ELECTRICITY SURROUNDS US – TOUCHES EVERY ONE OF US, EVERY DAY, EVERYWHERE. A FORCE BEHIND THE LITTLE MIRACLES, THAT SHAPES THE UNIVERSE AND DRIVES THE MODERN SOCIETY OF WHICH WE ARE PART.

With special thanks to:

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1 HISTORY OF ELECTRICITY

1.1 Introduction

For centuries electricity has been a challenge to scientists. They have long known that it exists, and have discovered how to generate it on a large scale, but find it difficult to explain exactly what electricity is.
Where did it all begin?
Around 600 BC Greeks found that by rubbing an 'electron' (a hard Fossilised resin that today is known as Amber) against a fur cloth, it would attract particles of straw. This strange effect remained a mystery for over 2000 years, until, around AD 1600, Dr William Gilbert investigated the reactions of amber and magnets and first recorded the word 'Electric' in a report on the theory of magnetism.
Gilbert's experiments led to a number of investigations by many pioneers in the development of electricity technology over the next 350 years.

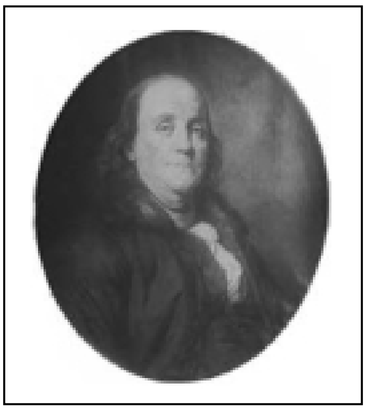
1.2 Fathers of Electricity

Electrical history goes back before Christ and brings us to the computer age. Along this journey you will discover it took several people, along the way, to make the light bulb glow.

The accredited father of the science of electricity and magnetism is **William Gilbert**, who was a physician and man of learning at the court of Elizabeth.

Prior to him, all that was known of these phenomena was what the ancients knew, that the lodestone possessed magnetic properties and that amber and jet, when rubbed, would attract bits of paper or other substances of small specific gravity. William Gilbert's great treatise "On the Magnet", printed in Latin in 1600, containing the fruits of his researches and experiments for many years, indeed provided the basis for a new science.

On foundations well and truly laid by several Europeans, like **Otto von Guericke** of Germany, **Du Fay** of France, and **Stephen Gray** of England, worked before **Benjamin Franklin** and added to the structure of electrical knowledge.
Modern milestones in the discovery and harnessing of electricity began in 1729 with Stephen Gray's discovery of the conduction of electricity.



Benjamin Franklin

In October of 1745, **Georg Von Kleist** discovered that electricity was controllable and invented what came to be called the 'Leyden Jar'. "It is an electrical condenser consisting of a glass jar coated inside and outside with metal foil, having the inner coating connected to a conducting rod passed through the insulated stopper."

Benjamin Franklin (1706-1790) was an American writer, publisher, scientist and diplomat, who helped to draw up the famous Declaration of Independence and the US Constitution. Starting in 1747, Benjamin Franklin worked with static charges in the air and noted that their existence suggested the existence of an electrical fluid that could possibly be composed of particles.

In 1750 Franklin discovered that lightning was the same as electrical discharges, and proposed the idea of lightning rods that would draw this charge away from homes, making them safer and less prone to fires.

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.

James Watt (1736-1819) was born in Scotland. Although he conducted no electrical experiments, he must not be overlooked. Watt thought that the steam engine would replace animal power, where the number of horses replaced seemed an obvious way to measure the charge for performance. Interestingly, Watt measured the rate of work exerted by a horse drawing rubbish up an old mine shaft and found it amounted to about 22,000 ft-lbs per minute. He added a margin of 50% arriving at 33,000 ft-lbs.

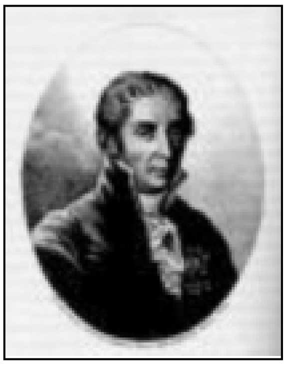
His improvements to steam engines were patented over a period of 15 years, starting in 1769 and his name was given to the electric unit of power, the Watt.

Thomas Seebeck (1770-1831) a German physicist was the discover of the "Seebeck effect".
He twisted two wires made of different metals and heated a junction where the two wires met. He produced a small current. The current is the result of a flow of heat from the hot to the cold junction. This is called thermoelectricity. Thermo is a Greek word meaning heat.

In 1799 the Royal Institution of Great Britain was founded. It provided important support for the investigation of electricity and magnetism.

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.

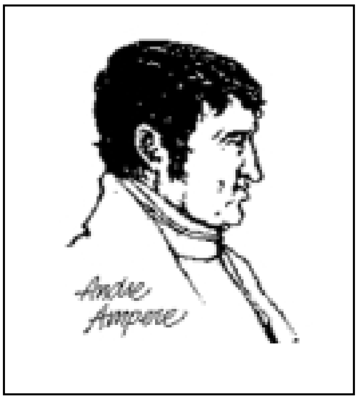
By 1792 another Italian scientist, **Alessandro Volta**, disagreed: he realised that the main factors in Galvani's discovery were the two different metals - the steel knife and the tin plate - apon which the frog was lying. Volta showed that when moisture comes between two different metals, electricity 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.

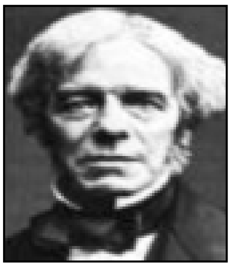
In 1820, **Hans Christian Oersted** discovered the magnetic effects of a current, by observing that electrical currents effected the needle on a compass.
A few weeks later, **Andre Marie Ampere**, a French mathematician who devoted himself to the

study of electricity and magnetism, was the first to explain the electro-dynamic theory. A permanent memorial to Ampere is the use of his name for the unit of electric current. Andre Marie Ampere discovered that a coil of wires acts like a magnet when a current is passed thorough it.



In 1827 **Joseph Henry** began a series of electromagnetic experiments and discovered the concept of electrical inductance. He also built one of the first electrical motors.

That same year, **Georg Simon Ohm** working in the field of current electricity discovered the ‘conduction law that relates potential, current, and circuit resistance.’ In tribute to him, the Ohm, denotes the unit of electrical resistance.

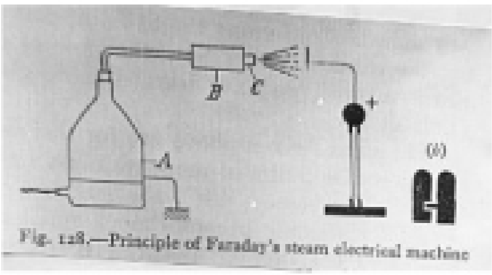


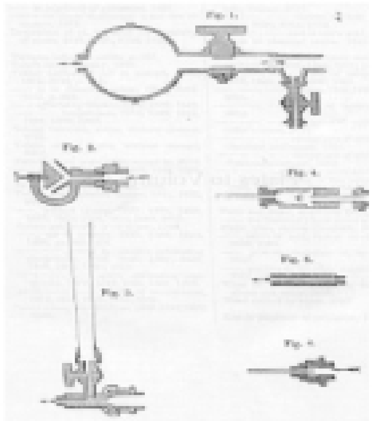
An Englishman, **Michael Faraday** (1791-1867), made one of the most significant discoveries in the history of electricity: Electromagnetic induction. His pioneering work dealt with how electric currents work. Many inventions would come from his experiments, but they would come fifty to one hundred years later.
Failures never discouraged Faraday. He would say; "the failures are just as important as the successes." He felt failures also teach.
The farad, the unit of capacitance is named in the honor of Michael 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, and provided only a small electric current.
He discovered the first method of generating electricity by means of motion in a magnetic field.

In Experimental Researches In Electricity Faraday’s investigations - on the electricity evolved by the friction of water and steam against other bodies - runs to twenty one pages.

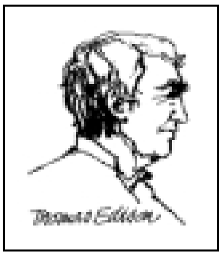
- The issue of steam alone does not evolve electricity (which confirmed Schafhauetl’s finding).
- The electricity produced is not due to either evaporation or condensation.
- The electricity is due entirely to the friction of particles of water, which the steam carries forward against the surrounding solid matter of the passage.
- Pure water must be used, any contamination, for example by salt, and no electricity is produced.
- The cause of the evolution of electricity by the liberation of confined steam is not evaporation but friction and therefore is not connected with the general electricity of the atmosphere.





Michael Faraday 1843.

James Maxwell (1831-1879) a Scottish mathematician translated Faraday's theories into mathematical expressions. Maxwell was one of the finest mathematicians in history.
A maxwell is the electromagnetic unit of magnetic flux, named in his honor.
Today he is widely regarded as secondary only to Isaac Newton and Albert Einstein in the world of science.



Thomas Alva Edison (1847-1931) was one of the most well known inventors of all time with 1093 patents. Self-educated, Edison was interested in chemistry and electronics. During the whole of his life, Edison received only three months of formal schooling, and was dismissed from school as being retarded.

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 by 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.

Nikola Tesla (1856-1943) envisioned a world without poles and power lines. Refered to as the greatest inventive genius of all time. Tesla's system triumphed to make possible the first large-scale harnessing of Niagara Falls with the first hydroelectric plant in the United States in 1886. Today the unit of measurement for magnetic fields commemorates Tesla's name.

George Westinghouse (1846-1914) was a famous American inventor and industrialist who purchased and developed Nikola Tesla's patented motor for generating alternating current. The work of Westinghouse, Tesla and others gradually persuaded American society that the future lay with AC rather than DC (Adoption of AC generation enabled the transmission of large blocks of electrical, power using higher voltages via transformers, which would have been impossible otherwise).
To solve the problem of sending electricity over long distances, George Westinghouse developed a device called a transformer. The transformer allowed electricity to be efficiently transmitted over long distances. This made it possible to supply electricity to homes and

business located far from the electric generating plant.

October 1893 Westinghouse was awarded the contract to build the first generators at Niagara Falls. He used his money to buy up patents in the electric field. One of the inventions he bought was the transformer from William Stanley. Westinghouse invented the air brake system to stop trains, the first of more than one hundred patents he would receive in this area alone.

Alexander Graham Bell (1847-1922) born in Scotland, was raised in a family that was interested and involved in the science of sound. Bell's father and grandfather both taught speech to the deaf. A unit of sound level is called ***a bel*** in his honor. Sound levels are measured in tenths of a bel, or ***decibels***. The abbreviation for decibel is dB.

Heinrich Hertz (1857-1894) a German physicist, laid the ground work for the vacuum tube. He laid the foundation for the future development of radio, telephone, telegraph, and even television. He was one of the first people to demonstrate the existence of electric waves. Hertz was convinced that there were electromagnetic waves in space.

Otto Hahn (1879-1968), a German chemist and physicist, made the vital discovery which led to the first nuclear reactor. He uncovered the process of nuclear fission by which nuclei of atoms of heavy elements can break into smaller nuclei, in the process releasing large quantities of energy. Hahn was awarded the Nobel prize for chemistry in 1944.

Albert Einstein (1879-1955). Einstein's formula proved that one gram of mass can be converted into a torrential amount of energy. To do this, the activity of the atoms has to occur in the nucleus. E = energy, M = mass, and C = the speed of light which is 186,000 miles per second. When you square 186,000 you can see it would only take a small amount of mass to produce a huge amount of energy.

These milestones marked the beginning of the field of electricity and electrical engineering that are continuously being further developed.

1.3 Lets go back in time

Year	Event
600 B.C.	Thales of Miletus writes about amber becoming charged by rubbing - he was describing what we now call static electricity.
1600	English scientist, William Gilbert first coined the term "electricity" from the Greek word for amber. Gilbert wrote about the electrification of many substances in his "De magnete, magneticisique corporibus". He also first used the terms electric force, magnetic pole, and electric attraction.
1660	Otto von Guericke invented a machine that produced static electricity.
1675	Robert Boyle discovered that electric force could be transmitted through a vacuum and observed attraction and repulsion.
1729	Stephen Gray's discovery of the conduction of electricity.
1733	Charles Francois du Fay discovered that electricity comes in two forms which he called resinous (-) and vitreous (+). Benjamin Franklin and Ebenezer Kinnersley later renamed the two forms as positive and negative.
1745	• Georg Von Kleist discovered that electricity was controllable. • Dutch physicist, Pieter van Musschenbroek invented the "Leyden Jar" the first electrical capacitor. Leyden jars store static electricity.
1747	• Benjamin Franklin experiments with static charges in the air and theorized about the existence of an electrical fluid that could be composed of particles. • William Watson discharged a Leyden jar through a circuit, that began the comprehension of current and circuit. • Henry Cavendish started measuring the conductivity of different materials
1752	Benjamin Franklin invented the lightening rod - he demonstrated lightning was electricity.
1767	Joseph Priestley discovered that electricity followed Newton's inverse-square law of gravity.
1786	Italian physician, Luigi Galvani demonstrated what we now understand to be the electrical basis of nerve impulses when he made frog muscles twitch by jolting them with a spark from an electrostatic machine.
1800	First electric battery invented by Alessandro Volta. Volta proved that electricity could travel over wires.
1816	First energy utility in US founded.
1820	• Relationship of electricity and magnetism confirmed by Hans Christian Oersted who observed that electrical currents effected the needle on a compass • and André Marie Ampere, who discovered that a coil of wires acted like a magnet when a current is passed thorough it. • D. F. Arago invented the electromagnet.
1821	First electric motor (Faraday).
1826	Ohms Law (Georg Simon Ohm) - "conduction law that relates potential, current, and circuit resistance"
1827	Joseph Henry's electromagnetic experiments lead to the concept of electrical inductance. Joseph Henry built one of the first electrical motors.
1831	Principles of electromagnetism induction, generation and transmission discovered (Michael Faraday).
1837	First industrial electric motors.
1839	First fuel cell.
1841	J. P. Joule's law of electrical heating published.
1873	James Clerk Maxwell wrote equations that described the electromagnetic field, and predicted the existence of electromagnetic waves traveling with the speed of light.

1880 • First power system isolated from Edison.
• Brush arc light dynamo driven by water turbine used to provide theatre and storefront illumination.

1881 Brush dynamo, connected to turbine in Quigley's flour mill lights city street lamps.

1882 • Edison's Pearl Street Station.
• First hydroelectric station opens.

1883 • Transformer invented.
• Edison introduces "three-wire" transmission system.

1884 Steam turbine invented.

1886 • William Stanley develops transformer and Alternating Current electric system.
• Frank Sprague builds first American transformer and demonstrates use of step up and step down transformers for long distance AC power transmission

1888 Rotating field AC alternator invented by Nikola Tesla.

1891 60 cycle AC system introduced in U.S.

1892 General Electric Company formed by the merger of Thomson-Houston and Edison General Electric.

1893 • Westinghouse demonstrates "universal system" of generation and distribution at Chicago exposition.

1897 Electron discovered by J. J. Thomson.

1900 Highest voltage transmission line 60 Kilovolt.

1903 • First successful gas turbine (France).
• World's first all turbine station (Chicago).
• Shawinigan Water & Power installs world's largest generator (5,000 Watts) and world's largest and highest voltage line—136 Km and 50 Kilovolts (to Montreal).
• Electric vacuum cleaner.
• Electric washing machine.

1904 John Ambrose Fleming invented the diode rectifier vacuum tube.

1905 First low head hydro plant with direct connected vertical shaft turbines and generators.

1906 Fully submerged hydroelectric plant built inside Ambursen Dam.

1907 Lee De Forest invented the electric amplifier.

1909 First pumped storage plant (Switzerland).

1910 Ernest R. Rutherford measured the distribution of an electric charge within the atom.

1911 • Air conditioning.
• R. D. Johnson invents differential surge tank and Johnson hydrostatic penstock valve.

1913 • Electric refrigerator.
• Robert Millikan measured the electric charge on a single electron.

1917 Hydracone draft tube patented by W. M. White.

1936 • Highest steam temperature reaches 900 degrees Fahrenheit vs. 600 degrees Fahrenheit in early 1920s.

1947 Transistor invented.

1953 • First 345 Kilovolt transmission line.

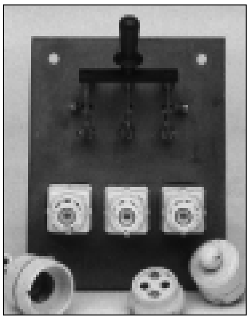
1986 Chernobyl nuclear accident (USSR).

1998 • Scottish Power (UK) to buy Pacificorp, first foreign takeover of US utility. National (UK) Grid then announces purchase of New England Electric System.

1999 • Electricity marketed on Internet.

1.4 History of Electricity Use

Thales of Miletus (640-546 B.C.) is credited with the discovery that amber when rubbed acquired the property of attracting light objects. The word electricity comes from "elektron" the Greek word for amber. Otto von Guericke invented the first static electric generator in 1675, while the first current generator was made by Alosio Galvani in 1780. But except for some supposed medicinal applications, electricity had little use.



Communication, the first of the great uses for electricity, began with the telegraph invented by Samuel Morse around 1840, to be followed by the telephone, radio and television by A. Graham Bell. Thomas Edison added lighting in 1880, which was soon followed by working electric motors and electric heating. Most recently has come electronics and the computer revolution. In all electricity has fundamentally transformed the way we live.

As the practical uses for electricity grew and multiplied, so did the demand for its production. Growth in distribution lead to high voltage transmission and the interconnection of the modern power grid, with power plants sometimes located over a thousand miles from consumers. Quite recently the monopoly structure of the industry has begun to be dismantled in favor of competition among generators.

Coal-fired steam and water power were the first sources of energy used to make electricity commercially, later gas and oil were also burned to make steam, as well as fueling reciprocating engines. In the late 1960's gas and oil fired combustion turbines, similar to jet engines, were introduced, as was nuclear power. Fossil fuel still accounts for most production of electricity, about 70%, with coal powering about 75% of the fossil fraction.

Despite its great importance in our daily lives, most of us rarely stop to think what life would be like without electricity. Yet like air and water, we tend to take electricity for granted. Everyday, we use electricity to do many functions for us. Electricity is a controllable and convenient form of energy used in the applications of heat, light and power.

1.5 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 centre, 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 go, 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 with the electric bulb. Prior to 1879, electricity had been used in arc lights for outdoor lightning to our homes.

1.6 How is electricity generated?

An electric generator is device for converting mechanical energy into electrical energy. The process is based on the relationship between magnetism and electricity. When a wire or any other electrically conductive material moves across a magnetic field, an electric current occurs in the wire.
An electric utility power station uses either a turbine, engine, water wheel, or other similar machine to drive an electric generator or a device that converts mechanical or chemical energy to electricity. Steam turbines, internal-combustion engines, gas combustion turbines, water turbines, and wind turbines are the most common methods to generate electricity.
Most of the electricity is produced in steam turbines. A turbine converts the kinetic energy of a moving fluid to mechanical energy. Steam turbines have a series of blades mounted on a shaft against which steam is forced, thus rotating the shaft connected to the generator. In a fossil-fuelled steam turbine, the fuel is burned in a furnace to heat water in a boiler to produce steam. Coal, petroleum, and natural gas are burned in large furnaces to heat water to make steam that in turn pushes on the blades of a turbine.
Nuclear power is a method in which steam is produced by heating water through a process called nuclear fission.
Hydropower is a process in which flowing water is used to spin a turbine connected to a generator.

1.7 Other generating sources

Geothermal power comes from heat energy buried beneath the surface of the earth. In some areas of the globe, enough heat rises close to the surface of the earth to heat underground water into steam, which can be tapped for use at steam-turbine plants. This energy source generates less than 1 % of the electricity.

Solar power is derived from the energy of the sun. However, the sun's energy is not available full-time and it is widely scattered. The processes used to produce electricity using the sun's energy have historically been more expensive than using conventional fossil fuels.

Photovoltaic conversion generates electric power directly from the light of the sun in a photovoltaic cell. Solar-thermal electric generators use the radiant energy from the sun to produce steam to drive turbines.

Wind power is derived from the conversion of the energy contained in wind into electricity. Wind power, like the sun, is rapidly growing source of electricity, and is used for less than 1 % of the nation's electricity. A wind turbine is similar to a typical windmill.

Biomass includes wood, municipal solid waste, and agricultural waste, such as corncobs and wheat straw. These are some other energy sources for producing electricity. These sources replace fossil fuels in the boiler. The combustion of wood and waste create steam that is typically used in conventional steam-electric plants.

1.8 How is electricity measured?

Electricity is measured in units of power called watts. It was named to honour James Watt, the inventor of the steam engine. One watt is a very small amount of power. It would require nearly 750 watts to equal one horsepower. A kilowatt represents 1,000 watts. A kilowatt-hour (kWh) is equal to the energy of 1,000 watts working for one hour. The amount of electricity a power plant generates or a customer uses over a period of time is measured in kilowatt-hours. Kilowatt-hours are determined by multiplying the number of kW's required by the number of hours of use. For example, if you use a 40-watt light bulb 5 hours a day, you have used 200 watts of power or 0,2 kilowatt-hours of electrical energy.

The electricity produced by a generator travels along cables to a transformer, which changes electricity from low voltage to high voltage. Electricity can be moved long distances more efficiently using high voltage. Transmission lines are used to carry the electricity to a substation. Substations have transformers that change the high voltage electricity into lower voltage electricity. From the substation, distribution lines carry the electricity to homes, offices and factories, which require low voltage electricity.

1.9 The future of electricity (2000-2050)

In the coming 50 years, it will be crucial that the world's energy systems be made environmentally benign and sufficient to meet everybody's energy needs.

We have better technologies than ever before to use energy efficiently, and to use energy resources without harming the environment.

The change of the world's energy system consists of a very large of changes to local and national energy systems to make them sustainable.

Europe is already the world leader in renewable energy. The purpose of renewable energy is that we can change the unsustainable energy system world wide in sustainable one.
We have several resources for renewable energy:

A. Wind
Wind is a significant and valuable renewable energy source. It is safe and abundant and can make an important contribution to future clean, sustainable and diversified electricity supplies. Unlike

other sources of energy, wind does not pollute the atmosphere and does not create any hazardous waste.

Wind is a limitless resource, it will be the fuel of the future.
The overall economic profile of wind power compares favourably. Whereas the cost of most forms of energy are bound to rise with time, the costs of wind energy are actually coming down.

The installed capacity in Europe has increased by about 40 % per year in the past six years. Today wind energy projects across Europe produce enough electricity to meet the domestic needs of 5 million people. The wind energy industry has set a goal for 60 000 MW of wind energy capacity to be installed by 2010, which would provide electricity for about 75 million people.

B. Hydropower

Hydropower is a pollution-free power source. Hydro-electricity generators change the energy of moving water into electrical energy. They do this using a continuous flow of water to turn a water turbine that is connected to an electricity generator. Water flows from a dam or reservoir to the turbine through a huge pipe called a penstock. He water passes through a spiral-shaped pipe, making it spin. The spinning water makes a turbine turn.

It is very important that the speed of the turbine remains constant so that the amount of electricity being produced, remains the same.

Hydro-electricity generation makes up 20 % of the world’s electricity. Asia is the fastest growing region for hydro-electricity production in the world.

C. Solar power

Sunlight "solar energy" can be used to generate electricity, provide hot water, and to heat, cool, and light buildings. A power plant can also use a concentrating solar power system, which uses the sun's heat to generate electricity. The sunlight is collected and focused with mirrors to create a high-intensity heat source. This heat source produces steam or mechanical power to run a generator that creates electricity.

Solar panels to consider are photovoltaic, flat plate hydronic panels, and Forced Convection Hot air solar Heating Systems.

D. Different solar technologies

Photovoltaïcs (PV): Photovoltaic solar cells, which directly convert sunlight into electricity, are made of semi-conducting materials. The simplest cells power watches and calculators and the like, while more complex systems can light houses and provide power to the electric grid.

Concentrating Solar power: concentrating solar power technologies use reflective materials such as mirrors to concentrate the sun's energy. This concentrated heat energy is then converted into electricity.

ELECTRICAL CONTRACTORS OF EUROPE CREATE TECHNOLOGICAL INFRASTRUCTURE FOR THE FUTURE SOCIETY

2 HISTORY OF AIE: 1954-2004

2.1 Before 1954

The story began in 600 BC, when Thales of Miletus discovered electricity, a word derived from the Greek "electron" and which expressed for him the electrostatic effects which amber had on straw when it was rubbed. After a long interval, since we have had to wait until the 18th century, the story resumed its course and a series of famous electricians emerged: Coulomb, Franklin and Volta in the 18th century, followed by Ampère, Faraday, Oersted, Ohm and Gauss in the 19th century.

But also in the same era it was, more particularly, Gramme, with the dynamo, batteries and accumulators, and Edison, with the popularisation of the carbon filament incandescent lamp, who prepared the ground for the electrical contractors.

The provision of energy and lighting opened up the way for the trade: public lighting to begin with, followed by domestic lighting in the towns. That takes us up to 1880/1890, more than a hundred years ago.

At the same time, the advent of alternating current transformers led to the expansion of energy distribution: the industrialists and manufacturers of electrical equipment also began to do installation.

Finally, there was the third source of the trade of contractor: the telephone, the electric bell and the house-bell! Yes - irony of fate - it is low-voltage currents, rediscovered in our time, which is the third driving force behind the launch of this trade, a trade which was known as “bell installer” in some countries - they installed electric bells in buildings.

Quickly within the towns the contractors merged; from 1885 local associations appeared. What was, in fact, occurring was the establishment of structures and representatives, faced with workers who were organising themselves into unions or confederations at all levels, throughout Europe. And that is how, for between 40 and 50 years, national unions, associations or federations, mostly starting as municipal or regional organisations, continued to emerge in every country. Denmark 1898, Scotland 1900, England 1901, France and Madrid 1922, Spain 1958 and Belgium 1960.

Union, association and federation - three different words but three words with a common origin, representing similar objectives. There we find, in fact, Latin or Greek roots such as "federare" (to unite), "ad sociare" (to combine with a view to) and "sundikos" (an advocate or delegate in law). The concerns of these first organisations were, in fact, as follows: salaries, organisation of work and working hours; in a word, they are social aspects.

A second uniting factor then bound these initial nuclei of contractors: safety, through standardisation, the safety of the users of the electrical installations - a topic of yesterday, today and, no doubt, tomorrow. For the industrialists, installation constituted a complementary activity at this time. Now, these industrialists are close to their customers - the energy producers and distributors - and the whole thus constituted, which we now call the "electricity sector" had to cooperate and work with the authorities, in order to conceive what will become standardisation. They had to conceive and develop the necessary regulations.

That is how the national contractors associations continued to spread throughout Europe.
Before World War II, very few businesses were active beyond our borders. We were little concerned by the practice of our trade among our neighbours. The means of communication were not, by a long way, what they are today. As in politics, the idea of "Europe" or "Common Market", did not enter the minds of our fellow members.

The political and economic situation in Europe changed, however, after the war: 1939-1945 was a period of intense rebuilding, with supply problems for electrical equipment, major social problems resulting from the Cold War, social, technological and even political structures inherited from the pre-war situation and a lack of awareness of the change in mentalities throughout the world.

In 1953, there was a visit to the USA by a group of electricians with their own businesses, from the F.N.E.E. (France), led by its president, Robert COMTET, and by the current secretary general, Maurice MALLET. It was then, in fact, that the idea was born to create an organisation which amalgamated the existing national federations or associations.

As a result of all these steps, it was in 1954 that the F.N.E.E. was able to call the members together.

2.2 1954: Creation of the AIE

On 18th and 19th March 1954 – four years before the Treaty of Rome – five national associations decided that, despite borders and cultural differences, they had many things in common and joined forces within an international association. **They were Switzerland, Italy, Denmark, Great Britain and France**, five countries ahead of their time, when you look at how things turned out… Their initial objectives were as follows:

- Surveys of the practices within the various countries, swapping experiences, establishing a permanent link between all the national associations and
- Centralising, classifying and distributing, to all the associations, commercial and industrial information, as well as that relating to human relations between employers and employees.

As the years went by, there was an increasing need for communication and exchanging views, since the idea of a "European Common Market" of identical or harmonised standards and what was at the time the almost-Utopian vision of a "single currency" became indispensable concepts for the near future.

And so, in 1954, the "Association Internationale des entreprises d'équipement Electrique" was born, its statutes were adopted and its headquarters were established in Paris, at 9 Avenue Victoria; for several years, the president of the F.N.E.E., Robert Comtet, who was its instigator, fulfils the role of President, while Maurice Mallet (also from F.N.E.E.) becomes Secretary General. And when you go through the initial records, the letters exchanged at the time, you are again aware of the fact that the first common priority is in the social area. These countries were concerned with being able to compare hourly wage-rates and the cost of the various payments, as well as their respective collective bargaining agreements.

In the course of the first 20 years of the AIE’s existence, technical problems were also high on the executive's list of concerns. This was hardly surprising, as they were the most direct link for a trade considered to be technical in nature.

The AIE was interested in access to the trade - regulated in a few countries only - in safety, in standardisation, in the corrosion of the lead sheath containing the cables, in relations with energy distributors, in apprenticeships and in so many topics which are sometimes still important to certain of them, more than 40 years later.

Right from the first reports, for example, it appears that, even at that time the electricity distribution companies in certain towns are organising offices and shops to sell equipment and are establishing electrical installation businesses, either directly or through branches.

The AIE was then to expand steadily – note the arrival of **Austria** in 1956, of **Germany** in 1961, of **Scotland** in 1963, of **Spain** in 1965 (then in the form of the current FENIE, only in 1985), of **the Netherlands** in 1967 and of **Belgium** in 1969.

In the mid seventies, a certain change of thinking became apparent. There was the entry of Great Britain to the Common Market, the subsequent awakening of the Scandinavian countries, requests for admission by Spain and later by **Portugal** at the beginning of the eighties, by **Greece** in 1996, by **Hungary** in 2002 and by **Cyprus** in 2003. It was a question of finding a cruising speed, conserving the friendly “club” spirit which existed at the beginning and of still becoming a more sophisticated tool, at the disposal of the national associations, with 21 members to date. Finally, the intensification of the “European” concept resulted in the AIE devoting more time and resources to solving economic problems, while still remaining active in the development of the technical side of the profession.
There was, indeed, a good deal to be learned from each other, there was a genuine need for communication and swapping experiences but it all entailed an effort of goodwill. Each country endeavoured to satisfy the requirement for modernisation and tried to foresee the consequences of this economic Europe; from then on the AIE became the crucible of ideas and proposals.

That is how the committees stirred themselves into life.

The AIE *technical committee* was extremely active from the start. It concentrated on the exchange of information between countries and particularly on proposing study topics. That was indeed the case when the list of graphic symbols established by the AIE was forwarded to the Committee 3 of the CEI, resulting in the adoption of some of them. That also proved to be highly important when it came to extending the CEI 60-439 standard, designed for line manufacturers, to switchboards produced on site or in the workshop by the contractors (the modes of testing and checking being different). Without positive action, this activity would no longer have been possible, to the benefit of the builders.

Among the committee's achievements, the following should be mentioned:
- comparison of connection diagrams for housing;
- the position regarding the abolition of Class 0 for lighting installations;
- the publication of the International Vocabulary of Electrical Equipment;
- the methods for inspecting and testing installations;
- types of embedded conduits and splicing conductors;
- home automation; relations with builders and associations for skilled workers;
- the selection of the AIE representatives to the Committee 64 of the CEI;
- proposals for standards projects submitted to CENELEC for safeguarding existing domestic installations (ES 59009);
- the compilation of a Technical Directory, which is a list which gives, for each member country, legislative texts, standards, personnel qualification, regulations governing access to the profession, verification procedures and various other procedures.

In 1975, the first International Conference of Electrical Equipment Companies was held in Paris; the papers presented during the two days of discussion covered all areas of activity and were published in a voluminous compendium.

- The *social committee* permanently studied the comparative change in the cost of labour and the impact of Social Security contributions, with considerable difficulties arising from the diversity between factors which were taken into account or were not (between the definitions of labour costs or of overheads possibly being allocated to that area, for example)
  It also made a study of the existing regulations in the various member states in the area of relocation compensation.

- The *vocational training committee* studied the document prepared by the CEE on the trade of electrical contractor, a document that, in the long run, should result in vocational training on a European scale, and the definitions of the various grades and qualifications of personnel.

- Numerous European surveys have been carried out by the economics committee on problems such as:
    - guarantee and insurance systems
    - equipment distribution systems
    - computerisation of businesses

2.3 Development of the AIE in the new millennium

Any trade association, be it national or pan European like the AIE, has to mirror the industry that it represents if it is to succeed in satisfying the needs of its member companies.

Today, the AIE has become the European Commission's representative for all the profession's problems, a partner of CENELEC for standardisation problems and the electricians' representative to the CEETB (Comité Européen des Equipements Techniques du Bâtiment - European committee for technical construction equipment, see below).

When all is said and done, the AIE is to the European authorities what its members, the national associations, are to their respective governments: the spokesperson, the partner and the representative of a trade which today numbers 175,000 businesses in Europe, 900,000 workers with a revenue of 60 billion euros and 80% AIE membership.

The electrical industry is changing rapidly with the advance of new technology and new applications are being developed all the time. As technology advances, electrical contractors carry out an ever-increasing proportion of the value of construction work. Mechanical and electrical installations can account for as much as 60 % of the initial cost of a project but this percentage can be much greater when life cycle costs are taken into account.

Indeed, with the increasing complexity of technical installations the private consumer and house owner, as well as the professional specified or purchasing official are becoming more and more dependant on the knowledge and creativity of the electrical contractor.

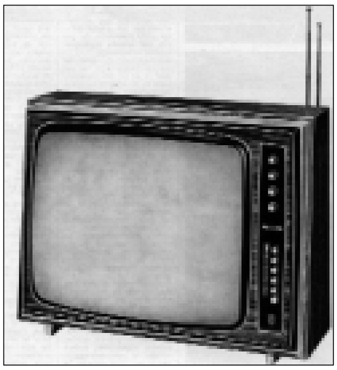
Nowadays, the electrician is no longer just a skilled technician. He is an expert adviser who is able to explain to the client the possibilities and advantages of new technology. It is not only the technical aspect but also the environmental impact of the installation.

Automation techniques, including optical fibre technology, microprocessors, and programmable logic controllers, are normal skills of modern electrical contractors.

Electrical contractors design, install and maintain intelligent systems for all kinds of industrial, commercial and domestic purposes alongside the well-known power and lightning applications. They know how to deal with telecommunications, highway and street lighting, energy management systems, access, fire and security control equipment, lightning protection systems, advertising and identification signs and emergency power generating systems.

Our companies are responding to these new markets and the AIE must do the same. The AIE has therefore repositioned itself for the new millennium to exploit the opportunities that are arising and to bring about improvements in all aspects of the industry.

In 1999, the Council of Delegates – the decision making body of the AIE – agreed new Articles, strategy and structure. The strategy is simple: co-ordination and promotion of the common interests of European electrical installers and contractors.



Monitoring and influencing the legislative process of the EU relevant to our businesses and facilitating the exchange of information between member associations will achieve realization of the strategy.

However Brussels, the seat of the European Union, is increasingly affecting our commercial lives and unified representation of our members' interests is vital. In 2000, the second step in the reorganization of the Association took place. It was agreed that a professional service for member associations and a strengthened identity in Europe would be assisted by the establishment of the AIE with its own office and independent secretariat in Brussels. By being close to the policy makers and political centre of power in the European Union, the AIE is better able to influence legislation and consultation procedures that impinge on the commercial and technical future of its member contractors.

50 years old but still young, the AIE has lost nothing of its original qualities, its enthusiasm and its Sixties dynamism. It is a marvellous reflection of the development in its members' concerns and in electrical businesses.

2.4 What are those electrician's businesses?

In the Fifties, the medium-sized business (50-250 people) was of major importance. The craft industry (up to 10 persons) was restricted to small local businesses, especially in the country. Competition was relatively limited, customer contact was often based on mutual trust - the customer had his electrician and didn't often change…

In the sixties there was a great sense of optimism, many companies and individuals enjoyed an increasingly enhanced way of life and were experiencing a much-improved standard of living after the austerity and deprivations of the 39-45 war years and fifties. Business was good, electricity use was booming, competition was less severe and relationships with customers remained close.

The seventies continued that trend but we could sense that the good times were not going to last for ever. Many strikes in other industries gave rise to excessive wage settlements. As always, when wage increases and is not balanced with productivity improvements, the price paid for increased prosperity turned into rage inflation.

During the eighties competition became much fiercer, especially for SMEs who had trained many young people in the preceding years. Those young people had become highly skilled and naturally the entrepreneurial spirit flourished. The result was that SMEs found themselves in competition with those who had been their former employees. This drove down prices especially for the very small companies.

The beginning of the nineties saw a very severe recession and a lot of industrial unrest as 'sunset' industries went into terminal decline (coal mining, steel making, ship building, heavy industries). This had a impact on the electrical sector. Many companies lost customers as their markets declined or manufacturing was sourced from elsewhere. Clients took less interest in the subcontractors employed by their general contractor – direct contact between electrical contractor and client was much less common.

But when equilibrium was restored in the mid-nineties many electrical contractors were quick to

embrace and exploit the opportunities presented by the ‘sunrise’ industries (telecommunications, data, control systems, new technology).
Today, the average business must adapt or perish. New markets are coming onto the scene: home and building automation, security, ICT, automatic controls, robotics and renewable energies.

Most often, however, the majority of them have a workforce of less than 10, have been founded by the head of the business himself and are now in the second or third generation of the family. Basically made up of technicians, they work mainly in housing, in the services sector, in industry and in public lighting. It goes without saying that those sectors can then produce new work, either in renovation or in servicing and maintenance.

And so we are involved with a technical trade which is constantly going forward. Thanks to its various branches, to this "new building/renovation" duality and to this third sector which is now indispensable, "maintenance/servicing", it remains relatively well-balanced and level-headed, sometimes even coveted by others, which is a good sign.

What we must today look forward to, and be ready for, is the day when the ever-increasing value of the electrical installations makes it sensible and logical for clients to appoint us as the project leaders.

What is it about the associations, of which the contractors always enjoy being a part?

Some of them are nearly 100 years old, some have scarcely come of age, some depend, in certain countries, on building federations or public works and in other countries they are totally independent, with workforces which can vary from 5 to 50/60 employees, budgets which can reach 35/40 billion francs, with a number of them having their own marketing subsidiary, insurance, assessment system and/or training centre/s.

But although they are all given the task of defending the interests of the same profession, they are, however, capable of displaying identical and similar aspects and also differences which are sometimes significant.

Similar aspects are: information, assistance to businesses, advice, answering questions, daily services in numerous areas but mainly in those of technology, safety, standardisation and sometimes more, with the areas of welfare, management economics and training.
Other points of similarity: several associations have been induced to develop specific software for electricians, which is sometimes free and sometimes not, but which has one objective: to develop training in businesses and to lead them to be more competitive. Let us also take note of the fact that the expected result has been achieved and that the new, similar trend has generally taken over, training towards quality, towards management with, if necessary, certification at the end of the road; This is another mission for which the professional association can legitimately claim to be responsible.

To deal with differences: some associations are not the only ones representing the trade in their country; they must, however, maintain their level of representation and, to do this they must continuously invest time, money thought and organisation in recruiting new members.

On the other hand, other organisations are the only ones in their country, are highly representative and are able to benefit from unionisation rates of 70 to 80%. We should also mention that when we have to recruit, the membership fees -which pay for forms of action which are not always obvious, such as lobbying - are generally seen as too expensive. It is true to say that the professional organisation has something in common with the iceberg - only one tenth of what it achieves is seen!

Let us consider how slow the standardisation process is, its intangible nature and let us emphasise, however, that this work of the association benefits everyone, both members and non-members!
On their isolation, or, on the contrary, on their belonging to another world - building, metallurgy, industry or public works - will depend the missions and, as a result, the structures and the budgets.

An association which is incorporated in the building industry or in public works (e.g. France, Belgium and Portugal) will basically limit or restrict itself to aspects which are solely and specifically electrical; on the other hand, other associations, which are totally independent, must be prepared to do battle on all fronts, in all sectors. The structures of such an association will, of necessity, be different. On the other hand it is free and never forced towards the compromise which cohabitation and pooling of resources bring about.

Three final points in this "tour of the associations": it is worth noting that the unionisation rates reach 80%-90% in the Scandinavian countries - compared with 20%-30% in others and one explanation is their position when it comes to wage-negotiation.

Point 2: we should emphasise the special nature of some association which are founded along with those of the heating engineers and the plumbers, such as Assistal in Italy, Tekniq in Denmark and Uneto-Vni in the Netherlands.

Point 3: some organisations demand qualifications from the members and make them undergo a real audit process before accepting them; others recruit without any prior requirements. Two philosophies, two quite different approaches but it is obvious that only the first allows the professional organisation to enter into certain undertakings on behalf of their members, based on the results and the quality of their services.

And so, to end this "round-up" : there are both points in common and differences but thanks to the AIE we are in a position to stress that they all have the same major concerns, the concerns which are to be found at european level. Just to mention some:

- quality, certification of quality assurance - a worthwhile investment or a constraint ignored by the customer?
- prices which are too low - indicating low cost without quality, overall costs
- too many businesses for the size of the market
- sub-contracting and all its inherent dangers (lack of quality, lack of creativity, maintenance not included); the attitude to adopt to general contracting?
- guaranteed payment and late payment
- Relations within the electrical sector, and waste recovery,
- inspection of old electrical installations, safety diagnosis: a considerable market if you consider the amount of accommodation which is dilapidated and, therefore, dangerous.
- Promoting the profession, supply strategy, meeting the customer halfway, encouraging him to enter maintenance contracts, maintenance which allows him to keep up with technological development and which allows the contractor to increase his added value.
- low-voltage currents, the Intelligent Building and innovative technologies!
- developing the companies in the direction of the notion of global supply, multi-services and multi-technologies!

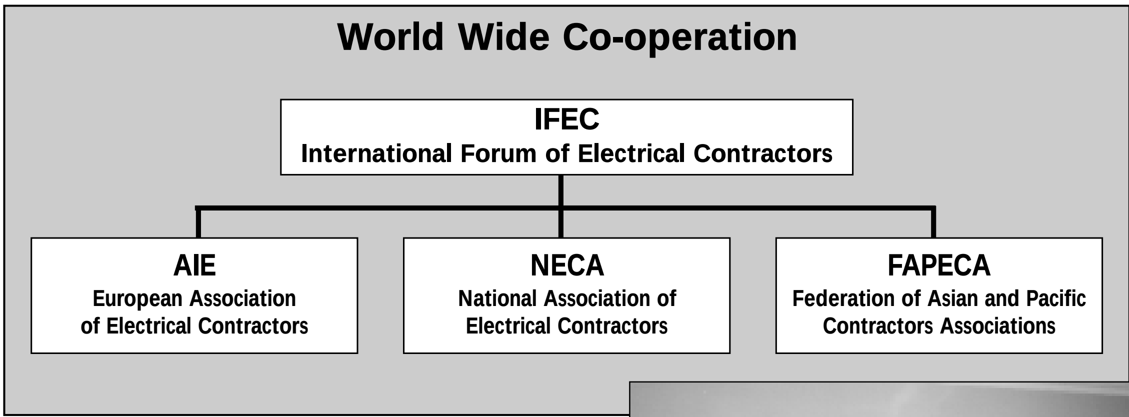
So many questions, so many topics of interest or concerns for the companies, all shared and taken up by their respective national associations and, therefore also by the AIE.

Finally, regarding the AIE, we must remember that the FFIE played a dominant role in it for many years, as founder, for eight years of presidency, 24 years on the President's committee and providing the Secretariat in Paris for 47 years!

2.5 International Forum of Electrical Contractors

But the scope is wider than Europe.

During the course of the Seventies and Eighties, the successive AIE presidents were given the opportunity to establish useful contacts with other organisations such as the *National Electrical Contractors Association* (N.E.C.A.) of the United States, FAPECA (Asia) and JECA (Japan).



Under the French presidency (1984-1986), three conference debates were organised in New Orleans, London and Monte Carlo on topics of comparison for the continents.

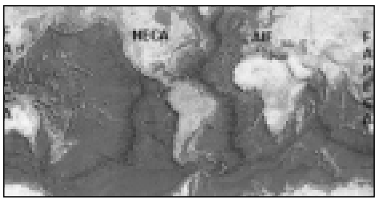
In 1995, a letter of intent was signed by the presidents of the associations:

- A.I.E.
- National Electrical Contractors Association (U.S.A.)
- Federation of Asian and Pacific Electrical Contractors Associations (FAPECA)

  with a view to creating an "International Forum of Electrical Contractors" - IFEC.

IFEC Presidents

- 1995-1997 B.E. Pettersen, AIE
- 1997-1999 D.R. Boyden, NECA
- 1999-2001 Lo Chang-Mao, FAPECA
- 2001-2003 J. Harrower, AIE
- 2003-2005 J. Grau, NECA

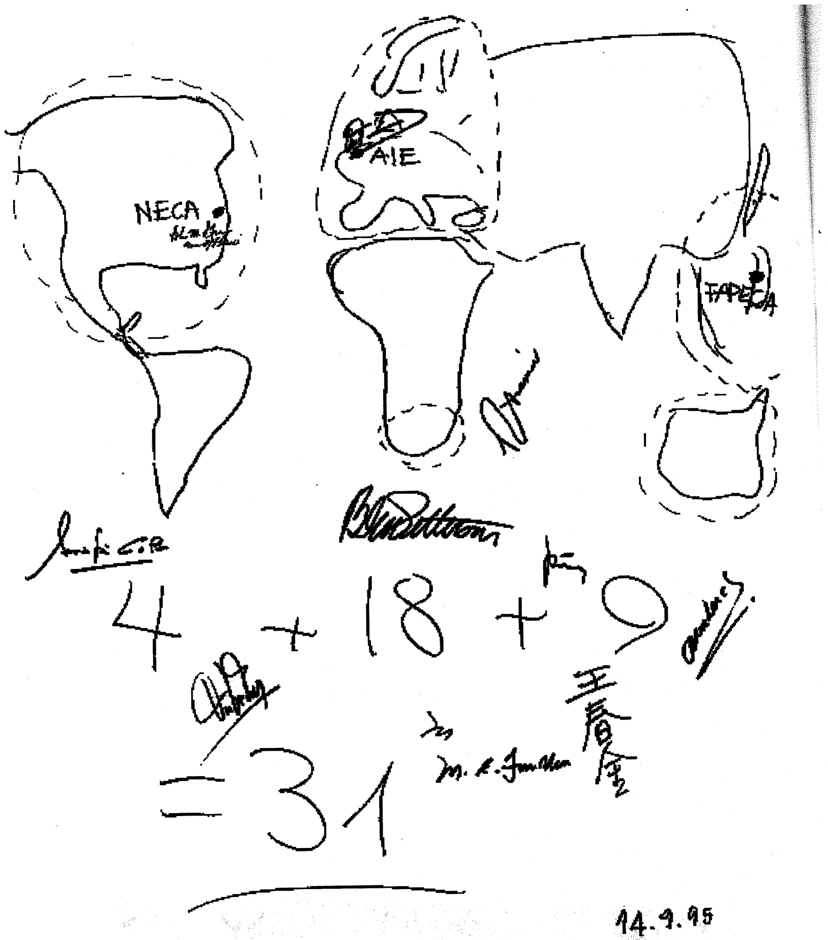


"It has been hugely beneficial to have met so many people from the same and allied industries not just those in Europe, but also those that we meet from our corresponding membership – the

America, Australia, South Africa and through the International Forum of Electrical Contractors, the far east and Pacific rim. What I have learned is that our problems are not unique; they are similar all round the world. So the benefits of such contacts are that we can look at how other countries are tackling their problems and see if we can use the same solutions in our context." (John Harrower)

Conclusion

But it is time to wind up: if, thanks to five visionary countries in 1954, 21 electricians' associations can meet up, exchange ideas and information, "swap tricks", represent and defend more efficiently a trade which deserves its place in the world around us and if, thanks to AIE, we are able to acknowledge that, in the long run, in Europe, in the United States, in Korea, in South Africa or in Australia, all those fellow members are familiar with similar difficulties, share the same enthusiasm and undergo the same constraints, then we must feel deeply grateful to the founders of those associations which were local, national and then international and we must be aware that there is, throughout the world, a common culture of electricians and, encouraged by that fact, it is especially fitting to follow the path which has been mapped out for us and show faith, drive and vigour and to be as effective as those who were our forerunners.



Drawing by President B.E. Pettersen on the day of the signature in Antwerp

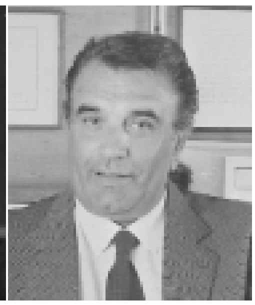
Dessin du Président B.E. Pettersen le jour de la signature à Anvers

Zeichnung vom Präsidenten B.E. Pettersen am Tag der Unterzeichnung in Antwerpen

2.6 Councils and Presidents (1954 – 2004)

YEAR	CITY	COUNTRY	PRESIDENT	COUNTRY
1954	Paris (F)	F	Comtet	F
	London	GB		
1955	Zürich	CH	Comtet	F
	Kopenhagen	DK		
1956	Roma	I	Barlow	GB
	Paris	F		
1957	London	GB	Duserre	CH
	Kopenhagen	DK		
1958	Genève	CH		
	Wien	A	Favero	I
	Roma	I		
1959	Berlin	D		
1960	Luzern	CH	Comtet	F
1961	Paris	F		
1962	Kopenhagen	DK	Lindberg	DK
1963	London	GB		
1964	Milano	I	Barlow	GB
1964	Edinburgh	Scot		
1966	Paris	F	Favero	I
1967	Frankfurt	D		
1968	Firenze	I	Dolezal	A
1970	Wien	A		
	London	GB	Lutiger	CH
1971	Paris	F		
	Zurich	CH		
1972	Bern	CH	Bennett	Scot
1973	Stuttgart	D		
1974	Edinburgh	Scot	Huguet	F
1975	Kopenhagen	DK		
1976	Nice	F	Kruggel	D
1977	Barcelona	E		
1978	München	D	Croon	NL
1979	Padova	I		
1980	Amsterdam	NL	Grinsted	DK
1981	Harstad	N		
1982	Kopenhagen	DK	Harrower I	GB
1983	Tours	F		
1984	Eastbourne	GB	Rollet	F
1985	Wien	A		
1986	Marseille	F	Gemmo	I
1987	Helsinki	SF		



1988	Firenze	I	Haas	D
1989	Zermatt	CH		
1990	Münster	D	Bartosch	A
1991	P. Mallorca	E		
1992	Wien	A	Amherd	CH
1993	Paris	F		
1994	Locarno	CH	Pettersen	N
1995	Antwerpen	B		
1996	Oslo	N	Calvo	E
1997	Edinburgh	Scot		
1998	Madrid	E	Kiaergaard	DK
1999	Luxembourg	LUX		
2000	Kopenhagen	DK	Harrower II	GB
2001	Sintra	P		
2002	London	GB	Pettersen	N
2003	Athen	GR		
2004	Brussel	B	Bertram	D

General Secretaries :

1954 – 1985	Paris	Maurice	Mallet	F
1986 – 1994	Paris	Roland	Auber	F
1994 – 2001	Paris	Denis	Hannotin	F
2001 -	Brussels	Evelyne	Schellekens	B

Secretary :

1974-2001	Paris	Françoise	Weyckmans	F

2.7 Structure of the AIE

2.7.1 Organisation:

The AIE today is structured as follows:

- Council of Delegates Management Committee
- Management Committee
- Policy Coordinating Committee
- General Secretaries' Committee
- Task Forces

The **Council of Delegates (COD**) – the policy of The Association shall be determined by the Council of Delegates and its business shall be administered by the Management Committee. The Council of Delegates shall establish working groups or task forces as may be required and these may be granted powers to act on behalf of The Association where appropriate. The Council of Delegates by two delegates and the General Secretary or Director of the said member country.

The **Management Committee (MC)** – reporting to the PCC-comprises the President the Vice President and the Past President. The MC is responsible for the day to day administration and internal management of the AIE: secretarial and support resources; facilities; finances; budget and accounts; overseeing implementation of policy determined by the PCC and confirmed by the Council of delegates. The Secretary General carries out the responsibilities defined in the Articles and Internal Rules and be accountable to this group.

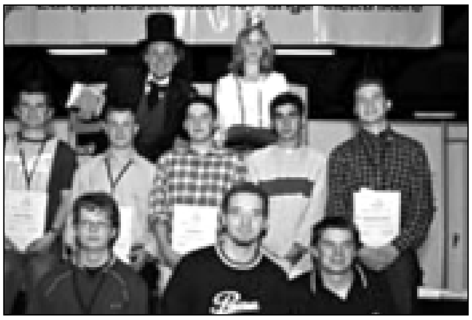
The **Policy Co-ordination Committee (PCC)** – comprising the Management Committee (MC), a person responsible for Economic Matters, and a person responsible for Technical Matters (all elected by the Council of Delegates), the chairmen of all task forces and the Secretary General. The PCC is responsible for matters of AIE policy only and is chaired by the President. The responsibilities for co-ordination of Technical and Economic matters are undertaken by the PCC with guidance provided by the Technical and Economic Task Forces. The Technical and Economic Task Forces are co-ordinated by two persons: the person responsible for Technical matters and the person responsible for Economic matters.
The **General Secretaries' Committee**, contributes to the implementation of the objects of the Association:

- strategic monitoring
- exchanging information
- any other task entrusted by the Council of Delegates or by The Policy Co-ordination Committee.

The Task Forces, established by the Council of Delegates, with terms of references and time scales; each task force shall be chaired by a person appointed by the PCC, to which it shall report at regular intervals. Co-ordination between chairmen of task forces may be established on the initiative of the persons respectively responsible for economic and technical matters.

A specific Task Force is in charge of the **European wide Competition of Young Electricians**.

Testimony of Herr Karl Friedrich Haas (ZVEH-Germany), AIE President in 1988-1989



"That was a difficult venture, as the training systems were vastly different in the AIE member states and it was difficult to compare the training methods. Also, the materials used for installations "between Spitzbergen and Sicily" partly differed, owing to climatic circumstances and different types of technical developments. This problem, however, seemed as if it could be resolved. And so I became concerned as to how a promising start could be made to the project.

After my remarks on the project at the 1985 annual conference, I initially found two partners who agreed with the idea, Mr **Hans Bartosch** from Austria and Mr Albert Amherd from Switzerland. Together we made a start and as early as June 1987 we were able to present a plan of execution which had been worked out by my Swiss colleagues. Other AIE member states gradually joined the group of supporters and participants. It was not however until November 1992 that it was possible to hold the first competition. After outstanding preparation and exemplary organisation, it took place in the Sion vocational training centre of the Swiss association of electrical contracting companies, the VSEI. For this we owe the Swiss association our particular respect and thanks.

The aim of the competition was, and still is, as follows:

1. to give young people the opportunity to meet others from different countries in their field of employment,
2. to take into account the requirements of national economies which are developing together,
3. to give particularly gifted and ambitious young people the opportunity to demonstrate their level of achievement publicly and to gain recognition for it,
4. to provide proof of the training firms' readiness and ability to train employees,
5. to promote the mobility of young workers in Europe, which is becoming increasingly necessary and popular.

Many details remain to be clarified in the meantime and they have now, in fact, been clarified to the general satisfaction of the participants. The competition is be held every two years, under the auspices of the AIE and is being held this year for the sixth time. I believe that, for the AIE, an important field of work has thus been opened up, which will continue to require particular care and dedication."

2.7.2 Current priorities of the AIE

Promoting Electrical safety through inspection and maintenance

Out of the sixteen European countries that have responded to a recent AIE survey, ten have legal requirements on the inspection of new electrical installations and three developed legal rules for existing electrical installations.

None of the countries having legal requirements on regular inspections for new installations intends to reinforce them.
In the majority of countries – and for new electrical installations – public authorities are in charge of verifying compliance with legal requirements. Most countries entrust electrical contractors to carry out this verification after the completion of the installation works. To this end, contractors have to respect certain conditions determined by public authorities. In some cases, the verification executed by the electrical contractor is itself supervised by an independent notified body.

Regarding existing installations, the situation in the various countries is more differentiated. Requirements are sometimes issued by public authorities, but also very often by energy distributors, as they would have to bear the consequences of installations connected in poor quality. The periodicity of inspections for existing installations varies from 5 to 25 years according to the nature of the building and / or the event that may lead to inspection activities.
The AIE is therefore present in all initiatives, projects or actions promoting electrical safety and periodic inspection at an European and international level (see also infra) and encourages contact and sharing of experiences between countries with a common goal: increasing the level of safety in electrical installations.

Energy services and renewable energies

The European Commission adopted the draft directive on the promotion of energy end-use efficiency and energy services end 2003. It states that a general energy end-use savings target of 1% per year should be achieved. This is 1% of the average amount of energy distributed or sold to final customers the previous five years. These savings will have to be registered from the following sectors: households, agriculture, commercial and public sectors, transport and the industry. All types of energy will be taken into account (electricity, natural gas, district heating, cooling, heating fuel, coal and lignite, forestry and agricultural energy products, transport fuels). Public sectors should save at least 1.5% energy a year, notably thanks to energy efficient public procurement.

Energy distributors and/or retail supply companies would have to integrate energy services into their distribution and sales of energy until a 5 % share of their customers has been covered.

The AIE in collaboration with CEETB monitors closely the developments of the Directive and takes action whenever necessary to promote the electrical contractors' role.

Smart House and ICT

The European Committee for Electro technical Standardization (CENELEC) and the European Commission DG ENTR have signed an agreement covering the development of a **European Smart House Code of Practice** and the establishment and operation of a **Smart House Open Forum**. The AIE is actively involved in the current drafting of the Code of Practice and the Forum as well as in the CENELEC ICT and Smart House Standards Steering Group.

The *specific* objective of this second phase of the Smart House mission is to deliver a “Code of Practice” for all actors, systems, networks, protocols, applications and services involved in the Smart House, specifying functionalities, methodologies, recommended standards and working practices that ensure convergence, interoperability and interactivity of multiple (and competing) products, applications and services in and to the Smart House.

The Codes of Practice that the Smart House Standardization Initiative aim to put into place are aimed at providing this structure:
• They will specify a set of requirements to which installers, operators and manufacturers should refer.
• They will specify a set of requirements that service providers, service operators and network operators should refer
• They will reference minimum levels of secu-rity for systems in the Smart House and for communication and provision of systems to it
• They will reference Data Protection issues.
• They will reference certain standards and specifications that should be used.
• They will address consumer issues and those concerned with the user interface to SMARTHOUSE applications and services.

Standardisation issues

The AIE also focuses its attention to the identification of topics of interest in the standardisation field of electrical installations as to advise - for the common interest of electrical contractors - and ensure comments whenever necessary on draft standards of CENELEC and/or initiatives of the European Commission in the standardisation field.

2.7.3 Publications of the AIE

The A.I.E has published over the years a series of reports, brochures and conducted surveys on a number of issues such as:

- “*Towards improved electrical installations in European homes*” (2004)
- “*Domestic Electrical safety experiences in Europe*” (2004)
- “*The European Electrical Contracting Industry and the Building Electronic System (BES) market towards 2007*” (2003) followed by an enquiry on the existing training courses in the sector of electronic building systems.
- “*The Waste of Electrical and Electronic Equipment Directive*” (2003): a report on the evolution, application and the problems facing associations following the publication of the directive on 13 February 2003 (2003)
- “*The European Inquiry on fire detection and alarm systems Installation, commissioning and maintenance*” (2003): a compilation of comments on the situation of electrical contractors vis-à-vis the installation and maintenance of FADS in Europe.
- “*The report on the national situation following the deregulation of the electricity markets*” (2003)
- “*Updating the AIE Technical Directory of 1993*” and the ECA document on access to foreign markets (under construction)
- “*The electrical contractors in Europe create the technological infrastructure for the future society*” (1998): brochure edited in 6 languages
- The AIE Yearbook (1996)
- “*The International Vocabulary of Electrical Equipment*” (1994): a ten-years work with translation in French,

English and German of electrical terms and equipment
- "*Aspects of Inspection and testing of electrical installations*" (1979)
- "*Health and Safety at work*" (1979)
- "*Energy conservation in Europe*" (1979): summary of national activities
- "*List of Graphic symbols for drawings and diagrams for electrical installations*" (1976)

Short surveys have been conducted on the following items:

- An enquiry on the current activities of the members active in renewable energies (2004)
- Member associations' statistics (2004)
- Data in the framework of the draft directive on energy services (2003)
- An enquiry 'Late payment of subcontractors' (2004)
- Electronic News flashes by the AIE or the CEETB, containing up-to-date news
- The CEETB information bulletin to which the AIE participates actively by contributing articles.

2.7.4. Impressions of and personalities within the AIE

"The AIE brought me a lot of troubles … and work but also friendships, knowledge and understanding of most other European countries (if really possible). I remember Mr Pierre Rollet, twisting his ankle in a Venetian church: "ça m'apprendra, moi, Anglican, à entrer dans une église catholique!"
but also Mr Raynaud, while fishing blackfish, splashed with blood of his captures: we thought he was wounded! And of course Sir James with his bagpipe!"

– Roland Auber.

"The characters, the AIE song, the willingness and enthusiasm of some but unfortunately the idleness of others, the jolly jaunts in places I would otherwise not have visited, the warm welcomes, the unnecessary and avoidable arguments often caused by misunderstanding or mistranslation, the successes (and despite everything there have been quite a lot of those and there will be many more to come), Eurostar (which I think I may have, single handed, kept from insolvency), strikes in Paris, a lot of very nice people that I will miss enormously when it's my time to go, an excellent friendly and helpful secretariat (both present and past), Pedro the dog (or is it Pepe?), walking into the AIE office glass door, Denis – a not very tall person – wearing a very long AIE tie, Evelyne when she was pregnant being asked in an e-mail if she had yet 'given bird', (some mistranslations are wonderful, others catastrophic), the battles of Athens and Naples, an electric shock in Luxembourg, flamenco dancing in Madrid (and also in Madrid, the Crown Price looking as bewildered as us at what we were all doing in his palace), a representative of Edinburgh council after

listening to a rather long speech in Spanish apologising for not being able to understand Italian, the putsch of 2002 (deposing of the then crown prince of the AIE) and its repercussions, the Viking experience (and a naked Father Christmas). Many more, but that's enough for now!"

– J.Harrower.

"The differences have definitely been a enrichment, and a challenge to a better understanding. But everybody should bring with him a more open mind, instead of clinging to his own culture.
I have learnt to know many interesting colleagues throughout Europe - and globally. What I have learnt is that most "electrical problems" are universal and that we must be patient. Solutions are not found from one day to the other. It will rather take several years."

– Björn Erik Pettersen.

3 CO-OPERATING PARTNERS

3.1 CENELEC

3.1.1 Introduction

CENELEC, the European Committee for Electro-technical Standardization, was created in 1973 in line with the enlargement of the Common Market to Denmark, Ireland and the United Kingdom. It was the result from the merger of two previous organizations: CENELCOM and CENEL. Nowadays, CENELEC is a non-profit technical organization set up under Belgian law and composed of the National Electro-technical Committees of 28 European countries. In addition, 7 National Committees from Central and Eastern Europe are participating in CENELEC work with an Affiliate status.

CENELEC's mission is to prepare voluntary electro technical standards that help develop the single European Market / European Economic Area for electrical and electronic goods and services by removing barriers to trade, creating new markets and cutting compliance costs.

But in addition to the regular standardization work achieved by CENELEC since its foundation, a European Council Resolution of 7th May 1985 gave CENELEC a new dimension to its mission by recognizing it as the Standardization Body able to provide harmonized standards. The use and application status of standards and their relation to European legislation distinguish ENs from all other standards throughout the world. The European Standards are the only ones helping manufacturers comply with the applicable law.

CENELEC Standards grant direct access to the market of all CENELEC 22 member countries without the need to test, add / remove any specifications for your product depending on the country of sale.

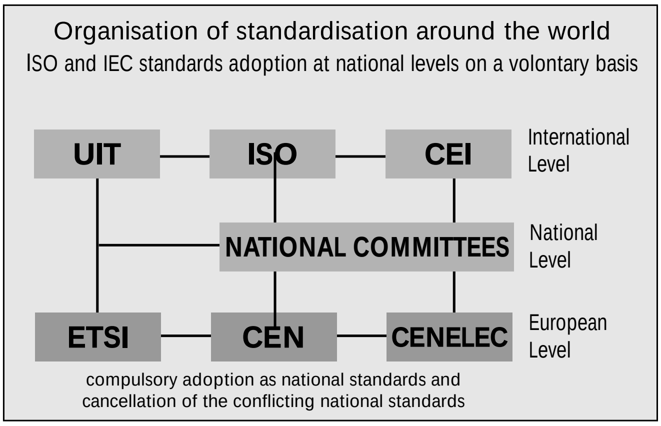
Furthermore, and thanks to the Dresden Agreement signed with the IEC for which CENELEC adopts international standards whenever possible, CENELEC helps make the European marketplace as open to non-European exporters as it is to home-based manufacturers and producers. The outcome of the Dresden Agreement is that most CENELEC standards are also international standards, and thus are also recognized and used outside the European scene.

Recently CENELEC has set up an ICT unit (Information and Communication Technologies) in order to enhance its profile in this field. This unit works in close cooperation with CEN and ETSI. In addition to the traditional European standard deliverables, the dynamic Workshop (CWA: CENELEC Workshop Agreement) has been included in its portfolio, offering an open platform to foster the development of pre-standards for short lifetime products where time-to-market is critical.

CENELEC takes into the account the opinion and input of the industry. Links with manufacturers have been forged through formal cooperation agreements set with 32 major European industry associations. Their industrial partners may advise on and state standardization priorities, may propose drafts as a contribution to the European standardization process and may deliver expert advise on the legislative consequences of new standards.

The AIE signed a cooperation agreement with CENELEC in 1992 and has been updated in 1995.

3.1.2 What is a standard?



Drafting

There are several ways to start harmonizing a standard:

- An initial document comes from the International Electro-technical Commission (80 % of cases).
- A document of European origin arises in one of CENELEC's own technical bodies;
- A first draft of a European document comes form one of CENELEC's Cooperating partners.
- A fourth source is the National Committees themselves. Under the Vilamoura Procedure, the NCs have agreed to notify CENELEC when they are planning any new work. CENELEC can, if it wants, take on this work.

Enquiry

When a suitable draft is available, it is submitted to the NCs for CENELEC enquiry, a procedure which lasts 6 months. Then the comments received are studied by the technical body working on the draft and incorporated into the document, where justified, before a final draft is sent out for vote.

Voting

The vote usually takes 3 months. At this stage the members have weighted votes corresponding to the size of the country they represent. For instance, the larger countries like France, Germany, Italy and the UK have 10 votes each while the smaller ones have one or two weighted votes.
There are two requirements for a standard to be approved:

- a majority of NCs in favour of the document;
- at least 71 % of the weighted votes cast are positive.

Numbering

The shortest unambiguous reference to a European Standard is to use its number. The number of a European Standard consists of the capital letters EN followed by a space and an number in Arabic numerals, without any space.

3.1.3 CENELEC deliverables

CENELEC concentrates most of its work on 2 major deliverables: The European Standard (EN) and the Harmonization Document (HD). These two documents are referred to commonly as "standards" and must be implemented in all CENELEC member countries, who must also withdraw any conflicting standards.

There are a few differences in the implementation process of EN's and HD's. Basically, the EN must be transposed as it is, not adding or deleting anything. The process for HD's is a bit more flexible. It is the technical content that must be transposed, no matter the wording or how many documents are made of it.

In addition to these two major deliverables, CENELEC also produces and approves documents with a different objective and target. Below, you will find a brief explanation to each CENELEC deliverable:

EN - European Standard

It is a normative document available, in principle, in the three official languages of CENELEC (English, French and German) that cannot be in conflict with any other CENELEC standard. EN's are the most important deliverable published by CENELEC. Its development is governed by the principles of consensus, openness and transparency, a national commitment to implement it in each and every one of the countries member of CENELEC, its technical coherence regarding both national and European levels. Before its implementation, the EN must follow the following steps: Drafting by a CENELEC Technical Committee or Working Group, Inquiry at national level, a formal vote followed by a standstill at national level and the final approval by the Technical Board before its implementation in all member countries.

HD - Harmonization Document

Same characteristics as the EN except for the fact that there is no obligation to publish an identical national standard at national level (may be done in different documents/parts), taking into account that the technical content of the HD must be transposed in an equal manner everywhere.

TS - Technical Specification

A TS is a normative document produced and approved by a Technical Committee (not by CENELEC as such). Several of the compulsory requirements needed to have a standard do not apply to Technical Specifications: there is no standstill, no public enquiry, the vote does not follow the same rules as in the CENELEC Technical Board (where it is weighted). A TS must only be produced in one of the official languages and its maximum lifetime is reduced to two or three years.

Technical Specifications are explained in terms of supporting the European Market and act as a guidance method towards evolving technologies and experimental circumstances that would not gather enough consensus as to publishing an EN.

A TS may not be in conflict with any other CENELEC standard. If a conflicting standard (EN) is published in the meantime, then the TS must be withdrawn.

TR - Technical Report

A Technical Report is an informative document on the technical content of standardization work. Only required in one of the 3 official languages, a TR is approved by the Technical Board or by a Technical Committee by simple majority. No lifetime limit applies.

G - Guides

CENELEC Guides are informative documents related to the "internal system". They may specify information about standardization principles and guidance to standards writers. Guides must be approved at General Assembly or Technical Board level. No lifetime limit applies.

CWA - CENELEC Workshop Agreement

As indicated by their name, CWA's are an agreement developed and approved by a Workshop through consensus reached among identified individuals and organizations. They must be published at least in one of the official languages. Revision is possible.

3.1.4 Benefits of the European electro-technical standardization

CENELEC has changed the electro-technical world in Europe removing practically all barriers to trade for electro-technical products, systems and services. This has been achieved by a series of identical national standards for the European market, which avoids the proliferation of conflicting national standards that must be removed when a new European standard is ratified.
CENELEC intends in many cases to develop standards for the electro-technical market even before the market does. Elaborated by consensus, CENELEC Standards are of the highest quality because they are developed with the contributions of all interested parties: manufacturers, consumers, environmentalists and anyone who has anything to say or is concerned by the new standard.
National Committees provide a platform for small companies who for financial and language reasons can only participate at national level.

CENELEC Standards define the characteristics of electro-technical products or services determining the performance and safety requirements that are voluntarily agreed upon by the interested parties. But in the electro-technical field, things are more complicated and security of consumers is the number one priority. The European Commission often encourages and supports this security policy linking the European legislation to CENELEC standards, leading to the so-called harmonized standards.

3.1.5 CENELEC’S vision 2010

However, the rapid changes of both the economic and the technical environment of electro-technical standardization call for a long-term plan of action based on visions about developments during the next ten years at least. These changes will have far-reaching impacts on the basis of CENELEC's existence and operation. The present situation of CENELEC seems to the insiders to be stable and sound.

The electro-technical standards are currently developed in Europe in an efficient way with the result that there exist no real technical barriers to trade due to electro-technical standards in the European Economic area. CENELEC is also attractive for many other European countries. There is however no reason for complacency.

CENELEC has probably not made people sufficiently aware of its performance and realizations. In fact, as the visibility of CENELEC and its work has been rather low, the special features and advantages of the coherent electro-technical standardization and its results are not always recognized by the public, including some European and national authorities.

The future standardization will change from today's product oriented approach to system oriented activity. Electro-technology will become a substantial part of all systems, especially where new technologies are applied. Any weakening or exclusion of CENELEC's involvement in the standardization of systems and in the application of new technologies would impair CENELEC's ability to produce and to maintain the set of coherent and up to date European standards in the field of electro-technology.

3.2 CEETB: Co-operation of Technical Contractors in Europe

3.2.1 CEETB in figures

The CEETB was founded in 1976 as the joint European association of electrical -AIE, heating, air conditioning – GCI, ventilation and plumbing contractors - UICP.

Through its 25 membership countries, the CEETB represents about 450,000 specialist building contractors with 2,400,000 employees in all EU Member States and beyond.

The overall turnover of these companies represents, within the EU, about 200 billion Euro.

3.2.2 From the traditional "installer" to the "technical contractor"

Over the past decades, the traditional "installers" have significantly extended their field of activities and developed into specialist contractors offering not only the installation of technical equipment, but a whole package of highly complex services in the areas of building comfort and end-use efficiency.

The European Commission consults with the AIE also through the CEETB, which brings together the European technical contractors. The Presidents of the four organisations met at the end of 2000. Discussions centred on the changes taking place in the industry and the emerging opportunities for technical contractors. For example, building engineering services account for more than 50% of construction costs and are the most significant element of life cycle costs. In addition, companies of all sizes, particularly larger contractors, are becoming multi-service and moving towards the provision, maintenance and management of all building engineering services.

It was agreed that greater cooperation and collaboration would lead to substantial benefits including the effectiveness of representation to the European Commission and Parliament, the owners and users of buildings, and the other parties within the construction industry. The efficiency of the organisation and administration of the CEETB and its constituent associations would be enhanced and information gathering, dissemination and communication would be improved. Additional benefits also include more efficient policy formulation, decision-making and enhancement of the value of services and representation provided to member companies. A Memorandum of Intent was drawn up on 1 December 2002 embodying the above principles, agreed by all four organisations AIE/GCI/UICP/CEETB and signed by the Presidents. The meeting of CEETB Secretaries General and the Board of Administration, which took place in

Paris on 16 May 2003, unanimously agreed that all the Secretaries General of the AIE and GCI-UICP would hold joint meetings from November 2003 onwards. Before or after these meetings AIE and GCI-UICP members can meet separately to consider specific issues.
Ways of improving co-operation and convergence of the associations are now being explored with the objective of bringing about beneficial change and greater profitability for the contractors that we represent.
It seems to be a natural economic law that electrical and technical contractors in all parts of the world face the same problems caused by similar positioning in the construction supply chain.
A joint newsletter – written in three languages by the AIE general secretary and the CEETB general secretary - is being issued approximately every six weeks to all associations.

3.2.3 Current priorities of the CEETB

The essential goal of the CEETB is to be the voice of the technical equipment enterprises at the community authorities that handle the relevant question for the building industry.

This is based on the following elements:
- Promoting the role of specialist building contractors as providers of energy services in the liberalised energy markets, including contributing to the future Energy Services Directive
- Promoting regular inspection and maintenance schemes of technical building equipment in order to increase efficiency, diminish emissions and guarantee user safety, including contributing to the practical implementation of the Energy Performance of Buildings Directive
- Defending the position of specialist building contractors in the revised Public procurement directives
- Contributing to the future legislation on reduced VAT rates on labour-intensive services with the aim to include repair and refurbishment works as well as new construction of housing in the directive
- Promoting the work in integrated project teams by initiating a wide debate with all construction stakeholders at European level
- Promoting the use of whole life cost schemes in construction and integrating a WLC approach in the EMAT system (Economically most advantageous tender).

4 ELECTRICAL SAFETY

4.1 Introduction

In Europe, 70% of homes are over 30 years old, and these installations back in the 60's and 70's have not been designed for today's proliferation of electrical appliances. Safety is becoming a major aspect. The past 30 years have seen a tremendous increase in the use of electrical appliances, and many of these consume major power.
For example, 70% of bedrooms in old installations have 2 sockets or less. But even in new homes, or while renovating, we underestimate the electrical functionality we need, now and in the future.
There is a lot of talk about smarter installations and intelligent homes. However, the first priority should be given to providing a major part of European homes with the basic safety and comfort requirements needed for a modern lifestyle.
An AIE survey demonstrated that out of 16 national electrical contractors associations the overall majority wasn't satisfied with the current system of inspection of the electrical installations, in particular the existing electrical installations.

Are you satisfied with the current system of inspection?

Even, if the inspection system differs from one country to another with regard to the "the inspector" - the contractor himself or an inspection body -, and the difference in intervals of inspection, regularly or randomly, the vast majority of AIE's electrical contractors associations considers electrical safety with consequently regular inspection and maintenance of the installations a TOP priority of their agenda.

In the nineties, AIE members have been participating the CENELEC BTTF 95-1 works (inspection of electrical installations in domestic accommodations) and they have had the opportunity to comment the ES 59009 draft.

The ES 59009 got a positive vote and has been published in 2001. ES 59009 had been proposed as a contribution to IEC TC 64 WG 61 in charge of the revision of part 6 of 60364 ("verification of electrical installations").

The AIE is therefore present in all initiatives, projects or actions promoting electrical safety. One of these initiatives is FEEDS.

4.2 Feeds

4.2.1 Introduction

FEEDS, the European Forum for Domestic Electrical Safety, was established in February 2002, and presently consists of the following members: AIE, ECI, Europacable, FISUEL, UIE and representatives from 4 'pilot' countries (France, Italy, Poland, Spain).

The forum was set up with the aim to develop a position paper with an overview of the status of Europe's wiring, fire statistics and incidents in the home as well as current regulation on periodic inspection.

4.2.2 Mandate for the forum

At a Conference held in Barcelona on February 22nd 2002, a mandate was agreed by the delegates that a smaller working group, under the patronage of AIE, FISUEL and UIE should be set up to take the conclusions of the Conference forward, with a view to reporting back to them in a year's time-on the progress made. In September 2002, Europacable joined FEEDS.
The AIE actively contributed to the report "Towards improved electrical installations in European homes" – 2004 that demonstrates that improving electrical safety in the home justifies the regulatory effort required.

The report released in September 2004 is available at the AIE secretariat.

4.3 Fisuel

4.3.1 Introduction

FISUEL stands for the International Federation for the safety of electricity users and that can help States to:
• set up electrical installation standardization;
• harmonise inspection procedures and the application of these standards.

4.3.2 Objectives

• Favouring the creation of standards, regulations and installation inspection systems, if they do not already exist, based on the model of systems which are already established in other countries and have been thoroughly tested.
• Jointly promoting all electrical safety at an international level, and encouraging contact and sharing of experiences between countries with a common goal:
• increasing the level of safety in electrical installations;
• aim at harmonizing their systems of reference.
• FISUEL is a point of convergence for means, strengths and skills.

The AIE is not member of FISUEL but nevertheless both associations are in close contact and have developed a collaboration with regard to sharing experiences and ideas in favour and to promote electrical safety for the sake of both the sector and the customer.

5 ANNEXES

Annex 1:

Members of AIE

AUSTRIA

Bundesinnung der Elektro-, Audio-, Video- und Alarmanlagentechniker
www.elektrotechniker.at
Name of the president: Wolfgang Haybäck

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	6575	6575
Out of which: 0 à 10 employees	4603	4603
Out of which: 11 à 50 employees	1886	1886
Out of which: less than 50 employees	86	86
Total number of actives		
Out of which: Skill electricians	34000	34000
Out of which: Apprentices		
Total turnover in EURO		

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings					
Offices					
Industrial					
Communication					
Security					
Street lighting					
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					

BELGIUM

Fedelec
www.fedelec.be
Name of the president: José Carabin

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	8412	1147
Out of which: 0 à 10 employees	7513	936
Out of which: 11 à 50 employees	899	211

Total number of actives		
Out of which:	42127	11837
Out of which: Skill electricians	19022	5108
Out of which: Apprentices	754	168
Total turnover in EURO	2859	2057

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	37	55	35	10	100
Offices	30	50	40	10	100
Industrial	18	30	20	50	100
Communication	7	50	35	15	100
Security	6	45	10	45	100
Street lighting	2	20		80	100
Total 100 % < 1 000 V	100				
From 1 to 36 kV					
Above 36 kV					

CYPRUS

Poseh: Pan-Cyprian Federation of Electrical Contractors
Name of the president: Ttofas Pieris

DENMARK

ELFO - TEKNIQ
www.elfo.dk
Name of the president: Leif Jensen

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	2400	1860
Out of which:	2000	1480
0 à 10 employees		
Out of which:	330	310
11 à 50 employees		

Total number of actives	23000	21400
Out of which: Skill electricians	13500	12200
Out of which: Apprentices	4000	3800
Total turnover in EURO	2200	2000

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	20	20	40	40	100
Offices	15	20	40	40	100
Industrial	30	30	30	40	100
Communication	10				
Security	10				
Street lighting	5				
Total 100 % < 1 000 V	100				
From 1 to 36 kV					
Above 36 kV					

ENGLAND

ECA: The Electrical Contractors' Association
www.eca.co.uk
Name of the president: Tony Morgan

FINLAND

STUL: Suomen Sähkö- ja teleurokoitsijaliitto (Electrical contractors' association of Finland)
www.stul.fi
Name of the president: Janne Skogberg

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	2200	1930
Out of which: 0 à 10 employees	1950	1700
Out of which: 11 à 50 employees	240	220
Total number of actives	13000	10500
Out of which: Skill electricians	11800	9500
Out of which: Apprentices	1200	1000
Total turnover in EURO	2.000.000.000	1.400.000.000

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings		80	15	5	100
Offices		80	15	5	100
Industrial		60	20	20	100
Communication		60	20	20	100
Security		80	10	10	100
Street lighting		60	10	30	100
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					

FRANCE

SERCE and FFIE
www.ffie.fr
Name of the president : Yves Thuilier (SERCE) / Francis Lepers (FFIE)

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	33000	5000
Out of which: 0 à 10 employees	30000	
Out of which: 11 à 50 employees		

Total number of actives	223611	150000
Out of which: Skill electricians	20000	14000
Out of which: Apprentices		
Total turnover in EURO	12500	10000

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	18	38	53	9	100
Offices	29	54	33	13	100
Industrial	31	45	32	23	100
Communication					
Security					
Street lighting	22	46	25	30	100
Total 100 % < 1 000 V	100				100
From 1 to 36 kV					
Above 36 kV					

GERMANY

ZVEH: Zentralverband der deutschen Elektro- und Informationstechnischen Handwerke
www.zveh.de
Name of the president: Walter Tschischka

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	76980	42339
Out of which: 0 à 10 employees	61584	35988
Out of which: 11 à 50 employees	10007	5081

Total number of actives	349800	192390
Out of which:	299727	165455
Skill electricians		
Out of which:	50073	26935
Apprentices		
Total turnover in EURO	30421 Mio	16732 Mio

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings		60	25	15	100
Offices		55	25	20	100
Industrial		55	30	15	100
Communication		65	15	20	100
Security		45	20	35	100
Street lighting		25	25	50	100
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					

GREECE

POSEH: Panhellenic Federation of Electrical Contractors Association
www.poseh.gr
Name of the president: Efstathios Daras

HUNGARY

EMOSZ
www.emosz.hu
Name of the president: Jozsef Kun

IRELAND

ECA IRELAND: The Electrical Contractors' Association Construction House, Canal Road
www.cif.ie
Name of the president: Joe Morgan

ITALY

ASSISTAL: Associazione Nazionale Costruttori di Impianti
www.assistal.it
Name of the president : Ivano Padovani

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number		570
Out of which: 0 à 10 employees		245
Out of which:		276
11 à 50 employees		

Total number of actives		
Out of which: Skill electricians		
Out of which: Apprentices		
Total turnover in EURO		1390000

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings					51.7
Offices					
Industrial					43.5
Communication					
Security					0.7
Street lighting					4.1
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					1

LUXEMBURG

APEL: Association des patrons électriciens du Grand-Duché du Luxembourg
Name of the president : Guy Geffroy

THE NETHERLANDS

UNETO-VNI

www.uneto-vni.nl

Name of the president: S.J. Heeres

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	3000	2650
Out of which: 0 à 10 employees	2600	2200
Out of which: 11 à 50 employees	400	400

Total number of actives	70000	60000
Out of which:	30000	25000
Skill electricians		
Out of which:	5000	4000
Apprentices		
Total turnover in EURO	5.686.000	4.936.000

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Rehabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	2231000	36	39	25	100
Offices	207200	43	24	33	100
Industrial	1100000	50	40	10	100
Infrastructural	283000		66	34	100
Security					
Street lighting					
Total 100 % < 1 000 V		56	28	16	100
From 1 to 36 kV					
Above 36 kV					

NORWAY

NELFO: Foreningen for EL og IT bedriftene
www.nelfo.no
Name of the president: Jarle Oeyum

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	2432	1310
Out of which: 0 à 10 employees	1688	800
Out of which: 11 à 50 employees	500	419

Total number of actives	32282	26672
Out of which: Skill electricians	17890	14670
Out of which: Apprentices	2905	2660
Total turnover in EURO	3105	2880

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Rehabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	20	20	40	40	100
Offices	15	20	40	40	100
Industrial	30	30	30	40	100
Communication	10				
Security	10				
Street lighting	5				
Total 100 % < 1 000 V	100				
From 1 to 36 kV					
Above 36 kV					

PORTUGAL

AECOPS: Associaçao de Empresas de Construçao e Obras Publicas
www.aecops.pt
Name of the president: Joaquim Carlos Fortunato

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	2500	900
Out of which: 0 à 10 employees	2250	810
Out of which: 11 à 50 employees	250	90
Total number of actives	21600	7550
Out of which: Skill electricians	17300	6000
Out of which: Apprentices	1300	1550
Total turnover in EURO	828	290

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	45	85	5	10	100
Offices	25	75	5	20	100
Industrial	10	70	10	20	100
Communication	5	60	5	35	100
Security	5	60	5	35	100
Street lighting	10	90	2	8	100
Total 100 % < 1 000 V	100	79	5	16	100
From 1 to 36 kV	40				
Above 36 kV	60				

SCOTLAND

SELECT
www.select.org.uk
Name of the president: H. Mc Donald

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	1500	550
Out of which: 0 à 10 employees	1300	400
Out of which: 11 à 50 employees	200	150

Total number of actives	12500	8000
Out of which: Skill electricians	12000	8000
Out of which: Apprentices		
Total turnover in EURO		

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Rehabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	30	60	20	20	100
Offices	30	50	20	30	100
Industrial	20	20	40	40	100
Communication	10	80	10	10	100
Security	>5	50	20	30	100
Street lighting	<5	70	0	30	100
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					

SPAIN

FENIE: Federacion nacional de industriales electricistas de Espana
www.fenie.es
Name of the president: Romualdo Arias Blanco

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	18000	9232
Out of which:	80%	6462
0 à 10 employees		
Out of which:	20%	2770
11 à 50 employees		

Total number of actives	90000	
Out of which:	90000	
Skill electricians		
Out of which:	0	
Apprentices		
Total turnover in EURO		

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Rehabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	40	90	3	7	100
Offices	5	80	0	20	100
Industrial	15	85	-	15	100
Communication	25	100	-	0	100
Security	0	-	-	-	-
Street lighting	15	92	-	8	100
Total 100 %					
< 1 000 V	100				
From 1 to 36 kV					
Above 36 kV					

SWEDEN

EIO: Elektriska Installatörsorganisationen

www.eio.se

Name of the president: Gösta Allthin

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	3100	2603
Out of which: 0 à 10 employees		4551
Out of which: 11 à 50 employees		10033

Total number of actives		21099
Out of which: Skill electricians		17000
Out of which: Apprentices		1000
Total turnover in EURO	3684	

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings	7	57	29	14	100
Offices	20	70	15	15	100
Industrial	42	45	31	24	100
Communication	23	78	9	13	100
Security	7	75	13	12	100
Street lighting	1	67	13	20	100
Total 100 % < 1 000 V	100				
From 1 to 36 kV	6				
Above 36 kV	6				

SWITZERLAND

USIE / VSEI: Union suisse des installateurs éléctriciens / Verband Schweizerischer Elektro-Installationsfirmen
www.vsei.ch
Name of the president : Alfons Meier

1 CONTRACTORS

Number of contractors	*In the whole of the country*	*In the association*
Total number	3200	2350
Out of which: 0 à 10 employees	2350	1600
Out of which: 11 à 50 employees	780	750
Total number of actives	35000	31000
Out of which: Skill electricians	20500	17500
Out of which: Apprentices	9500	9000
Total turnover in EURO	2600	1950

2 ACTIVITIES

In percent at total activity

	TOTAL	*New*	*Réhabilitation*	*Maintenance/ Services*	*Total 100 %*
Housing - buildings					
Offices					
Industrial					
Communication					
Security					
Street lighting					
Total 100 % < 1 000 V					
From 1 to 36 kV					
Above 36 kV					

Annex 2:

Sectors of AIE

AIE-members have different activities that cover all kinds of electrical installations.

- Energy production and transport
    - ✔ micro generating stations, hydraulic or wind operated
    - ✔ generating sets
- Electric power transmission and distribution
    - ✔ high and low voltage overhead lines and underground cable networks
    - ✔ grid stations
    - ✔ transformer stations
    - ✔ contact lines for railways, traction
- Electrical construction for industry
    - ✔ automation, robotics
    - ✔ panels equipment assemblies
    - ✔ iron works, sheet-iron works
    - ✔ electro mechanics, motorisation
    - ✔ rewinding, repairs
- General installation
    - ✔ individual or collective housing
    - ✔ stores and shops, hospitals, offices, schools, colleges, etc.
    - ✔ light or heavy industries
    - ✔ ship building, offshore
- Special installations
    - ✔ industrial instrumentation
    - ✔ automation, central management processing
    - ✔ security (lighting, intruder alarm, access control, fire detection, alarms, etc.)
    - ✔ office networking
    - ✔ house automation
    - ✔ refrigeration installations
    - ✔ energy management: transfer equipment, heat pumps, optimisers
    - ✔ lightning rods, Faraday cages, earthing networks
    - ✔ temporary installations (construction sites, exhibitions, cultural manifestations, decorative illuminations of buildings)
- Lighting
    - ✔ street lighting
    - ✔ monument illuminations, gardens
    - ✔ special lighting systems (airfield ground lights, waterways or sea navigation)
    - ✔ electric signs
    - ✔ stage lighting
- Telecommunications
    - ✔ telephone, telex, telefax
    - ✔ TV, radio
    - ✔ computer networks, electronic mail
    - ✔ sound distribution
- Retail trade
    - ✔ sale and repair of electric household goods
    - ✔ sale and repair of TV, radio
    - ✔ sale of luminaries, equipments
- Services
    - ✔ engineering
    - ✔ maintenance: on programme or on demand
    - ✔ periodical inspection
    - ✔ supervision, telesupervision