Electrical Engineering

普通高等教育"十一五"规划教材
PUTONG GAODENG JIAOYU SHIYIWU GUIHUA JIAOCAI

DIANLI ZHUANYEYINGYU

电力专业英语

（第三版）

刘 然 包兰宇 景志华 编著

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内 容 提 要

本书为普通高等教育“十一五”规划教材。本书是为满足高等学校专业英语教学的需要而编写的专业英语教材。全书共分12个单元，每个单元侧重一个专业，内容涉及到发电、供电、继电保护、汽轮机、锅炉、热控、通信、核能、水电等十几个专业，是一本电力系统各专业通用的教材。

本书主要作为高等学校电气工程及其自动化专业教材，也可作为科技人员和工程技术人员学习专业英语的参考用书。

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Ⅰ. 电… Ⅱ. ①刘…②包…③景… Ⅲ. 电力工业-英语-高等学校-教材 Ⅳ. H31

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第三版前言

专业英语课程是大学英语教学的一个重要组成部分。专业英语课程设置的目的不是用来复习和补充专业知识，而是借助专业知识的“桥梁”来学习另一种文化背景下语言的表述、概念的澄清、能力或技巧的培养，提高对英语语言的应用能力。专业英语教材既是教授学生英语专业知识的媒介，又是让学生了解本专业最新科学技术发展状况的窗口。因此，本书在编写过程中，突出了以下几个特点：

1. 题材多样，电力系统专业知识覆盖面广。不只局限于某单一专业，而是加入了相关专业的内容，让学生对相关专业有所了解，为以后的专业扩展打下基础。

2. 书中所有素材都选自英语原文资料，语言地道、准确、难易适中。

3. 每单元围绕一个主题，打破了专业英语教材通常的编写体例，除了阅读和翻译两项内容之外，每单元都有翻译技巧训练和各种形式的练习。教师可以采用边讲边练的教学方法，将英语技能与专业知识有机地结合在一起，实现专业英语课程的教学目标。

4. 各单元自成体系，教师可根据课时的多少自主选取学习内容。

本书第一版的编者都是电力系统院校的英语教师。为了使本书在专业知识方面的内容更加准确，具有一定的学术水平，从内容设计、素材的搜集到编写过程，编者都充分利用电力院校的专业人才优势，随时向专业教师请教，征求意见，不断修改。可以说，本书是英语教师和电力系统专业课教师共同的劳动结晶。

《电力专业英语》第一版由刘然担任主编，参加编写的有俞晓箭、孟丽君、金品卓、曹艳春、刘俊琦、包兰宇、林晓琴、郑仰成、景志华和关哲。沈阳工程学院张铁岩教授对此书做了初审，对外贸易大学单其昌教授和外籍教师 Mr. Peter B. McLaren 与 Ms. Sharon L. Calladine 对其进行了最后审校。

此书第二版和第三版的修订编写工作是由刘然、包兰宇和景志华合作完成。根据各校电力专业英语教学的实际情况和要求，在第一版的基础上对此书从编排体例、结构和内容等方面进行了修改。

编　者

2009 年 3 月

目　录

Unit One

Passage A

The Production of Electrical Energy

Although our concern in this book is with the electrical aspects of power systems, it is important to know what basic energy sources can be used to produce electrical energy on a large scale. Electrical energy sources can be broken down into two broad categories, thermal and non-thermal. A brief discussion of varying alternatives follows below.

Thermal Sources

Coal. Substantial reserves and the development of the necessary technology mean that coal is and will continue to be a major energy source. Presently coal represents about 45% of total electrical energy sources.

Oil and Natural Gas. In the 1950s and 1960s there was a trend toward greater utilization of these fuels because of their superior combustion properties. However, the cost, scarcity, and competition from petroleum products indicate that while these fuels will remain important for electrical energy production, their percentage share of total energy supply will decrease.

Nuclear Fission from Uranium. Since the 1950s fission reactors have been used commercially for the production of electrical power. Uranium resources in the U. S. are slightly less than oil and gas reserves. Serious problems relating to environmental impact have accentuated social concern and some legal and regulatory constraints have been placed upon the development of this resource. A prudent growth in the comparative importance of this source is expected, along with a legitimate and proper concern for the environment.

Solar. It is possible to collect solar energy directly and concentrate it on steam boilers. The major problems are the diffuse nature, which requires large areas for collection, and the unreliability of atmospheric conditions. At present there are no commercial installations. This source is particularly attractive as no "fuel" is required and because of its non-polluting characteristics.

Nuclear Fusion. Certain types of nuclear reaction are possible, where certain light nuclear particles can be combined, or fused, into heavier particles. Such reactions produce pure energy. The most attractive feature here is that common elements such as hydrogen isotopes can be used as fuel, making this source essentially inexhaustible. The difficulty is that a sustained fusion reaction requires production of extremely high temperatures and particle concentrations for a sufficiently long time. The technical problems associated with this are formidable and most experts will not predict commercial installation until well into the next century.

Geothermal. Heat from the earth's interior and subsurface water combine to produce natural steam, which can be used for electricity production. Total reserves are estimated at up to about half of the total gas and oil reserves. Expectations are that this resource will continue to be developed, but that it will only make a minor contribution to the total energy supply.

Biomass. Synthetic gas can be produced from organic material grown expressly for this purpose. Cerrently the amount of electrical energy produced from this source is negligible , and is not expected to be very significant in the future.

Garbage and Sewage. There are combustible components in garbage that can be used as fuel; these components are separated from noncombustible items and mixed with coal. Sewer gasses are also combustible. In certain situations utilization of these fuels may prove to be economical; however, such installations should be viewed as supplementary, and would contribute only a small fraction of the total energy supply.

Nonthermal Sources

Hydro. Hydroelectric power has been an economical and pollution free course of energy. It currently stands at about 12% of the total energy supply. It has the advantage of being immediately (within seconds at least) available, whereas thermal sources meet demand at a much slower rate. Hydroelectric sources are constrained by navigational requirements and actual or predicted rainfall.

Tidal. There are a few sites around the world where it proves economical to convert the change in potential energy caused by tide levels into an electrical form. The percentage of total energy supply output is quite small, and expected to remain so.

Wind. Wind can be used to drive turbines that in turn drive electricity generators, because wind is intermittent, such a system must include energy storage devices, such as batteries, or supply loads that are tolerant of unpredictable source interruptions. As isolated electric power supplies, such systems are now commercially available in sizes up to about 50 kW. Research on much larger units is currently under way; presently, wind energy is negligible as a fraction of the total energy output.

Wave. There have been several experimental machines designed to convert kinetic wave energyinto electricity. None as of now appears to have been feasible for large-scale economic electrical energyproduction.

New Words

1. thermal [ˈθəːməl] *a.* 热的，热量的；由热造成的
2. nonthermal [ˈnɔnˈθəːməl] *a.* 非热的
3. utilization [ˌjuːtilaiˈzeiʃən] *n.* 利用
4. combustion [kəmˈbʌstʃən] *n.* 燃烧

5. scarcity ['skεəsiti] *n.* 缺乏；萧条
6. fission ['fiʃən] *n.* 分裂；裂变
7. uranium [juə'reinjəm] *n.* 铀
8. impact ['impækt] *n.* 影响；效果；冲击
9. accentuate [æk'sentjueit] *vt.* 强调；增强
10. regulatory ['regjulətəri] *a.* 规章的；受规章限制的
11. prudent ['pru:dənt] *a.* 谨慎的；慎重的
12. concurrent [kən'kʌrənt] *a.* 共有的；合作的；一致的
13. legitimate [li'dʒitimit] *a.* 合法的；合理的；正统的
14. diffuse [di'fju:s] *a.* 扩散的；漫射的；向各个方向移动的
15. installation [instɔ:'leiʃən] *n.* 安装；设备；设施
16. fusion ['fju:ʒən] *n.* 熔化；合成；聚变
17. fuse [fju:z] *vt. vi.* 熔化；熔合
18. isotope ['aisəutəup] *n.* 同位素
19. formidable ['fɔ: midəbl] *a.* 难对付的；难克服的
20. geothermal [dʒi (:) əu'θə:məl] *a.* 地热的；地温的
21. subsurface ['sʌb'sə:fis] *a.* 表面下的
22. biomass ['baiəumæs] *n.* 生物量
23. expressly [iks'presli] *ad.* 明显地，明确地；特意地
24. negligible ['neglidʒəbl] *a.* 可以忽略的，微不足道的
25. garbage ['ga:bidʒ] *n.* 垃圾；废料
26. sewage ['sju (:) idʒ] *n.* 污水，污物
27. combustible [kəm'bʌstəbl] *a.* 易燃的；可燃的
28. noncombustible ['nɔnkəm'bʌstəbl] *a.* 不易燃烧的
29. sewer [sjuə] *n.* 阴沟，排水管
30. supplementary [sʌpli'mentəri] *a.* 补充的，增加的
31. hydro. ['haidrəu] *a.* = hydroelectric 水力发电的
32. constrained [kən'streind] *a.* 被强迫的；被约束的
33. tidal ['taidl] *a.* 潮汐的
34. inherently [in'hiərəntli] *a.* 内在的；固有的；生来的
35. intermittent [ˌintə (:) 'mitent] *a.* 间歇的；周期性的
36. tolerant ['tɔlərənt] *a.* 忍受的，容忍的
37. kinetic [kai'netik] *a.* 动力学的；运动的；活跃的；有力的

Phrases and Expressions

1. a trend toward 有……的趋势
2. superior combustion properties 较好的燃烧性能
3. commercial installations 商业设施

4. particle concentrations 粒子聚集
5. subsurface water 地下水
6. synthetic gas 合成气体
7. organic material 有机材料
8. be separated from 从……中分离出来
9. navigation requirement 水上航运要求
10. as of now 到现在为止

Skills of Translation

词 义 的 选 择

一般说来，在科技英语的翻译过程中要遵循"忠实原文、通俗易懂"的原则。首先要熟悉背景，理解原文，并注意用恰当的汉语确切地表达原文的意思。最后要校对、复核和定稿。

英语中一词多义的现象比较普遍。翻译时，要在许多不同的词义中选出一个最确切的词义，才能使译文正确。词义选择一般从以下几个方面入手：

一、根据词类选择词义

Microprocessors monitor tyre wear and brake power on cars. （*v.* 检查，检测）

微机检测汽车轮胎的耐用性和制动力。

The patient was connected to a television wave monitor. （*n.* 监视器）

病人的情况曾通过波形监视器监视。

二、根据上下文选择词义

The country's industry has developed quickly in the last decade.

过去十年里我国工业迅猛发展。

To develop the instrument, many experts were invited.

在研制这种仪器时请了许多专家。

三、根据专业选择词义

Power can be transmitted over a long distance.

电力能输送到很远的距离。

Friction causes a loss of power in the machine.

摩擦会引起机器功率的损耗。

China will not be the first to use nuclear weapons although considered one of the nuclear powers.

尽管中国被看作是核大国之一，但中国决不会首先使用核武器。

四、根据搭配选择词义

high beam 远距离光束

high brass 优质黄铜

high current 强电流

high explosive 烈性炸药
high gear 高速齿轮
high seas 公海
high summer 盛夏
high steel 硬钢

Exercises

Ⅰ. Decide whether the following statements are True (T) or False (F) according to the text:

1. ________ There are two main categories of electrical power sources, thermal and non-thermal.
2. ________ The amount of oil and gas used as electrical power energy sources will increase.
3. ________ Solar power has been widely used to produce electricity.
4. ________ Up to now, we haven't got commercial installations using nuclear fusion as fuel.
5. ________ We can use the noncombustible materials in garbage as fuel.
6. ________ Some scientists are developing larger power units to use wind.

Ⅱ. Translate the following expressions into Chinese or English:

1. the electrical power system	________________
2. ________________	计算机系统
3. a hydraulic turbine	________________
4. ________________	汽轮机
5. mechanical power	________________
6. ________________	化学能
7. petroleum products	________________
8. ________________	石油设备
9. collect solar energy	________________
10. ________________	集邮
11. light nuclear particles	________________
12. ________________	重核粒子
13. nuclear reactions	________________
14. ________________	核武器
15. synthetic gas	________________
16. ________________	合成纤维
17. potential energy	________________
18. ________________	潜在的资源
19. a thermal power station	________________

20. ______________________ 热量单位

Ⅲ. Fill in the following blanks with the words given. There are extra items.

impact	utilization	combustible	negligible	installation	a trend toward (s)
scarcity	thermal	fuse	be separated from	formidable	garbage

1. The street is covered with old tins and other forms of ______________.
2. Where is the heating ______________ in this factory?
3. Lead will ______________ at a lower temperature than some other metals.
4. He made a great ______________ on literature and art in his time.
5. There is ______________ wearing dark color shirts this summer.
6. Petroleum is highly ______________, so don't smoke while you're handling it.
7. Theory should by no means ______________ practice.
8. There was a ______________ amount of rain last year.
9. There are more ______________ power stations than hydroelectric stations.
10. The examination paper contained several ______________ questions.

Ⅳ. Put the following sentences into English.

1. 到目前为止，煤仍然是生产电能的一种重要原料。(as of now)

____

____

2. 一些有机材料可以用来生产合成气体。(organic materials)

____

____

3. 我们可以将垃圾中的可燃成分与煤混合来发电。(mix … with)

____

____

4. 水力发电的优点之一就是没有污染。(nonpolluting characteristic)

____

____

5. 利用石油和天然气发电的状况将会改变。(utilization)

____

____

Passage B

A Brief History of the Power Industry (1)

Prior to 1800 the study of electrical and magnetic phenomena had been of interest to only a few scientists. William Gibbert, C. A. De Coulomb, Benjamin Franklin, and a few others made significant contributions to the meager store of piecemeal knowledge about electricity. But at that time no applications were known, and studies were motivated only by intellectual curiosity. People illuminated their homes with candles, whale oil lamps, and kerosene lamps, and motive power was supplied mostly by people and draft animals.

From about 1800 to 1810 commercial illuminating gas companies were formed, first in Europe and shortly thereafter in the Untied States. The tallow candle and kerosene interests, sensing vigorous competition from this young industry, actively opposed gas lighting, describing it as a health menace and emphasizing its explosive potential. However, the basic advantage of more light at lower cost could not be suppressed indefinitely, and steady growth in the industry occurred throughout the nineteenth century, with the industry at its zenith in about 1885.

Exciting advances in understanding electrical and magnetic phenomena occurred during this same period. Humphrey Davy, Andre Ampere, George Ohm and Karl Gauss made significant discoveries, but the discovery that was to become basic to elevating electricity from its status as an interesting scientific phenomena to a major technology with far reaching social implications was made by two independent workers, Michael Faraday and Joseph Henry. Ampere, among others, observed that magnetic fields were created by electric currents; yet no one discovered how electrical currents could be produced from magnetic fields. Faraday worked on such problems from 1821 to 1831, finally succeeding in formulating the great law that bears his name. He subsequently built a machine that generated a voltage based on magnetic induction principles. Independently, Joseph Henry also discovered electromagnetic induction at about the same time, and went on to apply his discoveries to many areas, including electromagnets and the telegraph.

Several workers, including Charles Whetstone, Alfred Werner and Carl Siemens applied the induction principle to the construction of primitive electrical generators in the period from about 1840 into the 1870s. About the same time a phenomenon discovered some years earlier began to receive serious attention as a practical light source. It was observed that when two current-carrying carbon electrodes were drawn apart and electric arc of intense brilliance was formed.

Commercialization of arc lighting accoured in the 1870s, with the first use as in lighthouse illumination; additional applications were street lighting and other outdoor installations. Predictably, arc lighting provided the stimulus to develop better and more efficient generators. An American engineer, C. F. Brush, made notable contributions in this area with his series arc lighting system and associated generator. The system was practical and grew into a successful business with little opposition from gas illuminating companies, since they did not directly compete in the same applications. The principal objection to arc lighting was its high intensity, making it unsuitable for most indoor applications. For those uses, gas lighting was still the best choice.

Observers noted as early as 1809 that current-carrying materials could heat to the point of incandescence. The idea of use of them as a light source was obvious, and a great many workers tried to produce such a device. The main problem was that the incandescent material quickly consumed itself. In an effort to retard or prevent this destruction, the material was encased in a globe filled with inert gas or a vacuum. The problem of placing a material with a high melting point, proper conductance, and good illuminating properties into a globe with an atmosphere proved too much for the technology of the time. Some small improvement was noted from time to time, but until the 1870s the electric lamp was far from a practical reality.

A 29-year-old inventor named Thomas Edison came to Menlo Park, New Jersey, in 1875 to establish an electrical laboratory to work on a number of projects, including the development of an incandescent electric lamp. In October 1879, after innumerable unsuccessful trials and experiments, an enclosed evacuated bulb containing a carbonized cotton thread filament was energized. Some three years later, in 1882, the first system installed to sell electrical energy for incandescent lighting in the United States began operation from Pearl Street Station in New York City. The system had dc, three wire, 220/110 volts, and supplied a load of Edison lamps with a total power requirement of 30 kilowatts. The electric motor was already known, and the existence of an electrical supply was a ready made incentive to its refinement and commercial acceptance. Use of electrical motive power quickly became popular, and was employed for many applications.

New Words

1. meager ['miːgə] *a.* 贫乏的，不足的
2. piecemeal ['piːsmiːl] *a.* 零碎的
3. illuminate [i'ljuːmineit] *vt.* 照明；用灯装饰
4. whale [weil] *n.* 鲸
5. kerosene ['kerəsiːn] *n.* 煤油，火油
6. tallow ['tæləu] *n.*（动物）脂；（做皂、烛等用的）牛脂
7. menace ['menəs] *n.* 威胁者；危险物
8. suppress [sə'pres] *vt.* 压制，压抑；查禁
9. zenith ['zeniθ] *n.* 顶点，顶峰
10. elevate ['eliveit] *vt.* 抬起，使升高
11. formulate ['fɔːmjuleit] *vt.* 用公式表示；把……化成公式；系统地提出（简述）
12. induction [in'dʌkʃən] *n.* 感应，感应现象
13. voltage ['vəultidʒ] *n.* 电压
14. electromagnetic [i'lektrəumæg'netik] *a.* 电磁的
15. electromagnet [i'lektrəu'mægnit] *n.* 电磁体；电磁铁
16. electrode [i'lektrəud] *n.* 电极
17. brilliance ['briljəns] *n.* 光辉；异彩
18. arc [aːk] *n.* 弧；弧光
19. commercialization [kəˌməʃəːlai'zeiʃən] *n.* 商业化
20. illumination [iˌljuːmi'neiʃən] *n.* 照明，光亮

21. lighthouse [ˈlaithaus] *n.* 灯塔
22. predictably [priˈdiktəbli] *ad.* 可预言的
23. stimulus [ˈstimjuləs] *n.* 刺激；促进因素
24. incandescence [ˌinkænˈdesns] *n.* 白热；白炽
25. retard [riˈtaːd] *vt.* 阻止；妨碍
26. encase [inˈkeis] *vt.* 把……装箱；把……放入壳内
27. inert [iˈnəːt] *a.* 惰性的；不活泼的
28. conductance [kənˈdʌktəns] *n.* 传导性，导电性
29. evacuate [iˈvækjueit] *vt.* 撤离；抽出
30. carbonize [ˈkaːbənaiz] *vt.* 使碳化
31. filament [ˈfiləmənt] *n.* 灯丝；丝极
32. energize [ˈenədʒaiz] *vt.* 给与……电压；加强
33. dc. (direct current) 直流电
34. volt [vəult] *n.* 伏，伏特
35. incentive [inˈsentiv] *n.* 刺激；鼓励；刺激物
36. refinement [riˈfainmənt] *n.* 细致的改进；精确

Notes

1. kerosene lamps 煤油灯
2. motive power 动力
3. illuminating gas companies 燃气照明公司
4. magnetic fields 磁场
5. electriccurrent 电流
6. magnetic induction principles 电磁感应原理
7. practical light source 实用光源
8. William Griber 威廉·吉伯特 (1540—1603) 英国医师及物理学家
9. C. A. de Coulomb 库伦 (1736—1806) 法国物理学家
10. Benjamin Franklin 本杰明·富兰克林 (1706—1790) 美国政治家及哲学家
11. Humphrey Davy 哈弗瑞·德维 (1778—1829) 英国化学家
12. Andre Ampere 安德·安培 (1775—1836) 法国物理学家
13. Geory Ohm 乔治·欧姆 (1787—1854) 德国物理学家
14. Karl Gause 卡尔·高斯 (1777—1855) 德国数学家及天文学家
15. Michael Faraday 迈克尔·法拉第 (1791—1867) 英国化学家及物理学家
16. Joseph Henry 约瑟·亨利 (1797—1878) 美国物理学家
17. Charles Wheatstone 查理·惠斯登 (1802—1875) 英国物理学家及发明家
18. Alfred Werner 阿佛列·维纳 (1866—1919) 瑞士化学家
19. current-carrying materials 导电物质
20. melting point 熔点

21. incandescent electric lamp 白炽灯
22. an electric motor 电动机
23. a ready-made incentive 现成的刺激物
24. voltage drops 电压降
25. in close proximity to 与……靠得很近
26. alternating current 交流电
27. current levels 电流强度
28. Thomas Edison 托马斯·爱迪生（1847—1931）美国发明家
29. New Jersey 新泽西（美国州名）

Passage C

A Brief History of the Power Industry (2)

Another technical problem was encountered. Increasing loads meant increasing currents, which caused unacceptable voltage drops if generating stations were located at any appreciable distance from the loads. The requirement of keeping generation in close proximity to loads became increasingly difficult because acceptable generation sites were frequently unavailable. It was seen that electrical power was proportional to the production of voltage and current. Clearly, less current would be needed at higher voltage. Unfortunately higher voltage was not desirable from either the viewpoint of present technology or customer safety. What was needed was to transmit power at higher voltage over long distances and then to change it to lower values at the load point. The key was to design a device that could transform voltage and current levels efficiently and reliably.

In the 1890s the newly formed Westinghouse Company experimented with a new form of electricity, christened "alternating current" (ac). Finally The ac form was widely accepted for the following reasons:

* The ac transformer could perform the much needed ability to easily change voltage and current levels.
* ac generators were inherently simpler.
* ac motors, although not as versatile, were simpler and cheaper.

Local electric utilities expanded until they shared boundaries. An operating advantage was apparent; since the loads in neighbouring systems did not necessarily peak at the same time, why not interconnect the systems and meet the peak load conditions with the combined generation? The advantages of interconnecting different generating sites and loads were already well known; this step would better utilize everyone's equipment. A technical problem was immediately apparent; many different frequencies were in use at the time, including 25, 50, 60, 125, and 133 Hz. As interconnected systems must operate at the same frequency, expensive frequency conversion equipment would be required. At the time generating units at