实用行业英语系列

实用电力英语

A Practical Course of English for Electric System

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中国科学技术大学出版社

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A Practical Course of English for Electric System

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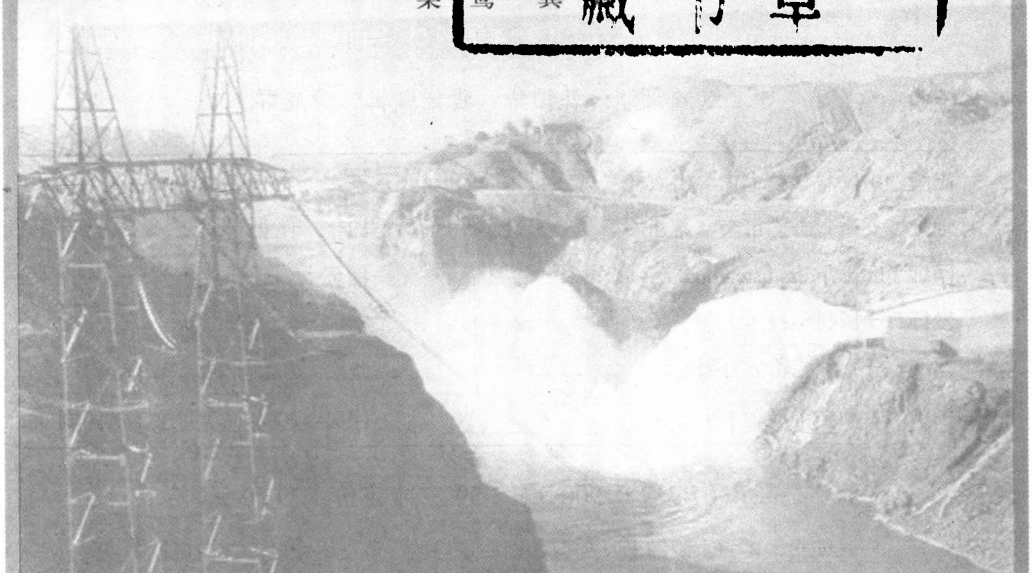

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内 容 简 介

本教材从高等学校应用型人才培养的目的出发，结合学生毕业后的工作实际，力求向学生提供其未来在电力系统岗位所需要的专业英语知识和词汇，培养学生使用涉外业务英语和现场运用英语的能力。本书亦可作为电力系统在职人员的培训教材。

本教材包括 10 个单元并附有电力英语常用英文缩写词、常用希腊字母代表的词汇和电力单位的名称、符号及换算，书的末尾附有本教材的参考译文（部分）及涉及的词汇。

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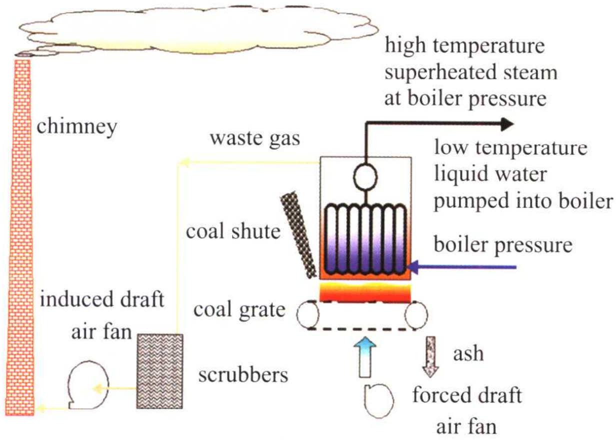

Figure 1 Steam Turbine
(Passage Ⅱ, Unit 3)

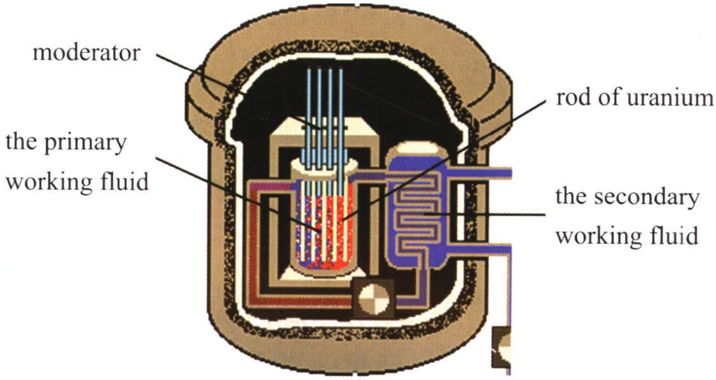

Figure 2 Reactor Core
(Passage Ⅳ, Unit 7)

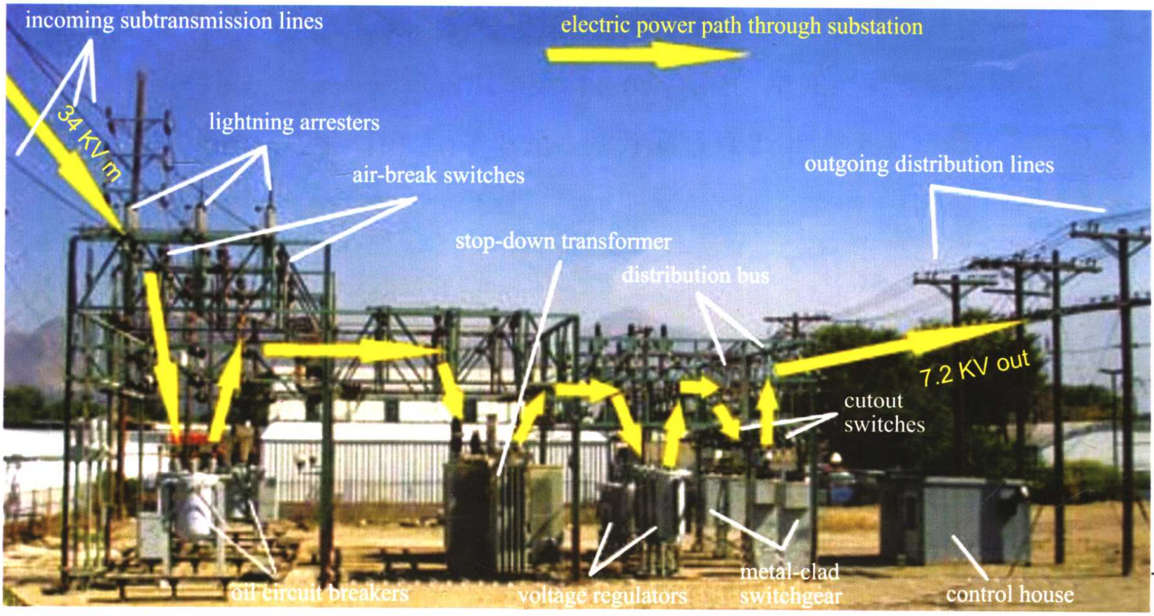

Figure 3 Typical Substation (Passage Ⅰ, Unit 6)

前　言

本教材从高等学校应用型人才培养的目的出发，结合学生毕业后的工作实际，力求向学生提供其未来在电力系统岗位所需要的专业英语知识和词汇，培养学生使用涉外业务英语和现场运用英语的能力。本教材也可作为电力系统在职人员涉外教材，通过该教材使他们基本掌握电力英语的相关词汇，并能够流利地表达。

本教材本着电力系统的应用实际，收集了电力系统概况、电的基本原理、汽机、锅炉、发电机知识、输配电、水力发电和核电知识以及电力建设等专业知识。

本书在编写过程中，始终得到安徽电气工程技术学院领导和学院基础部的大力支持和关心，在此表示衷心感谢。该教材参考译文部分由本院电力系吴义纯老师校阅，在此一并感谢。

本书由周承柏主编，栾鸾担任副主编，主审为石玉洁，具体各章节编写情况如下：周承柏编写第 1、6、9、10 单元；栾鸾编写第 4、8 单元；龚婷编写第 3、7 单元；张芳编写第 2、5 单元。

编　者

2006 年 4 月

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Unit 1

Electricity History

Passage I Electricity History

History of Electricity

Despite what you have learned, Benjamin Franklin did not "invent" electricity. In fact, electricity did not begin when Benjamin Franklin at when he flew his kite during a thunderstorm or when light bulbs were installed in houses all around the world.

Benjamin Franklin

The truth is that electricity has always been around because it naturally exists in the world. Lightning, for instance, is simply a flow of electrons between the ground and the clouds. When you touch something and get a shock, that is really static electricity moving toward you.

Hence, electrical equipment like motors, light bulbs, and batteries aren't needed for electricity to exist. They are just creative inventions designed to harness and use electricity.

The first discoveries of electricity were made back in ancient Greece. Greek philosophers discovered that when amber is rubbed against cloth, lightweight objects will stick to it. This is the basis of static electricity.

Over the centuries, there have been many discoveries made about electricity. We've all heard of famous people like Benjamin Franklin and Thomas Edison, but there have been many other inventors throughout history that were each a part in the development of electricity.

Electricity Personalities

Benjamin Franklin

Franklin was an American writer, publisher, scientist and diplomat, who helped to draw up the famous Declaration of Independence and the US Constitution. In 1752 Franklin proved that lightning and the spark from amber were one and the same thing. The story of this famous milestone is a familiar one, in which Franklin fastened an iron spike to a silken kite, which he flew during a thunderstorm, while holding the end of the kite string by an iron key. When lightening flashed, a tiny spark jumped from the key to his wrist. The experiment proved Franklin's theory, but was extremely dangerous — he could easily have been killed.

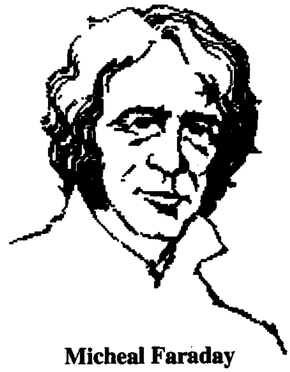
Galvani and Volta

Alessandro Volta

In 1786, Luigi Galvani, an Italian professor of medicine, found that when the leg of a dead frog was touched by a metal knife, the leg twitched violently. Galvani thought that the muscles of the frog must contain electricity. By 1792 another Italian scientist, Alessandro Volta, disagreed: he realised that the main factors in Galvani's discovery were the two different metals — the steel knife and the tin plate — upon which the frog was lying. Volta showed that when moisture comes between two different metals, electricity is created. This led him to invent the first electric battery, the voltaic pile, which he made from thin sheets of copper and zinc separated by moist pasteboard.

In this way, a new kind of electricity was discovered, electricity that flowed steadily like a current of water instead of discharging itself in a single spark or shock. Volta showed that electricity could be made to travel from one place to another by wire, thereby making an important contribution to the science of electricity. The unit of electrical potential, the Volt, is named after Volta.

Michael Faraday



Micheal Faraday

The credit for generating electric current on a practical scale goes to the famous English scientist, Michael Faraday. Faraday was greatly interested in the invention of the electromagnet, but his brilliant mind took earlier experiments still further. If electricity could produce magnetism, why couldn't magnetism produce electricity.

In 1831, Faraday found the solution. Electricity could be produced through magnetism by motion. He discovered that when a magnet was moved inside a coil of copper wire, a tiny electric current flows through the wire. Of course, by today's standards, Faraday's electric dynamo or electric generator was crude.

Thomas Edison and Joseph Swan

Thoms Ediston

Nearly 40 years went by before a really practical DC (Direct Current) generator was built by Thomas Edison in America. Edison's many inventions included the phonograph and an improved printing telegraph. In 1878 Joseph Swan, a British scientist, invented the incandescent filament lamp and within twelve months Edison made a similar discovery in America.

Swan and Edison later set up a joint company to produce the first practical filament lamp. Prior to this, electric lighting had been crude arc lamps.

Edison used his DC generator to provide electricity to light his laboratory and later to illuminate the first New York street to be lit by electric lamps, in September 1882. Edison's successes were not without controversy, however — although he was convinced of the merits of DC for generating electricity, other scientists in Europe and America recognised that DC brought major disadvantages.

Key Words

a flow of electrons 电子流

static electricity 静电

harness [ˋhɑːnis] *v.* 利用……产生动力

milestone [ˋmailstəun] *n.* 里程碑

electrical potential 电压

coil [kɔil] *n.* 线圈

dynamo [dainəmu] *n.* 发电机

incandescent filament 白炽灯丝

arc lamp 弧光灯

Questions

1. According to the text, what is lightning?

2. Is it true that we need electrical equipment because this is the way that electricity can exist?

3. Who made the first electric battery?

4. What did Faraday discover?

5. Who made the first really practical Direct Current generator?

Passage II What Is Electricity?

What Is Electricity

Electricity is a form of energy. Electricity is the flow of electrons. All matter is made up of atoms, and an atom has a center, called a nucleus. The nucleus contains positively charged particles called protons and uncharged particles called neutrons. The nucleus of an atom is surrounded by negatively charged particles called electrons. The negative charge of an electron is equal to the positive charge of a proton, and the number of electrons in an atom is usually equal to the number of protons. When the balancing force between protons and electrons is upset by an outside force, an atom may gain or lose an electron. When electrons are "lost" from an atom, the free movement of these electrons constitutes an electric current.

Electricity is a basic part of nature and it is one of our most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Many cities and towns were built alongside waterfalls (a primary source of mechanical energy) that turned water wheels to perform work. Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Beginning with Benjamin Franklin's experiment with a kite one stormy night in Philadelphia, the principles of electricity gradually became understood. In the mid-1800s, Thomas Edison changed everyone's life — he perfected his invention — the electric light bulb. Prior to 1879, electricity had been used in arc lights for outdoor lighting. Edison's invention used electricity to bring indoor lighting to our homes.

Key Words

nucleus [ˈnjuːkliəs] *n.* 原子核
particle [ˈpɑːtikl] *n.* 粒子
proton [ˈprəutɔn] *n.* 质子
kerosene [ˈkerəsiːn] *n.* 煤油，火油
turbine [ˈtəːbain] *n.* 涡轮
internal-combustion engine 内燃机
kinetic energy 动能
hydropower [ˈhaidrə,pauə] *n.* 水力发电
nuclear fission 核子分裂
enriched uranium 浓缩铀
reservoir [ˈrezəvwɑː] *n.* 水库

Questions

1. What is the nucleus of an atom surrounded by?

2. What are primary sources? Does electricity belong to this?

3. What is an electric generator?

4. For what purpose did George Westinghouse develop the transformer?

5. What is the working theory of an electric generator?

Passage III What Is Voltage?

Potential Energy vs "Potential"

Voltage is also called "electrical potential."

So ... is voltage a type of potential energy? Close, but not totally accurate. Think of it like this. If you roll a big boulder to the top of a hill, you have stored some potential energy. But after the boulder has rolled back down, THE HILL IS STILL THERE. The hill is like voltage: the height of the hill has "Gravitational Potential." But the hill is not "made" of Potential Energy, since we need both the hill "and" the boulder before we can create potential energy. The situation with voltage is similar. Before we can store any ELECTRICAL potential energy, we need some charges, but we also need some voltage-field through which to push our charges. The charges are like the boulder, while the voltage is like the hill (Volts are like height in feet. Well, sort of...). But we wouldn't say that the Potential Energy is the boulder, or we wouldn't say the hill is the PE. In the same way, we should not say that electric charges are Potential Energy; neither should we say that voltage is Potential Energy. However, there is a close connection between them. Voltage is "electric potential" in approximately the same way that the height of a hill is connected with "gravitational potential." You can push an electron up a voltage-hill, and if you let it go it will race back down again.

Currents Don't Have Voltage

Voltage is not a characteristic of electric current. It's a common mistake to believe that a current "has a voltage" (and this mistake is probably associated with the "current electricity" misconception, where people believe that "current" is a kind of substance that flows). Voltage and current are two independent things. It is easy to create a current which lacks a voltage: just short out an electromagnet coil. It is also easy to create a voltage without a current: flashlight batteries maintain their voltage even when they are sitting on the shelf in the store. Water analogy: Think of water pressure without a flow. That's like voltage alone. Now think of water that's coasting along; a water flow without a pressure. That's like electric current alone.

"Kinds" of Electricity?

Grade-school textbooks wrongly teach that electricity comes in two types: static electricity and current electricity. These textbooks would be much closer to the truth if they instead said this:

The two halves of "electricity" are "voltage electricity" and "current electricity."

Still misleading, since the meaning of the word "electricity" is not clearly defined. It would be better if they said that electrical energy has two main characteristics: voltage and current. But the above statement is not nearly as bad as the stuff they teach about "static vs. current."

For one thing, the stillness of the charges is not important. "Static" electricity is not electricity which is static. Instead, "static charge" really means "separated opposite charges". We should not be surprised to learn that "static electricity" is able to flow from place to place without losing any of its characteristics. Maybe it's not "static" anymore, but this doesn't matter, since a separation of charge can move along. It's the imbalance between opposite charges that's important, and their "static-ness" is not.

Seeing the Invisible Voltage

Magnetic fields are invisible, and so is voltage. Both can be made visible. Iron filings let us see magnetic fields. To see voltage, suspend some metal or plastic fibers in oil, or sprinkle grass seeds on a pool of glycerin. If we then expose the oil to the strong voltage-field surrounding a charged object, the fibers or grass seeds will line up and show the shape of the field. Rub a balloon on your head, hold it near the suspended fibers, and you'll "see" the lines of e-field flux.

Measuring Voltage

To measure current, we allow the magnetism around a coil of wire to deflect a compass needle. To measure voltage, we allow the "electricism" between a pair of delicately suspended metal plates to deflect one of those plates. The simplest voltmeter is called a "foil-leaf electroscope." We find such things in books about "static electricity", when they really should be in all electronics books. A more complicated version of the foil-leaf electroscope is called a "quadrant electrometer." These two devices can measure voltage directly, without creating any electric current at all. Besides the moving capacitor plates, there are a few other ways to measure voltage too.

The Voltage of Light

Here's a strange idea: Flowing Electromagnetic energy always has voltage. For example, if you touch the antenna of a powerful radio transmitter, you can receive an electric shock because of the high voltage at the antenna. Radio waves are electromagnetism, and the intense waves surrounding a radio transmitter's antenna will have a high voltage-field. Radio waves can be measured in terms of voltage. Even the brightness of the light from the sun can be measured in terms of volts per meter. So can the energy which comes from the electric generators and flows along wires to a 120v table lamp. All of these involve electric fields (and voltage), and magnetic fields (and current).

Expose All Students to High Voltage!

"High voltage." Might you already know what that is? It's not just the dangerous devices behind the electric company fence. High voltage is also balloons rubbed upon your hair, and "static electric generators" and their very long sparks. You might be interested to know that all voltage does the same things as "High

Voltage." The effects are just weaker. Understand "high voltage," and you'll understand voltage itself. High voltage devices are not just toys, they are educational: they let us experience voltage directly. If you want to understand magnetism, then play with electromagnet coils and bar magnets. If you want to understand voltage, then get yourself a VandeGraaff generator.

Voltage has wrongly been hidden within "static electricity" and declared to be an obsolete and useless science, important only for historical reasons. But in a certain sense, "static electricity" is "voltage". Static electricity is a high-voltage phenomenon. If we stop teaching about "static electricity," and regard it as ancient and useless "Ben-Franklinish" stuff, then we also stop teaching about voltage. Can you see why voltage has become such a mystery? We've nearly eliminated "static electricity" from high school science classes, and so we've also throw away our basic voltage concepts.

Key Words

magnetic fields 磁场
glycerine [ˈglisərin] *n.* 甘油
voltmeter [ˈvəult,miːtə] *n.* 伏特计
foil-leaf electroscope 金属薄片验电器
capacitor [kəˈpæsitə] *n.* 电容器
antenna [ænˈtenə] *n.* 天线
radio transmitter 无线电发送器
electromagnet coils 电磁圈
bar magnets 磁棒

Questions

1. Is voltage a type of potential energy?
2. What do we need when we can store any electrical potential energy?
3. Is it true that we say electricity comes in two types: static and current?
4. Which is more important, the staticness or the imbalance between opposite charges?

5. Is all High Voltage dangerous?

Passage IV Power Failure

Power is a very important thing today because we count on electricity to keep us safe and comfortable. Without electricity, you can't use any electrical appliance. For many people, the furnace and running water don't work during a power failure. Even if the central heat uses gas or oil, you may use an electric fan to circulate the heat. Your water may depend on an electric pump to bring it into your home. Power failures can be a disaster if they last more than 24 hours because the food in a refrigerator or freezer can defrost and spoil. Without enough heat, some people who aren't strong and healthy can get very sick or die. One of the more common effects of a power outage is that you have no lights except flashlights or gas lanterns.

Nick's Yard in the Ice Storm of '99

People lose power when:

- Lightning strikes a telephone pole as shown above.
- Ice becomes too heavy on the power lines.
- Trees get too heavy from snow, ice or rainstorms and they fall over on the power lines.
- Earthquakes or other natural disasters can break the lines.
- Renovations and home construction can cause disruptions in power supply.

Here's What Happens to Sam When There Is No Power

The stove does not work so we can't have any hot food. The refrigerator does not work so we're not supposed to open it and let the cold air out because the food might spoil. The computer does not work, so I can't do ThinkQuest. The TV, VCR, stereo, dishwasher, the washer and dryer stop working as well. Worst of all, our heat and air conditioning don't work so the house gets freezing cold in the winter and hot in the summer. The lights don't work so, when it gets dark outside, it's very dark inside, too, and we need to use candles and flashlights. The pump and aerator for my fish tank stop working, so if the power goes out for very long, the water has too much ammonia and not enough oxygen for the fish, which will make them sick.

Key Words

electrical appliance 电器

circulate [ˈsəːkjuleit] *v.* 使……循环

aerator [ˈεəreitə] *n.* 通风装置

ammonia [əˈməuniə] *n.* 氨

Questions

1. What is a power failure?
2. Why is power a very important thing today?
3. When do people lose power?
4. What effect may power failure have on our life?
5. Have you ever experienced any power failure?