实用电力英语丛书

Practical English Series in Electric Power

主　编　包兰宇　陈　力

输配电分册

Power Transmission and Distribution

中国电力出版社
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内 容 提 要

为满足电力国际交流和对外合作的需要，特组织专家编写了《实用电力英语丛书》，分为《发电分册》、《输配电分册》、《供用电分册》、《电力经济与管理分册》四册。本丛书内容简洁实用，旨在从读、写、译等三方面提高在职技术人员和工人的英语阅读、翻译和日常电力应用文的写作能力。本丛书特点为：①根据电力实际需要进行分册，便于相关专业人员按需选择，针对性较强；②收录的文章均选自英语原文资料，文后附有译文、翻译技巧、注释和应用练习；③为了增强实用性，还专门设计了求职信、(商业)信函、产品说明、标书、合同等一系列应用极广的实用文写作实例和练习。

《输配电分册》是本丛书之一，它主要包括国外文献中有关输配电工程技术的文章，如电气设备、电气主接线、直流输电、电力系统稳定性和继电保护及自动装置等内容。

本丛书可供电力系统从事发电、输配电、用电及电力经济的技术人员及管理人员的在职培训和继续教育之用，也可作为他们日常自学教材，并可作为各大中专院校的专业教材。

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前言

我国加入WTO后，中外合作的机会越来越多，尤其是随着我国电力事业突飞猛进地发展，对实用电力英语的需求更加迫切。因此，我们特组织专家编写了《实用电力英语丛书》。

本丛书根据电力行业实际情况，分为《发电分册》、《输配电分册》、《供用电分册》、《电力经济与管理分册》四册。本丛书内容简洁实用，着重从读、写、译等方面提高在职技术人员和工人的阅读、翻译和日常电力应用文的写作能力。在本书编写过程中，为给读者提供原汁原味的英文，编者翻阅了大量国外资料，从中选取与各专业相关的短文，以期给读者看到地道的英文表述方式。本丛书每一分册均分为十个单元，每一单元都设有阅读理解、翻译技巧、应用练习三部分，并在每一单元后给出本单元短文译文和练习答案。为了增强实用性，本书给出短文注释和实用短语，并在应用练习中设计了求职信、(商业)信函、产品说明、标书、合同等一系列实用性极广的应用文写作的框架与范例，便于大家快速掌握写作技巧，并熟练应用。另外，本丛书文后还列出了一些重点词汇的词性、词义和出处，便于大家查阅。

《输配电分册》是本丛书之一，它主要包括国外文献中有

关输配电工程技术的文章，如电气设备、电气主接线、直流输电、电力系统稳定性和继电保护及自动装置等内容。

《输配电分册》由包兰宇、陈力主编，和薇涵、劳群芳参编。具体分工如下：第1、2、4、5、7单元由陈力编写，第3单元由劳群芳编写，第5单元由陈力、劳群芳共同编写，第8、9、10单元由和薇涵编写。由于翻译技巧部分有一定的通用性，故本套丛书翻译技巧部分的讲解内容大致相同，由景志华编写。本书翻译技巧部分的练习由包兰宇编写。本书第1单元至第10单元的实用写作部分由包兰宇编写。毛志芳在本书的编写过程中做了一些具体工作，本书作者表示感谢。本套丛书均由张春江教授主审。

由于本丛书是一次新的尝试，对一些专用术语的理解恐有不妥及疏漏之处，衷心希望广大读者批评指正，请读者在使用过程中将意见反馈给我们，以便及时进行修改。

编　者

2004年1月

目 录

Unit One

Substation

Part I Reading Comprehension

In this part, you will read two passages. The purpose of this part is to increase your reading ability. After each passage, you will find some useful expressions. Try to remember these phrases which can add up your English vocabulary of electric power. Now begin your reading.

Passage A Substation

The purpose of a ***substation*** is to transform the 变电站 characteristics of the electrical energy supplied to some form suitable for use, as for example, a conversion from alternating current to direct current for the use of city railway service, or a change from one voltage to another, or one frequency to another. Their functions include:

Tap. — To be economical, transmission of larger 分支 amounts of power over long distances must be done at voltages above 110,000 volts. Substations for supplying small amounts of power from such high-voltage lines are not satisfactory from the standpoint of operation and are also uneconomical①. It is, therefore, common practice to install a few substations at advantageous points along the high-tension lines and step down the high-transmission voltage to a lower secondary-transmission voltage from which numerous small loads may be supplied.

Distribution. — Any substation that is used to transform electrical energy to a ***potential*** that is low enough for general distribution and utilization is a distributing substation②. Such a substation will generally receive its energy over a few comparatively high-tension lines and distribute it over a large number of low-voltage lines.

电位

Industrial. — When fairly large blocks of power are required by industrial plants, it often becomes necessary and advisable to install an individual substation to supply such a load directly from the main high-voltage line or secondary line of lower voltage. Its simplest form would comprise only ***switching*** equipment, there being no voltage transformation. In most cases a voltage transformation is probably needed; hence transformer equipment is included.

开关

Sectionalizing. — In very long high-voltage large-capacity lines, particularly when several circuits are run in parallel, it is often necessary to split the lines into sections, in order that proper protection to the line and service can be obtained. Such a substation is, therefore, helpful in sectionalizing damaged sections of a line, providing continuity of service. Such a substation will generally comprise only switching equipment. In long lines it may also serve

从……分开

to supply power-factor-correcting equipment.

Transmission-line Supply. — It is becoming more and more common to install the high-tension equipment of a power plant outdoors, the installation becoming nothing more than a ***step-up*** substation 升高电压 receiving its power at generator voltage, then stepping up its voltage and finally sending it out over high-voltage transmission lines[3]. Such a substation is nothing more than an outdoor distributing substation turned around, the voltage being stepped up instead of stepped down.

Power-factor Correction. — The voltage at the end of long lines tends to increase as the load supplied is decreased, while on the other hand it tends to decrease as the load is increased. Owing to the inductance and capacity effects, this ***variation*** 变化 in voltage is accompanied by a wide variation in power factor of a line, it is necessary to use synchronous condensers at the end of the line. To supply such a machine the transmission-line voltage must be stepped down, hence a power-factor-correcting substation will include switching equipment, transformers, and all equipment necessary for the operation of synchronous condensers.

Frequency changer. — To interconnect two systems of different frequencies it is absolutely necessary that frequency changers be used. Invariably a station of this type will ***necessitate*** transformers to step 需要 down or step up the voltage supplied to or delivered from the frequency changer, since the highest voltage that is normally feasible for rotating machinery has been found to be about 13,200 volts.

Railway. — Substations supplying railways may be generally classified under two heads, namely, as alternating current and as direct current. In the cases of alternating-current substations the problem is generally one of voltage transformation and of supplying single-phase power to the trains. It is, however, possible to supply single-phase to three-phase inside the ***locomotive*** by the use of a phase converter. In the case of direct-current railways, the substations are generally supplied with three-phase power and converted to direct current by means of rotary ***converters***, motor-generator sets, or rectifiers.

机车

变流器

Direct current for Light and Power. — There are still a few sections in some of out large cities which are supplied with direct-current three-wire systems. Such a supply is invariably obtained from synchronous converters. There are also certain types of motor loads in industrial plants which require direct current; these are as a general rule supplied from rotary converters. For ***electrolytic*** work, low-voltage direct current is absolutely essential, hence motor generators or rotary converters are also applicable.

电解

Notes to Passage A

① 此句中的 supplying small amounts of power from such high-voltage lines 为动名词短语,修饰 substations。全句的意思

是:从运行的角度来看,从这样的高压线路直接引出向小容量负荷供电的变电站是不能令人满意的,也是不经济的。

② 此句中的 that is used to transform electrical energy to a potential 为定语从句,修饰 Any substation。而 that is low enough for general distribution and utilization 为另一个定语从句,修饰 potential。全句的意思是:任何用于传送可以直接配电和利用的较低电压等级的电能的变电站都是配电变电站。

③ . . . the installation becoming nothing more than a step-up substation receiving its power at generator voltage, then stepping up its voltage and finally sending it out over high-voltage transmission lines. 此处为分词独立主格结构。句中的 receiving, stepping up, sending 为分词和分词短语,修饰 a step-up substation。全句的意思是:安装的装置只不过是一个升压变压器,它以发电机电压接受电能,然后将电压升高,并最终通过高压输电线路将电能送出。

Useful Expressions in Passage A

1) alternating current	交流
2) direct current	直流
3) high-voltage	高压
4) high-tension line	高压线路
5) distributing substation	配电变电站
6) in parallel	并联
7) damaged section	故障段
8) power-factor-correcting	功率因数补偿(调整)
9) synchronous condensers	同步调相机
10) step up	升高电压

11) step down	降低电压
12) frequency changer	变频器
13) phase converter	换相器

Passage B Five-wire Distribution System Demonstration Project

A four-wire ***multi-grounded*** distribution system is the predominant system used in North America. One of the features of a four-wire design is that unbalanced load current can return in the earth. The presence of ground current results in the drawbacks that high-impedance faults are difficult to detect, ***stray*** voltages can be caused, and magnetic fields are higher. Other types of distribution designs have been proposed to address these concerns including three-wire designs.

多点接地

杂散的，寄生的

The five-wire design is a new approach that may reduce stray voltage and magnetic fields and also make high-impedance faults more easily detectable①. The fifth wire is an isolated neutral that carries all of the unbalanced return current. Under normal conditions, the five-wire design operates very similar to the four-wire design with one major exception: all the return current is confined to the neutral that is isolated from ground. The multi-grounded ground wire continues to perform the safety functions associated with a multi-grounded system.

The purpose of this study was to ***simulate***, 仿真,模拟 construct, and monitor a five-wire distribution system over a two-year period. The first year of the two-year monitoring period involved extensive monitoring of an existing four-wire system. After completion of the first year of monitoring, the four-wire system was converted to a five-wire system, and another year of monitoring was performed.

A 12.47 kV three phase ***wye*** distribution system 星形接线 circuit in South Cooperstown, New York was chosen as the five-wire ***demonstration*** site. The circuit 论证 consists of approximately ten to thirteen kilometers of overhead line. Most of the line is of armless construction, with some cross-arm construction scattered throughout the system. Approximately four kilometers of South Cooperstown circuit was converted to a five-wire configuration. The two-***bushing*** transformer has 套管 an arrester on both bushings, and one bushing is attached to the fifth wire.

The main conclusion of the five-wire demonstration project is that the five-wire system improved performance for high impedance faults, stray voltages, and magnetic fields relative to a four-wire system:

High-impedance faults can be detected more easily on a five-wire system. High-impedance faults as low as 5A may be detected on a five-wire system.

Stray voltages are much less on a pure five-wire system than on a four-wire system. If only a portion of a circuit is converted to a five-wire system, end effects will impact the system's ability to control stray voltage. Some of the unbalanced return current in the four-wire system may return via the ground wire in the five-wire system causing stray voltage on the five-wire portion②.

Magnetic fields are lower on the five-wire system. This is especially true when the overhead line is near conducting objects in the ground like buried phone wires or water pipes.

Balancing transformers are an effective way of conversion from a five-wire system to a four-wire system. A balancing transformer offers lower impedance that helps with over current coordination③. A balancing transformer will also provide some protection for an open neutral condition.

The fifth wire (the neutral) should be treated as an ***energized*** conductor and installed as such. Surge ***arresters*** of the same ***rating*** as the phase arrester should be mounted on the neutral bushings of all transformers.

带电的
避雷器/额定值

Crew practices are important when considering a five-wire system. The location of the neutral and its insulation require proper attention. Initial installations should have the fifth wire labeled to warn crews that it is not to be treated as a grounded conductor.

运行人员

Notes to Passage B

① 此句中 that may reduce stray voltage and magnetic fields