energy systems resilience by promoting infrastructure modernization and supply and demand policies that help withstand systemic shocks and cyberattacks;

(7) putting in place emergency response systems, including reserves and fuel substitution for importing countries, in case of major energy disruptions.

II Match Column A with Column B.

1B 2 G 3 D 4 I 5 F 6 H 7 J 8 C 9 A 10 E

III True or False.

1 T 2 F 3 T 4 T 5 F 6 T 7 T 8 F 9 T 10 T

IV Complete the passage with the words or expressions from the text.

1 A 2 E 3 L 4 J 5 M 6 K 7 B 8 H 9 G 10 C 11 N 12 I 13 D 14 F 15 O

V Translate the following sentences into English or Chinese.

1. 无论几十年内页岩油和页岩气都将继续供应世界，世界已经进入了一个长期的石油峰值时代。

2. 应对气候变化的必要性被认为是紧迫的: 2018 年碳排放量增长了 2%，这是 7 年来增长最快的一年。
3. 可再生能源，至少有 40 年的历史，在概念上作为集中式能源的替代能源，已经越来越流行。
4. 能源安全是一个有争议且复杂的术语，它包含了供应安全性、基础设施可靠性、经济成熟力和环保性等概念。
5. 对消费国和中转国来说，供应安全很重要；对于生产国/出口国来说，需求安全可能与供应安全同等重要。
6. Most European countries have adopted policies toward a new energy transition with significant social, political, and economic implications.
7. China has been producing more electricity from renewable energy than both Russia and the United States, and it has increased its corresponding share of renewables since 2011.
8. The proposed index of energy security comprises the following dimensions: physical availability, technology development, economic affordability, social accessibility, governance, unconventional threats, and natural environment.
9. Denmark is arguably one of the most environmentally friendly energy producers in Europe, reaching a 71% share of renewable energy in electricity production in 2017.
10. As renewable energy sources are incorporated in the energy mix during the rest of the twenty-first century, the impact of geopolitical conflict on energy security will lessen.

VI Please put the following terms into their corresponding English or Chinese.

1.大规模脱碳　　2. 集中式能源
3.资源诅咒　　4.地缘政治冲突
5.产消合一系统(主要是可再生能源)　　6.地理位置
7.自然资源财富/禀赋　　8.能源安全的历史基石
9.黑天鹅型自然灾害(极端罕见且具有重大影响的自然灾害)
10.替代能源(指非传统的、可再生能源)
11. carbon emission　　12. low-carbon economy
13. peak oil　　14. shale oil and gas
15. transit countries/ transit states　　16. energy intensity
17. Strategic Petroleum Reserves (SPR)　　18. energy diversification
19. environmentally friendly　　20. geopolitical landscape

Unit 6 Text C

I Critical Thinking.

1. What strategy can be adopted to ensure energy security?

Reference answer:

Scientific and technological innovation can be a good development strategy to optimize the configuration of industry, maintain a reasonable pace of economic growth and ensure social stability and energy security.

China has intensified investment in scientific and technological innovation. The nation's gross domestic research and development (R&D) spending grew from RMB1.03 trillion in 2012 to more than RMB2.8 trillion in 2021. Its R&D spending intensity, or the expenditure on R&D as a percentage of its GDP, rose from 1.91 percent in 2012 to 2.44

percent in 2021, approaching the **average level** of the Organization for Economic Cooperation and Development (OECD) countries. Chinese enterprises' investment in R&D has continued to increase, accounting for more than 76 percent of the country's total R&D investment. By the end of 2021, China's energy conservation and environmental protection industry owned 49,000 valid invention patents, and the new energy industry held 60,000, 1.6 and 1.7 times more than in 2017. From 2011 to 2020, the number of patent applications filed by China for environment-related technology inventions was close to **60 percent** of the world total, making it **the most active country** in environmental technology innovation.

The **new energy security strategy** featuring Four Reforms and One Cooperation was put forward by Xi Jinping at the conference of the Leading Group for Financial and Economic Affairs under the CPC Central Committee held on June 13, 2014. Four Reforms and One Cooperation refer to: one reform to improve the energy consumption structure by containing unnecessary consumption; one reform to build a more diversified energy supply structure; one reform to improve energy technologies to upgrade the industry; one reform to optimize the energy system for faster growth of the energy sector; comprehensive cooperation with other countries to realize energy security in an open environment.

2. What measures can be taken to improve energy security in rural and poor areas?

Reference answer:

China supports energy development in rural and poor area while building a clean and diversified energy supply system. China improves energy security in rural and poor areas by taking such measures as (1) improving rural energy infrastructure, (2) carrying out targeted poverty alleviation through energy projects, (3) using clean energy for heating in rural areas in north China.

Improving rural energy infrastructure. Making electricity accessible to all is a basic condition for building a moderately prosperous society in all respects. China implemented a three-year action plan to **ensure power access for people without electricity**, and had achieved this goal **by the end of 2015**.

Carrying out targeted poverty alleviation through energy projects. Energy is a driving force for economic development, and also an important impetus for poverty alleviation. China makes sound plans for the exploitation of energy resources in poor areas, introducing major energy projects in these areas to improve their capability to sustain themselves, thus adding new momentum to the local economy.

Using clean energy for heating in rural areas in north China. Winter heating is of great importance in northern China. To ensure that the residents stay warm in winter while reducing air pollution, China has launched clean heating programs in rural areas in accordance with local conditions.

The following achievements have been made in rural energy development and poverty alleviation.

(1) a new round of upgrading of rural power grids. In 2017, China completed the renovation and upgrading of rural power grids in small towns and central villages, electrified motor-pumped wells, and supplied poor villages with electricity for industrial and commercial use, benefiting 78,000 villages and 160 million rural residents. The country electrified 1.6 million motor-pumped wells, benefiting more than 10,000 townships and 10 million hectares of farmland. It also provided electricity to 33,000

villages. In 2019, China completed a new round of rural grid transformation and upgrading, achieving a supply reliability rate of 99.8 percent and an integrated voltage qualification rate of 97.9 percent. Stable and reliable power supply services have been provided to all rural areas in China.

(2) universal access to electric power. From 2013 to 2015, the state allocated RMB 24.78 billion to extend power grids to areas without electricity, benefiting some 1.55 million people. It carried out an independent solar PV power supply project, providing electricity to 1.19 million people. By the end of 2015, China had achieved full electricity coverage for its entire population.

(3) poverty alleviation through solar PV power generation. Poverty alleviation through solar PV power generation is one of the top 10 targeted poverty alleviation projects in China. Since 2014, the state has formulated relevant plans, introduced fiscal, financial and pricing policies, strengthened power grid building and operation services, and promoted various solar PV poverty alleviation projects funded by the government and implemented by enterprises. China has built a total of 26.36 million kW or solar PV power stations for this purpose, benefiting nearly 60,000 poor villages and 4.15 million poor households. The facilities now earn about RMB 18 billion from power generation and provide 1.25 million public welfare jobs every year.

3. How can global energy security be protected?

Reference answer:

Joint efforts by the international community can protect global energy security. Humanity has entered an era of connectivity when maintaining energy security and addressing global climate change have become major challenges confronting the whole world.

China bases international cooperation on the principle of mutual benefit and win-win results while embracing the concept of green development. It is endeavoring to ensure **energy security** in an open environment, open its energy sector wider to the world, promote high-quality Belt and Road cooperation, actively engage in global energy governance (as an active participant in international energy cooperation under multilateral mechanisms such as the UN, G20, APEC and BRICS, and a facilitator in regional energy cooperation through cooperation platforms built with ASEAN, the League of Arab States, African Union, and Central and Eastern Europe, and organized forums on clean energy at the East Asia Summit), guide global cooperation in climate change, and build a global community of shared future.

China's proposals for developing synergy on sustainable global energy development include (1) jointly promoting the transition to green and low-carbon energy to build a cleaner and more beautiful world, (2) jointly consolidating multilateral energy cooperation to accelerate the green economic recovery and growth, (3) jointly facilitating international investment in energy trading to protect global market stability, and (4) Jointly improving energy access in underdeveloped areas to address energy poverty.

The world today is experiencing a scale of change unseen in a century. The eco-environment has a direct bearing on human existence and its sustained development. Countries of the world need to work in solidarity to cope with the challenge. China will embrace the vision of a global community of shared future, work together with all countries to expand cooperation on global energy governance, promote the sustainable development of global energy, and protect global energy security.

II True or False.

1 T 2 F 3 T 4 T 5 F 6 T 7 T 8 T 9 F 10 T

III Please put the following terms into their corresponding English or Chinese.

1. 具有法律约束力的碳减排目标
2. 陆上和海上规划
3. 能源系统弹性
4. 对进口化石燃料的依赖
5. 能源政策优先事项
6. 短期能源安全模型
7. 化石燃料储量下降
8. 基础设施中的技术故障
9. 国家能源安全评估
10. 国际能源安全指数
11. International Energy Agency (IEA)
12. power failure(s)
13. cross-cutting risks
14. decarbonize the energy system
15. low carbon technologies
16. robust regulation
17. weighted metrics
18. quantitative indicators
19. developed and emerging economies
20. liquid fuels

Unit 7 Text A

I Critical Thinking.

1. What emerging technologies can be used in forming an Energy Internet?

Reference answer:

The internet, big data, Artificial Intelligence, 5G (the 5th Generation of mobile network) and other emerging technologies can be used in forming an Energy Internet.

Emerging technologies have become the main props of China's economic development. Thanks to accelerated efforts to implement emerging technologies such as artificial intelligence (AI), big data, blockchain, and quantum communication, new products and business forms including intelligent terminals, telemedicine, and online education have been cultivated, and their role in boosting growth has continued to increase. China's digital economy ranks second in the world. During the 13th Five-year Plan period (2016-2020), **the average annual growth rate** of the added value of information transmission, software and information technology services reached **21 percent**. The internet, big data, AI, 5G and other emerging technologies are deeply integrated with traditional industries, facilitating the integration of advanced manufacturing with modern services. The value-added output of high-tech and equipment manufacturing in 2021 accounted for 15.1 and 32.4 percent of that of industries above designated size, up 5.7 and 4.2 percentage points from 2012 respectively. China is on the way to realize the transformation and upgrading from "made in China" to "intelligent manufacturing in China".

2. What measures are desirable in promoting sustainable urban development?

Reference answer:

Sustainable urban development aims to achieve a balance between the development of and equity in the urban areas and the protection of the urban environment; it is an important issue in global policy making to help humanity respond to the most pressing social and environmental challenges.

Measures such as urban eco-environmental conservation and urban infrastructure improvement can be adopted.

China has placed great emphasis on urban eco-environmental conservation and has adopted a people-centered approach to urbanization, building beautiful cities featuring harmony between humanity and nature. Efforts have been made to expand urban eco-environmental space through construction of national garden cities and forest cities, as well as parks and greenways in cities. With increased greenery coverage, the urban eco-environment has been effectively restored. From 2012 to 2021, green coverage of built-up urban areas increased from 39 percent to 42 percent, and the per capita area of park greenery has increased from 11.8 square meters to 14.78 square meters. Also, great efforts have been made to construct green and low-carbon buildings, and renovation of existing ones has been promoted, contributing to increasingly higher energy efficiency.

The mechanism of coordinated prevention and control across regions and approaches in dealing with heavy air pollution have achieved remarkable results. The average PM2.5 density of China's cities at prefecture level and above dropped from 46 micrograms per cubic meter in 2015 to 30 micrograms per cubic meter in 2021. On 87.5 percent of the days in 2021, people enjoyed good air quality. China is making the fastest progress in air quality improvement.

China attaches great importance to the construction of environmental infrastructure and strives to address areas of weaknesses, optimize layouts, and improve quality. It has improved facilities for sewage collection, treatment, and recycling, and boosted the classification and treatment capacity of domestic waste.

An environmental infrastructure network extending from cities to towns and villages has taken shape. By the end of 2021, the sewage treatment capacity of cities and counties has reached 247 million cubic meters per day, the incineration treatment capacity of urban domestic waste exceeded 770,000 tonnes per day, and the harmless treatment rate of urban domestic waste was close to 100 percent.

3. What is the global trend of urban development?

Reference answer:

Globally, some 56% of the world's population — 4.4 billion inhabitants live in urban areas today and more than 80% of global GDP is generated in cities. This trend is expected to continue. Nearly 7 of 10 people will live in cities by 2050. Cities represent two-thirds of global energy consumption and account for more than 70% of greenhouse gas emissions.

Urbanization contributes to sustainable growth through increased productivity and innovation, but the speed and scale of urbanization brings challenges such as meeting accelerated demand for affordable housing, viable infrastructure including transport systems, basic services, and job, particularly for the nearly 1 billion urban poor who live in informal settlements to be near opportunities. (Rising conflicts contribute to pressure on cities as more than 50% of forcibly displaced people live in urban areas.) The expansion of urban land consumption outpaces population growth by as much as 50%, which puts pressure on land and natural resources.

Cities play an increasingly important role in tackling climate change, which requires national and local governments to play their role to achieve sustainable urban development.

II Match Column A with Column B.

1H 2 D 3 B 4 I 5 G 6 E 7 J 8 A 9 C 10 F

III True or False.
1 T 2 T 3 F 4 T 5 T　6 T 7 F 8 T 9 T 10 T

IV Complete the passage with the words or expressions from the text.
1 M 2 K 3 C 4 F 5 D　6 E 7 I 8 O 9 H 10 J　11 L 12 G 13 N 14 A 15 B

V Translate the following sentences into English or Chinese.
1. 如果风能、太阳能、储能和其他能源以协调的方式使用，就可以充分利用不同能源系统的优势和潜力，实现最大的能源捕获和利用效率。
2. 能源互联网具有分布式能源时空互补以及电网广域配置的优势。
3. 结合新能源技术和互联网技术，将大量分布式发电设备和分布式储能设备连接在一起，实现能源和信息双向交换的共享网络。
4. 能源路由器不仅使工业、商业和住宅建筑能够连接在一起，而且使它们兼具电力提供者和电力消费者的功能，同时能源存储设备也集中式或分布式地连接到能源网络。
5. 尽管如此，火力发电厂仍然由化石燃料提供动力，并产生污染；如果发电厂采用可再生能源而不是化石燃料，该系统将进一步促进城市的可持续发展。
6. With the widespread application of Internet technology, the idea of integrating energy systems to form an Energy Internet has come out.
7. Compared with the use of traditional energy systems, the application of Energy Internet in industrial development is more suitable for the sustainable development.
8. The volatility of renewable energy sources affects the smooth operation of energy systems and limits the efficient use of renewable energy.
9. With an energy internet, the close coupling, coordination and sharing of energy and information, high energy security and efficiency can be achieved.
10. In the energy internet, the information flow controls energy flow to ensure safety and reliability of the overall system.

VI Please put the following terms into their corresponding English or Chinese.

1. 电力电子技术	2. 能量路由器
3. 大容量储能装置/设备	4. 分布式可再生能源
5. 双向能(量)流	6. 能源枢纽
7. 输电通道	8. 高渗透开发
9. 热电厂; 火电厂	10. 隔热
11. Energy Internet	12. Smart Grid
13. sustainable urban development	14. local area network (LAN)
15. energy management system	16. World Health Organization (WHO)
17. big data processing	18. cloud computing
19. photovoltaic power generation	20. circular economy

VII Translate the following passage into English.

Through the replacement of the fossil fuel power plant with the renewable power generation, the input of the Energy Internet has zero pollutants, removing the emission of sulphur dioxide, nitrogen oxides and soot. The use of clean energy in the Energy Internet

system not only ends dependence on fossil energy and reduces emission of pollutants and their derivatives, but also improves quality of life and actuates sustainable development.

Energy Internet will change the way how energy is produced, transported and consumed and have profound impact on people's life. Energy Internet can promote energy transformation, increase energy efficiency, and help to realize circular economy and sustainable urban development.

Unit 7 Text B

I Critical Thinking.

1. What challenges can current Smart Grids pose?

Reference answer:

The ten main problems of current SG systems can be the following:

1) Cyber-attacks.
2) Low power and lossy networks.
3) Coupling two networks to simulate a real network.
4) System malfunctions and environmental effects when collecting large-scale and fine-grained
SG data.
5) Scale, storage and processing enormous amount of data to be aggregated and analyzed.
6) The dynamics of home area network SG communication system.
7) The harsh wireless environment in SG.
8) Serious security flaws in SG.
9) The increment of energy demand in large-modernized cities.
10) Cyber-attacks causing disrupted or imbalanced energy between the energy providers and consumers.

Hence, the following five **disadvantages** can be highlighted: (i) High requirements of communication networks to convey, sense and control data; security for primary users, fulfilling the QoS requirements of communications in SG, (ii) It is not designed as to the pricing rule for the energy storage sharing service in the SG, (iii) There are not low-cost controllers suitable for the smart meter, future energy utilization patterns, demand projection, and energy conservation solutions from the stored data in the cloud, (iv) It is necessary a more complex and interdependent empirical model of sensor networks to simulate actual network systems, and (v) other classes of appliances and other robust classifiers like Random Forest, Support Vector Machine, and Rotation Forest must be considered when collecting and extracting data.

2. What opportunities can Smart Grids provide?

Reference answer:

The top ten opportunities that Smart Grids provide can be listed:

1) Efficiency in energy consumption.
2) Green communications in SG.
3) Coupling a cyber physical and a social network.
4) Outlier mining allows to find abnormal patterns from real records in power generation, transmission, distribution, transformation, and consumption.
5) Allowing data mining in digital image and video processing applications.
6) Power electronics as a tool for solving the climate change problems faced by our society.

7) To improve the management of the transmission of data through a smart meter between communicating devices.
8) Exploiting the broadcast nature of the wireless medium in SG.
9) Security protocols to detect security weaknesses in SG.
10) Emergence of microgrids with sensing technologies and Fog-Cloud computing infrastructures to build smart electrical grids.

Therefore, five main **advantages** of Smart Grids are (i) Models to locate malicious node in SG nodes, provide the usage scenarios of outlier denial and outlier mining in SG environment, (ii) Performing numerous SG big data analytics, power electronics as a relevant item in SG and in renewable energy systems, (iii) To model the effect of traffic intensity and the quantity of active devices in home area networks, (iv) To improve the reliability of Cognitive Radio Sensor Networks, and (v) Improving and speeding up the vulnerability of the security in SG.

3. What is the difference between Smart Grid and conventional Power Grid?

Reference answer:

The difference between Smart Grid and conventional Power Grid lies in their different design ideas. In the context of conventional Power Grid, "supply follows demand"; with the Smart Grid, "demand follows supply" and the real-time electricity price is not fixed and often cheaper and rewarding. Renewable energy from Wind and Solar is being pumped into the conventional Power Grid while wind speed and sunshine is intermittent or out of control; the only possibility is to forecast electricity generation from renewable sources and manipulate other generation and demand accordingly.

The complex system of power dispatching is made even more complex by the addition of "scattered-site power," the electric industry term for rooftop solar panels, small wind generators, and other small power inputs linked into the grid. In order to handle all this, the so-called "smart grid" is being developed that uses complex computer algorithms and artificial intelligence to efficiently control the flow of power across the nation. However, because of unavoidable transmission losses over distance, electricity still needs to be generated relatively close to the point of use in most areas of the United States and the world.

II Match Column A with Column B.

1G 2 F 3 I 4 B 5 H　　6 C 7 E 8 J 9 A 10 D

III True or False.

1 T 2 F 3 T 4 F 5 T　　6 T 7 T 8 F 9 T 10 T

IV Complete the passage with the words or expressions from the text.

1 O 2 I 3 L 4 F 5 H　6 C 7 K 8 M 9 D 10 E　11 A 12 G 13 J 14 B 15 N

V Translate the following sentences into English or Chinese.

1. 此外，用电动汽车交通、插电式混合动力电动汽车（PHEV）和插电式电动汽车（PEV）改变传统的燃料为主的交通车辆，并将电池储能系统（BESS）或储能系统集成到当前网络中，是解决温室气体（GHG）排放呈指数增长的另一个可能的解决方案。

2. 然而，可再生能源的间歇性会显著改变系统的电压分布，干扰传统的有载分接开关控制系统，也会对电网的性能产生负面影响。
3. 智能电网（SG）的能源管理确保了供需之间的稳定，同时遵从所有系统约束，以实现电气系统的经济、可靠和安全运行。
4. 能源管理系统(EMS)的目标是在消费者之间优化分配不同的能源，同时以不影响网络可靠、安全和安全运行的方式引入可持续能源供应。
5. 可以提出一种基于物联网的系统架构，为连接设备实现特定的通信技术，该架构可以应用于智能电网(SG)领域的不同类型的模拟器：通信网络模拟器、电力系统模拟器、电力和通信组合模拟器。
6. Since CO2 emissions are the main cause of global warming, the best way to tackle it is to focus on the sectors that have contributed most to these emissions, namely transport and power generation.
7. Renewable energies are distinguished by their variable and intermittent production.
8. In addition, with the development of renewable sources there has been a shift from a traditionally passive to an active distribution system.
9. Rotating power outages can cause a damaging domino effect that negatively impacts banking, communications, manufacturing, traffic and security.
10. The global transition to the smart grid is justified by the need to meet the ever-increasing consumption of electricity and to ensure the sustainable and secure supply of electricity to the power system.

VI Please put the following terms into their corresponding English or Chinese.

1.插电式电动汽车　　2. 智能计量技术
3. 有效地优化和调度负载需求　　4. 常规有载分接开关控制系统
5. 分布式发电源　　6. 拓扑参数和操作参数
7. 电池储能系统　　8. 经济高效的实时硬件实现
9. 准确快速的不确定性建模　　10. 启发式演算法
11. International Electrotechnical Commission
12. Plug-in Hybrid Electric Vehicles (PHEVs)
13. power outage(s)　　14. digital sensor(s)
15. voltage profile　　16. power dispatching
17. intelligent algorithms　　18. the cost-effectiveness of SGs (Smart Grids)
19. load control　　20. line losses

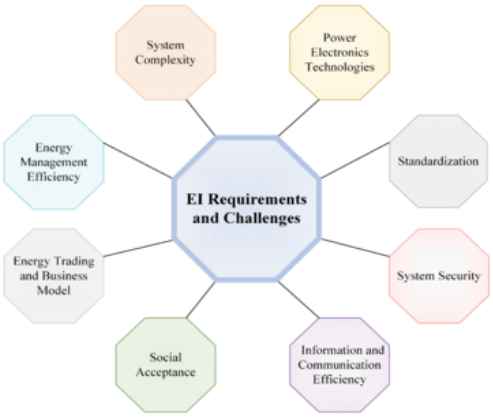
Unit 7 Text C

I Critical Thinking.

1. What are the challenges that should be addressed in future researches of Energy Internet (EI)?

Reference answer:

The Energy Internet combines many promising features and versatile technologies and requires coordination and cooperation between numerous networks of energy, information and communication. This raises such challenges as system complexity, system security, efficiency, standardization issues, social acceptance, and energy trading and business models.



(1) **System complexity**: An EI structure is built on multiple systems, which makes design, control, and optimization of the entire multi-level system comprising communication, information, and energy infrastructure very complex.

(2) **Latency**: To enable plug and play services and fully utilize the energy at all times, latency requirements have to be very strict. For example, in an electric substation, the communication latency for protection information is 8–12ms, and for controlling and monitoring purposes is 16ms.

(3) **Power electronics technologies**: With the unprecedented integration of energy resources into the existing power system, EI components must provide robust conversion of energy resources as well as desired frequencies and voltages.

(4) **Efficiency**: A core objective of the EI is to achieve improved efficiency compared to traditional power grids and smart grid. However, this is not easy because the aim of EI is to incorporate massive utilization of RERs ((Renewable Energy Resources).). Indeed, it is important to manage, control, and optimize all RERs efficiently.

(5) **System security**: In the EI, the multiway flow of information and communication is monitored and controlled by widespread and heterogeneous devices including the ER (Emergency Response), smart meters, etc. These ubiquitous devices bring many security concerns for the ICN (Information Center Network) and energy network.

(6) **Standardization**: To promote and implement the EI in a comprehensive manner, a set of well-defined standards should be established with global-level collaborations among governments, regulatory authorities, and industries.

(7) **Energy trading and business models**: To support and strengthen the EI applications, new policies for energy trading and innovative business frameworks are an urgent and critical requirement.

(8) **Social acceptance**: The EI can only be realized by involving energy users fully and by making the best possible use of advanced technologies. Social awareness should be promoted extensively through the following steps: (i) improving or changing users' perceptions of modern technologies; (ii) promoting or publicizing the EI concept; and (iii) involving users in decision making.

https://ieeexplore.ieee.org/abstract/document/9216056

2. What's the difference between Energy Internet and Smart Grid?

Reference answer:

Motivated by the success of internet technologies, the energy internet (EI), also known as a web-based smart grid (SG) or SG 2.0, has become the most recognized visionary concept for future energy systems.

The origin of the EI can be traced back to 2007, when many initiatives were launched worldwide. These initiatives investigated how to integrate maturing information and communication technologies (ICTs) into the development of electrical power systems. A future renewable electric energy delivery and management (FREEDM) system built on automated and flexible electric power distribution resembled the seed of the EI in the USA. Researchers from the UK proposed an overarching structure of a virtual power plant (VPP) that integrates some distributed energy resources (DERs) into one operation portfolio. Because the key enabling technology of this VPP is plug-and-play, which is also the primary accelerator of the Internet of Things (IoT), the VPP is often taken as a preliminary application of the EI.

In Germany, the E-Energy flagship project supported by the German Federal Ministry of Economics and Technology for the first time presented a systematic solution for achieving the 2020 energy plan of Germany, i.e. the EI. The solution aimed to integrate advanced ICT into efficient management of the power system with growing penetration of DERs and intermittent renewables.

Similarly, the iPower platform operated between 2010 and 2015 exhibited the Danish perspective of the EI. Through iPower, universities and industrial partners in Denmark showed the feasibility of using market-based and service-oriented solutions to manage a large number of flexible consumption units.

The two defining technologies of the twenty-first century—the Internet and renewable energy—are merging to create a powerful "third industrial revolution". As a result, hundreds of millions of people will produce green energy anywhere and will share it with anyone through an EI, just like how information is created and exchanged online.

The EI is a promising set of solutions that will enable a paradigm shift in energy towards an energy ecosystem with advanced connectivity, intelligent management and seamless integration of billions of smart devices, machines, and systems from multiple energy sectors. Tremendous effort has been given to developing EI demonstrations and pilot applications that are massively implemented in Europe to prove feasibility, demonstrate values, and create various kinds of learning effects.

3. What may be the future evolution of the Energy Internet?

Reference answer:

In view of the similarity shared by the Energy Internet and the information Internet, it can be envisaged that the development of the Energy Internet will experience a similar route to the development of the information Internet.

In the early stage, the construction of network infrastructure should be carried out. In this period, breakthroughs will be made in energy exchange technology and energy storage technology, and a scalable and flexible distributed energy sharing network will be established.

Then, with the expansion of commercial applications, a rich network application development will be started, and energy network applications such as information publishing; information search; business transactions; and point-to-point real-time energy exchange, B2B and B2C energy source trading platforms will appear.

In the end, the Energy Internet will be widely popularized, and an Energy Internet economic model that is completely different from the traditional economy will be created; like the information Internet, the Energy Internet will change human life and work.

4. Is the fossil fuel revolution (or shale boom) important to the energy economy of the United States?

Reference answer:

Yes. According to the US Energy Information Agency (EIA), by 2009, shale gas had led the United States from natural gas shortages to becoming the largest producer of natural gas in the world. Shale resources began significant development in the early years of the 21st century, and unconventional hydrocarbons have increased natural gas and petroleum production in the United States by nearly 60% since 2008. The United States surpassed Russia in 2009 as the top producer of natural gas in the world and exceeded Saudi Arabia as the top oil producer in 2013. Shale has taken the United States from a dependence on energy imports to becoming the largest fossil energy producer in the world, which is a complete paradigm shift and why the shale boom is called a fossil fuel revolution. US shale gas and shale oil are indigenous resources, and are projected to increase in production over the next 50 years. It is virtually impossible to overstate the importance of the successful development of shale gas and tight oil to the energy economy of the United States.

5. How many periods can the development of China's engagement in global energy governance be divided into?

Reference answer:

Four periods. Global energy governance first appears in the 12th Five-Year Energy Plan (2010-2015). China's five-year plans are a series of strategic development initiatives that provide guidelines for development over five-year periods. The development of China's engagement in global energy governance can be observed from the milestone events in the following table.

Period	Level of engagement	Milestone events
Pre-1980s	No engagement	Began exporting oil, without communication with international energy entities.
1980s	Start of engagement	Acquired membership in the WEC in 1983. Joined IAEA in 1984.

1990s	More active engagement	Together with Hong Kong, China and Chinese Taipei, joined the APEC Energy Working Group in 1991. Signed UNFCCC treaty in 1992. Established co-operation relationships with IEA in 1996.
Since 2000	More influential engagement	Became a founding member of JODI in 2001. Established co-operation relationship with Energy Charter in 2001. Became a founding member of IEF in 2002. Established co-operation relationship with OPEC in 2005. Became a founding member of SCO Energy Club in 2007. Became a founding member of IFNEC in 2010. Involved in in-depth energy discussions under the G20 process since the early 2010s. Joined IRENA in 2014.

Notes:
WEC (World Energy Council)
IAEA (International Atomic Energy Agency)
APEC (Asia-Pacific Economic Co-operation)
UNFCCC (United Nations Framework Convention on Climate Change)
IEA (International Energy Agency)
JODI (Joint Organization Data Initiative)
IEF (International Energy Forum)
OPEC (Organization for the Petroleum Exporting Countries)
SCO (Shanghai Cooperation Organization)
IFNEC (International Framework for Nuclear Energy Cooperation)
IRENA (International Renewable Energy Agency)
G20 (Group of Twenty) (The premier forum for international economic cooperation, founded in 1999, comprises 19 countries [Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom and United States] and European Union)

II True or False.
1 T 2 T 3 F 4 F 5 T 6 T 7 F 8 T 9 T 10 T

III Please put the following terms into their corresponding English or Chinese.
1.最佳折衷有效解 2.微型燃气轮机与燃料电池
3.地源热泵与钻孔储热 4.高活性阳极材料
5.乙醇氧化钯基电催化剂的两种特殊结构 6.钯/碳;钯碳催化剂
7.非支配排序遗传算法 II（NSGA-II） 8.可持续且价格合理的能源系统
9.传输容量/ 输电能力 10.(电气和电子工程师协会)39 节点电力系统
11. the distributed power generation system 12. ethanol oxidation
13. solid solution alloy 14. near surface alloy
15. the renewable energy conversion efficiency 16. the fuzzy set theory
17. wind curtailment 18. multi energy synergy
19. a CCHP (Combined Cooling Heating and Power) system

20. the direct ethanol fuel cells (DEFCs)

Unit 8 Text A

I Critical Thinking.

1. From China's perspective, what is the shift to building new electric power generating capacity based on renewable sources founded on?

Strategic calculations that go well beyond the price of oil.

2. Why is it predicted that China's commitment to renewables will remain whether the world prices of oil and coal continue to fall or rise?

China's commitment to renewables will remain – because the commitment to renewables is based on strategic calculations of cleaning the air and enhancing energy security, which have little or nothing to do with fossil fuel prices.And asChina maintains its demand for renewables, the world market for renewables is likely to hold.

3. Is China facing the challenge of power shortage? How to solve this problem?

China is facing the challenge of power shortage in many regions. With the rapidly developing industry and the ever-increasing population, demand for electricity supply is soaring. Besides, due to global warming, summers in recent years are much hotter than before, so most working places and households are air-conditioned, which consumes additional electricity.

As China becomes one of the largest consumers of energy in the world, being able to achieve an efficient and sustainable energy system will be critical. On the one hand, we need to conserve and save our energy. For example we can use less electricity for lighting, take shorter showers, and unplug computers, printers, TVs, and cellphone chargers when we aren't using them. By these means, we hope the drain on energy resources could be slowed down.

Another way to solve the problem of power shortage is to develop new energy resources such as nuclear, water, solar and wind power. These sources of renewable energy contribute to electric power generation, which may replace the conventional energy and thus help solve the problem of power shortage in China.

4. What is solar energy? What are the prospects for solar energy in China?

Solar energy.

Sunlight energy can be converted into electricity by indirectly using concentrated solar power (CSP), directly using solar photovoltaics (PV), or a combination. The former applies tracking systems with mirrors or lenses to focus a large area of light to a small beam, while the latter depends on the photovoltaic effect to generate an electric current.

Prospect for solar energy in China

Regarding its advantages on avaiRegarding its advantages on availability, accessibility, efficiency, cost and capacity over other types of renewable energy resources, solar energy is one of the best options to satisfy the future energy demand in China. With the official support, technological innovation and domestic market expansion, price of electric power generated by the solar energy systems is expected to decrease rapidly in the foresee future, stimulating the development of solar energy industry in China. To achieve this goal, financial and policy support from both the central and local government is essential. Academic researches aimed at improving the industry

application of solar energy should be encouraged to fill the gap between knowledge-oriented programs and practical operations. Both the technical breakthrough and massive investment are necessary for the transmission of electricity generated by the solar energy plants located at the western and northern regions with rich solar radiation resources but no access to the existing power grid.

In terms of current applications, solar water heater has been widely used in enormous residential houses around the whole nation, making China a leader in the production and utilization of solar water heater worldwide. Millions of farms located in the rural areas have introduced solar greenhouses to fertilize the agricultural production. Solar PV panels are integrated with the lighting systems to provide road lighting in cities and solar water pumps are used to generate electricity in remote villages. With the abundant solar energy resources available and the increasing purchasing power of citizens, solar energy products based on advanced technology is expected to have a considerable potential in future China.

5. Talk about the importance of energy and energy efficiency.

Energy is essential to heating homes and cooking meals. It is needed to deliver proper health care in hospitals and to teach children. It is essential for economic growth and development and for powering industries, farms and businesses. It plays a significant role in making a better life for people.

Energy efficiency can offer huge potential to getmore benefit out of less energy and make energy more affordable for the poor, and it can reduce emissions which is quite essential as the world steps up to the challenges of climate change.

II Match Column A with Column B.

1-5:f g c h i6-10:a b d e j

III True （T） or False （F） according to the passage.

1 T 2 T 3 T 4 F 5 T　　6 T 7 T 8 F 9 T 10 **T**

IV Complete the passage with the words or expressions from the text.

1 C 2 H 3 A 4 F 5 B　6 G 7 O 8 L 9 I 10 E　11 K 12 D 13 M 14 N 15 J.

V Translate the following sentences into Chinese or English.

1. 石油价格暴跌
2. 油价的下跌促使人们预测可再生能源的投资将减少。
3. 这些价格的上涨引发了人们对石油替代品的寻找。
4. 油价价格开始下跌，并继续下跌.
5. 随着油价下跌，石油作为能源的利用率上升，人们对可再生能源的依赖性下降。
6. The shift to renewables is predicated on costs
7. In fact China's electric power generating system has been based on coal much more than on oil.
8. China has held steady to its program of building renewables generating capacity — notwithstanding these reductions in coal prices.

9. The commitment to renewables is based on strategic calculations of cleaning the air and enhancing energy security.
10. In terms of current applications, solar water heater has been widely used in enormous residential houses around the whole nation.

VI Please put the following expressions into their corresponding English or Chinese.

1. energy security
2. renewable energy suppliers
3. take a battering
4. share price
5. the world's largest investor in renewable
6. renewables strategy
7. be based solely on the price of fossil fuels.
8. enhance its energy security
9. reliance on imports of fossil fuels
10. offer decisive advantages
11. 提供能源发电设备
12. 独立于资源流动
13. 太阳能光伏
14. 跟踪系统
15. 产生电流
16. 依赖光伏效应
17. 生产能力
18. 符合国际标准
19. 就目前应用而言
20. 给农业生产施肥

VII Translate the following passage into English.

Sunlight energy can be converted into electricity by indirectly using concentrated solar power (CSP), directly using solar photovoltaics (PV), or a combination. The former applies tracking systems with mirrors or lenses to focus a large area of light to a small beam, while the latter depends on the photovoltaic effect to generate an electric current.

Early 2000s witnessed the rapid development of solar PV technology in China. During the mid-1990s, the country's producing capacity of PV module was only 5 MW, within which only 1.4 MW met the modern international standards. In 2012, China shared half of the total installed capacity of solar PV globally. Domestic solar PV companies were encouraged to install solar power with connections to the national grid.

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Unit 8 Text B

I Critical Thinking: work in groups and discuss the following questions.

1. Why is it stated that ASEAN is one of the most prominent players in the global economic and energy portfolia?

The Association of Southeast Asian Nations (ASEAN), as a region, was the 7th largest economy and the 5th largest investment destination in 2016. With a collective GDP of over USD 2.5 trillion, ASEAN is one of the largest economic blocs in the world.

2. Is energy efficiency necessary for ASEAN? Why?

Yes.

ASEAN's accelerated economic performance and projected growth in recent years requires increasing energy demands across the region. Its strong economic growth has fuelled a 70% increase in energy demand since 2000, and the region now accounts for 5% of total global energy demand, which will create huge pressure on energy supply, energy security and the environment. So, it is important to efficiently manage the finite energy resource to meet the infinite demand and sustain the achievements of the economic development. Energy efficiency, which offers a possible measure to mitigate the demand shock, is of particular importance in the ASEAN context of the dramatic energy demand growth and vast energy saving potential.

3. Why should ASEAN strengthen its cooperation in promoting energy efficiency (EE) ?

As the region is experiencing increasing energy demand, each country will require concerted effort to meet the projected target. More specifically, ASEAN should strengthen its cooperation in effective policy development and harmonization. Many ASEAN countries have implemented various measures to promote energy efficiencies, with Thailand, Singapore and the Philippines being the leaders. The development of energy efficiencies in ASEAN members, in terms of sectoral goals, action plan, policy measures, activities, and achievements, however, is unbalanced, which offer opportunities for regional cooperation. Good practice in some ASEAN members in the areas of goals, policy instruments, standards, labeling and financing offer lessons for the others. Regional cooperation has been present in the past few decades fueled by ASEAN dialogue countries and is further boosted by the building of ASEAN Economic Community. The considerable economic benefits from the cooperation will further sustain the energy cooperation.

So the cooperation among ASEAN countries is one of the greatest drivers to foster dynamic regional and economic growth in ASEAN in reducing energy intensity and sustaining energy efficiency (EE)

II Match Column A with Column B.

1 b 2 f 3 e 4 a 5 j 6 c 7 i 8 g 9 d 10 h

III True (T) or False(F) according to the passage.

1 T 2 F 3 T 4 T 5 T 6 T 7 T 8 F 9 T 10. T

IV Fill in the blanks in the following sentences with the words given.

1. M 2. I 3. J 4.A 5. C 6. B 7. D 8. E 9. F 10. G 11. L 12.K

13. O 14. N 15. H

V Translate the following expressions into Chinese or English.

1.东南亚国家联盟(ASEAN)
2. 投资目的地
3. 世界上最大的经济集团之一
4. 全球能源需求总量
5. 有效地管理有限的能源资源
6 满足无限的需求
7.降低能源强度
8. 需要共同努力
9. 实现预计的目标
10. 强化合作
11. reduce energy intensity
12. sustain energy efficiency (EE)
13. revise/remove fossil fuel subsidies
14. introduce market prices that reflect real economic costs
15. private sector
16. regulatory frameworks
17. regularly update relevant information
18. through stakeholders' consultation.
19. project developers and other stakeholders
20. reach the long-term targets of 30% reduction in energy intensity

VI. Translate the following sentences into Chinese or English.

1. 有效地管理有限的能源资源，以满足无限的需求，维持经济发展的成果，具有重要意义。
2. 大多数东盟国家已经整合了能源管理的相关政策。
3. 它在不影响消费者使用或国家竞争力的情况下减少了能源消耗。
4. 在大规模工业增长的推动下，预计 2010 年至 2035 年间，亚太地区的能源需求将增加一倍以上。
5. 提高能源效率已被确定为该地区实现能源安全、可及性、可负担性和可持续发展的首要任务。
6. All countries in the region have adopted EE policies and programmes to achieve energy savings across different sectors.
7. Many countries have already enacted a series of laws, acts or regulations for energy conservation.
8. It can reduce import dependency, and result in less environmental pollution.
9. The policymakers and development banks are already familiar with traditional financing instruments.
10. Based on our findings, the following critical recommendations should be followed to provide an uninterrupted EE financing plan.

Unit 8 Text C

I Critical Thinking: work in groups and discuss the following questions.

1. Say something about the importance of energy and energy efficency.

Energy is essential to heating homes and cooking meals. It is needed to deliver proper health care in hospitals and to teach children. It is essential for economic growth and development and for powering industries, farms and businesses. It plays a significant role in making a better life for people all over the world, in particular for the world's poorest.

Energy efficiency can offer huge potential to get more benefit out of less energy and make energy more affordable for the poor, and it can reduce emissions which is quite essential as the world steps up to the challenges of climate change.

2. What does energy security mean?

The IEA defines energy security as "the uninterrupted availability of energy sources at an affordable price". Energy security has many dimensions: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and sustainable environmental needs. Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes within the supply-demand balance. Lack of energy security is thus linked to the negative economic and social impacts of either physical unavailability of energy, or prices that are not competitive or are overly volatile.

3. Say something about the necessity of achieving energy efficiency in China

We must take advantage of the vast pool of readily available and useful energy obtainable through energy efficiency since nearly large perccent of the energy used is wasted through inefficiencies. Today, China imports nearly 70 per cent of its oil from foreign and sometimes unstable and unfriendly countries — and that percentage is terrible. At the same time, we waste much of our domestic energy sources such as coal. While our government can play a critical role in making the China energy-efficient through incentives and other means. The private sector can also capitalize on utilizing our own fuel efficiently providing the nation with the "fifth fuel" (coal, nuclear, natural gas and oil comprise the four fuels)for advancing energy independency.

4. Talk about the significance of energy efficiency in China.

China's high-speed economic growth and ambitious urbanization depend heavily on the massive consumption of fossil fuel. However, the over-dependence on the depleting fossil fuels causes severe environmental problems, making China the largest energy consumer and the biggest CO_2 emitter in the world. Faced with significant challenges in terms of managing its environment and moving forward with the concept of sustainable economic development, the Chinese government plans to move away from fossil fuels and rely on renewables such as hydropower, wind power, solar power, biomass power and nuclear power. The renewable energy development policies include laws and regulations, economic encouragement, technical research and development. China is

exploiting our abundant domestic renewable energy sources to meet the future energy demand and reduce carbon emissions. To move toward a low carbon society, technological progress and policy improvements are needed for improving grid access (wind), securing nuclear fuel supplies and managing safety protocols (nuclear), integrating supply chains to achieve indigenous manufacture of technologies across supply chains (solar). Beyond that, China has also put forward proposals that involve developing smart-grid system, investing on renewable energy research, improving the feed-in tariff system and clarifying the subsidy system.

5. Discuss the necessity of improving energy efficiency in developing countries.

Energy efficiency is universally recognized as one of the most cost-effective instrument to enhance energy security, mitigate climate change and improve industrial competitiveness. Energy efficiency can decouple the demand of energy from the combined need of economic and population growth, and improvement of living standards through reducing energy intensity. It is particularly important in developing countries where future challenges are high but opportunities are also significant. Energy intensity in developing countries often is either high due a lack of energy efficiency technology and management expertise, or low due to low industrialization level. In the latter case, energy intensity will increase rapidly during the industrialization and urbanization stage. The increase of energy intensity, together with the usual trend of growing energy demand due to economic growth, will create shock to the energy demand (Sheng et al., 2013). Promotion of energy efficiencies may smooth the demand shock from industrialization and urbanization by reducing the elasticity.

II True （T） or False （F） according to the passage.

1 T 2 T 3 T 4 T 5 F　　6 T 7 F 8 T 9 T 10 T

III Please put the following expressions into their corresponding Chinese or English.

1　能源效率
2　惊人的回报
3　日益成熟的技术
4　LED 照明
5　商业安装
6　简易替换器件
7　可靠性问题
8　主流消费者
9　减速
10　即将来临
11. basic parameter 12. insulation manufacturer
13. fuel efficient car
14. consumer electronics
15. high efficiency
16. light sensor
17. artificial light
18. utilities spending
19. air leak

20. fuel economy standard
21. flatten out
22. take a lead
23. be held accountable for
24. extraction technology

Unit 9 Text A

I Critical Thinking.

1. What is China's new responses to climate change?

China's responses to climate change are an important part of its efforts to achieve eco-environmental progress and high-quality development. Based on the requirements of its internal sustainable development, and its due responsibility for building a global community of shared future, China has formulated new principles on tackling climate change and is contributing its solutions to global climate governance.

a. Building a strong sense of common community
b. Implementing the new development philosophy
c. Taking a people-centered approach
d. Striving for carbon dioxide peaking and carbon neutrality
e. Synergizing the reduction of pollution and carbon emissions

2. What are the philosophy that China pursues in responding to climate change?

Actions are driven by philosophies. In this new development stage, China pursues a philosophy that development must be innovative, coordinated, green, open and shared, and accelerates the pace in creating a new development dynamic. Among the five axes of the new philosophy, green development is a necessary condition for sustainability. It represents the people's aspiration for a better life, and is a key guide for China's climate actions. China holds the view that clear waters and green mountains are invaluable assets, and that eco-environmental protection and improvement lead to greater productivity. Mitigating climate change reflects the overall global transition towards green and low-carbon living. China has abandoned its previous development model that damaged or even destroyed the eco-environment. Instead, following the current technological revolution and industrial trends, it has seized the opportunities created by green transition, transformed and upgraded its economic and industrial structure and energy mix through innovation, and achieved a green recovery from the Covid-19 pandemic. A better eco-environment is boosting China's sustainable economic and social development.

3. Why does China take a people-centered approach?

Climate change poses a severe threat to the economic and social development of all countries and to people's lives and property. Therefore our responses affect the fundamental interests of all people. Mitigating and adapting to climate change are essential for increasing the people's sense of eco-environmental gain, and will provide them with a fairer, more sustainable and safer environment that promotes higher quality and more efficient development. China puts people and lives first, and cherishes the life, value and dignity of every individual. Taking into full consideration the people's aspiration for a better life, their expectation of a sound eco-environment, and their responsibility for future generations, China is pioneering a new approach that synergizes the efforts to fight climate change, develop the economy, generate employment, eliminate poverty, and protect the environment. It guarantees and improves people's wellbeing through development, strives for social equity and justice in the process of green transition, and increases people's sense of gain, happiness and security.

4. How does China implement a national strategy of actively responding to climate change?

As the largest developing country, with a population of over 1.4 billion, China faces major challenges across a range of important areas including economic development, improving the people's lives, pollution control, and eco-environmental protection. In order to meet its targets in response to climate change, China has risen to these challenges and formulated and implemented a variety of strategies, regulations, policies, standards, and actions.

a. Intensifying efforts in response to climate change
b. Staying committed to a green and low-carbon path to development
c. Tightening control over greenhouse gas emissions
d. Giving full play to the role of the market
e. Reinforcing ability to adapt to climate change
f. Increasing support for addressing climate change

5. How does China increase support for addressing climate change?

China attaches great importance to developing support capacity to address climate change. It has continuously improved the statistical and accounting system for greenhouse gas emissions, given a key role to green finance, and leveraged the supporting role of scientific and technological innovation to promote the transfer and application of climate change technologies.

a. Improving the statistical and accounting systems of greenhouse gas emissions.
b. Increasing green finance support.
c. Strengthening the role of scientific and technological innovation.

II Match Column A with Column B.

1-5:j g c h i **6-10**: a b d e f

III True （T） or False （F） according to the passage.

1 T 2 T 3 T 4 T 5 F 6 T 7 T 8 T 9 T 10 F

IV Complete the passage with the words or expressions from the text.

1 C 2 H 3 B 4 F 5 A 6 G 7 L 8 O 9 I 10 E 11 K 12 D 13 M 14 N 15 J.

V Translate the following sentences into Chinese or English.

1. 中国高度重视应对气候变化。
2. 这些努力取得了积极成效。
3. 中共十八大以来，中国贯彻新发展理念，将应对气候变化摆在国家治理更加突出的位置。
4. 中国以最大努力减缓气候变化。
5. 中国努力建设人与自然和谐共生的现代化。
6. China has adopted more vigorous policies and measures.
7. China strives to peak CO_2 emissions before 2030.
8. China strives to achieve carbon neutrality before 2060.
9. China is taking pragmatic actions towards these goals.
10. China puts people and lives first, and cherishes the life, value and dignity of every individual.

VI Please put the following expressions into their corresponding English or Chinese.

1. improvement of the eco-environment
2. conserve biodiversity
3. improve ecosystems
4. structural adjustment
5. optimize configuration
6. policy synergy
7. innovative mechanisms
8. build a strong sense of common community
9. implement the new development philosophy
10. eliminate poverty, and protect the environment
11. 碳达峰
12. 碳中和
13. 能源部门
14. 加快形成
15. 产业结构
16. 生产方式
17. 节约资源
18. 保护环境
19. 高质量发展
20. 空间格局

VII Translate the following passage into English.

Climate change poses a severe threat to the economic and social development of all countries and to people's lives and property. Therefore, our responses affect the fundamental interests of all people. Mitigating and adapting to climate change are essential for increasing the people's sense of eco-environmental gain, and will provide them with a fairer, more sustainable and safer environment that promotes higher quality and more efficient development. China puts people and lives first, and cherishes the life, value and dignity of every individual. Taking into full consideration the people's aspiration for a better life, their expectation of a sound eco-environment, and their responsibility for future generations, China is pioneering a new approach that synergizes the efforts to fight climate change, develop the economy, generate employment, eliminate poverty, and protect the environment. It guarantees and improves people's wellbeing through development, strives for social equity and justice in the process of green transition, and increases people's sense of gain, happiness and security.

Unit 9 Text B

I Critical Thinking: work in groups and discuss the following questions.

1. What is the reason for climate change according to the text?

According to the first paragragh: "*What are the causes of climate change? We are. While a wide range of natural phenomena can radically affect the climate, climate scientists overwhelmingly agree that global warming and resultant climate effects that we're witnessing are the result of human activities*.", we can get the answer that the reason for climate change is that large amounts of greenhouse gases are released into the atmosphere as a result of many human activities worldwide.

2. What do we urgently need to do in order to mitigate climate change?

We urgently need to use energy efficiently while embracing clean energy sources. We urgently need to go on developing renewables instead of using fossil fuels. We urgently need to reduce greenhouse emissions. We urgently need to adopt a lifestyle guided by the Reduce-Reuse-Recycle principle.

3. Discuss your ideas about improving energy efficiency in your daily life.

Consider more energy-efficient products:

1)give some thought to fuel efficiency when buying a car;

2)consider appliances with better energy efficiency when buying air conditioners, TVs, washing machines, etc.;

3)replace incandescent light bulbs with LED bulbs;

Use energy more efficiently:

1)share a car with a friend or use public transport;

2)adjust thermostat, lower in winter, higher in summer;

3)make house more energy efficient by using heat insulating windows; plug air leaks in windows and doors to increase energy efficiency.

4. Talk about how to reduce greenhouse effects.

With the development of economy, more and more greenhouse gases are being discharged into the air. CO_2 makes up about 70% of the greenhouse gases, which is considered to be one of the greatest causes of global warming. It has harmful effects, causing the sea level to rise and many natural disasters to strike. So we must do something to avoid these things from happening.

First, we should go to work by bus or on foot instead of driving.

Second,we should use more renewables, and less oil and coal. For example, we can use solar energy if possible. After all it is free. All we need to buy is the equipment. Then we can get much hot water and heating from the sun and even generate electricity with little money spent on the equipment.

Third, turning off the power switch or disconnect the power plug such as televisions and heaters, when not in use, will help save energy, protect the environment, as well as save money.

Fourth, reduce, reuse and recycle.Only buy what you need; don't fill your cupboards with things you may or may not use. Reuse whatever you can, like containers and paper, and recycle what you cannot reuse. It is really easy for us to do.

Fifth, we should plant more trees.

The most important is that we should cultivate our environmental awareness and develop awareness of energy effciency, developing a habit of protecting our environment and using energy efficiently in everyday life and work.

5. Discuss how you understand the idea about the impact of climate change.

The global climate is changing and posing increasingly severe risks for ecosystems, human health and the economy. The earth is already facing impacts of a changing climate, including rising sea levels, more extreme weather, flooding, droughts and storms.

The changes are happening because large amounts of greenhouse gases are released into the atmosphere as a result of human activities worldwide. About two-thirds of global greenhouse gas emissions are linked to burning fossil fuels for energy to be used for heating, electricity, transport and industry. Combustion of fossil fuels also releases air pollutants that harm the environment and human health.

Mitigating and adapting to climate change are key challenges of the 21st century. To succeed in limiting global warming, the world urgently needs to use energy efficiently while embracing clean energy sources.

II Match Column A with Column B.

1 h 2 f 3 e 4 a 5 j 6 c 7 i 8 d 9 g 10 b

III True (T) or False(F) according to the passage.

1 F 2 T 3 T 4 T 5 F 6 T 7 T 8 T 9 T 10. T

IV Fill in the blanks in the following sentences with the words given.

1. H 2. I 3. J 4.A 5. C 6. B 7. D 8. E 9. F 10. G 11. L 12.K
13. M 14. N 15. O

V Translate the following expressions into Chinese or English.

1 让路给…
2 尽某人的职责
3 有机农业
4 传统农业
5 土壤侵蚀
6 化肥
7 作物产量
8 转向
9 大有帮助
10 .恢复生态平衡
11. as opposed to
12. fuel efficient car
13.in impeccable condition
14. exhaust gases
15. the culture of consumerism
16. at all times
17. think twice
18. put … into practice
19. undo the impact
20. forest conservation

VI. Translate the following sentences into Chinese or English.

1. 气候科学家们一致认为，我们所目睹的全球变暖和由此产生的气候影响是人类活动的结果。
2. 其中一些清洁的可再生能源包括风能、太阳能、水或水电、生物质能和地热能。
3. 我们不仅有助于减少温室气体(特别是二氧化碳)排放到大气中，从而有助于减缓全球变暖和应对气候变化。
4. 减少对化石能源的依赖有助于确保世界发展的可持续性。
5. 从我们的大气中去除二氧化碳的最干净、最有效的方法实际上是免费的。
6. This has in turn contributed to a faster rate of global warming and climate change.
7. Take part in your local community's plant-a-tree effort.
8. Soils are an important sink for atmospheric carbon dioxide.
9. As the demand for organically grown products increases, organic farming will become more economically viable and more popular.
10. As a community, encouraging local farmers to cultivate various products can also go a long way in reducing carbon emissions and restoring the ecological balance.

Unit 9 Text C

I. Critical Thinking: work in groups and discuss the following questions.

1. What efforts has China made in its shift toward a greener future as far as you know?

a. Eco-provinces. The State Environmental Protection Administration, now the Ministry of Ecology and Environment, approved a pilot program in 2013 that introduced seven ecological provinces nationwide. At present, ecological provinces, cities and villages cover almost half of the country.

b. Energy conservation and emissions reduction. The strategic plan of energy conservation and emissions reduction originates from China's 11th Five-Year Plan guidelines. It has led to remarkable achievements in reducing energy consumption and greenhouse gas emissions.

c. Clean energy. Because of its huge population and the stage it is at in its development, China has committed much more to the development of clean energy such as hydropower and wind power. For the well-being of its population and people all over the world, China has always strived to minimize the costs of pollution.

d. The most stringent environmental protection Law in China's history. Introduced in 2015 and seen as the strictest law of its kind to date, China's revised Environmental Protection Law introduced much heavier punishments, promising to name and shame enterprises which break the law.

e. Air pollution prevention. In northern China, home to Beijing, Tianjin and Hebei Province, a choking haze at times plagues the regions. Under the new Atmospheric Pollution Prevention and Control Law, which came into effect on January 1, 2016, ventilation corridors will be built in Beijing and outdated production facilities will be closed down gradually.

2. Discuss the pros and cons of electric vehicles.

Pros:

a. Electric cars use electricity as fuel, producing fewer emissions than their conventional counterparts.
b. Lower fuel costs because electricity is cheaper than gas.
c. Lower maintenance costs because there are fewer moving parts.
Cons:
a. Electric cars cost more than equivalent gas cars despite government rebates. And charging the cars' battery can be an added strain to your pocket.
b. The batteries of electric cars do not usually allow cars to travel 100 miles or more. This makes these cars not suitable for distant road trip because there is the tendency to stop for few hours for charging purposes.
c. Limited availability of public charging stations.

3. Discuss the greenhouse gases you know and where they come from.

Greenhouse gases occur both naturally and as a result of human activities. Some of the major greenhouse gases are:

• Carbon dioxide (CO_2) – released when we burn oil, coal and natural gas.

• Methane (CH_4) – from landfills, the production and transport of coal, oil and natural gas, and agricultural practices.

• Nitrous oxide (N_2O) – from the agricultural and industrial activities and burning fossil fuels and the treatment of wastewater.

4. What is the nature of climate change?

Climate change is not an "environmental" problem in the same sense as others – it is an energy problem, first and foremost. Our heavy excessive dependence on fossil fuels to make energy causes carbon dioxide to be released into the atmosphere. Carbon dioxide, in turn, is the principal component of the "greenhouse gases"that are responsible for warming the planet. Energy use and climate change are two sides of the same coin.

5. What suggestions are given to cope with the issue of climate change causing global warming?

a. Anything that reduces oil consumption should be made a major priority.

b. Improving the efficiency of electrical power plants and filtering out the harmful emissions have to be another top priority.

c.We should accelerate research into promising new techniques for the capture and "sequestration" of carbon during the combustion of fossil fuels in electricity generation.

II. Match Column A with Column B.

1-5: b h c a g 6-10: d i j f e

III. True （T） or False （F） according to the passage.

1 T 2 F 3 T 4 T 5 T 6 T 7 F 8 T 9 T 10 T

IV. Please put the following expressions into their corresponding Chinese or English.

1 迄今为止
2 农药滥用
3 同心协力
4 清理整顿
5 有毒物质
6 首先

7 相应地
8 家庭取暖
9 从…方面说来
10 适用于
11 根本的转变
12. make a significant difference
13. to the maximum extent possible
14. broad comment
15. public transportation
16. filter out
17. top priority
18. call for
19. hollowed-out coalmine
20. add to
21. on a very large scale