An English Reading and Translation Course for Electric Power Speciality

电力专业英语阅读与翻译

屠志健 编著

上海外语教育出版社
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前　言

本书在编者所编教学用书《电力专业英语》以及多年教学实践的基础上，考虑到电力行业中广大工程技术人员的实际需要而编写。本书中的课文和阅读材料节选自大量国内外最新的英语电力书刊，个别地方编者进行了衔接。所选内容涉及面宽，还包括近年来新发展的技术，这使读者在学习本书后可为阅读电力类各专业文献打下一个良好的基础。为了增加外语的可读性，课文和阅读材料所选内容尽量避开繁琐的公式、推导和图表。本书的另一目的是为了提高电力专业英语英译汉的水平。为此，在每课中编写了翻译方法、翻译技巧的相关内容，并且结合课文和阅读材料中的具体句子加以说明，之中汇集了编者多年专业英语的教学经验。本书还介绍了专业论文、产品样本说明书、招标文件、专利说明书的阅读与翻译，并在附录中附有范文与参考译文以使读者对它们有一个初步的了解和印象。阅读材料都有参考译文。编者建议读者在阅读阅读材料时先不要看参考译文，借助于词典自行阅读并注意其中一些很有用的专业词汇及表达。若阅读后再将其译成中文，然后与参考译文对照并进行总结，这对提高翻译水平肯定是大有好处的。

本书承蒙中国工程院院士、上海交通大学饶芳权教授撰写了序，对读者阅读本书以及如何学好专业外语给予了提纲挈领的指导。

在本书的编写工作中，得到了许多单位和个人的支持和帮助。长期从事电力系统技术工作和教学工作的两位老专家陈警众教授级高工与徐圣书教授对本书的初稿进行了详细的审阅，并提出了许多建设性的修改意见。上海电力学院张一尘教授、勒希教授分别编写了本书的第12课和第21课，并与编者共同策划了本书的编写工作。上海电力学院章民泰教授提供了多年来在专业英语翻译中的经验并提供了专利样文。本书的编写还得到了上海电力学院电力工程系专业老师以及华东电力集团公司、上海电力公司、华东电力情报所等单位的大力协助。在此，编者一并表示由衷的感谢！

限于编者水平和经验，书中错误和不妥之处在所难免，敬请读者批评指正。

编者

二〇〇〇年三月

序

随着我国改革开放形势的发展，和国外的交往越来越多，人们学习外语（首先是英语）的热情越来越高，如何提高学习效率，成为大家关注的问题。

要学好一门外语，最理想的当然是生活在讲外语的环境，周围都是外国人，耳濡目染，自然能学到地道的外语，其次是找一些有趣的外语书（如国外出版的小说名著缩写本或科普小品）由浅入深循序渐进，慢慢读下去，持之以恒，自有成效。对一般的人，这两种办法都难做到。所以对成年人来说，较切实的办法是学完外语的基础课程后，找一本自己熟悉的外文业务书，硬啃下去，开始虽然很艰难，但毕竟书上讲的东西，自己本来很熟悉，不至于理解错误，坚持读下去，慢慢会渐入佳境。旧俄小说《怎么办》中的男主人翁，通过硬啃英文圣经来学会英语，就是这种办法。我在中学时学的是英语，上大学时改学了俄语，1956年“向科学进军”高潮中，为了把荒废了的英语捡起来，就找了一本龙门书局影印的《交流电机原理》（罗兰士著），靠着一本英汉四用字典和一本英俄电工辞典，硬啃下去，开头很难，处处都是生字，一小时也读不了多少，但坚持读到一百页后，就觉得比较顺手了，因为技术书的句子结构到底比较单调，那些生字，多碰几回也就记住了。所以我一向认为，对理工科学生而言，如能找到一本较好的外文中级科普书，坚持把它读通，是一条掌握外文的捷径。如果这种书的选材和编法能充分考虑到外语学习者的需要，循序渐进，那就更好。记得早些年曾读过一本英国人写的《科技英语结构》（A.J.Herbert: *The Structure of Technical English*），就觉得编得很好，读后得益良多。

上海电力学院的屠志健先生在他从事专业英语教学二十多年的基础上，编著了这本“电力专业英语阅读与翻译”也是朝着这个方向去努力的，而且更进一步，把选文的范围集中在电力工业这一方面，把全书课文串起来，编成一本概括电力工业全貌的科普书，把电力工业常用的词语和一些电工技术新知识也巧妙地编织进去，的确颇有新意，对电工学生也很切实用，相信会受到大家欢迎的。

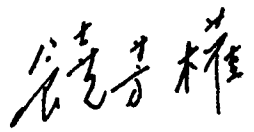
此外屠先生结合每课课文，系统地讲解了英汉翻译工作中应注意的问题，读者在读完全书后，如果能回过头来再仔细读几遍，相信会更加体会屠先生的金针度人的苦心。

通读全书，可以看出屠先生是处处为读者着想，不仅每课都有详尽的讲解，连阅读材料也附上参考译文，千方百计为读者提供方便。但我认为一个人如果连字典也懒得查，外文恐怕也学不好，此外查一个生词，最好认真查一下词典上整个词条的解释。阅读材料的参考译文提供阅读后的参考和对照，非不得已，不要去看。希望读者不要忘记屠先生在前言中的嘱咐。

我在日常工作中，经常看见一些人把英语句子当成逐字翻译过去的中文句子，实际上两种语言差别很大，外国人没这种说法。所以我建议读者在通过这本书学习电工技术英语的英译汉技巧的同时，多读一下英语课文，留心两种语言表达方式的差异，最好加一点背功，这样您的成绩就会百尺竿头更进一步。

承屠先生美意，把他的书稿给我看，给我一个学习机会，希望这本书出版后，能在使用中广泛吸取读者的意见，再出新版时改得更好。

最后建议读者在学完这本书后，要鼓其余勇，广泛阅读，不要把眼光只看在电工文献上，现在科技发展日新月异，要读得多些，快些，广些。如有余力，最好读些文科类的资料，因为我们和外国人打交通，不可能只谈本专业的事情。

中国工程院院士
上海交通大学教授 

2000.5.18

Contents

Lesson One

Text

Electric Power System

Electric power[1] is a most convenient, clean, safe, and useful form of energy[2] which supplies the major portion of energy needs of a modern society. At the present time the lack of electricity (a blackout) is newsworthy[3]. Electric power is so vital to the lives of people that its unavailability causes inconvenience, loss of production[4], and danger to many individuals who are in operation (such as cardiac operation[5]) in hospital. A prolonged blackout, which is inevitable when a growing load is combined with no generation additions, could lead to social disorder, and even national tragedy. With the developing of industry and growing in living standard, the electric power demand is growing continuously and its growth rate is much greater than that of all other forms of energy. Now high electric power consumption per capita has been one of the indications of modernization of a country.

Electric power is generated in power generating stations (plants), or simply known as power stations (plants). Power generation means conversion of energy from a primary form[6] to the electrical form. The current sources of nearly all the electrical energy[7] generated come from: the conversion of chemical energy of fossil fuels[8], nuclear fission energy, and the kinetic energy of water which is allowed to fall through a difference of elevation, they are referred to[9] as fossil-fired power, nuclear power and hydro power respectively.

The voltage is usually transformed to a high level[10] at the power plant and then via[11] high voltage or extra-high voltage transmission lines the electric power is transmitted to general power consumption areas (load areas). Electric power is transmitted at high voltage level either because of the distance or because of the amount of power, or because of their combination[12]. Before electric power is delivered to the electric power consumers or users, there may be more voltage transformations[13]. First at primary substations, the voltage is reduced and then transmitted to local substations via subtransmission lines. Then another voltage reduction is experienced[14] in local substations and the electric power is delivered[15] to the power consumers (loads) via distribution systems. In distribution systems, electric power is directly delivered to electric users via feeders. Thus the entire system consisting[16] electrically[17] of power stations, substations, power consumers, transmission lines and feeders is called a power system. In functional terms, a power system includes power generation, power transmission, power transformation, power distribution and power uti-

lization. The connection between the power stations and loads is not a simple path but a complex network. The electric power utilities will plan[18], design, build and operate their power systems.

The growth in size of power plants and in the higher voltage equipment was accompanied by interconnections of the generating facilities. These interconnections decreased the probability of service interruptions, made the utilization of the most economical units[19] possible, and decreased the total reserve capacity required to meet equipment-forced outages. The modern power system must recognize the public's dependence on electric service. Service reliability must be very high. Ideally, the loads must be fed at constant voltage and frequency at all time. In practical terms[20], this means that both voltage and frequency must be held within limited tolerances so that the consumer's equipment may operate satisfactorily. For example, a drop in voltage of 10－15% or a reduction of the system frequency of only a few hertz may lead to stalling of the motor loads on the power system. Thus it can be accurately stated that the power system operator must maintain a very high standard of continuous electrical service[21].

Modern AC power systems are invariably[22] three-phase[23]. The design of distribution networks is such that normal operation is reasonably close to balanced three-phase working[24], and often a study of the electrical conditions in one phase is sufficient to give a complete analysis. Equal loading on all three phases of a network is ensured by allotting as far as possible equal domestic loads to each phase of the low voltage distribution feeders. Industrial loads usually take three-phase supplies[25]. A very useful and simple way of graphically representing a network is the schematic or line diagram in which three-phase circuits are represented[26] by single lines. Standard symbols are used to indicate the various components. A transmission line is represented by a single line between two ends. The simplified diagram is called the single-line diagram. The single-line diagram summarizes the relevant information about the system for the particular problem studied. For example, relays and circuit breakers are not important when dealing with a normal state problem. However, when fault conditions are considered, the location of relays and circuit breakers is important and is thus included in the single-line diagram. The International Electrotechnical Commission (IEC), the American National Standards Institute (ANSI), and the Institute of Electrical and Electronics Engineers (IEEE) have published a set of standard symbols for electrical diagrams. A basic symbol for a rotating machine[27] is a circle.

The basic elements of a modern power system are shown in figure 1-1. Obviously not every possible element of a power system is shown, for example, combustion turbines, circuit breakers, and fuses are not included. In this figure, for convenience, geographical separation is used to distinguish between bulk power supply[28] and distribution. The generation plants, transmission lines, and primary substations are shown above the dashed line, the load (except the large industrial customer) and distribution below the line. In most actual systems, all the elements are more or less intermingled geographically.

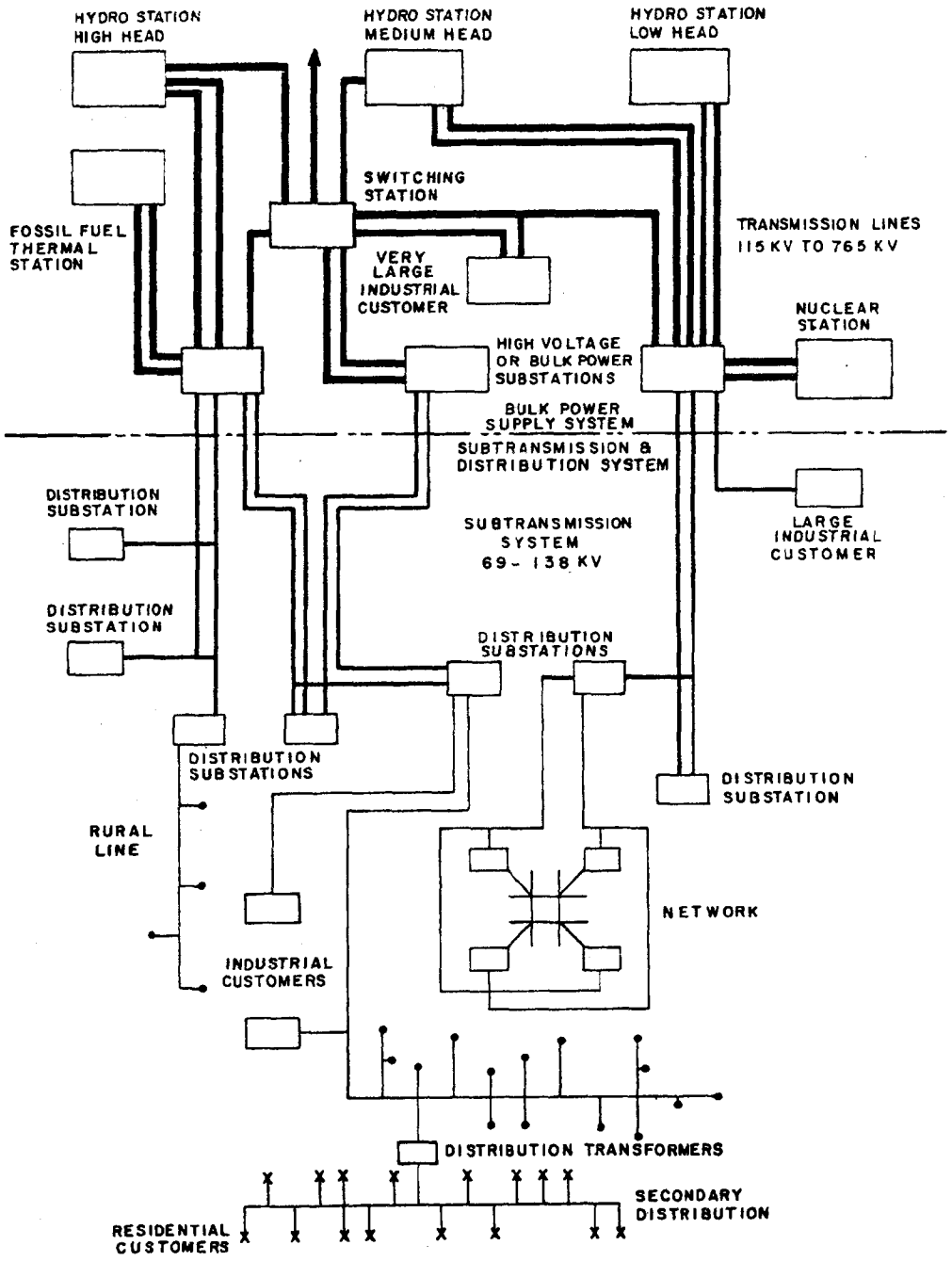


Figure 1 – 1. Basic elements of a modern power system showing several types of electric generation.

New words and expressions

electric power 电力
blackout *n*. 断电、停电
power consumption 用电(量)
electric power demand 电力需求量
rate *n*. 速率,费率
hydro power 水电
power transformation 变电、变压
extra-high voltage(EHV) 超高压
load *n*. 负荷、负载
power transmission 输电
domestic load[də'mestik ləud] 民用负荷
deliver *v*. 输送、交付、递交
power consumer 电力用户
substation *n*. 变电站、变电所
subtransmission *n*. 二次输电
power distribution 配电
feeder['fi:də] *n*. 馈电线
network *n*. 网络
operate *v*. 运行、工作、操作、动作
interconnection *n*. 互联(相互联接)
probability *n*. 可能性、概率
interruption[intə'rʌpʃən] *n*. 中断
reserve capacity 备用容量
outage['autidʒ] *n*. 断电、停电、停运
reliability *n*. 可靠性
frequency *n*. 频率
limited *a*. 有限的
tolerance['tələrəns] *n*. 容差
per capita['kæpitə] 人均
power generation 发电
power utilization 用电
power station (plant) 发电站(厂)
fossil fuel['fɔsəl 'fju:əl] 矿物燃料
fission['fiʃən] *n*. 裂变
elevation[eli'veiʃən] *n*. 高度,高程
fossil-fired power 火电
nuclear power 核电
hertz[hə:ts] *n*. 赫兹
stall[stɔ:l] *v*. 失速
motor *n*. 电动机
alternating ['ɔ:ltə:neitiŋ]current (AC) 交流
direct current (DC) 直流
three-phase *n*. 三相
single-phase *n*. 单相
balanced *a*. 平衡的、对称的
allot *v*. 分配、调配
schematic [ski'mætik]diagram 示意图、原理图
symbol *n*. 符号、图形符号
fault[fɔ:lt] *n*. 故障
relay['ri:lei] *n*. 继电器
circuit breaker (CB) 断路器
normal/abnormal *a*. 正常的/异常的
combustion turbine['tə:bain] 燃气轮机
fuse *n*. 熔断器
dashed line 虚线
hydro power station 水电站
high/medium/low head 高/中/低水头
transformer *n*. 变压器
residential customer 居民用户

Notes to the text

1. power 功率、动力。本书中出现的 power 绝大多数是指 electric power(electric 省略)如

power system 电力系统

2. ... form of energy ……能源的形式
3. is newsworthy 有新闻价值的、值得报道的。也可意译为将是重大新闻
4. loss of production 停产
5. cardiac operation 心脏手术
6. primary (form of) energy 一次(形式的)能源,如煤、石油、水力、太阳能。而电力为二次能源
7. The current sources of nearly all the electrical energy ... 这里的 current 词义为目前的(形容词)而不是电流(名词)
8. fossil-fuel 矿物燃料。指煤、石油、天然气
9. be referred to as 称为
10. high level 高的(电压)等级。电力系统中规定了额定电压从低到高的各种等级
11. via = by way of 经由
12. or their combination 或者两者兼而有之
13. There may be more voltage transformation 可能有多次变压
14. then another voltage reduction is experienced 可译为:然后电压经过再次降低
15. transmit 和 deliver 在一定意义上都有输电之意,但 deliver 的对象是电力用户,此两词分别与 transmission line 和 feeder 对应
16. consist of 由……组成
17. electrically 在电气上
18. plan 规划
19. units 这里指发电机组 generator units
20. in practical terms = in practice 实际上
21. service 这里是指 power supply 供电
22. invariable = always 总是
23. three-phase 三相(phase 后不加 s,在中间有短划) three phases 三个相(phase 后加 s,在中间无短划)
24. The design of distribution networks is such that normal operation is reasonable close to balanced three-phase working, 配电网设计为使其正常运行时相当接近三相对称运行
25. take three-phase supply 采取三相供电
26. ... three-phase circuits are represented ... 这里 circuits 为线路
27. rotating machine 这里是指 rotating electric machine 旋转电机
28. bulk power supply 大容量供电

Translation Skill

专业英语的文体特点

翻译就是将一种语言译成另一种语言,电力专业英语的英译汉是将电力专业的英语文献或资料翻译成汉语。这是一个对原文进行阅读、理解、思维、组织、表达的过程。对翻译人员来讲,首先要对被翻译的对象,即专业英语的文体特点有一个概况性的了解。英语有各种不同的文体,如文艺文体、新闻文体、应用文文体等。专业英语的文体则归属于科技英语文体。而科技英语又包括两类,一类为科普英语,另一类就是不同专业的专业英语,所以专业英语的文体特点也就是科技英语的文体特点,只不过在词汇的专业性上有所不同罢了。下面我们看看专业英语文体有哪些特点。

1. 专业术语(词汇)、科技词汇、合成词、缩写词多

由上分析,在专业英语中,专业词汇、科技词汇多是毋庸置疑的。但随着当今技术的迅速发展,在专业英语中也不断出现新的专业术语,如 flexible AC transmission system (FACTS) 灵活(柔性)交流输电, custom power 定制电力等。在专业英语中有一些合成词则是由动词词组转化而来的,如

feed back	*v*.反馈	feedback	*n*.反馈
shut down	*v*.关闭、关机	shutdown	*n*.关闭、关机
break down	*v*.击穿	breakdown	*n*.击穿

有些专业词汇随着使用频率的增高和人们对它的熟悉,为简练起见常采用首字母的缩写形式,如AC—alternating current,交流

DC—direct current,直流

GIS—gas insulated switchgear,气体绝缘封闭组合电器

SCR—silicon controlled rectifier,可控硅整流器

2. 广泛使用被动语句

以第 1 课第 3 段为例,12 个句子中被动语句就有 9 句,占句子总数的 75%。这是因为专业英语和科技英语侧重叙事、推理、描述客观事物,尽量避免第一、第二人称,以造成主观臆断的印象。如 The capacitance of a capacitor is measured in farads.电容器的电容量以法拉为单位来测量,而不用 We measure the capacitance of a capacitor in farads.我们以法拉为单位来测量电容。

3. 出现长句

科技专业英语中,有时为了表述一个复杂的概念,并使之逻辑严密,结构紧凑,往往需要采用一气呵成的方式,这就得求助于复杂和扩张的结构,使句子变得很长。在这类长句中,往往采用许多从句和短语,特别是非限定式短语,其中从句、短语可相互套叠。例:在第 2 课的阅读材料中, Further interconnection of electric power systems over wide areas, continuing development of reliable automated control systems and apparatus, provi-

sion of additional reserve facilities, and further effort in developing personnel to engineer, design, construct, maintain, and operate these facilities will continue to improve the reliability of electric power supply. 这一句共有 48 个词组成。这个句子虽长但结构并不复杂，其中前 38 个词都是主语部分，当然主语中有许多并列成分和附加成分，层次结构明确，所以不难理解。

4. 句子结构严谨，逻辑性强

这是由于科技类英语注重事实、结果的说明和原理的阐述，这来不得半点含糊其辞，更不允许模棱两可。

此外，专业英语中一般还配有公式、表格、示意图和原理图。

Reading material

The Development History and Status Quo of Power Industry

Electric power industry is one major industry that has shaped and contributed to the progress and technological advances of mankind over the past century. It is not surprising then that the growth of electric energy consumption in the world has been nothing but[1] phenomenal. In the United States, for example, annual power generation had grown to well over 400 times in the period between the turn of the century[2] and the early 1970s. This growth rate is 50 times as much as the growth of any other energy forms used during the same period. In China, since 1949 the electric power industry has made big stride in its development, the annual generation of electricity increased from 4.3 TWh(1 TWh = 10^9 kWh) in 1949 to 12000 TWh in 1998 and total installed capacity from 1850 MW in 1949 to 280 GW in 1998, both ranked second only after U.S.A.[3]

Edison Electric Illuminating Company of New York pioneered the central station power generation in 1881. This station had a capacity of four 250-hp boilers supplying steam to six engine-dynamo[4] sets and supplied power for lighting to 59 customers within an area of approximately 1 square mile. Edison's system used a 110 V two-wire DC underground distribution network. The low voltage of the circuit limited the service area of a central station, and consequently this type of central stations proliferated throughout metropolitan areas.

The present form of power systems would be impossible without alternating current. The development of a practical transformer freed the utilities from the limitations imposed by the low voltage inherent in direct current. After the advent of transformers, much of the load was served by alternating current instead of direct current. Then it became possible to generate power and transmit it to the load area at voltages appropriate for those functions, while continuing to serve the utilization devices at the low voltage considered safe for