

电力英语阅读与翻译

边康莎 王丽琴 邢念增 副主编
刘健 主编

ENGLISH FOR ELECTRIC POWER INDUSTRY

(第二版)

English



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ENGLISH FOR ELECTRIC POWER INDUSTRY

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内 容 提 要

本书是电力企业工程技术人员和管理人员学习专业英语的培训教材。内容涉及电力系统、电力系统故障、电力系统稳定、火电厂、水电厂、变电站及其自动化、断路器、变压器、输电线和电缆、过电压、绝缘、防雷和接地、电力系统测量仪表、继电器、电力系统继电保护、RTU 和 SCADA 系统、日本的配电自动化系统、电压调节与无功补偿、电动机、电力系统通信等十九章。本书中英文原文精选自国外经典教材、国际期刊以及设备说明书，并含有详细注释和中文对照。

本书可作为电力企业工程技术人员和管理人员学习专业英语的培训教材，亦可用作高等学校有关电力系统专业的学生、研究生和教师的参考书。

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前 言

随着我国电力工业的发展,对外交流和引进设备的增多,有必要提高电力系统职工的专业英语水平,以便于他们能够更好地从事本职工作。为此,我们根据多年来举办培训班及开办专业英语课程的基本内容编写了本书。

本书第一版出版后,受到广大读者热烈欢迎,不少读者还诚恳地给我们提出了许多宝贵意见,这促使我们将原书重新修订再次出版,以满足读者的要求。

修订版在原书的基础上增加了电力系统稳定、电压调节与无功补偿、电动机等三章;对一些读者关心的内容,如变电站及其自动化、发电新技术、断路器、继电保护等内容进行了补充;为了方便读者学习和阅读,修订版将全部课文作了翻译,并增加了科技英语的构词法的介绍。

修订版的内容包括电力系统、电力系统故障、电力系统稳定、火电厂、水电厂、变电站及其自动化、断路设备、变压器、输电线和电缆、过电压、绝缘、防雷和接地、电力系统测量仪表、继电器、电力系统继电保护、RTU和SCADA系统、日本的配电自动化系统、电压调节与无功补偿、电动机、电力系统通信等十九章。

修订版仍由刘健博士担任主编,边康莎、王丽琴和邢念增为副主编。书中第一、二、四、五、七、九、十、十一、十二、十三、十五、十六章由刘健编写,第三、八、十七、十八章由邢念增编写,第十四章由张时帆编写,第六章由刘佩芬编写,第十九章由张忠武编写;所有文中的注解和词汇表由边康莎编写,附录由王丽琴编写;书中的译文由王丽琴、边康莎、刘健、张时帆、刘佩芬、张忠武、陈延枫、王丽、颜惠宇、刘元津、白春、眭肖钰等同志完成。

在修订过程中始终得到孙永安先生、林则荣教授和严百平博士的支持和帮助,在此一并表示感谢!

由于时间仓促,水平有限,书中的错误和不当之处恳请批评指正。

编 者

一九九九年九月

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长期从事电气工程研究，著有《远动原理与电力系统自动化》、《开关电容 DC-DC 变换器》、《维修电工》等著作，并在 IEEE 等国际、国内重要期刊上发表学术论文 70 余篇，其中多篇被 EI 收录，并多次获省部级成果奖。研究领域为配电网自动化、无人值班变电站、调度自动化、远方抄表、电力系统仿真、电源系统以及功率因数补偿与谐波抑制等。

Content (目录)

前言

主编简介

Chapter 1	The Electric Power System	1
Part 1	Minimum Power System	1
Part 2	More Complicated Systems	3
Part 3	Typical System Layout	5
Part 4	Auxiliary Equipment	6
第一章	电力系统	9
第一节	最小的电力系统	9
第二节	较复杂的电力系统	9
第三节	典型的系统配置	11
第四节	辅助设备	12
Chapter 2	Faults on Power Systems	14
Part 1	Faults and its Damage	14
Part 2	Overload	15
Part 3	Various Faults	16
Part 4	Permanent Faults and Temporary Faults	18
第二章	电力系统故障	19
第一节	故障及其危害	19
第二节	过负荷	19
第三节	各类故障	19
第四节	永久故障及暂时故障	20
Chapter 3	Power System Stability	22
Part 1	Transient Stability	22
Part 2	Model	23
Part 3	Dynamic Model	23
Part 4	Energy Balance	25
Part 5	Swing Equation	27
第三章	电力系统的稳定性	29
第一节	瞬态稳定	29
第二节	数学模型	29
第三节	动态模型	30

第四节	能量守恒 (平衡)	31
第五节	摆动方程	32
Chapter 4	Fossil-Fuel Plant	35
Part 1	Single Stage Turbine	35
Part 2	Multistage Arrangement	36
Part 3	Generator	38
第四章	火电厂	41
第一节	单级汽轮机	41
第二节	多级汽轮机	42
第三节	发电机	42
Chapter 5	Hydroelectric Power Plant	46
Part 1	Types of Hydroelectric Turbines	46
Part 2	Cross Section of a Hydroplant	47
Part 3	Desirable Feature of Hydroplant	48
Part 4	Nonthermal Electric Energy Production	50
第五章	水力发电厂	53
第一节	水轮机的类型	53
第二节	水电厂剖面图	54
第三节	水电厂理想的特征	54
第四节	非热力发电	54
Chapter 6	Substation and Its Automation	56
Part 1	Substation	56
Part 2	Control From Afar	58
Part 3	Coordination in Substation Automation System	61
Part 4	Local-net Needs	64
Part 5	Unambiguous User-interfaces and Cost-justified Enhancement	66
第六章	变电站及其自动化	70
第一节	变电站	70
第二节	远方控制	71
第三节	变电站自动化系统间的协作	72
第四节	局域网的要求	73
第五节	明确的用户界面和合理的性能价格比	75
Chapter 7	Circuit-Interrupting Devices	78
Part 1	Types	78
Part 2	Air Circuit Breakers	79
Part 3	Oil Circuit Breakers	81
Part 4	Vacuum Circuit Breakers	82
Part 5	Circuit Breaker Characteristics	85

第七章 断路设备	88
第一节 类型	88
第二节 空气断路器	88
第三节 油断路器	89
第四节 真空断路器	90
第五节 断路器的特性	92
Chapter 8 Transformer	94
Part 1 Types and Construction of Transformer	94
Part 2 The Ideal Transformer	95
Part 3 The Equivalent Circuit of a Transformer	97
Part 4 The Autotransformer	99
第八章 变压器	101
第一节 变压器的类型及结构	101
第二节 理想变压器	101
第三节 变压器的等效电路	102
第四节 自耦变压器	103
Chapter 9 Transmission Line and Cables	106
Part 1 Transmission Line	106
Part 2 Considerations for Transmission Line	107
Part 3 Line Voltage Regulation and Compensation	108
Part 4 Cables	109
第九章 输电线和电缆	112
第一节 传输线	112
第二节 传输线的一些考虑因素	112
第三节 传输线的电压调节和补偿	112
第四节 电缆	113
Chapter 10 Overvoltages	115
Part 1 Overvoltage Due to Lightning	115
Part 2 Switching Transients	117
Part 3 Contact with Circuits of Higher Voltage	118
第十章 过电压	122
第一节 雷电造成的过电压	122
第二节 开关瞬态造成的过电压	123
第三节 接触到更高电压线路引起的过电压	124
Chapter 11 Line Insulation, Lightning and Grounding	126
Part 1 Electrical Insulation	126
Part 2 Insulating Materials	126
Part 3 Limitations on Design to Insulation	128

Part 4	Transmission Line Insulation	129
Part 5	Lightning Arresters	130
Part 6	Grounding	131
第十一章	绝缘、防雷与接地	134
第一节	电气绝缘	134
第二节	绝缘材料	134
第三节	绝缘设计的极限	134
第四节	传输线的绝缘	135
第五节	避雷器	135
第六节	接地	136
Chapter 12	System Instrumentation	138
Part 1	Importance of Instrumentation	138
Part 2	Effects without Instrumentation	140
Part 3	Instruments for System Monitoring	141
Part 4	Instrument Circuits	142
第十二章	测量仪表	146
第一节	测量仪表的重要性	146
第二节	不装测量仪表的后果	146
第三节	系统监测仪表	147
第四节	测量仪表电路	147
Chapter 13	Relays	150
Part 1	Relays and Its Characteristics	150
Part 2	Basic Relays Types	151
Part 3	Relays Timing	154
Part 4	Over-Current Relays Type COC4-20-M1	156
第十三章	继电器	161
第一节	继电器及其性能	161
第二节	继电器的基本类型	161
第三节	继电器的时延特性	163
第四节	COC4-20-M1 型过电流继电器	164
Chapter 14	Power System Protection	169
Part 1	The Directional Protection Basis	169
Part 2	Introduction To Distance Protection	171
Part 3	Basic Principles of Power-Line Carrier Directional Comparison Protection	175
Part 4	Differential Protection	177
Part 5	Rotor Earth-fault Protection For Generator	179
Part 6	Stator Earth-fault Protection For Generator Transformer Units	183

Part 7	Generator Transformer Overfluxing Protection	185
Part 8	Principle of Operation For Circuit Breaker Fail Protection	187
第十四章	电力系统继电保护	191
第一节	方向保护基础.....	191
第二节	距离保护介绍.....	192
第三节	电力线高频(载波)方向比较式保护的基本原理.....	194
第四节	差动保护.....	195
第五节	发电机转子接地保护.....	196
第六节	发电机变压器组的发电机定子接地保护.....	197
第七节	发电机出口变压器的过励磁保护.....	198
第八节	断路器失灵保护的工作原理.....	199
Chapter 15	RTU and SCADA	202
Part 1	A Typical SCADA System	202
Part 2	Remote Terminal Units (RTUs)	204
Part 3	Supervisory Control and Data Acquisition (SCADA)	205
Part 4	Three Levels of Control Centers	207
第十五章	RTU 和 SCADA	209
第一节	典型的 SCADA 系统.....	209
第二节	远程终端设备 (RTUs)	209
第三节	数据采集与监控系统 (SCADA)	210
第四节	控制中心的三个层次.....	211
Chapter 16	Distribution Automation System (DAS) in Japan	212
Part 1	Overview	212
Part 2	Advantages and Configuration	214
Part 3	Functions of the Three Stages DAS	215
Part 4	Pole-mounted Equipment Interface	216
Part 5	Fault Detecting Relay for Radial System	217
第十六章	日本的配电网自动化系统 (DAS)	219
第一节	概述.....	219
第二节	DAS 的优越性和体系结构	220
第三节	三个阶段的 DAS 的功能	220
第四节	柱上设备的接口.....	221
第五节	辐射状配电网的故障检测继电器.....	221
Chapter 17	Voltage Regulation and Compensation	224
Part 1	Voltage Control System	224
Part 2	Exciter System Block Diagram	225
Part 3	Simplified Excitation System	226
Part 4	Generator Voltage Control	228

第十七章	电压调整和无功补偿	232
第一节	电压控制系统.....	232
第二节	励磁系统框图.....	233
第三节	简化的励磁系统.....	233
第四节	发电机电压控制.....	234
Chapter 18	Motors	238
Part 1	Principle of Operation of an Induction Machine	238
Part 2	Performance Characteristics	240
Part 3	Equivalent Circuit	241
Part 4	Synchronous Motors	243
Part 5	Dc Motors	246
第十八章	电动机	248
第一节	感应电动机的工作原理.....	248
第二节	感应电动机的工作特点.....	249
第三节	感应电动机的等效电路.....	250
第四节	同步电动机.....	251
第五节	直流电动机.....	252
Chapter 19	Communication in Electric Power System	254
Part 1	Fiberoptics Communications	254
Part 2	Power Line Carrier Communications	255
Part 3	Other Wire Communications	257
Part 4	Wireless Communications	258
第十九章	电力系统通信	263
第一节	光纤通信.....	263
第二节	电力线载波通信.....	263
第三节	其他有线通信方式.....	264
第四节	无线通信.....	265
附录	谈谈翻译技巧	267

Chapter 1 The Electric Power System

Part 1 Minimum Power System

A minimum electric power system is shown in Fig. 1-1. The system consists of an energy source, a prime mover, a generator, and a load.

The energy source may be coal, gas, or oil burned in a furnace to heat water and generate steam in a boiler; it may be fissionable material which, in a nuclear reactor, will heat water to produce steam;¹ it may be water in a pond at an elevation above the generating station; or it may be oil or gas burned in an internal combustion engine.

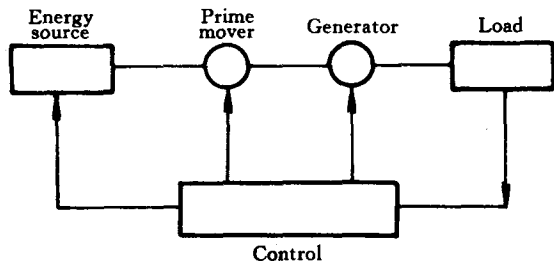


Fig. 1-1 The minimum electric power system

The prime mover may be a steam-driven turbine, a hydraulic turbine or water wheel, or an internal combustion engine. Each one of these prime movers has the ability to convert energy in the form of heat, falling water, or fuel into rotation of a shaft, which in turn will drive the generator.

The electrical load on the generator may be lights, motors, heaters, or other devices, alone or in combination. Probably the load will vary from minute to minute as different demands occur.

The control system functions to keep the speed of the machines substantially constant and the voltage within prescribed limits, even though the load may change.² To meet these load conditions, it is necessary for fuel input to change, for the prime mover input to vary, and for the torque on the shaft from the prime mover to the generator to change in order that the generator may be kept at constant speed. In addition, the field current to the generator must be adjusted to maintain constant output voltage. The control system may include a man stationed in the power plant who watches a set of meters on the generator-output terminals and makes the necessary adjustments manually.³ In a modern station, the control system is a servomechanism that senses a generator-output conditions and automatically makes the necessary changes in energy input and field current to hold the electrical output within certain specifications.

New Words and Expressions

1. minimum *a*

最小的

2. prime mover

原动机

3. generator <i>n</i>	发电机	4. load <i>n</i>	负载
5. furnace <i>n</i>	炉膛, 燃烧室	6. boiler <i>n</i>	锅炉
7. fissionable <i>a</i>	可裂变的	8. reactor <i>n</i>	反应堆
fissionable material	核燃料	nuclear reactor	核反应堆
9. elevation <i>n</i>	高度, 海拔	10. internal combustion engine	内燃机
11. steam-driven turbine	汽轮机	12. hydraulic turbine	水轮机
13. convert <i>v</i>	变换, 转换	14. rotation <i>n</i>	旋转, 转动
15. shaft <i>n</i>	传动轴, 轴	16. combination <i>n</i>	组合, 合并
17. function <i>v</i>	起作用	18. substantially <i>ad</i>	大体上
19. constant <i>a</i>	恒定的, 稳定的	20. prescribed <i>a</i>	所规定的
21. torque <i>n</i>	力矩	22. field <i>n</i>	磁场
23. current <i>n</i>	电流	24. station <i>v</i>	值守, 值班
25. terminal <i>a</i>	末端的, 终端的	26. manually <i>ad</i>	人工的, 手动的
27. servomechanism <i>n</i>	伺服机构, 跟踪装置	28. specification <i>n</i>	技术要求
29. sense <i>v</i>	显示, 测定		
*	*	*	*
1. convert...into...	把...转换为...	2. in turn	转而, 随后
3. from minute to minute	随时, 瞬时	4. in addition	另外

Notes

1. ...; it may be fissionable material which, in a nuclear reactor, will heat water to produce steam; ...

它有可能是核反应堆中的核燃料, 用来加热水以产生蒸汽。

句中的介词短语 in a nuclear reactor 是定语, 修饰关系代词 which。which 引出的定语从句修饰 fissionable material。

2. The control system functions to keep the speed of the machines substantially constant and the voltage within prescribed limits, even though the load may change.

控制系统的作用是, 在负载有可能变化的情况下仍能保持机器的大体稳定并将电压控制在规定的范围内。

句中的 speed 和 voltage 是并列关系, 两者均为不定式 keep 的宾语。even though 所引出的是让步条件从句, 意为“即使是在...的情况下”。

3. The control system may include a man stationed in the power plant who watches a set of meters on the generator-output terminals and makes necessary adjustments manually.

控制系统可能会包括一位派守在电厂的值班员, 该值班员观察发电机输出终端的一整套仪表, 并做一些必要的手动调整。

句中的 stationed in the power plant 为过去分词短语, 作定语修饰 man, 意为“被派守

在...”。紧接其后的关系代词 who 引出的定语从句仍修饰 man。该定语从句中有两个并列的谓语动词 watches 和 makes，分别指出被派守在电厂的值班员的两项任务。

Part 2 More Complicated Systems

In most situations the load is not directly connected to the generator terminals. More commonly the load is some distance from the generator, requiring a power line connecting them. It is desirable to keep the electric power supply at the load within specifications. However, the controls are near the generator, which may be in another building, perhaps several miles away.

If the distance from the generator to the load is considerable, it may be desirable to install transformers at the generator and at the load end, and to transmit the power over a high-voltage line (Fig. 1-2). For the same power, the higher-voltage line carries less current, has lower losses for the same wire size, and provides more stable voltage.

In some cases an overhead line may be unacceptable. Instead it may be advantageous to use an underground cable. With the power systems talked above, the power supply to the load must be interrupted if, for any reason, any component of the system must be removed from service for maintenance or repair.

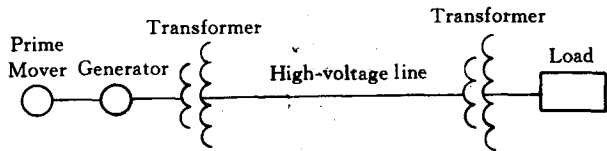


Fig. 1-2 A generator connected through transformers and a high-voltage line to a distant load

Additional system load may require more power than the generator can supply. Another generator with its associated transformers and high-voltage line might be added.

It can be shown that there are some advantages in making ties between the generators (1) and at the ends of the high-voltage lines (2 and 3), as shown in Fig. 1-3. This system will operate satisfactorily as long as no trouble develops or no equipment needs to be taken out of service.

The above system may be vastly improved by the introduction of circuit breakers, which may be opened and closed as needed.¹ Circuit breakers added to the system, Fig. 1-4,

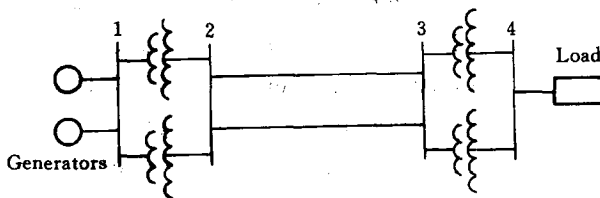


Fig. 1-3 A system with parallel operation of the generators, of the transformers and of the transmission lines

permit selected piece of equipment to switch out of service without disturbing the remainder of system.² With this arrangement any element of the system may be deenergized for maintenance or repair by operation of circuit breakers. Of course, if any piece of equipment is

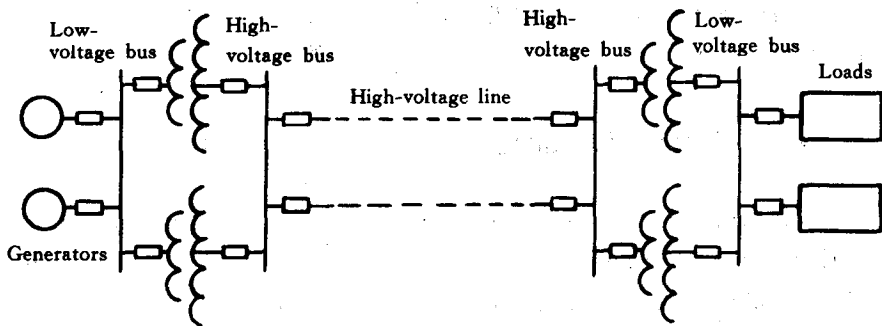


Fig. 1-4 A system with necessary circuit breakers

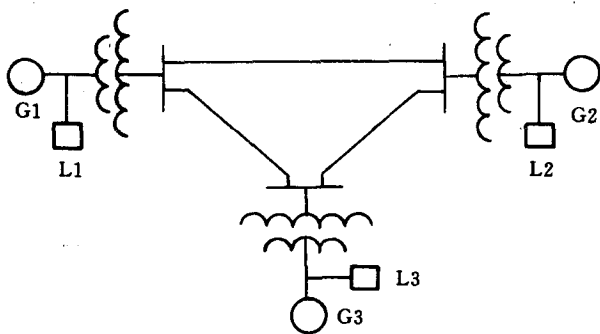


Fig. 1-5 Three generators supplying three loads over high-voltage transmission lines

taken out of service, the total load must then be carried by the remaining equipment. Attention must be given to avoid overloads during such circumstances. If possible, outages of equipment are scheduled at times when load requirements are below normal.

Fig. 1-5 shows a system in which three generators and three loads are tied together by three transmission lines. No circuit breakers are shown in this diagram, although many would

be required in such a system.

New Words and Expressions

1. complicated <i>a</i>	复杂的	2. desirable <i>a</i>	理想的
3. considerable <i>a</i>	值得考虑的, 相当大的	4. transformer <i>n</i>	变压器
5. stable <i>a</i>	稳定的	6. unacceptable <i>a</i>	不可接受的
7. advantageous <i>a</i>	有利的	8. high voltage line	高压线路
9. overhead line	架空线路	10. underground cable	埋地电缆
11. component <i>n</i>	(组成) 部分	12. maintenance <i>n</i>	维修、检修
13. associated <i>a</i>	联接的, 关联的	14. circuit breaker	断路器件
15. deenergize <i>v</i>	切断、断电	16. outage <i>n</i>	停电
		deenergized <i>a</i>	不带电的
17. schedule <i>v</i>	排定, 安排	18. diagram <i>n</i>	图、简图
19. transmission line	输电线		

*

*

*

*

1. in some cases
3. as long as

在某些情况下
只要

2. for any reason
4. switch out (off)

无论何种原因
关闭, 断开

Notes

1. ..., which may be opened and closed as needed.

句中的 as needed 系一个有省略成分的时间状语从句。

2. Circuit breakers added to the system, Fig. 1-4, permit selected piece of equipment to switch out of service without disturbing the remainder of system.

系统中增加的断路器(如图 1-4 所示)可使选定的设备退出运行,而不会使系统的其他部分受到影响。

Part 3 Typical System Layout

The generators, lines, and other equipment which form an electric system are arranged depending on the manner in which load grows in the area and may be rearranged from time to time.¹

However, there are certain plans into which a particular system design may be classified. Three types are illustrated; the radial system, the loop system, and the network system. All of these are shown without the necessary circuit breakers. In each of these systems, a single generator serves four loads.

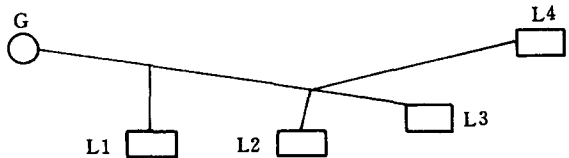


Fig. 1-6 A radial power system supplying several loads

The radial system is shown in Fig. 1-6. Here the lines form a "tree" spreading out from the generator. Opening any line results in interruption of power to one or more of the loads.

The loop system is illustrated in Fig. 1-7. With this arrangement all loads may be served even though one line section is removed from service. In some instances during normal operation, the loop may be open at some point, such as A. In case a line section is to be taken out, the loop is first closed at A and then the line section removed. In this manner

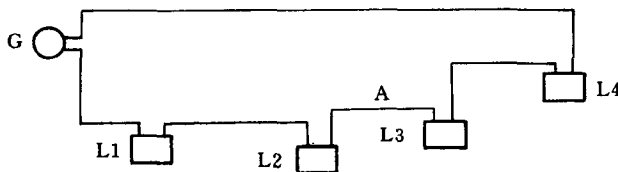


Fig. 1-7 A loop arrangement of lines for supplying several loads

no service interruptions occur.

Fig. 1-8 shows the same loads being served by a network. With this arrangement each load has two or more circuits over which it is fed.

Distribution circuits are commonly designed so that they may be

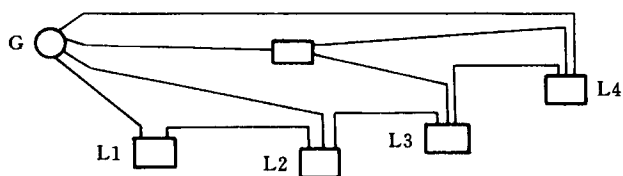


Fig. 1-8 A network of lines for supplying several loads

classified as radial or loop circuits. The high-voltage transmission lines of most power systems are arranged as networks. The interconnection of major power systems results in networks made up many line sections.

New Words and Expressions

1. typical <i>a</i>	典型的	2. layout <i>n</i>	布局, 配置
3. particular <i>a</i>	特殊的	4. classify <i>v</i>	分类
5. illustrate <i>v</i>	图解, 说明	6. radial system	辐射状系统
7. loop system	环网系统	8. network system	网络系统
9. distribution circuit	配电线路	10. interconnection <i>n</i>	互联
11. section <i>n</i>	分段, 部分		
*	*	*	*
1. result in	导致	2. in case	假使, 万一

Notes

1. The generators, lines, and other equipment which form an electric system are arranged depending on the manner in which loads grow in the area and may be rearranged from time to time.

一个由发电机、线路以及其他设备构成的电力系统, 其布局取决于当地的负荷增长方式, 并有随时调整的可能。

本句的主结构为 The generators, lines, and other equipment...are arranged...and maybe rearranged...

Part 4 Auxiliary Equipment

Circuit breakers are necessary to deenergize equipment either for normal operation or on the occurrence of short circuits. Circuit breakers must be designed to carry normal-load currents continuously, to withstand the extremely high currents that occur during faults, and to separate contacts and clear a circuit in the presence of fault. Circuit breakers are rated in terms of these duties.

When a circuit breaker opens to deenergize a piece of equipment, one side of the circuit breaker usually remains energized, as it is connected to operating equipment. Since it is sometimes necessary to work on the circuit breaker itself, it is also necessary to have means by which the circuit breaker may be completely disconnected from other energized equip-