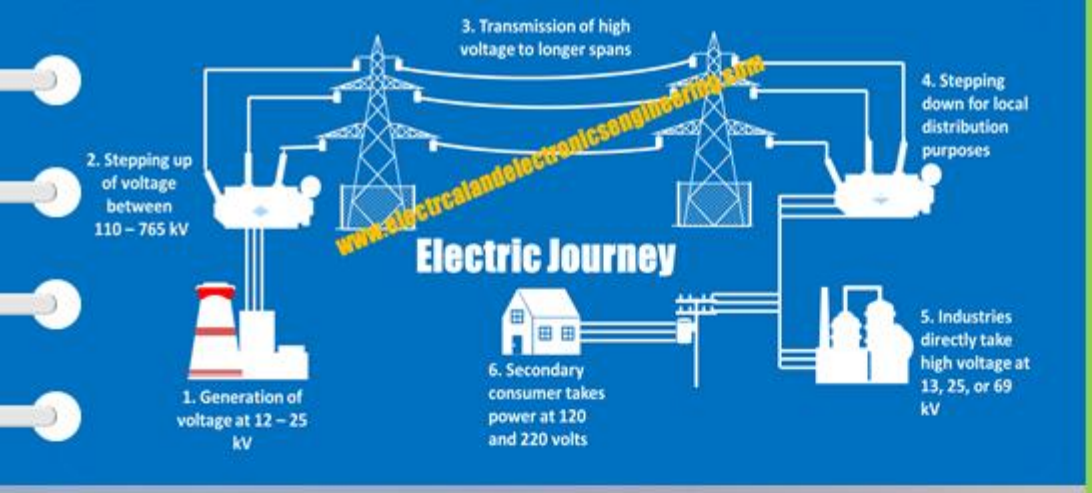

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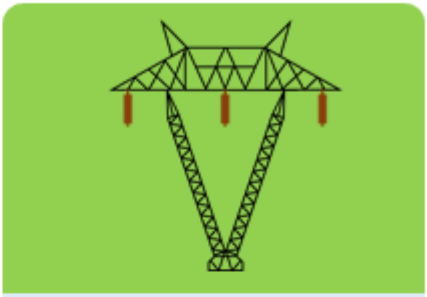
EEE

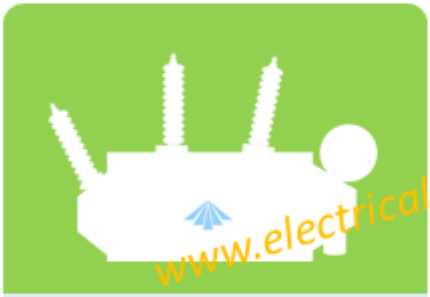
How Electric Power System Works

Components of Electric Power System

#1 Generation



#2 Transmission



#3 Distribution

#4 Protection

#5 Economics

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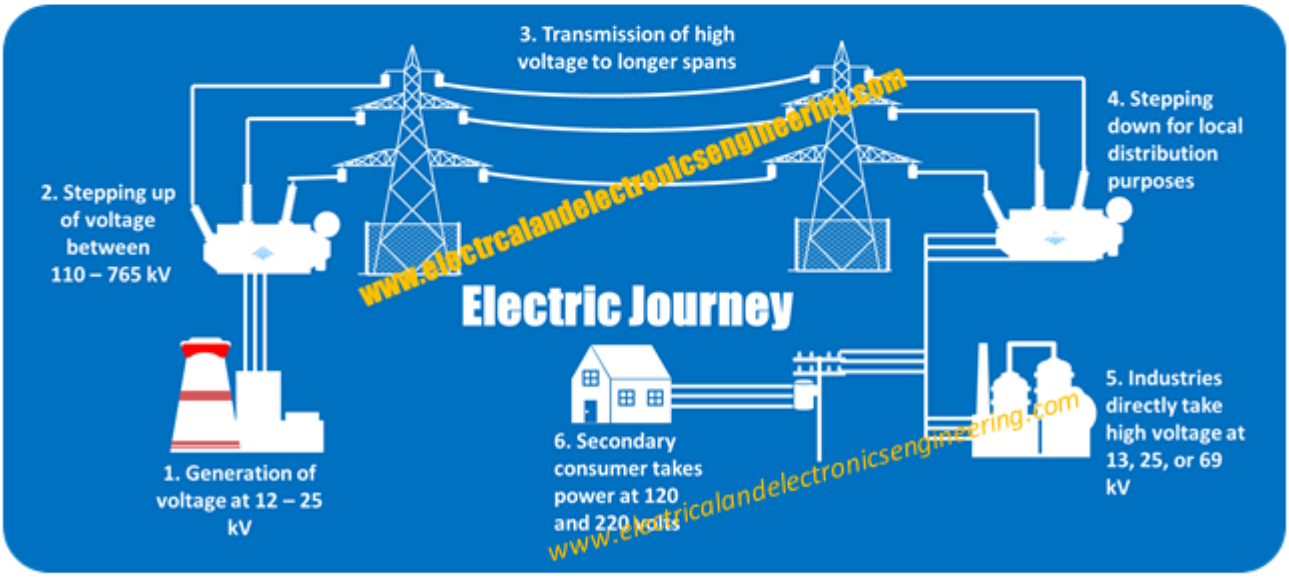
How Electric Power System work

In our electric power system electricity is generated at a voltage level of 12 – 25 kV. Electricity is then stepped up between 110 – 765 kV using step up transformers for increasing the efficiency. This stepped-up electricity transmitted through transmission lines is then stepped down using step-down transformers. Industrial consumers usually take electricity at voltage level of 13, 25, or 69 kV. While for residential consumer it is further stepped down and provided at 120/230 volts.

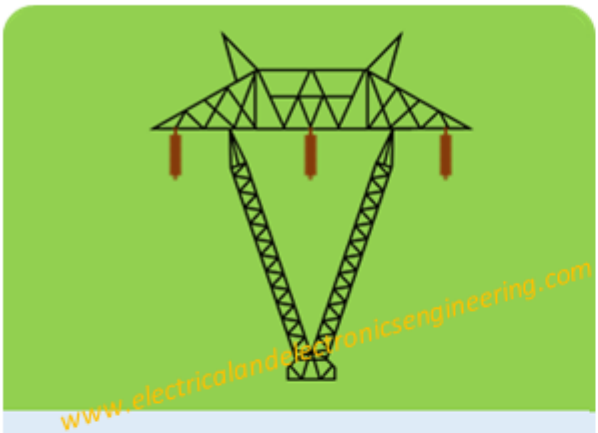
The figure below illustrates the entire process.



#1 Generation

Electrical power can be generated from various sources that are available in nature. Energy from natural sources such as coal, nuclear, water, wind, solar emery is converted to electrical power.

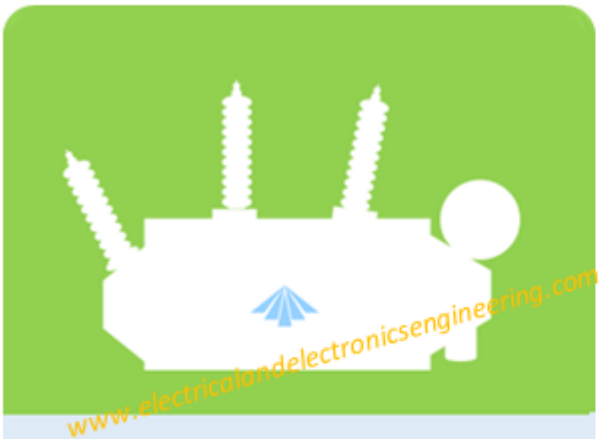
How energy from natural sources is converted to electricity	
Coal	A coal power plant utilizes the thermal energy of coal. In this plant the heat energy from coal converts water to steam. This steam is used in steam turbines that are synchronized with alternators and produce electricity at output
Water	A hydroelectric power plant utilizes potential enery of water. Water from height is allowed to fall at turbine blades. Since turbines are synchronized with alternator electricity is produced at output.
Wind	Wind farms are construced in places having excess of air. Air hitting the turbine blades rotate the turbine which are synchronized.
Solar	A solar panel contains photocell which convert sunlight to electricity
Nuclear	In nuclear power plant, the nuclear elements are subjects to fission process which generated heat. Heat energy is used for converting water to steam. This steam feds to steam turbines synchronized with generator.



#2 Transmission

Nuclear, Coal and Hydro electric power plants are located far away from populations. The bulk power generated at such stations is stepped up and transmitted using power transmission lines.

Components of Power Transmission Lines	
Conductors	These are the transmission lines which carry electricity from one place to another
Pole (Pylon)	A pylon is the main structure which carries transmission line conductors
Insulator	The conductors are tied to poles using insulator. An insulator supports conductor as well as keeps it insulated from poles



#3 Distribution

The transmitted power is received by transformers and then stepped down. This power is then distributed to industries as well as then provided to consumers

Components of Power Transmission Lines	
Primary distribution voltage	Industrial consumers take electricity at 13, 25 or 69 kV.
Secondary distribution voltage	For final residential consumers and home owners the power is further stepped down to final distribution voltages (120,230 V)

#4 Protection

During the process of electrical transmission, distribution and utilization various faults are expected to occur. Various protection devices are employed for providing protection to electrical systems

List of protection devices in Electrical Systems	
Circuit breaker	A circuit breaker is a protection element which trips down in case of excessive current and provides protection to connected circuit

#5 Economics

Power generation economics is the method of determining the optimal cost of production of electricity. The major goal of power engineers is to determine optimal cost that is equally acceptable for production company and utility

Basic terms associated with Economics of Electrical Power	
Depreciation	The decrease in value of power plant equipment and building due to constant use is known as depreciation
Tariff	The rate at which electrical energy is supplied to a consumer is known as tariff
Straight line method	The method of determining depreciation in which a constant depreciation charge is considered every year on the basis of total depreciation and the overall useful life of the property
Capital cost	The overall one time cost that is needed as initial investment

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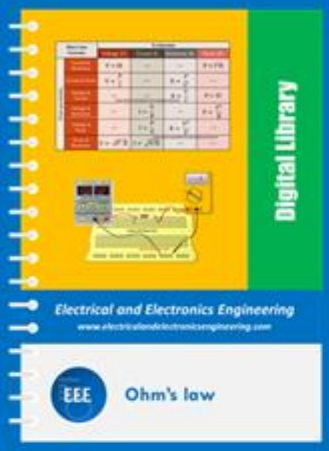

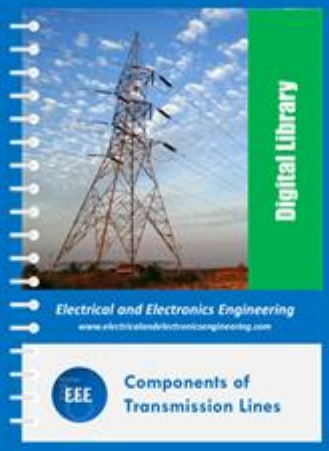

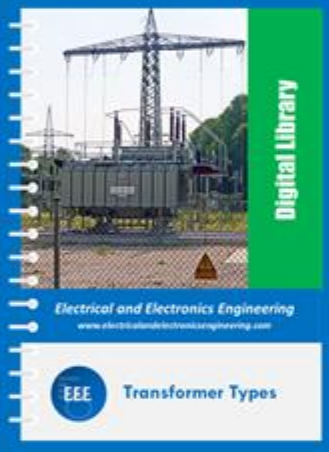

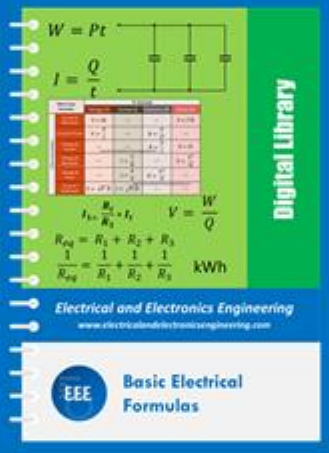

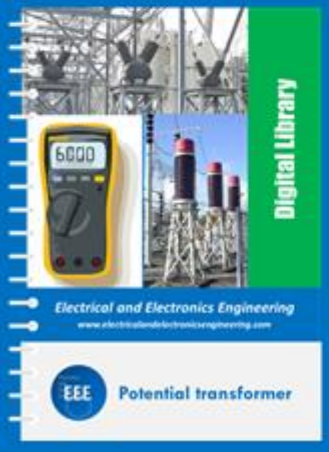

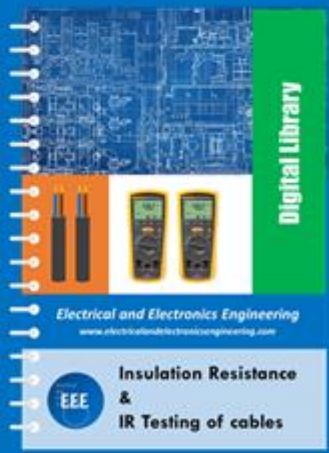

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