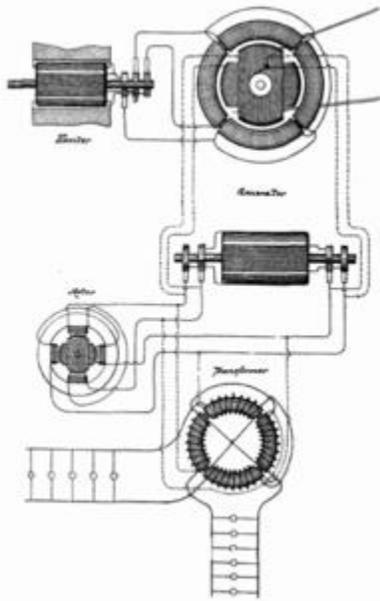


ELECTRICITY GENERATION

Electricity generation is the first process in the delivery of electricity to consumers. The other three processes are electric power transmission, electricity distribution and electricity retailing. World wide generation, transmission, distribution and retailing are being shown separately.

Electricity generation



Nikola Tesla's generation system using AC circuits to transport energy across great distances.

The importance of dependable electricity generation, transmission and distribution was revealed when it became apparent that electricity was useful for providing heat, light and power for human activities. Decentralised power generation became possible when it was recognised that alternating current electric power lines can transport electricity at low costs across great distances by taking advantage of the ability to transform the voltage using power transformers.

Electricity has been generated for the purpose of powering human technologies for at least 120 years from various sources of potential energy. The first power plants were run on wood, while today we rely mainly on petroleum, natural gas, coal, hydroelectric and nuclear power and a small amount from hydrogen, solar energy, tidal harnesses, wind generators, and geothermal sources.

Electricity demand

The demand for electricity can be met in two different ways. The primary method thus far has been for public or private utilities to construct large scale centralized projects to generate and transmit the electricity required to fuel growing economies. Many of these projects have unpleasant environmental effects such as air or radiation pollution and the flooding of large areas of land.

Increasingly, distributed generation is seen as an alternate way to supply the electrical demand close to the users. Smaller, distributed projects can:

Protect from blackouts caused by the closure of de-centralised power plants or transmission lines for maintenance, market manipulation or emergency shut downs or detox

Reduce pollution

Allow smaller players to enter the energy markets

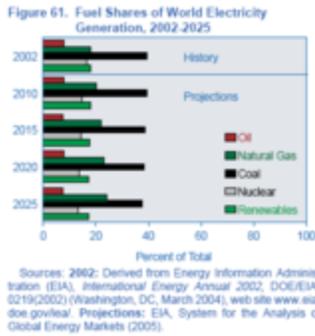
Methods of generating electricity

Methods for transforming other power into electrical power

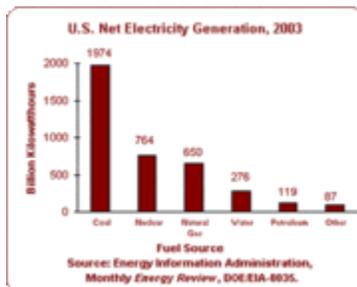
Rotating turbines attached to electrical generators produce most commercially available electricity. Turbines may be driven by using steam, water, wind or other fluids as an intermediate energy carrier. The most common usage is by steam in fossil fuel power plants or nuclear power plants, and by water in hydroelectric dams. Alternately, turbines can be driven directly by the combustion of natural gas. Co-generation gas turbines (COGT) offer efficiencies of up to 60%, as they generate power both directly by combustion of natural gas and also use residual heat to generate electricity from steam. Small mobile electricity generators are often powered by Diesel engines, especially on ships, remote building sites or for emergency standby.

Fuel cells produce electricity using a variety of chemicals and are seen by some people to be the most likely source of power in the long term, especially if Hydrogen can be used as the feedstock. However, hydrogen is usually only an energy carrier, and must be formed by some other power source.

Primary energy sources used in electrical power generation



World Electricity Generation



U.S. Electricity Generation

The world relies mainly on coal and natural gas for power. The high capital requirements of nuclear power and the fear of its dangers have prevented the ordering of new nuclear power plants in North America since the 1970s.

Steam turbines can be powered using steam produced from geothermal sources, solar energy, or Nuclear reactors, which use the energy created by the fission of radioactive plutonium or uranium to generate heat. Nuclear power plants often use a primary and secondary steam circuit to add an additional layer of protection between the location of the nuclear fuel and the generator room.

Hydroelectric power plants use water flowing directly through the turbines to power the generators. Tidal harnesses use the force of the moon on bodies of water to spin a turbine. Wind turbines use wind to turn turbines that are hooked up to a generator. Pumped-storage hydroelectricity is used to level demand on the power grid.

Power generation by thermonuclear fusion has been suggested as a possible way of generating electricity; currently a number of technical obstacles and environmental concerns stand in the way, but if realized fusion might provide a relatively clean and safe source of electrical power. The construction of a large experimental reactor (ITER) is expected to commence in 2005-2006.

Improving efficiency

Co-generation (combined heat and power) plants combine the generation of electricity and heat using solar power, fossil fuels, syngas, biomass, or biogas as a fuel source. These plants can achieve efficiencies as high as 80%, but many of these plants being built today only expect to achieve stated maximum 55% efficiency. Heated steam turns a turbine, and then excess heat is distributed for space heating in buildings, industrial processes or green house heating. Whole communities can benefit from heat distributed through a district heating scheme.

The ability to achieve tri-generation using fossil fuels or solar energy to generate heat, electricity and evaporative cooling exists. These combined power plants have the best energy conversion ratio after hydroelectric plants. Small photovoltaic arrays, windmills and bicycles hooked up to a turbine can all be used to generate mobile electricity.

Ownership and reform of electricity generation market

Electricity reform around the world is de-coupling electricity generation from the regulated monopoly [[1]] elements of transmission and electricity distribution; see electricity market [[2]]. The generation and distribution of electricity is managed by either privately owned or state owned public utility [[3]]. In recent years some governments have started to privatization [[4]] or corporatization [[5]] these utilities as part of a move to introduce market forces to monopolies [[6]]. The New Zealand Electricity Market [[7]] is a typical example.

Source : http://engineering.wikia.com/wiki/Electricity_generation