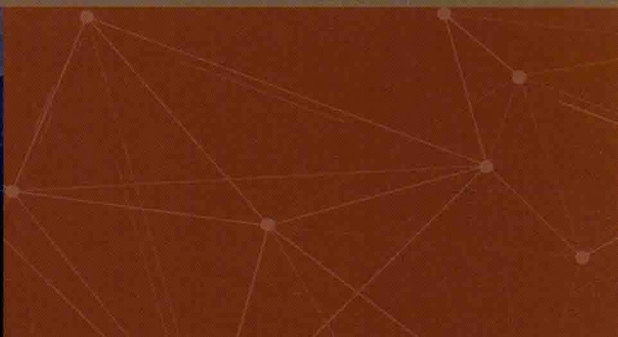


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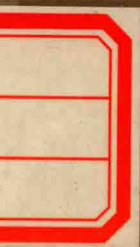


普通高等教育“十三五”规划教材  
新能源科学与工程专业系列教材



# 新能源专业英语基础

薛春荣 钱 斌 编著  
冯金福 魏青竹



科学出版社

普通高等教育“十三五”规划教材

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科学出版社

北 京

## 内 容 简 介

本书对太阳能、风能、生物质能、核聚变能等主流新能源作了详细的分析介绍,同时引用部分国内外专业研究报告及文献,对主流新能源的原理、技术、优缺点、开发应用、国内外行业发展现状及形势作了全面阐述,最大限度地让读者了解新能源的相关知识,同时能够轻松地学习相关行业英语。

本书内容丰富、图文并茂、深入浅出,可作为高等院校新能源相关专业本科生和研究生的专业英语教材或相关双语课程的教材,也可供从事新能源行业工作的工程技术人员和管理人员参考。

### 图书在版编目(CIP)数据

新能源专业英语基础/薛春荣等编著. —北京:科学出版社,2016.7  
普通高等教育“十三五”规划教材  
ISBN 978-7-03-049133-6

I. ①新… II. ①薛… III. ①新能源-英语-高等学校-教材  
IV. ①H31

中国版本图书馆CIP数据核字(2016)第143234号

责任编辑:余江 张丽花 / 责任校对:郭瑞芝

责任印制:徐晓晨 / 封面设计:迷底书装

科 学 出 版 社 出 版

北京东黄城根北街16号

邮政编码:100717

<http://www.sciencep.com>

北京中石油彩色印刷有限责任公司印刷

科学出版社发行 各地新华书店经销

\*

2016年7月第1版 开本:720×1000 B5

2017年1月第二次印刷 印张:16

字数:323 000

定价:48.00元

(如有印装质量问题,我社负责调换)

# 前 言

能源技术的革新带动人类社会日益进步,并对社会发展起着巨大的推动作用。至今所采用的“化石燃料”能源,在带给人类文明与进步的同时,却因能源消耗的大幅提高以及随之而来的环境污染,给人类生存环境造成灾害。“改善能源结构,保护地球”成为全球的呼声,被世界各国所关注。在全球环境污染和能源危机日益严重的今天,研究各种新型能源的利用对缓解能源危机、保护生态环境和促进经济的可持续发展具有重要意义。英语作为一种重要的全球化的交流工具,正随着科技的飞速发展、信息全球化和社会化而日趋成为一种国际化的语言和必备沟通工具。学好新能源专业英语是新能源领域的学生和工程技术人员获取国外新能源方面的科研信息、发展动态和前沿技术的基本前提。

本书内容涉及新能源概论、太阳能、风能、水能、海洋能、生物质能、核能、氢能和先进储能材料等方面的知识及新技术和新动向。本书共分8章:第1章简要介绍新能源的基础知识,包括新能源的概念、种类、优势和开发利用前景。第2~7章每一章针对一种主流新能源,对该能源的原理、技术、优缺点、开发应用、国内外行业发展现状及形势作了全面阐述,最大限度地让读者了解该能源的相关知识,同时能够轻松地学习该领域的行业英语。第8章介绍了先进的储能材料,重点介绍了超导材料和石墨烯。

《新能源专业英语基础》每单元均包括正文和课后习题,每一单元均配有专业术语和疑难词语解释,以及长难句翻译。为提高读者的理解能力和翻译水平,每章都提供了句子的分析与翻译技巧,特别是长难句和定语从句的分析与翻译技巧。书后附了常用实用文体的写作技巧,以帮助读者提高英语实用能力。书中选用的资料来源广泛,内容系统性强,涉及的专业词汇覆盖面广。

本书由薛春荣、钱斌、冯金福、魏青竹共同编写,薛春荣还负责全书的统稿和定稿。常熟理工学院新能源专业2013级的何富国同学和薛娣同学为本书的翻译和校对做了大量的工作,常熟理工学院物理与电子工程学院领导为本书的出版提供了大力支持,本书参阅和利用了国内外相关资料,充实和丰富了本书的内容,在此一并表示感谢。同时,本书部分内容材料来自互联网,原作者无法一一查证和联系,对此深表歉意和感谢。

新能源的开发和利用技术涉及面广、发展迅速,由于作者水平有限,书中难免有不足和疏漏之处,恳请各位专家、同仁和广大读者不吝赐教。

作 者

2015年12月

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# Chapter 1 Introduction to new energy

## 1.1 Non-renewable versus renewable energy

### 1.1.1 Non-renewable energy

Energy is all around us in different forms, such as light, heat and electricity. Much of our energy supply comes from coal, oil, natural gas or **radioactive**<sup>1</sup> elements. Fossil fuels provide about 80% of the global energy **demand**<sup>2</sup>, and this will continue to be the situation for decades to come. They are considered **non-renewable**<sup>3</sup> because once they are removed from the ground and used, they are not immediately replaced. In fact, the world's natural gas, **crude**<sup>4</sup> oil and coal **deposits**<sup>5</sup> took millions of years to form. **Uranium**<sup>6</sup>, which is used for nuclear energy, has limited supply as well. Humans will use up most of these deposits in less than 200 years. Once they are gone, non-renewable energy supplies cannot be replaced within human time **scales**<sup>7</sup>.

As **plants**<sup>8</sup> and animals die, they **decompose**<sup>9</sup> (break down) in the earth. *Over time, they become covered with layers of dirt.*<sup>①</sup> After millions of years, these plants and animals remains turn into fossil fuels. Fossil fuels can be solid, liquid or gaseous—coal, oil or natural gas. People burn fossil fuels to produce energy. A home, for example, may be heated by oil or natural gas. A **power plant**<sup>10</sup> may burn coal to produce electricity. For many years, fossil fuels have been a readily available, fairly inexpensive way to provide energy, so they have been widely used. In fact, fossil fuels **currently**<sup>11</sup> provide 85% of the energy used in the United States. Unfortunately, however, there are problems associated with people's dependence on fossil fuels.

Fossil fuels are called non-renewable energy sources. It took millions of years for the fossil fuels we rely on today to form. Once we have used up all of the coal, oil and natural gas currently under Earth's surface, there will be no more coal, oil or natural gas to replace them. Fossil fuels are being used much faster than they can form. It is impossible to determine exactly how much longer these resources will last. Many experts think, however, that our coal reserves may not last longer than 130 more years. They expect oil and natural gas to run out even sooner.



## New Words and Expressions

- 1 radioactive /ˌreɪdiəʊ'æktɪv/ *adj.* 放射性的
- 2 demand /dɪ'mænd/ *v.* 要求, 请求 *n.* 需求, 请求
- 3 non-renewable 不可再生的
- 4 crude /kruːd/ *adj.* 粗糙的, 天然的, 未加工的 *n.* 原材料, 天然物质
- 5 deposit /dɪ'pɒzɪt/ *n.* 储蓄, 沉淀物, 寄存品 *v.* 储蓄, 放置
- 6 uranium /ju'reɪniəm/ *n.* 铀
- 7 scale /skeɪl/ *n.* 规模, 级别 *v.* 测量, 攀登
- 8 plant /plɑːnt/ *n.* 植物, 设备, 工厂 *v.* 种植, 建设, 布置
- 9 decompose /ˌdi:kəm'pəʊz/ *v.* 分解, 腐烂
- 10 a power plant 发电厂
- 11 currently /'kʌrəntli/ *adv.* 当前, 目前

## Notes

①Over time, they become covered with layers of dirt.

随着时间的推移, 它们(植物和动物)的表面会覆盖层层的污垢。

### 1.1.2 Non-renewable energy and the Environment

One problem with fossil fuels is the negative impact they have on the environment. Burning fossil fuels creates a type of pollution called **soot**<sup>1</sup>, as shown in Fig.1-1.



Fig.1-1 Pollution created by burning fossil fuels

*These tiny particles mix with water particles in the sky to create smog—a gray-brown haze that hangs in the air.*<sup>①</sup> Smog has been linked to lung **disorders**<sup>2</sup> such



as **bronchitis**<sup>3</sup> and **asthma**<sup>4</sup>. According to experts, the pollution from coal-fired plants is responsible for more than 23,000 **premature**<sup>5</sup> (early) deaths in the United States every year. In contrast, the technology used in the wind industry gives off no harmful **emissions**<sup>6</sup>. The wind industry has recorded only one death among members of the public (people who are not wind industry workers) in 20 years of operation. The person killed was a German **skydiver**<sup>7</sup> who flew off course and **parachuted**<sup>8</sup> into a wind plant.

When coal and oil are burned, they give off or emit, **sulfur dioxide**<sup>9</sup> and **nitrogen oxides**<sup>10</sup>. *When these chemicals mix with other compounds in the atmosphere, such as water and oxygen, they create a toxic (poisonous) solution of sulfuric acid and nitric acid.*<sup>②</sup> If these chemicals are present in areas where there is wet weather, they create acid rain (which also includes acid fog, snow and mist), as shown in Fig.1-2.

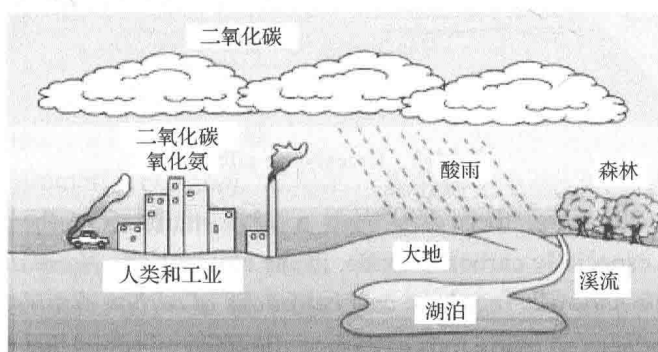


Fig.1-2 The interrelations between acid rain and ecosystem

Acid rain can harm and even kill trees, fish and other living creatures where it falls. In the United States, about two-thirds of all sulfur dioxide and one-quarter of nitrogen oxides in the air come from power plants that create electricity by burning fossil fuels such as coal.

The burning of fossil fuels also releases greenhouse gases, such as carbon dioxide and **methane**<sup>11</sup>. Some greenhouse gases are found naturally in Earth's atmosphere. They help keep the planet's temperature stable. Sunlight passes through the atmosphere to strike Earth. Some of the solar energy is absorbed, and a large amount of it bounces back toward space. Some of the solar energy that bounces back is trapped by the greenhouse gases that are naturally in the atmosphere. If the right amount of solar energy is radiated back into space, the surface temperature of Earth will remain generally constant. Unfortunately, the emission of greenhouse gases—such as those created by burning fossil fuels—is upsetting this balance, as shown in Fig.1-3.

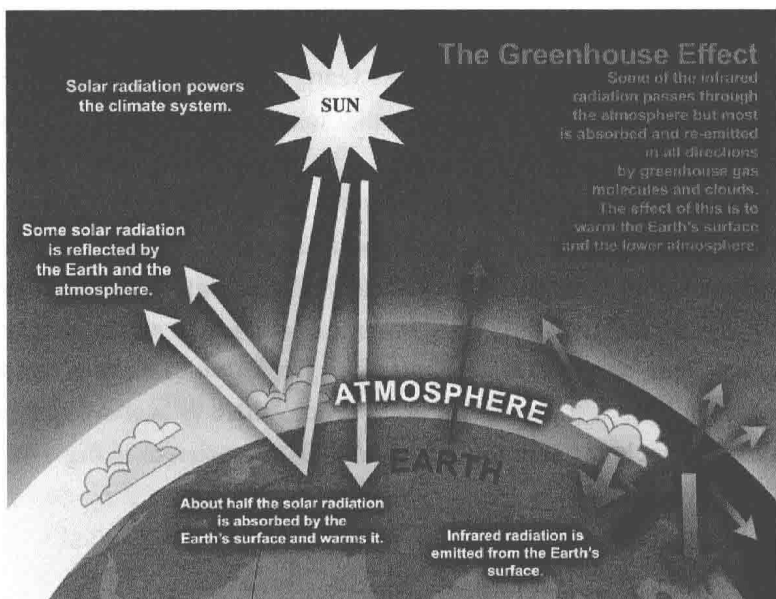


Fig.1-3 Greenhouse effect

In the past 150 years, there has been a 25% increase in the level of certain greenhouse gases, especially carbon dioxide, in the atmosphere. *Normally, the process of plant photosynthesis naturally regulates concentrations of carbon dioxide.*<sup>®</sup> Unfortunately, human activity produces so many tons of carbon dioxide emissions that there is too much for the world's plant life to absorb. This imbalance has led to an ongoing increase in concentrations of greenhouse gases in the atmosphere. Experts have determined that, over time, the rising concentration of these gases will produce an increase in Earth's surface temperature, as shown in Fig.1-4.

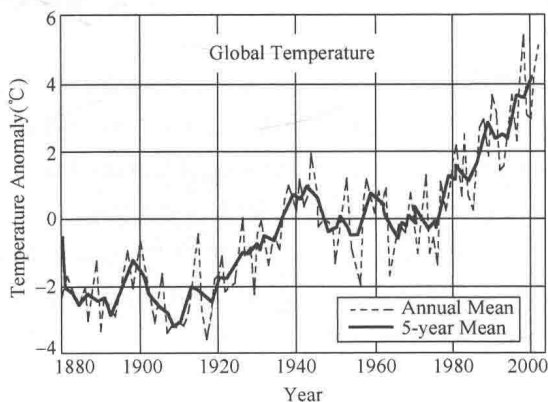


Fig.1-4 An increase in Earth's surface temperature

Most scientists believe that these rising temperatures may cause changes in sea level, **precipitation**<sup>12</sup> (such as rainfall) and the seriousness of storms. This warming of Earth's surface and atmosphere is commonly referred to as global warming or global climate change.

Climate change could affect every part of the planet. As the **glaciers**<sup>13</sup> and large sheets of ice start to melt, sea levels could rise, causing small islands and coastal lands to become flooded. As the glaciers continue to shrink, other areas that rely on glacial run off from mountains for fresh water could face a severe shortage of water. Rainfall in other areas could decrease **drastically**<sup>14</sup>.

### New Words and Expressions

- 1 soot /sut/ *n.* 煤烟, 油烟 *v.* 煤烟弄脏
- 2 disorder /dis'ɔ:də(r)/ *n.* 混乱, 动乱 *v.* 使混乱
- 3 bronchitis /brən'kɑ:tɪs/ *n.* 支气管炎
- 4 asthma /'æsmə/ *n.* 气喘, 哮喘
- 5 premature /'premətʃə(r)/ *adj.* 过早的, 提前的
- 6 emission /i'mɪʃn/ *n.* 排放, 辐射, 排放物
- 7 precipitation /prɪ,sɪpɪ'teɪʃn/ *n.* 沉淀, 降落
- 8 skydiver /'skɑ:dɪvə(r)/ *n.* 跳伞运动员
- 9 parachute /'pærəʃu:t/ *n.* 降落伞 *v.* 跳伞
- 10 sulfur dioxide 二氧化硫
- 11 nitrogen oxides 氧化氮
- 12 methane /'mi:θeɪn/ *n.* 甲烷, 沼气
- 13 glacier /'glæsiə(r)/ *n.* 冰河, 冰川
- 14 drastically /'dra:stɪklɪ/ *adv.* 大大地, 彻底地, 激烈地

### Notes

- ① These tiny particles mix with water particles in the sky to create smog—a gray-brown haze that hangs in the air.  
这些微小的颗粒与空气中的小水滴混合形成雾——弥漫在空气中的棕灰色轻雾。
- ② When these chemicals mix with other compounds in the atmosphere, such as water and oxygen, they create a toxic (poisonous) solution of sulfuric acid and nitric acid.  
当这些化学物质与大气中的其他化合物(例如: 水和氧气)混合时, 它们就产生了一种有毒的硫酸和硝酸溶液。

③Normally, the process of plant photosynthesis naturally regulates concentrations of carbon dioxide.

通常情况下，植物的光合作用会自动调节二氧化碳浓度。

### 1.1.3 Renewable energy

Global demand for all forms of energy is expected to grow by more than 44% by the year 2030. Since there are problems associated with the traditional use of fossil fuels, many people think that finding **alternative**<sup>1</sup> energy sources—**sustainable**<sup>2</sup> energy sources—should be a priority. Sustainable energy sources can help meet the world's needs without harming the environment or **depleting**<sup>3</sup> all of the resources. To meet that goal, experts are looking at renewable energy sources, such as wind, solar and water power.

Renewable energy on the other hand quickly replaces itself and is usually available in a never-ending supply. Renewable energy comes from the natural flow of sunlight, wind or water around the Earth. With the help of special collectors, we can **capture**<sup>4</sup> some of this energy and put it to use in our homes and businesses. As long as sunlight, water and wind continue to flow and trees and other plants continue to grow, we have access to a ready of supply of energy.

#### New Words and Expressions

1 alternative /ɔ:l'tɜ:nətɪv/ *adj.* 替代的，备选的 *n.* 可供选择的事物

2 sustainable /sə'steɪnəbl/ *adj.* 可持续的

3 deplete /drɪ'pli:t/ *v.* 耗尽，用尽

4 capture /'kæptʃə(r)/ *v.* 俘获，占领 *n.* 捕获，捕捉

## 1.2 Kinds of renewable energy

### 1.2.1 Solar energy

For billions of years, the sun has poured out huge amounts of energy in several forms, including light, heat, **radio waves**<sup>1</sup> and even X-rays. The earth, in orbit around the sun, **intercepts**<sup>2</sup> a very small part of the sun's immense output. On the earth, direct sunlight is available from sunrise until sunset, except during solar **eclipses**<sup>3</sup>. Solar collectors and **modules**<sup>4</sup> are designed to capture some of the sun's energy and change it from radiation into more usable forms such as heat or electricity. In fact, sunlight is an excellent source of heat and electricity, the two most important forms of energy we

consume. Solar energy is becoming increasingly popular for remote power needs such as telecommunication towers, agricultural applications (irrigation and pasture management), in tropical countries that are not connected to an electrical grid, for heating swimming pools, and many other applications around the world.

Solar energy in one form or another is the source of nearly all energy on the earth. Humans, like all other animals and plants, rely on the sun for warmth and food. However, people also harness the sun's energy in many other different ways. For example, fossil fuels, plant matter from a past geological age, is used for transportation and electricity generation and is essentially just stored solar energy from millions of years ago. Similarly, **biomass**<sup>5</sup> converts the sun's energy into a fuel, which can then be used for heat, **transport**<sup>6</sup> or **electricity**<sup>7</sup>. Wind energy, used for hundred of years to provide **mechanical**<sup>8</sup> energy or for transportation, uses air currents that are created by solar heated air and the **rotation**<sup>9</sup> of the earth. Today **wind turbines**<sup>10</sup> convert wind power into electricity as well as its traditional uses. Even hydroelectricity is derived from the sun. **Hydropower**<sup>11</sup> depends on the evaporation of water by the sun, and its subsequent return to the earth as rain to provide water in **dams**<sup>12</sup>.

The solar radiation can be used principally as a source of heat, particularly in the forms of domestic hot water consumption, crop drying, power heat engines, power for refrigerators and air conditioners. China is a producing and also a consuming country for solar thermal application, as shown in Fig.1-5.

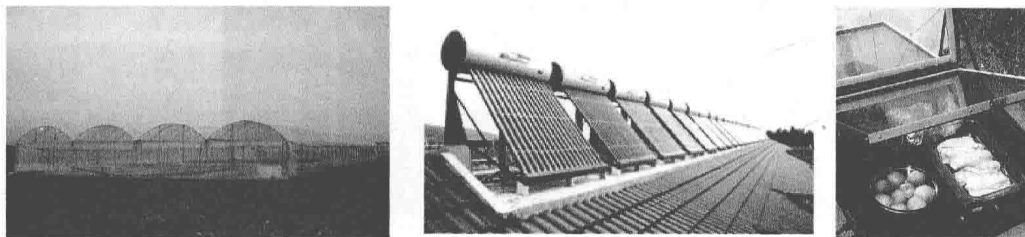


Fig.1-5 Solar thermal application in China

**Photovoltaics**<sup>13</sup> (often **abbreviated**<sup>14</sup> as PV) is a simple and **elegant**<sup>15</sup> method of harnessing the sun's energy. As shown in Fig.1-6, PV devices (solar cells) are unique in that they directly convert the incident solar radiation into electricity, with no noise, pollution or moving parts, making them **robust**<sup>16</sup>, reliable and long lasting. Solar cells are based on the same principles and materials behind the communications and computer revolutions.

Solar energy is expected to be the foundation of a sustainable energy economy, because sunlight is the most abundant renewable energy resource. Additionally, solar energy can be harnessed in an almost infinite variety of ways, from simple solar cookers

to large-scale grid-connected photovoltaic generation systems now used in different parts of the world.

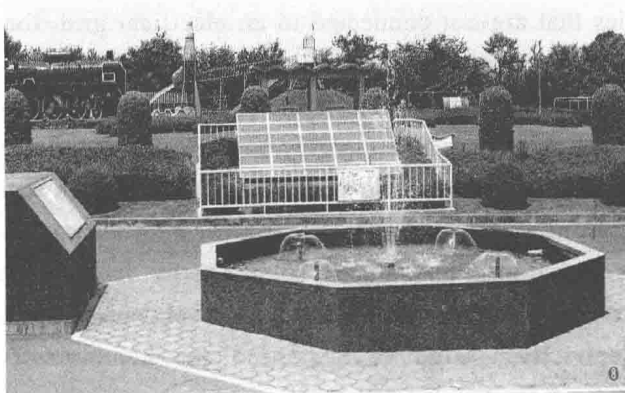


Fig.1-6 Photovoltaics

## New Words and Expressions

- 1 radio waves 无线电波
- 2 intercept /ˌɪntə'sept/ v. 拦截, 截击 n. 拦截, 拦截者
- 3 eclipse /'ɪkɪps/ n. 消失, 黯然失色 v. 使黯然失色
- 4 module /'mɒdju:l/ n. 模块, 组件
- 5 biomass /'baɪəʊmæs/ n. (单位面积或体积内)生物的数量
- 6 transport /'træns'pɔ:t/ v. 运送, 运输 n. 运输, 运输系统
- 7 electricity /ɪˌlek'trɪsəti/ n. 电力, 电流
- 8 mechanical /mə'kænikl/ adj. 机械的
- 9 rotation /rəʊ'teɪʃn/ n. 旋转, 转动, 循环
- 10 wind turbine 风力涡轮机
- 11 hydropower /'haɪdrəʊˌpaʊə/ n. 水电
- 12 dam /dæm/ n. 水坝
- 13 photovoltaic /fəʊtəʊvɒl'teɪk/ adj. 光电池的
- 14 abbreviate /ə'brɪviət/ v. 缩写, 缩略 n. 缩短, 缩写
- 15 elegant /'elɪɡənt/ adj. 优美的, 漂亮的
- 16 robust /rəʊ'bʌst/ adj. 精力充沛的

### 1.2.2 Wind energy

Wind energy is really just another form of solar energy. Sunlight falling on oceans and continents causes air to warm and rise, which in turn generates surface winds, as shown in Fig.1-7.

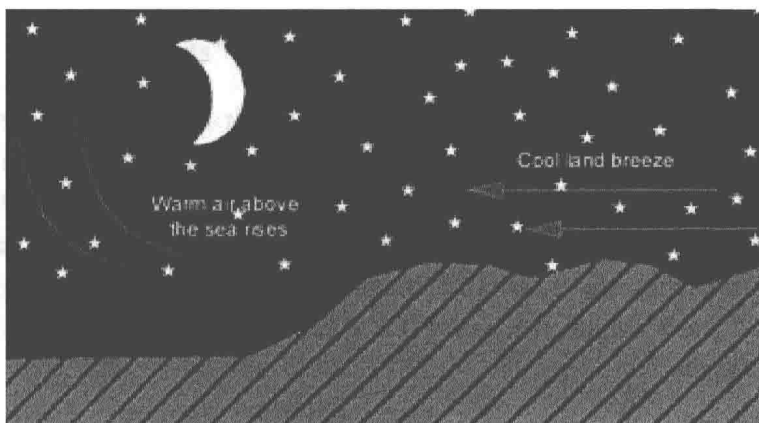


Fig.1-7 Wind energy

The wind has been used by humans for thousands of years, first to carry ships across oceans and later, to **pump**<sup>1</sup> water and **grind**<sup>2</sup> **grain**<sup>3</sup>. More recently, wind has been harnessed as a clean, safe source of electricity. The wind energy industry is becoming increasingly international as wind turbines (as shown in Fig.1-8) increase in size and the world market develops.



Fig.1-8 Wind turbines

### New Words and Expressions

- 1 pump /pʌmp/ *n.* 泵, 打气筒 *v.* 用泵抽, 注入, 抽水
- 2 grind /graɪnd/ *v.* 磨碎, 嚼碎 *n.* 碾
- 3 grain /greɪn/ *n.* 谷物, 谷粒 *v.* 把...作成细粒



### 1.2.3 Biomass energy

The term “**biomass**<sup>1</sup>” refers to any form of plant or animal **tissue**<sup>2</sup>. In the energy industry, biomass refers to wood, **straw**<sup>3</sup>, **biological**<sup>4</sup> waste products such as manure, and other natural materials that contain stored energy. As shown in Fig.1-9, the energy stored in biomass can be released by burning the material directly, or by feeding it to **micro-organisms**<sup>5</sup> that use it to make **biogas**<sup>6</sup>, a form of natural gas. Energy from biomass is still used around the world, for everything from cooking and heating to generating electricity.



Fig.1-9 Energy crops, Forest wood residues, Agricultural residues, Energy woods, Waste

Biomass is any organic matter of plant or animal origin. Biomass can be burned to produce heat and electricity, but it can also be **converted**<sup>7</sup> into **biofuels**<sup>8</sup>. Biofuels are generally designed as straight replacements for fuels derived from fossil sources, and are available as **liquids**<sup>9</sup>, **solids**<sup>10</sup> or gases. They consequently provide more flexibility than most other forms of renewable energy, and are easier to use in existing systems, markets and infrastructures.

Although its main benefit is in reducing the use of fossil fuels, **bioenergy**<sup>11</sup> is good for the environment and society too. Unlike fossil fuels, bioenergy produces no net increase in CO<sub>2</sub> emissions. **Cultivating**<sup>12</sup> biomass may also create more jobs, especially local jobs, than the production of fossil fuels.

For practical purposes, biomass is usually plant **material**<sup>13</sup> based on **lignocellulose**<sup>14</sup>: **wood**<sup>15</sup> from **forestry**<sup>16</sup>, straw from **crop plants**<sup>17</sup> such as **wheat**<sup>18</sup>, **maize**<sup>19</sup> and **rice**<sup>20</sup>, or purpose-grown energy crops.

Biofuels are created from biomass using three families of conversion processes: biological, chemical and **thermochemical**<sup>21</sup>.

*The simplest thermochemical process for bioenergy is to burn wood or agricultural waste and use the resulting heat for drying, space heating or to run steam turbines.*<sup>①</sup>

**Gasification**<sup>22</sup>—a process of incomplete combustion—can turn biomass into a gaseous mixture of carbon **monoxide**<sup>23</sup> and hydrogen that can be burned in space heaters, boilers, **internal**<sup>24</sup> combustion engines or gas turbines.

## New Words and Expressions

- 1 biomass /'baɪəʊməs/ *n.* (单位面积或体积内)生物的数量
- 2 tissue /'tɪʃu:/ *n.* 薄纸, 棉纸, 组织
- 3 straw /strɔ:/ *n.* 稻草, 麦秆 *adj.* 稻草的, 麦秆的
- 4 biological /,baɪə'lɒdʒɪkl/ *adj.* 生物学的, 生物的 *n.* 生物制品
- 5 micro-organism /,maɪkrəʊ'ɔ:gənɪzəm/ *n.* 微生物
- 6 biogas /'baɪəʊgæs/ *n.* 生物气
- 7 convert /kən'veɜ:t/ *v.* 转变, 换算, 改变
- 8 biofuel /'baɪəʊfju:əl/ *n.* 生物燃料
- 9 liquid /'lɪkwɪd/ *n.* 液体, 流音 *adj.* 液体的, 清澈的
- 10 solid /'sɒlɪd/ *adj.* 固体的, 实心的, 结实的, 可靠的 *n.* 固体, 立方体
- 11 bioenergy /bi:'əʊnədʒɪ/ *n.* 生物能
- 12 cultivate /'kʌltɪveɪt/ *v.* 种植, 栽培, 改善
- 13 material /mə'tɪəriəl/ *n.* 材料, 原料 *adj.* 物质的
- 14 lignocellulose /,lɪgnəʊ'seljʊləʊs/ *n.* 木质纤维素
- 15 municipal /mju:'nɪsɪpl/ *adj.* 都市的, 内政的 *n.* 市政债
- 16 effluent /'efluənt/ *adj.* 发出的, 流出的 *n.* 污水, 工业废水
- 17 crop plants 作物
- 18 wheat /wi:t/ *n.* 小麦
- 19 maize /meɪz/ *n.* 玉米, 玉米色
- 20 rice *n.* 稻米 *v.* 筛选
- 21 thermochemical /,θɜ:məʊ'kemɪkəl/ *adj.* 热化学的
- 22 Gasification /,gæsɪfɪ'keɪʃən/ *n.* 气化
- 23 monoxide /mɒ'nɒksaɪd/ *n.* 一氧化物
- 24 internal /ɪn'tɜ:nl/ *adj.* 国内的, 内部的 *n.* 内脏, 本质

## Notes

- ① The simplest thermochemical process for bioenergy is to burn wood or agricultural waste and use the resulting heat for drying, space heating or to run steam turbines.

生物能源最简单的热化学过程就是通过燃烧木材和农业废弃物, 或者使用其所产生的热量进行干燥、空间加热和运行汽轮机。

### 1.2.4 Moving water

Humans have used water power to supply energy for almost as long as we've used