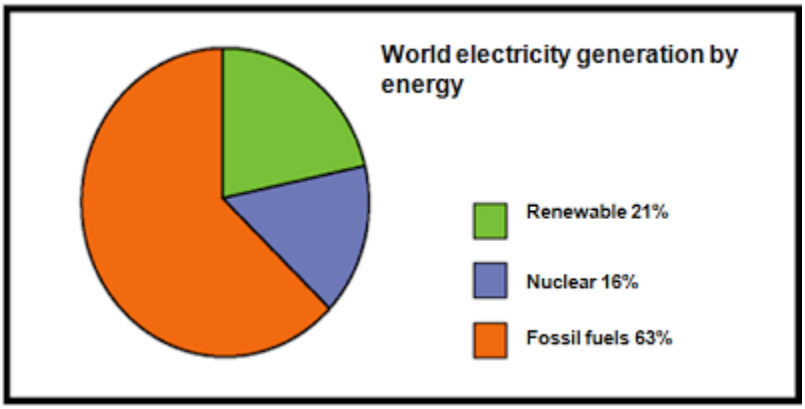
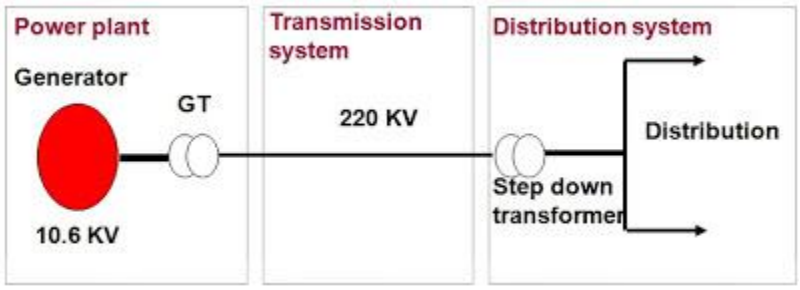
GENERATION & DISTRIBUTION OF ELECTRICITY

Electricity is mostly generated by power stations that use fossil fuels (coal, gas, oil) and nuclear facilities that use uranium. Due to environmental and safety concerns, and more recently energy security concerns as the oil supply is dependent on fewer and fewer countries, alternative sources of energy are being explored.

Renewable energy provides 21 percent of the world energy needs, including hydropower (20 percent), solar, wind, geothermal, biomass, and tidal energy (approximately 1 percent but growing). As the renewable energy sector grows, the technologies used are become more efficient and less expensive. Therefore prices are becoming more comparative to electricity from non-renewable sources.



- Electricity generation: fossil fuels and uranium
- Renewable energy is growing



This figure illustrates the generation, transmission and distribution of electricity

- AC generators (“alternators”) generate electricity
    1. Electricity generated at 9-13 KV
    2. Power generated from 67.5 to 1000 MW
- Power stations: generating transformers (GTs) to increase voltage to 132-400 KV
- Substations: step-down transformers to reduce voltage before distribution
- Electricity is mostly generated by AC generators called “alternators” in thermal, hydro or nuclear power plants at 50 or 60 cycles per second.

- Electricity is typically generated at about 9 to 13 KV at the generator terminal. The power generated by one generator (also termed as UNIT) is in the range of 67.5 MW, 110 MW, 220 MW, and 500 MW, although 1000 MW generators also exist.
- Higher MW rating of generation capacity is preferred because of less auxiliary power consumption and other operation & maintenance cost.
- Electricity must be generated when it is needed since electricity cannot be stored. All power stations have generating transformers (GTs) that increase the voltage to extra high voltages (EHV, e.g. 132 KV, 220 KV, 400 KV) prior to transmission.
- Similarly, sub-stations have step-down transformers, which reduce the voltage for distribution to industrial, commercial and residential users through distribution lines.
- There is no difference between a transmission line and a distribution line except for the voltage level and power handling capability. Transmission lines operate at EHV and are usually capable of transmitting large quantities of electric energy over great distances. Distribution lines carry limited quantities of power at a lower voltage over shorter distances.

Benefits of high voltage transmission

- Less voltage drop: good voltage regulation
- Less power loss: high transmission efficiency
- Smaller conductor: lower costs.

Less voltage drop: Voltage drops in transmission/distribution lines are dependent on the resistance, reactance and length of the line, and the current drawn. For the same quantity of power handled, a higher voltage results in a lower current drawn and lower voltage drop. Benefit is good voltage regulation i.e. the difference between voltages sent and received at small.

Less power loss: the power loss in lines is proportional to the resistance (R) and the square of the current (I), i.e. PLoss = I2R. A higher voltage results in lower currents and therefore lowers power losses. Benefit is high transmission efficiency smaller conductor: a higher voltage results in lower currents and therefore a smaller conductor is needed to handle the current. Benefit is less capital and erection cost.

Source: http://mediatoget.blogspot.in/2012/02/generation-distribution-of-electricity.html