



普通高等教育“十二五”规划教材

# 信息科技英语

主 编 鲍玉军 陈 营  
副主编 杨丽莉 钱爱玲



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## 内 容 提 要

专业英语是理工科专业学生的一门必修课。根据高校信息类专业学生学习专业英语的特点,本书共分为两部分:Part I 为精读部分,共包含 17 个单元,主要涉及信息领域中的电子技术、数字信号处理、计算机技术、现代通信技术、传感器、自动化、机器人、新能源及其应用等专业领域中近几年比较先进的应用型英文科技文献资料。在每一个单元中包含了英语科技文献中常见的语法知识和课外阅读资料,并提供了大量的习题,从而使学生阅读、翻译科技文献的能力得到较大的提高。Part II 为信息领域专业阅读材料。

本书可作为普通高等学校的信息类专业英语教学用书或参考书,对于考研英语复习、撰写英文文章或者想了解先进技术资料的学生、相关工程技术人员也具有一定的参考价值。

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# 前言

为了贯彻落实教育部《国家中长期教育改革和规划纲要》和《国家中长期人才发展规划纲要》的重大改革决定,根据教育部2011年5月发布的《关于“十二五”普通高等教育本科教材建设的若干意见》,本着教材必须符合教育规律,有科学性、先进性、适用性,进一步完善具有中国特色的普通高等教育本科教材体系的精神和“卓越工程师教育培养计划”的具体要求,编写了《信息科技英语》教材。

《信息科技英语》符合教育部《关于“十二五”普通高等教育本科教材建设的若干意见》的精神和“卓越工程师教育培养计划”的具体要求。

本书具有以下特色:

(1) 符合教育部《关于“十二五”普通高等教育本科教材建设的若干意见》的精神,具有时代性、先进性、创新性,为培养造就一大批创新能力强、适应经济社会发展需要的高质量各类型工程技术人才和卓越工程师打下良好的专业基础。

(2) 特色鲜明,内容新颖。本书每个单元的精读内容和课外阅读材料均选自信息领域电子技术、数字信号处理、计算机技术、现代通信技术、传感器、自动化、机器人、新能源及其应用等专业领域近几年比较先进的应用型英文科技文献资料。

(3) 教材每个单元中均包含了英语科技文献中常见语法知识的详细介绍,并配以大量实例和相关习题,从而使学生阅读英文科技文献、翻译科技文献的能力得到大大的提高。

(4) 教材难度适中,适用面广,内容主要侧重于应用型英语科技文献,适用不同的读者学习和参考,也有利于普通高校教学之用。

本书由鲍玉军、陈营担任主编,杨丽莉和钱爱玲担任副主编。其中 Part I 部分中的 Unit 1~Unit 4 由鲍玉军编写、Unit 5~Unit 11 由陈营编写、Unit 12~Unit 16 由杨丽莉编写、Unit 17 和 Part II 部分则由钱爱玲编写。全书由鲍玉军统稿。

由于时间仓促,作者水平有限,书中难免有错误或不妥之处,恳请读者批评指正。

编者

2012年6月

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# Part I 精 读

## Unit 1

### Text A

#### Solar Power

The sun is a blazing globe of hot gases fuelled by nuclear fusion—where small atoms are squeezed together at great pressure to make heavier atoms with the release of massive amounts of energy<sup>[1]</sup>.

The energy from the sun is radiated out in all directions as light. Much of the energy striking the earth is reflected back into space by the atmosphere, but a staggering 90,000 TW of power arrives at the earth's surface, 6,000 times more power than the entire human race uses<sup>[2]</sup>.

Usually, the term solar energy is generally used to refer to methods of collecting light and turning it directly into a useful form of energy. And the main available technologies are:

#### 1. Solar Thermal Collectors

This technology uses a solar panel that is specifically designed to collect light and heat up. Some, more carefully insulated panels, do not require direct sunshine, and will work even on a cloudy day. Typical working temperatures are below 100°C, and the energy is normally used to provide either space heating or hot water for washing. For example, the flat panel solar collectors are generally cheaper systems per unit area. Solar thermal systems typically achieve efficiencies over 80%.

#### 2. Photovoltaic Cells

Photovoltaic (PV) cells, which convert light directly into electricity, have become commonplace on devices such as calculators and watches. There are a number of technologies in development with the aim of making PV more economic for electrical power generation. All use semiconductor materials like those used in silicon chips.

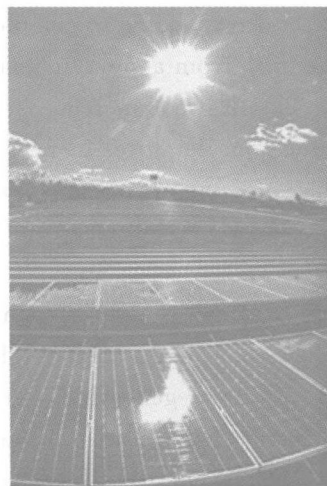


Fig. 1-1 Solar Energy

The heart of a PV cell is the interface between two different types of semiconductor. When a light photon hits a silicon atom in this region, it throws out an electron. The electron can travel through the n-type semiconductor to metal contacts on the surface. The hole left by the absence of the electron travels in the opposite direction. Once at the metal contact the electron flows through an electrical circuit back to meet up with a hole at the other contact.

As it flows through the external circuit, the electron does useful work, like charging a battery, or operating an electrical appliance. Photovoltaic systems have been reducing in cost, and increasing in efficiency in recent years. The most efficient commercially available systems can convert up to 16% of the light energy that strikes them into electrical energy<sup>[3]</sup>.

### 3. Solar Concentrators

If the sun's rays are concentrated using mirrors, much higher temperatures can be created—enough to make steam to drive a turbine and generate electricity<sup>[4]</sup>. The light is focused onto a central collector with oil flowing through it. The oil heats up to 400°C, and then moves on to heat water and make high pressure steam.

Solar concentrators only work in direct sunshine, with the collector aimed right at the sun. The mirror is held on a support that can turn to follow the sun as it moves throughout the day, adding to complexity and cost<sup>[5]</sup>. Because of this, they are only used in areas benefiting from a sunny climate, with more clear days.

The first commercial use of photovoltaic cells nearly 50 years ago was powering communications satellites in near-earth orbit. Today, the declining cost and increasing efficiency of solar energy technology has given rise to practical applications on earth—from powering personal electronic devices, homes and factories to generating utility-scale power.

Solar energy provides a huge advantage for satellites because they can be launched into orbit without the added weight of a fuel supply<sup>[6]</sup>. But the advantages on earth are even greater: Solar-generated energy provides abundant and pollution-free energy that's not dependent on fuel-delivery infrastructures, foreign relations or the price machinations of energy brokers and big business. Moreover, solar power generation provides energy when and where you need it, and is highly scalable to match your electrical demand.

### Words and Phrases

- |                                     |               |
|-------------------------------------|---------------|
| 1. blazing ['bleiziŋ] <i>adj.</i>   | 炽烧的, 闪耀的      |
| 2. nuclear fusion                   | [核] 核子融合; 核聚变 |
| 3. squeeze ['skwiz] <i>v. n.</i>    | 压榨, 挤, 挤榨     |
| 4. massive ['mæsiv] <i>adj.</i>     | 厚重的, 大块的      |
| 5. atmosphere ['ætmosfiə] <i>n.</i> | 大气, 空气        |



6. staggering [ˈstægəriŋ] <i>adj.</i>	令人惊愕的
7. flat panel	“平板式” 太阳能
8. photovoltaic [ˈfəʊtəʊvɒlˈteɪɪk] <i>adj.</i>	光电的; photovoltaic cell 光电电池
9. calculator [ˈkælkjuleɪtə] <i>n.</i>	计算机, 计算器
10. silicon chip	硅片
11. light photon	可见光子
12. n-type semiconductor	N 型半导体
13. opposite direction	相反方向
14. turbine [ˈtəːbɪn] <i>n.</i>	涡轮 (机)
15. concentrator [ˈkɒnsentreɪtə] <i>n.</i>	集中器
16. climate [ˈklaɪmɪt] <i>n.</i>	气候
17. declining <i>adj.</i>	倾斜的
18. utility-scale	效用率
19. be dependent on	依靠, 依赖
20. delivery [dɪˈlɪvəri] <i>n.</i>	递送, 交付, 传输
21. scalable [ˈskeɪləbl] <i>adj.</i>	可升级的

### Notes to the Text

[1] The sun is a blazing globe of hot gases fuelled by nuclear fusion—where small atoms are squeezed together at great pressure to make heavier atoms with the release of massive amounts of energy. 此句中 fuelled by nuclear fusion 作后置定语修饰 gases, where 引导的是一个定语从句。译文: 太阳是由核聚变产生的炽热气体组成的巨大发光球体。其中的小原子经过高压挤压形成较重的原子, 并在挤压过程中释放出巨大能量。

[2] Much of the energy striking the earth is reflected back into space by the atmosphere, but a staggering 90,000 TW of power arrives at the earth's surface, 6,000 times more power than the entire human race uses. 此句包含两个由 but 连接的分句, 第一个分句使用的是被动语态, striking the earth 为现在分词短语作定语修饰 energy。译文: 到达地球的许多能量通过大气被反射回太空, 但仍有多达 90,000 万亿瓦的电能会到达地球表面, 这比整个人类所用的还多出 6,000 倍。

[3] The most efficient commercially available systems can convert up to 16% of the light energy that strikes them into electrical energy. 此句的主语是 The most efficient commercially available 所修饰的 systems, conver... into... 表示“将转换为……”, 短语 up to 有“多达”之意, strike 在这里有“照在……上, 照射”的意思, that 引导的定语从句先行词是 energy。译文: 最有效的商用 (太阳能) 系统可将照射在其上多达 16% 的光能转换为电能。

[4] If the sun's rays are concentrated using mirrors, much higher temperatures can be created—enough to make steam to drive a turbine and generate electricity. 此句中 If 引

导的是一个条件状语从句，破折号在这里用来表示补充或附加说明。译文：如果使用反射镜把太阳的光线集中起来，会产生更高的温度，这足以使蒸汽带动涡轮发电。

[5] The mirror is held on a support that can turn to follow the sun as it moves throughout the day, adding to complexity and cost. 此句中 that 引导了一个定语从句，其先行词是 support，support 在本句中作名词用，意为“支撑物，支座，支架”，as it moves throughout the day 在这里做伴随状语，adding to complexity and cost 作结果状语。译文：反射镜被放置在一个支架上，支架可以在全天随着太阳直射的方向旋转，这就增加了复杂性和成本。

[6] Solar energy provides a huge advantage for satellites because they can be launched into orbit without the added weight of a fuel supply. 此句中包含了一个原因状语从句，从句中代词 they 指代 satellites，without the added weight of a fuel supply 作状语。译文：太阳能对于卫星的发射有一个巨大优势，因为借助太阳能可免去卫星自身燃料供应的负载而将它发射到轨道当中。

## Text B

### Nuclear Energy

Electricity, which plays such an important role in our lives, is generated in a power plant. This interaction depicts a Pressurized Water Reactor (PWR) nuclear power plant. The function of any power plant is to convert some material or source of energy into electricity.



Fig. 1-2 Daya Bay Nuclear Power Station in China

A nuclear power plant uses steam to generate electricity the same as a fossil fuel power plant. The major difference between a fossil fuel power plant and a nuclear power plant is the method used to heat the water and produce steam<sup>[1]</sup>. In a nuclear power plant, ura-

nium takes the place of coal, oil or gas to be the fuel used to heat water and produce steam.

A nuclear reaction occurs when uranium atoms split into smaller particles in a chain reaction that produces large amounts of heat<sup>[2]</sup>. This heat-producing fission process is controlled in a reactor. The core of the reactor contains the uranium fuel.

The fission process takes place within the fuel assemblies in the reactor core and is controlled by the control rods. Control rods, located inside the fuel assembly, are made of a material which absorbs neutrons. In addition to control rods, operators use boron dissolved in the coolant to absorb neutrons to control the fission process<sup>[3]</sup>.

The nuclear energy released by fission heats the water or coolant that flows through and around the fuel assemblies. In a nuclear power plant the coolant prevents the core of the reactor from becoming too hot and also carries heat away from the reactor to the steam generator<sup>[4]</sup>.

In a PWR, the system of piping that contains the coolant is called the primary side. The separate system of piping where steam is produced to spin the turbine is called the secondary side. The primary side water and the secondary side water do not mix.

In a nuclear power plant, a vessel known as a pressurizer keeps the primary side at high pressure to prevent boiling, yet allowing water temperatures to reach 600 degrees Fahrenheit. Heat from the primary side water is transferred to the secondary side through the steam generator. Since the secondary side water is at a lower pressure than the primary side, the secondary side water boils and becomes steam, which turns the turbine.

Because the fission process is radioactive, several barriers are built into every plant to protect against the release of radioactivity.

Besides these physical barriers, nuclear plants have a number of independent backup systems designed to operate in the event that normal operation of the plant is disrupted<sup>[5]</sup>. In addition, the reactor, all the safety devices, and the plant itself are constantly monitored and controlled from a control room. Highly trained technicians, government-licensed operators and nuclear engineers keep watch over computers, dials, gauges and controls at all times.

Our world must have an abundant and available source of electricity to prosper and grow. Nuclear energy can help to provide the electricity we need today and tomorrow in a safe, environmentally friendly manner.

### Words and Phrases

- |  |           |
|--|-----------|
| 1. Nuclear Energy                        | 核能        |
| 2. electricity [i'lek'trisiti] <i>n.</i> | 电流, 电, 电学 |
| 3. power plant                           | 发电厂, 发电站  |
| 4. depict [di'pikt] <i>vt.</i>           | 描述, 描写    |

5. fossil ['fɒsl] <i>adj.</i>	化石的, 陈腐的, 守旧的;
<i>n.</i>	化石, 僵化的事物
6. uranium [juə'reiniəm] <i>n.</i>	铀
7. take the place of	替代
8. chain reaction	连锁反应
9. fission ['fiʃən] <i>n.</i>	<物> (原子的) 分裂, 裂变
10. assembly [ə'sembli] <i>n.</i>	集合, 装配, 集会, 集结, 汇编
11. neutron ['nju:trɒn] <i>n.</i>	中子
12. coolant ['ku:lənt] <i>n.</i>	冷冻剂, 冷却液, 散热剂
13. turbine ['tə:bin, -baɪn] <i>n.</i>	涡轮机
14. vessel ['vesl] <i>n.</i>	船, 容器, 器皿, 脉管, 导管
15. pressurizer <i>n.</i>	加压器, 增压器, 保持压力装置
16. Fahrenheit ['færənhaɪt, 'fær-] <i>adj.</i>	华氏温度计的
<i>n.</i>	华氏温度计
17. radioactive ['reɪdiəu'æktɪv] <i>adj.</i>	放射性的, 有辐射能的
18. backup system	后备系统, 辅助系统, 备用系统
19. disrupt [dis'rʌpt] <i>v.</i>	使中断, 使分裂, 使瓦解, 使陷于混乱, 破坏
20. government-licensed <i>adj.</i>	经政府许可的
21. abundant [ə'bʌndənt] <i>adj.</i>	丰富的, 充裕的
22. environmental [ɪnvaɪərən'mentl] <i>adj.</i>	周围的, 环境的
<i>n.</i>	环境论

### Notes to the Text

[1] The major difference between a fossil fuel power plant and a nuclear power plant is the method used to heat the water and produce steam. 此句属于主系表结构, 主语是 The major difference, between... plant 作为它的定语, used to... steam 做 method 的定语。译文: 火力发电厂与核电站的主要区别就是把水加热产生蒸汽所用的方法不同。

[2] A nuclear reaction occurs when uranium atoms split into smaller particles in a chain reaction that produces large amounts of heat. 此句中 when 引导的是时间状语从句, that 引导的定语从句的先行词是 reaction。译文: 铀原子核在分裂为更小粒子的连锁反应中会释放出大量热量, 此时就发生了核反应。

[3] In addition to control rods, operators use boron dissolved in the coolant to absorb neutrons to control the fission process. 此句中 dissolved in the coolant 作为定语修饰 boron, to absorb neutrons 和 to control the fission process 都作目的状语。译文: 除了控制棒, 操作者还用溶解在冷却液中的硼来吸收中子以控制裂变过程。

[4] In a nuclear power plant the coolant prevents the core of the reactor from becoming too hot and also carries heat away from the reactor to the steam generator. 此句中 In a nuclear power plant 作状语, 主语为 the coolant。短语 prevent sb./sth. from doing

sth. 有“阻止某人/某事做某事，以免”的意思。译文：在核电站，冷却液可防止反应堆芯过热，并把热量从反应堆传送至蒸汽发生器。

[5] Besides these physical barriers, nuclear plants have a number of independent backup systems designed to operate in the event that normal operation of the plant is disrupted. 此句中 designed to... 作为定语修饰 backup systems, in the event... 作为状语, in the event that 的意思是“如果，万一，在……情况下”。译文：除了这些物理屏障，核电站还有许多独立的后备系统，当正常的操作被中断的情况下，它们便可以派上用场。

# Grammar

## 动名词

动名词在形式上与现在分词是完全一致的，只能通过分析其在句中的语法功能来对它们进行区别。动名词有主动态和被动态、一般式和完成式，以及物动词“do”为例，详述见 Table 1-1。

Table 1-1 “do” 的动名词的各种形式		
时态 \ 语态	主动态	被动态
一般式	doing (常用)	being done (常用)
完成式	having done	having been done

在科技英语中，通常以一般式的主动形式为最常见，其次是一般式的被动形式较为常见。当动名词带有自己的宾语或状语等时就称为动名词短语，它在句子中的座位一个整体担当某一句子成分的作用。

动名词在句子中主要起到名词的 4 种主要作用：主语、直接做宾语、表语和介词宾语。下面分别加以介绍。

### 1. 动名词做主语

动名词做主语，句子的谓语通常用现在时、单数、第三人称。

*Changing the resistance* is a method of controlling the flow of current.

改变电阻是控制电流的一种方法。

*Closing the switch* connects the cranking motor to the battery. (crank [kræŋk] v. 转动)

合上开关就把启动马达与蓄电池接通了。

*Adding an electron to a neutral atom* gives it a negative charge; *taking an electron away from a neutral atom* gives it a positive charge.

给中性原子增加一个电子就使它带负电荷；从中性原子取出一个电子就使它带正电荷。

(“adding... atom”和“taking... atom”是两个动名词短语，在句子中均作为主语。)

*Heating a gas* causes the molecules to move faster, and to become further apart.

加热气体使其分子运动得更快，相距得更远。

当动名词短语在句中做主语，而它的谓语是一种系表关系时，可用“it is + 形容词 + 动名词短语”的形式，如：

It is no use *employing radar to detect objects* in water.

用雷达探测水中目标是行不通的。

Sometimes the astronauts found it was difficult *keeping their feet underneath their bodies on the moon*. (astronaut ['æstrənɒt] n. 宇航员)

有时候宇航员们发现，在月球上，要使他们的双脚保持站立姿势是困难的。

(动名词短语“keeping... the moon”是宾语从句中的主语，it是形式主语。)

## 2. 动名词直接做宾语

某些动词要求动名词直接做宾语，常见的动词有：appreciate (鉴赏)、consider (考虑)、imagine (想象)、understand (理解)、finish (完成)、deny (否定)、mind (介意)、perform (执行，完成)、forbid (禁止)等，这类动词很多，需要大家平常加以记忆。

He has *finished correcting* the students' papers.

他已改完学生的试卷。

We *delay sending* doctors to that country.

我们推迟派医生去那个国家去。

To change the direction of travel of radio waves requires *changing the direction* of lines of electric forces.

要改变无线电波的传播方向，就要改变电力线的方向。

This device keeps the air in the room at a higher pressure than outside and helps to stop air *coming in*.

这个装置使室内的空气压力大于室外，并有助于阻止空气入内。

## 3. 动名词作表语

通常，充当表语的动名词主要用于be之后，用以表达句子主语的内容，而不是主语发出的动作。但在进行时态的句子中，doing的动作是由主语发出的。

The shortest distance between raw material and a finished part is *casting*.

铸造是把原材料加工为成品的最简便的方法。

Radar is *detecting and ranging* by radio.

雷达就是用无线电探测和测距。

Automation may mean *linking together a group of automatic machines* performing different operations to form an automatic production line. (automation [ɔtə'meɪʃən] n. 自动控制，自动操作)

自动化可以理解为，把完成不同作业的自动化机器连接起来，以形成一条自动化生产线。

Mechanization is *using machines instead of hand labor*. (mechanization [mekənaɪ'zeɪʃən] n. 机械化，机动化)

机械化就是用机器来代替手工劳动。

作表语的动名词与不定式的区别主要在于：动名词表示经常性的、抽象的行为；而动名词不定式表示一次性行为。如：

Our purpose is *developing our nuclear industry* at a higher speed.

我们的目的是更快地发展核工业。

His work today is *to machine a crank shaft*.

他今天的工作是加工一条曲轴。

#### 4. 动名词做介词宾语

动名词做介词宾语时，在介词后主要表示一种动作（其前面不能有任何冠词、形容词等）。它与介词一起构成介词短语，在句中做定语或状语。

Energy is involved in *doing work*, or in heating an object.

能量在于它做功，或使物体变热。

（动名词 *doing* 和 *heating* 均为介词 *in* 的宾语。）

In the dynamo, mechanical energy is used for *rotating the armature between the poles of an electromagnet*. (dynamo ['daɪnəməʊ] *n.* 发电机)

在直流发电机中，机械能被用来转动电磁铁两极之间的电枢。

（动名词 *rotating* 是介词 *for* 的宾语。）

However, if light is to be considered as *having wave nature*, interference and diffraction effects must be expected.

但是，如果考虑到光具有波动性，那么可以预期，光必然有干涉和衍射效应。

（动名词短语 “*having ... nature*” 在句中做介词 *as* 的宾语。）

Potential energy is capable of *being easily changed into kinetic energy*. (potential [pə'tenʃ(ə)l] *adj.* 潜在的，可能的，势的，位的)

位能可容易地转变为动能。

（“*being changed*” 为动名词一般式被动形式。）

### Exercises

#### 1. 翻译短语

发电系统      风力发电      太阳能发电      供电系统

电力系统      单相供电      电力供需      用电统计

发电量      起动电流      永磁同步发电机      异步发电机

solar energy panel      carbon emissions      Step-Up Converters

phase-controlled rectifying bridge      rated voltage      rectified voltage

electricity transmission      superelectricity transmission power line      harmonic current

#### 2. 画出句子中的动名词（或动名词短语），说明其在句中的语法功能，并将句子翻译为汉语

(1) Alloying a metal not only increases its hardness but also its electrical resistance.

(2) Improving the lubricant, introducing more perfect bearings and decreasing the

resistance on the part of the medium in which the motion is taking place are means of bringing the efficiency nearer to one (to 100%) . (lubricant ['lu:brikənt] *n.* 滑润剂)

(3) Animals cannot stop breathing and plants cannot stop absorbing while the surrounding atmosphere is diluting and cleansing itself. (atmosphere ['ætəməsfiə] *n.* 大气, 空气; dilute [dai'ljʊt,di'l-] *v.* 冲淡, 变淡)

(4) There is a well-known laboratory experiment that involves stretching a metal wire and observing the resulting increase in length.

(5) If progress in using atomic power to drive machines is fast enough, it is possible that oil-driven engines may give place to the new kind of engine.

(6) Using a computer to transcribe shorthand will be of great help whenever immediate transcripts are necessary. (transcribe [træns'kraib] *v.* 转录)

(7) Combining aluminum with copper, magnesium, and other metals yields an alloy that is light, yet strong enough to stand up to the stresses of flight. (aluminum [ə'ljuminəm] *n.* 铝)

(8) It is no use learning a theory without practice.

(9) One of the reasons for metal corrosion is being kept in the open air. (corrosion [kə'reʊzən] *n.* 侵蚀, 腐蚀状态)

(10) The mastery of science means mastering the law of nature.

(11) The relationship among the charge, field, and potential can be analyzed by using the results of these two chapters.

(12) Before considering the rate of change of a function, we shall first discuss the concept of a limit.

(13) The process of changing AC into DC is known as "rectification" .

### 3. 将下述短文翻译为汉语

(1) Transformers are related to the properties of inductors. If an inductor with an AC voltage across it is placed in parallel to a second inductor, the electromagnetic field of the first inductor will induce an AC voltage into the second inductor. When the two coils referred to as windings are placed on a core, they become a transformer. The input voltage is to the primary winding and the induced voltage is taken off the secondary winding. According to the proportion of two windings' number, transformer can be distributed into step-up transformer and step-down transformer.

(2) Capacitors are used in power supplies to smooth out pulsating DC and to produce steady DC voltage. A simple capacitor filter is connected across the output. When this peak voltage begins to decrease, the stored electrons in the negative side of the capacitor will discharge and flow through the load in an attempt to keep the voltage constant across the capacitor. The slight charging and discharging of the capacitor produces a ripple voltage (AC component) that is superimposed on the top of the steady DC.



## Reading Material

### Wind Power

We've used the wind as an energy source for a long time. The Babylonians and Chinese were using wind power to pump water for irrigating crops 4,000 years ago, and sailing boats were around long before that. Wind power was used in the Middle Ages, in Europe, to grind corn, which is where the term "windmill" comes from.

The Sun heats our atmosphere unevenly, so some patches become warmer than others. These warm patches of air rise, other air blows in to replace them—and we feel a wind blowing. We can use the energy in the wind by building a tall tower, with a large propeller on the top. The wind blows the propeller round, which turns a generator to produce electricity.

We tend to build many of these towers together, to make a "wind farm" and produce more electricity. The more towers, the more wind, and the larger the propellers, the more electricity we can make. It's only worth building wind farms in places that have strong, steady winds, although boats and caravans increasingly have small wind generators to help keep their batteries charged.



Fig. 1 - 3 Wind Power Station

The best places for wind farms are in coastal areas, at the tops of rounded hills, open plains and gaps in mountains—places where the wind is strong and reliable. Some are offshore. To be worthwhile, you need an average wind speed of around 25 km/h. Most wind farms in the UK are in Cornwall or Wales.

Isolated places such as farms may have their own wind generators. In California, several "wind farms" supply electricity to homes around Los Angeles.

The propellers are large, to extract energy from the largest possible volume of air. The blades can be angled to "fine" or "coarse" pitch, to cope with varying wind speeds, and the generator and propeller can turn to face the wind wherever it comes from. Some designs use vertical turbines, which don't need to be turned to face the wind.

The towers are tall, to get the propellers as high as possible, up to where the wind is stronger. This means that the land beneath can still be used for farming.

### Advantages

- ◆ Wind is free, wind farms need no fuel.