Power Generation Concepts

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Power system:

It consists of all most all electrical equipment and they are placed at different locations depends on requirement and all of them working together for the purpose of supplying electrical energy to consumer on economical basis.

Main components are

- Generation
- Transmission
- Distribution

Advantages of Electrical energy:

- Efficiency is more
- Reliability is high
- Economical
- Easy control
- No atmospheric pollution

Types of Generation:
- Conventional type
- Non-conventional type

Types of Generation:

Conventional type   Ex.: Thermal, Hydal, steam, Nuclear, Diesel , Gas etc.

- Bulk power generation in terms of MW & kV
- Generate High voltages
- Installation cost is more and running cost is less
- Synchronous generators are used (Constant speed). Ex.: Alternators
- Transmission of power for long distances and then connected to distribution system

Non-conventional type   Ex.: Solar, wind, tidal, Biomass, Geothermal etc.

- Generation in terms of kW & Volts
- Generate Low voltages
- Installation cost is less and running cost is more
- Asynchronous generators are used (variable speed). Ex. : Induction generators
- No question of transmission of power and only connected to distribution of power

Generating Stations

Thermal Power Plant:

Thermal power plant operate on the principle of Rankine thermodynamic cycle

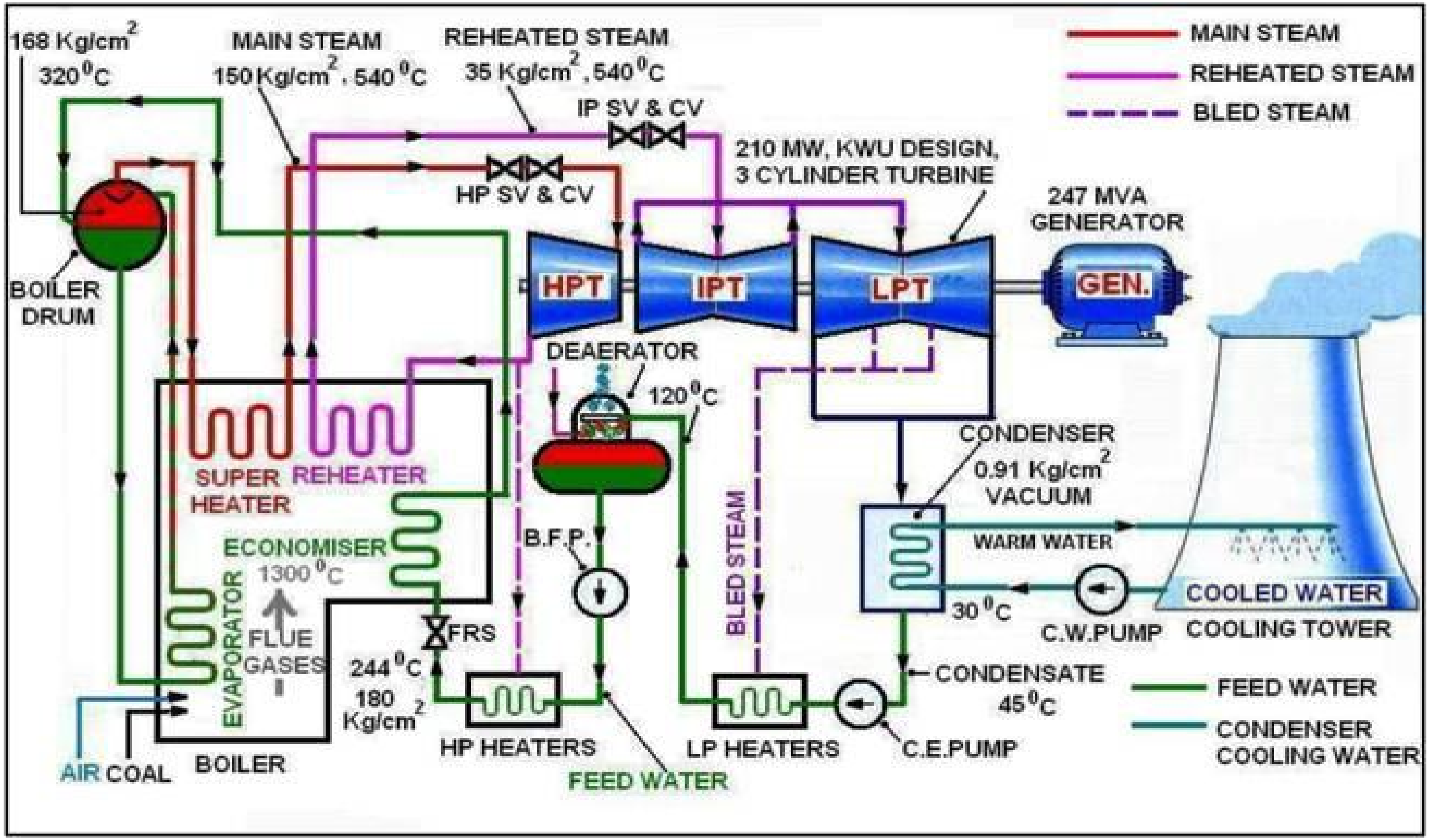


Fig. 1 Schematic diagram of Thermal plant

(*i*) **Thermal efficiency.** *The ratio of heat equivalent of mechanical energy transmitted to the turbine shaft to the heat of combustion of coal is known as* **thermal efficiency** *of steam power station.*

$$\text{Thermal efficiency, } \eta_{thermal} = \frac{\text{Heat equivalent of mech. energy transmitted to turbine shaft}}{\text{Heat of coal combustion}}$$

(*ii*) **Overall efficiency.** *The ratio of heat equivalent of electrical output to the heat of combustion of coal is known as* **overall efficiency** *of steam power station i.e.*

$$\text{Overall efficiency, } \eta_{overall} = \frac{\text{Heat equivalent of electrical ouput}}{\text{Heat of combustion of coal}}$$

$$\text{Overall efficiency} = \text{Thermal efficiency} \times \text{Electrical efficiency}$$

$$\text{Efficiency, } \eta = \frac{\text{Output power}}{\text{Input power}}$$

Example *Mechanical energy is supplied to a d.c. generator at the rate of 4200 J/s. The generator delivers 32·2 A at 120 V.*

(*i*) *What is the percentage efficiency of the generator ?*

(*ii*) *How much energy is lost per minute of operation ?*

Solution.

(*i*) Input power, $P_i = 4200 \text{ J/s} = 4200 \text{ W}$

Output power, $P_o = EI = 120 \times 32{\cdot}2 = 3864 \text{ W}$

$\therefore$ Efficiency, $$\eta = \frac{P_o}{P_i} \times 100 = \frac{3864}{4200} \times 100 = \mathbf{92\ \%}$$

(*ii*) Power lost, $P_L = P_i - P_o = 4200 - 3864 = 336 \text{ W}$

$\therefore$ Energy lost per minute (= 60 s) of operation

$$= P_L \times t = 336 \times 60 = \mathbf{20160\ J}$$

Note that efficiency *is always less than 1* (*or 100 %*). In other words, every system is less than 100 % efficient.

Example *A steam power station spends Rs. 30 lakhs per annum for coal used in the station. The coal has a calorific value of 5000 kcal/kg and costs Rs. 300 per ton. If the station has thermal efficiency of 33% and electrical efficiency of 90%, find the average load on the station.*

Solution.

Overall efficiency, $\eta_{overall} = 0{\cdot}33 \times 0{\cdot}9 = 0{\cdot}297$

Coal used/annum $= 30 \times 10^5/300 = 10^4$ tons $= 10^7$ kg

Heat of combustion = Coal used/annum × Calorific value

$= 10^7 \times 5000 = 5 \times 10^{10}$ kcal

Heat output $= \eta_{overall} \times$ Heat of combustion

$= (0{\cdot}297) \times (5 \times 10^{10}) = 1485 \times 10^7$ kcal

Units generated/annum $= 1485 \times 10^7/860$ kWh

$$\therefore \quad \text{Average load on station} = \frac{\text{Units generated / annum}}{\text{Hours in a year}} = \frac{1485 \times 10^7}{860 \times 8760} = \mathbf{1971\ kW}$$

Hydro Power Plant:

A generating station which utilises the potential energy of water at a high level for the generation of electrical energy is known as a **hydro-electric power station.**

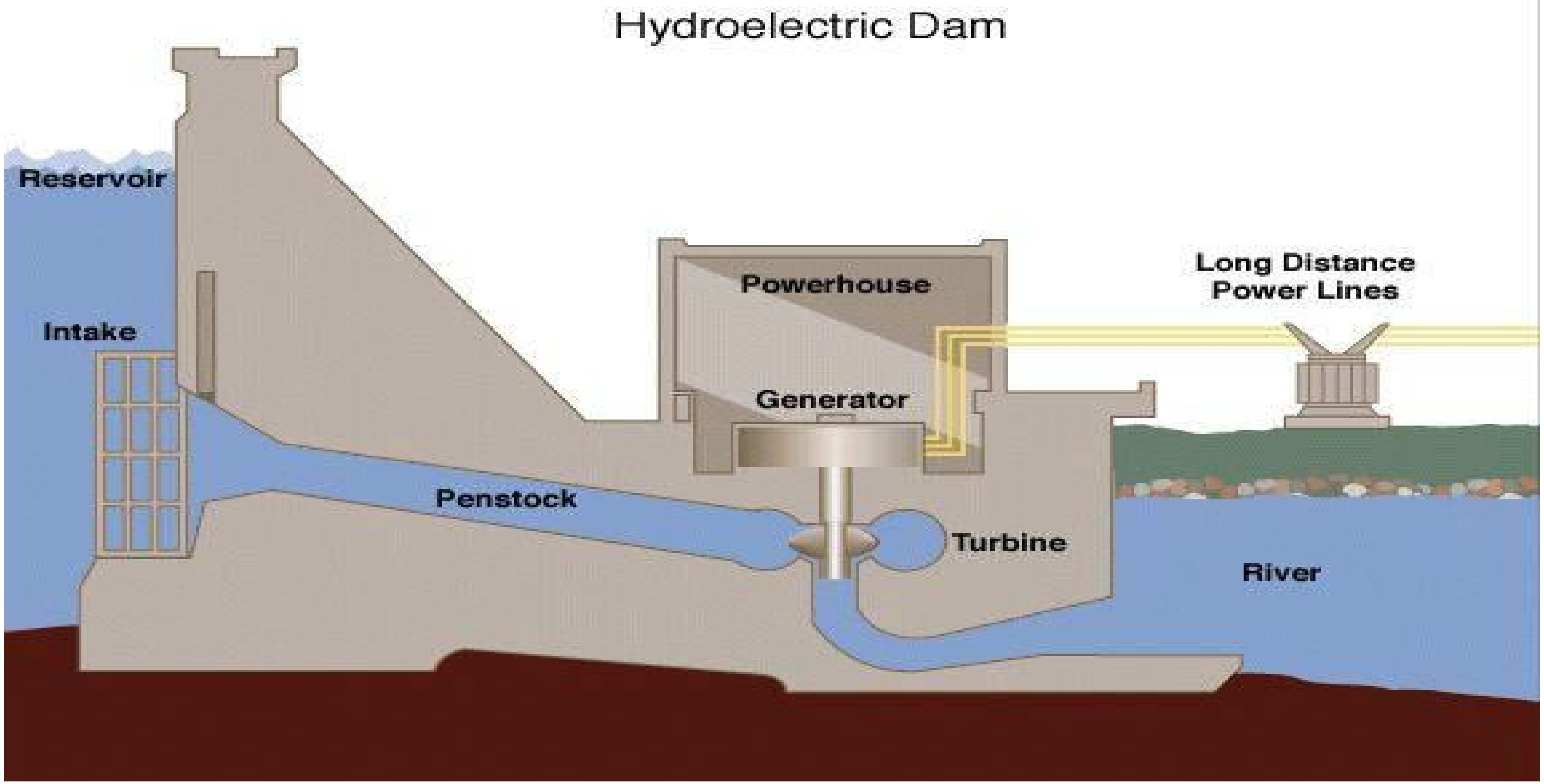


Fig. 2 Schematic diagram of Hydro power plant

Example *Water for a hydro-electric station is obtained from a reservoir with a head of 100 metres. Calculate the electrical energy generated per hour per cubic metre of water if the hydraulic efficiency be 0·86 and electrical efficiency 0·92.*

Solution.

Water head, $H = 100$ m ; discharge, $Q = 1\ m^3/sec$; $\eta_{overall} = 0{\cdot}86 \times 0{\cdot}92 = 0{\cdot}79$

Wt. of water available/sec, $W = Q \times 1000 \times 9{\cdot}81 = 9810\ N$

Power produced $= W \times H \times \eta_{overall} = 9810 \times 100 \times 0{\cdot}79$ watts

$= 775 \times 10^3$ watts $= 775$ kW

$\therefore$ Energy generated/hour $= 775 \times 1 =$ **775 kWh**

Example *The weekly discharge of a typical hydroelectric plant is as under :*

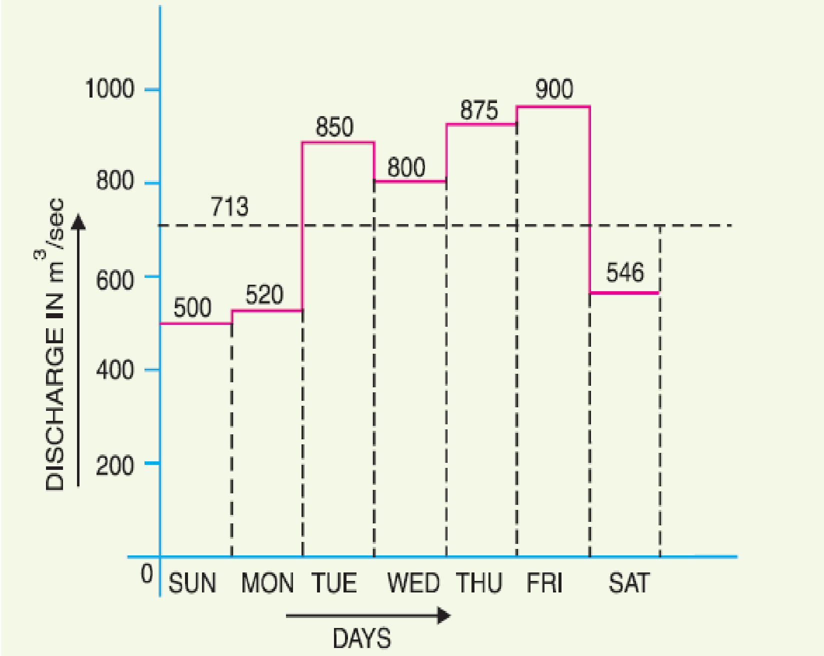
Day	*Sun*	*Mon*	*Tues*	*Wed*	*Thurs*	*Fri*	*Sat*
Discharge(m^3/sec)	*500*	*520*	*850*	*800*	*875*	*900*	*546*

The plant has an effective head of 15 m and an overall efficiency of 85%. If the plant operates on 40% load factor, estimate (i) the average daily discharge (ii) pondage required and (iii) installed capacity of proposed plant.

Fig. shows the plot of weekly discharge. In this graph, discharge is taken along Y-axis and days along X-axis.

(*i*) Average daily discharge $= \dfrac{500 + 520 + 850 + 800 + 875 + 900 + 546}{7}$

$= \dfrac{4991}{7} = \mathbf{713\ m^3/sec}$



(*ii*) It is clear from graph that on three dyas (*viz*., Sun, Mon. and Sat.), the discharge is less than the average discharge.

Volume of water actually available on these three days

$$= (500 + 520 + 546) \times 24 \times 3600\ m^3 = 1566 \times 24 \times 3600\ m^3$$

Volume of water required on these three days

$$= 3 \times 713 \times 24 \times 3600\ m^3 = 2139 \times 24 \times 3600\ m^3$$

Pondage required $= (2139 - 1566) \times 24 \times 3600 \text{ m}^3 = \mathbf{495 \times 10^5 \text{ m}^3}$

(*iii*) Wt. of water available/sec, $w = 713 \times 1000 \times 9{\cdot}81$ N

Average power produced $= w \times H \times \eta_{overall} = (713 \times 1000 \times 9{\cdot}81) \times (15) \times (0{\cdot}85)$ watts

$= 89180 \times 10^3$ watts $= 89180$ kW

Installed capacity of the plant

$$= \frac{\text{Output power}}{\text{Load factor}} = \frac{89180}{0{\times}4} = 223 \times 10^3 \text{ kW} = \mathbf{223\ MW}$$

Example *A diesel power station has fuel consumption of 0·28 kg per kWh, the calorific value of fuel being 10,000 kcal/kg. Determine (i) the overall efficiency, and (ii) efficiency of the engine if alternator efficiency is 95%.*

Solution.

Heat produced by 0·28 kg of oil $= 10{,}000 \times 0{\cdot}28 = 2800$ kcal

Heat equivalent of 1 kWh $= 860$ kcal

(*i*) Overall efficiency $= \dfrac{\text{Electrical output in heat units}}{\text{Heat of combustion}} = 860/2800 = 0{\cdot}307 = \mathbf{30{\cdot}7\%}$

(*ii*) Engine efficiency $= \dfrac{\text{Overall efficiency}}{\text{Alternator efficiency}} = \dfrac{30{\cdot}7}{0{\cdot}95} = \mathbf{32{\cdot}3\%}$

Nuclear power plant

A generating station in which nuclear energy is converted into electrical energy is known as a **nuclear power station.**

- On nuclear reactor heat transfer takes place during nuclear reaction.
- The heat energy thus released is utilised in raising steam at high temperature and pressure.
- The steam runs the steam turbine which converts steam energy into mechanical energy.
- The turbine drives the alternator which converts mechanical energy into electrical energy.

The whole arrangement can be divided into the following main stages :

(i) Nuclear reactor

(ii) Heat exchanger

(iii) Steam turbine

(iv) Alternator

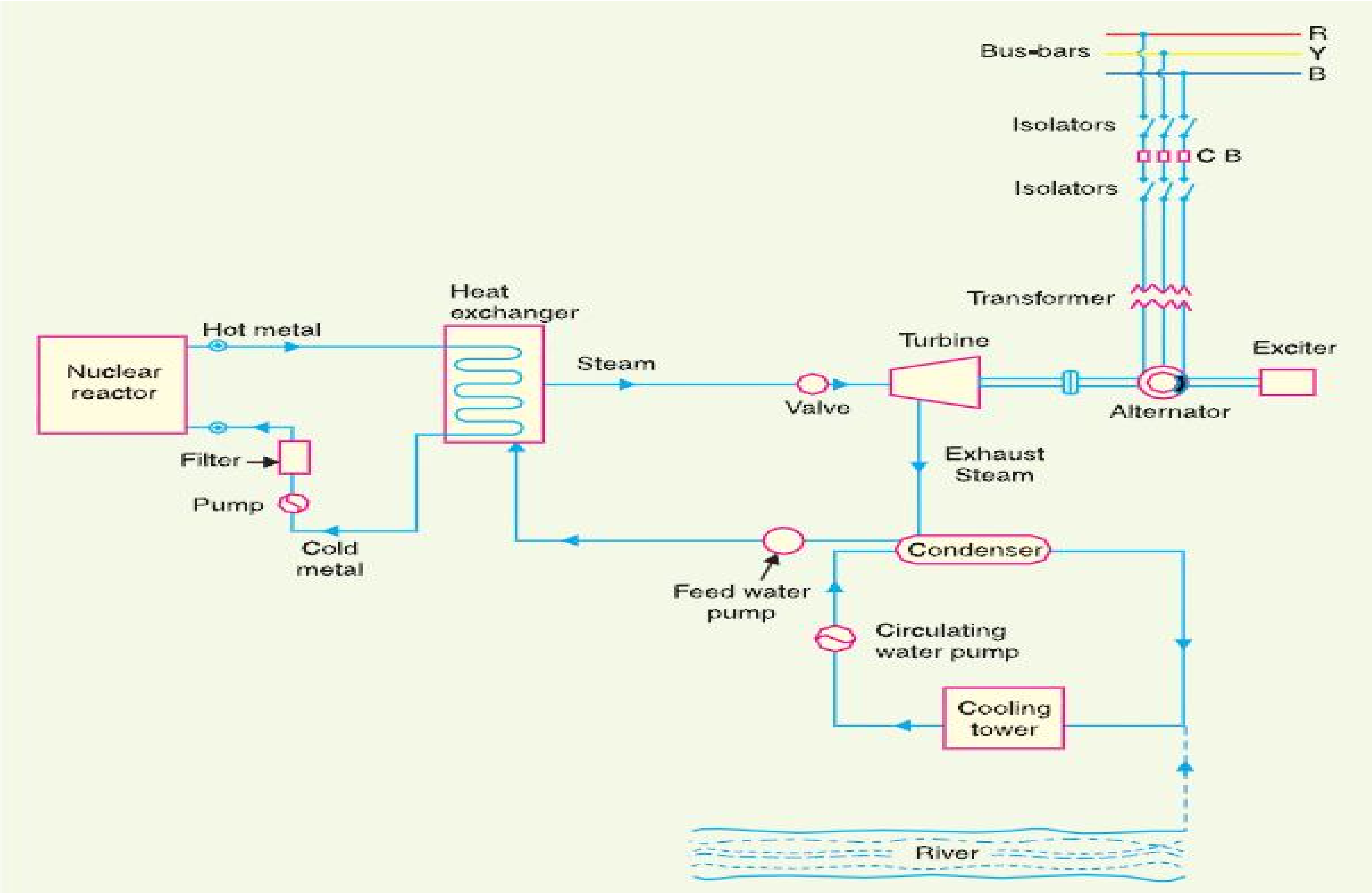
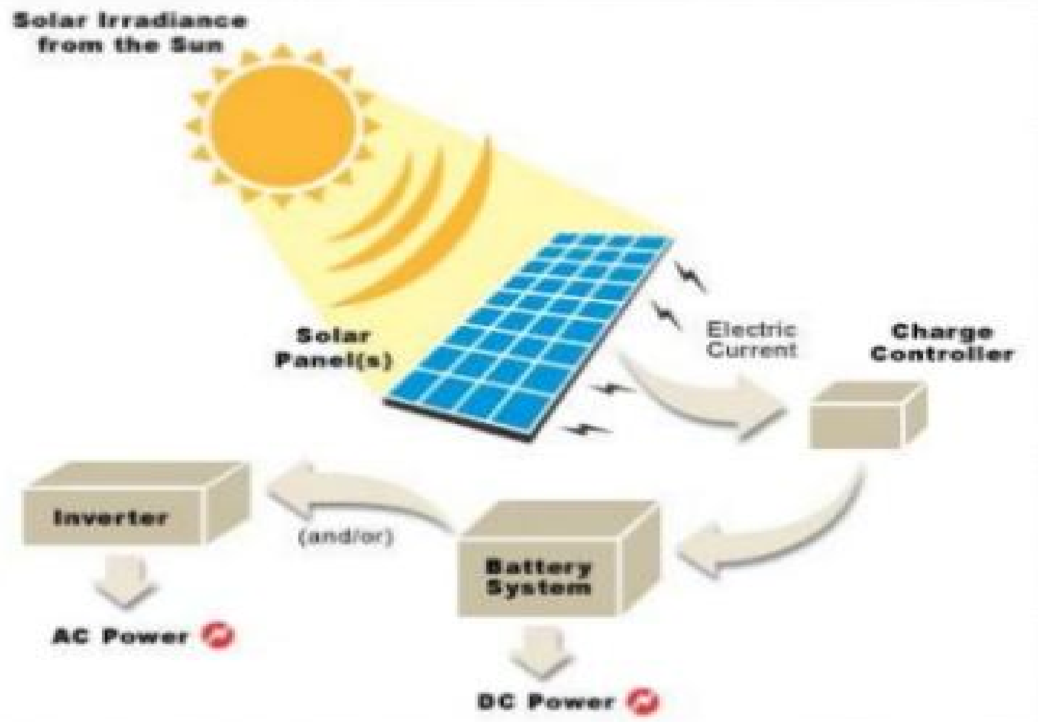


Fig. 3 Schematic diagram of Nuclear power plant

Solar Energy

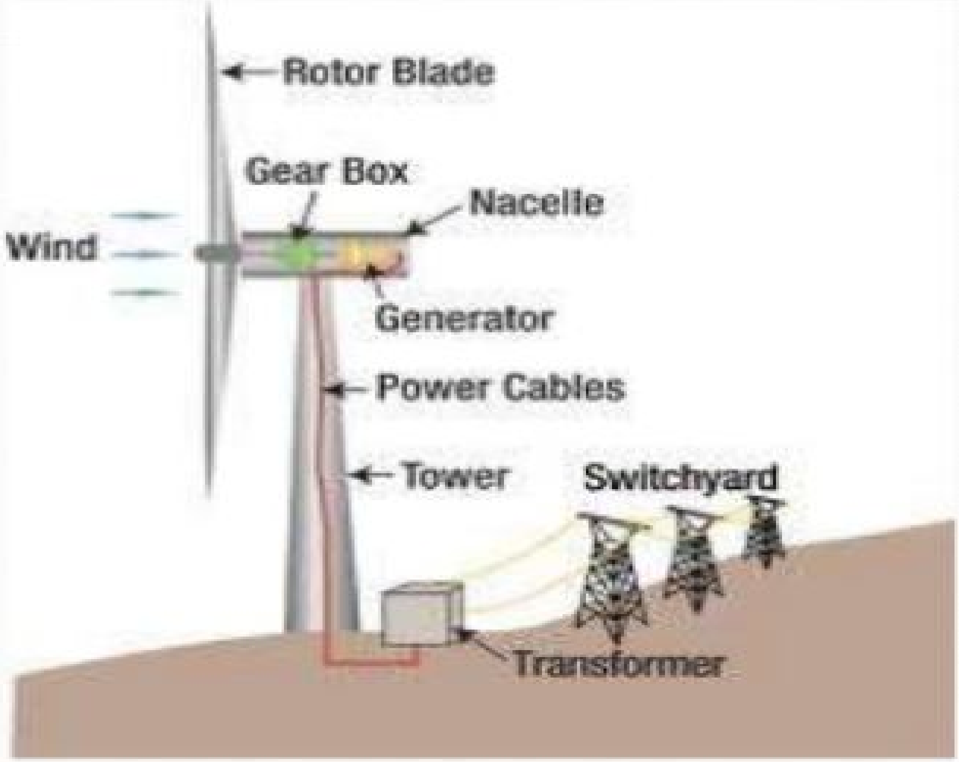
- Sun rays converted into electrical energy
- Unlimited supply
- No negative impact
- Free of cost
- Free from pollution



- Average solar radiation 5kwh/sq m
- 2300-3200 sun shine hours available per year
- Available most part of country

Wind Energy

- Converts wind energy into electrical energy
- No fuel cost
- Free from pollution



- Southern and Western coastal areas are ideal location
- Annual average wind speed 5-6 m/s
- Attractive option to supplement the energy supply

Example *What is the power ouput of a $_{92}U^{235}$ reactor if it takes 30 days to use up 2 kg of fuel? Given that energy released per fission is 200 MeV and Avogadro's number = $6{\cdot}023 \times 10^{26}$ per kilomole.*

Solution.

$$\text{Number of atoms in 2 kg fuel} = \frac{2}{235} \times 6{\cdot}023 \times 10^{26} = 5{\cdot}12 \times 10^{24}$$

These atoms fission in 30 days. Therefore, the fission rate (*i.e.,* number of fissions per second)

$$= \frac{5{\cdot}12 \times 10^{24}}{30 \times 24 \times 60 \times 60} = 1{\cdot}975 \times 10^{18}$$

$$\text{Energy released per fission} = 200 \text{ MeV} = (200 \times 10^{6}) \times 1{\cdot}6 \times 10^{-19} = 3{\cdot}2 \times 10^{-11} \text{J}$$

$\therefore$ Energy released per second *i.e.*, power output P is

$$P = (3{\cdot}2 \times 10^{-11}) \times (1{\cdot}975 \times 10^{18}) \text{ W}$$

$$= 63{\cdot}2 \times 10^{6} \text{ W} = \mathbf{63{\cdot}2 \text{ MW}}$$

Variable load on power station:

The load on a power station varies from time to time due to uncertain demands of the consumers and is known as variable load on the station.

Effects of variable load:

- Increase in production cost
- Need for additional equipment

Load Curves

The curve showing the variation of load on the power station with respect to (w.r.t) time is known as a **load curve.**

Types of Load curves

- Daily load curve : Drawn for the period of 24 hours
- Monthly load curve : Drawn for the period of 30 days
- Yearly load curve : Drawn for the period of 365 days

Importance: The daily load curves have attained a great importance in generation as they supply the following information readily :

(*i*) The daily load curve shows the variations of load on the power station during different hours of the day.

(*ii*) The area under the daily load curve gives the number of units generated in the day.

Units generated/day = Area (in kWh) under daily load curve.

(*iii*) The highest point on the daily load curve represents the maximum demand on the station on that day.

(*iv*) The area under the daily load curve divided by the total number of hours gives the average load on the station in the day.

Average load = Area (in kWh) under daily load curve/24 hours (*v*) The ratio of the area under the load curve to the total area of rectangle in which it is contained gives the load factor.

$$\text{Load factor} = \frac{\text{Average load}}{\text{Max. demand}} = \frac{\text{Average load} \times 24}{\text{Max. demand} \times 24}$$

$$= \frac{\text{Area (in kWh) under daily load curve}}{\text{Total area of rectangle in which the load curve is contained}}$$

(*vi*) The load curve helps in selecting the size and number of generating units.

(*vii*) The load curve helps in preparing the operation schedule of the station.

Important Terms and Factors

(i) Connected load: It is the sum of continuous ratings of all the equipment's connected to supply system.

(ii) Maximum demand: It is the greatest demand of load on the power station during a given period.

(iii) Demand factor: It is the ratio of maximum demand on the power station to its connected load i.e.,

$$\text{Demand factor} = \frac{\text{Maximum demand}}{\text{Connected load}}$$

(iv) Average load: The average of loads occurring on the power station in a given period (day or month or year) is known as average load or average demand.

$$\text{Daily average load} = \frac{\text{No. of units (kWh) generated in a day}}{\text{24 hours}}$$

$$\text{Monthly average load} = \frac{\text{No. of units (kWh) generated in a month}}{\text{Number of hours in a month}}$$

$$\text{Yearly average load} = \frac{\text{No. of units (kWh) generated in a year}}{\text{8760 hours}}$$

(v) Load factor: The ratio of average load to the maximum demand during a given period is known as load factor i.e.,

$$\text{Load factor} = \frac{\text{Average load}}{\text{Max. demand}}$$

If the plant is in operation for T hours,

$$\text{Load factor} = \frac{\text{Average load} \times \text{T}}{\text{Max. demand} \times \text{T}}$$

$$= \frac{\text{Units generated in T hours}}{\text{Max. demand} \times \text{T hours}}$$

(*vi*) **Diversity factor.** *The ratio of the sum of individual maximum demands to the maximum demand on power station is known as* **diversity factor** *i.e.,*

$$\text{Diversity factor} = \frac{\text{Sum of individual max. demands}}{\text{Max. demand on power station}}$$

A power station supplies load to various types of consumers whose maximum demands generally do not occur at the same time. Therefore, the maximum demand on the power station is always less than the sum of individual maximum demands of the consumers. Obviously, diversity† factor will always be greater than 1. The greater the diversity factor, the lesser‡ is the cost of generation of power.

(*vii*) **Plant capacity factor.** *It is the ratio of actual energy produced to the maximum possible energy that could have been produced during a given period i.e.,*

$$\text{Plant capacity factor} = \frac{\text{Actual energy produced}}{\text{Max. energy that could have been produced}}$$

$$= \frac{\text{Average demand} \times \text{T}^{**}}{\text{Plant capacity} \times \text{T}}$$

$$= \frac{\text{Average demand}}{\text{Plant capacity}}$$

Thus if the considered period is one year,

$$\text{Annual plant capacity factor} = \frac{\text{Annual kWh output}}{\text{Plant capacity} \times 8760}$$

$$\text{Reserve capacity} = \text{Plant capacity} - \text{Max. demand}$$

(*viii*) **Plant use factor.** *It is ratio of kWh generated to the product of plant capacity and the number of hours for which the plant was in operation i.e.*

$$\text{Plant use factor} = \frac{\text{Station output in kWh}}{\text{Plant capacity} \times \text{Hours of use}}$$

Suppose a plant having installed capacity of 20 MW produces annual output of $7{\cdot}35 \times 10^6$ kWh and remains in operation for 2190 hours in a year. Then,

$$\text{Plant use factor} = \frac{7 \cdot 35 \times 10^6}{\left(20 \times 10^3\right) \times 2190} = 0{\cdot}167 = 16{\cdot}7\%$$

Units Generated per Annum

It is often required to find the kWh generated per annum from maximum demand and load factor The procedure is as follows :

$$\text{Load factor} = \frac{\text{Average load}}{\text{Max. demand}}$$

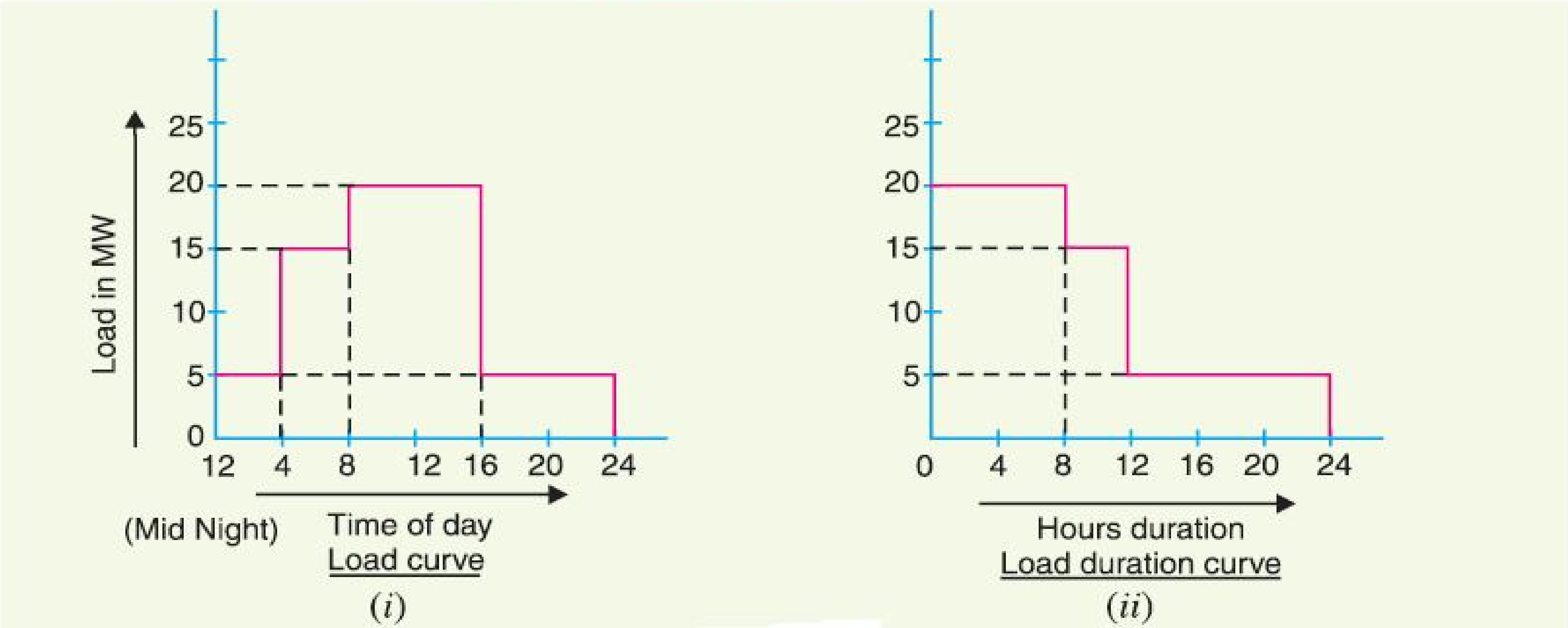
$$\therefore \quad \text{Average load} = \text{Max. demand} \times \text{L.F.}$$

$$\text{Units generated/annum} = \text{Average load (in kW)} \times \text{Hours in a year}$$

$$= \text{Max. demand (in kW)} \times \text{L.F.} \times 8760$$

Load Duration Curve

When the load elements of a load curve are arranged in the order of descending magnitudes, the curve thus obtained is called a **load duration curve.**



The following points may be noted about load duration curve :

(*i*) The load duration curve shows the number of hours during which the given load has prevailed.

(*ii*) The area under the load duration curve is equal to that of the corresponding load curve. Obviously, area under daily load duration curve (in kWh) will give the units generated on that day.

(*iii*) The load duration curve can be extended to include any period of time.

Example *A generating station has a connected load of 43MW and a maximum demand of 20 MW; the units generated being $61{\cdot}5 \times 10^6$ per annum. Calculate (i) the demand factor and (ii) load factor.*

Solution.

(*i*) $$\text{Demand factor} = \frac{\text{Max. demand}}{\text{Connected load}} = \frac{20}{43} = \mathbf{0{\cdot}465}$$

(*ii*) $$\text{Average demand} = \frac{\text{Units generated / annum}}{\text{Hours in a year}} = \frac{61\cdot5\times10^6}{8760} = 7020 \text{ kW}$$

$$\therefore \quad \text{Load factor} = \frac{\text{Average demand}}{\text{Max. demand}} = \frac{7020}{20\times10^3} = \mathbf{0{\cdot}351} \text{ or } \mathbf{35{\cdot}1\%}$$

Example *A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor.*

Solution.

Energy supplied for each working day

$$= (100 \times 2) + (50 \times 6) = 500 \text{ MWh}$$

$$\text{Station operates for} = 365 - 45 = 320 \text{ days in a year}$$

$$\therefore \quad \text{Energy supplied/year} = 500 \times 320 = 160{,}000 \text{ MWh}$$

$$\text{Annual load factor} = \frac{\text{MWh supplied per annum}}{\text{Max. demand in MW} \times \text{Working hours}} \times 100$$

$$= \frac{160{,}000}{(100)\times(320\times24)} \times 100 = \mathbf{20{\cdot}8\%}$$

Level of Voltages:

HV	-	up to 33 kV transmissions
EHV	-	66kV, 132kV & 220kV
Modern EHV	-	400kV
UHV	-	765kV and above

HVDC transmission is preferred if the voltages are beyond 500kV and the transmission distance is above 500km due to stability problems.

Transmission system:

- Voltage levels up to 33kV, 3- phase , 3 wire
- no intermediate consumers
- Feeders
- Constant current density (J= I/A)

Distribution system:

- Voltage levels:
  - Primary distribution 33kV – 11kV, 3- phase , 3 wire
  - Secondary distribution – 11kV – 415V, 220V, 3- phase , 4 wire
- Intermediate consumers
- Distributors
- Variable current density (J= I/A)
- Size of conductor depends up on voltage drop

Therefore, the choice of proper transmission voltage is depends on economics.
Generally the primary transmission is carried at 66 kV, 132 kV, 220 kV or 400 kV.

Primary transmission:

The electric power at 132 kV is transmitted by 3-phase, 3-wire overhead system to the outskirts of the city.

Secondary transmission:

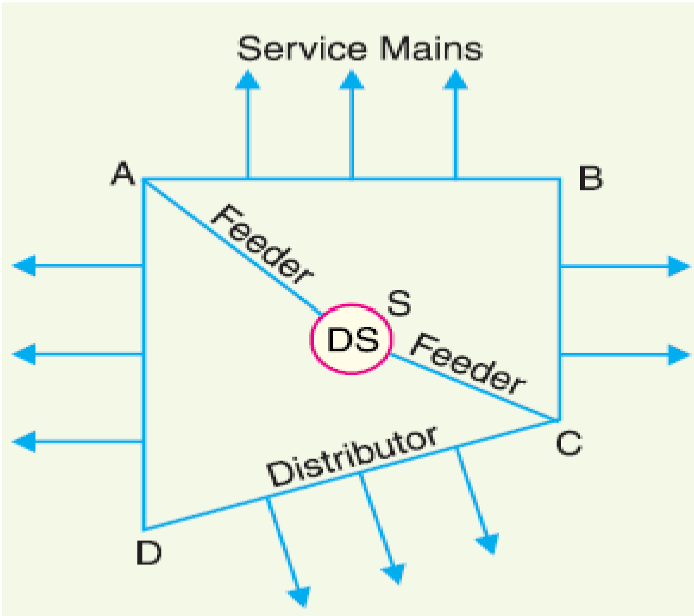
At the receiving station, the voltage is reduced to 33kV by step- down transformers. From this station, electric power is transmitted at 33kV by 3-phase, 3-wire overhead system to various sub-stations (*SS*) located at the strategic points in the city.

Primary distribution:

The secondary transmission line terminates at the sub-station (*SS*) where voltage is reduced from 33 kV to 11kV, 3-phase, 3-wire. The 11 kV lines run along the important road sides of the city. It may be noted that big consumers (having demand more than 50 kW) are generally supplied power at 11 kV for further handling with their own sub-stations.

Secondary distribution:

The electric power from primary distribution line (11 kV) is delivered to distribution sub-stations (*DS*). These sub-stations are located near the consumers' localities and step down the voltage to 400 V, 3-phase, 4-wire for secondary distribution. The voltage between any two phases is 400 V and between any phase and neutral is 230 V. The single-phase residential lighting load is connected between any one phase and neutral, whereas 3-phase, 400 V motor load is connected across 3-phase lines directly. It may be worthwhile to mention here that secondary distribution system consists of *feeders, distributors and service mains.*



Comparison of D.C. and A.C. Transmission system

1. DC Transmission

Advantages

(*i*) It requires only two conductors as compared to three for a.c. transmission.

(*ii*) There is no inductance, capacitance, phase displacement and surge problems in d.c. transmission.

(*iii*) Due to the absence of inductance, the voltage drop in a d.c. transmission line is less than the a.c. line for the same load and sending end voltage. For this reason, a d.c. transmission line has better voltage regulation.

(*iv*) There is no skin effect in a d.c. system. Therefore, entire cross-section of the line conductor is utilised.

(*v*) For the same working voltage, the potential stress on the insulation is less in case of d.c. system than that in a.c. system. Therefore, a d.c. line requires less insulation.

(*vi*) A d.c. line has less corona loss and reduced interference with communication circuits.

(*vii*) The high voltage d.c. transmission is free from the dielectric losses, particularly in the case of cables.

(*viii*) In d.c. transmission, there are no stability problems and synchronising difficulties.

Disadvantages

(*i*) Electric power cannot be generated at high d.c. voltage due to commutation problems.

(*ii*) The d.c. voltage cannot be stepped up for transmission of power at high voltages.

(*iii*) The d.c. switches and circuit breakers have their own limitations.

A.C. transmission

Now-a-days, electrical energy is almost exclusively generated, transmitted and distributed in the form of a.c.

Advantages

(*i*) The power can be generated at high voltages.

(*ii*) The maintenance of a.c. sub-stations is easy and cheaper.

(*iii*) The a.c. voltage can be stepped up or stepped down by transformers with ease and efficiency.

(iv) This permits to transmit power at high voltages and distribute it at safe potentials.

Disadvantages

(*i*) An a.c. line requires more copper than a d.c. line.

(*ii*) The construction of a.c. transmission line is more complicated than a d.c. transmission line.

(*iii*) Due to skin effect in the a.c. system, the effective resistance of the line is increased.

(*iv*) An a.c. line has capacitance. Therefore, there is a continuous loss of power due to charging current even when the line is open.

Advantages of High Transmission Voltage

(*i*) Reduces volume of conductor material

Total volume of conductor material required $= \dfrac{3P^2 \rho\, l^2}{W V^2 \cos^2 \phi}$

(*ii*) Increases transmission efficiency

$$\text{Transmission efficiency} = \left[1 - \frac{\sqrt{3}\;\; J \rho\, l}{V \cos \phi}\right] \text{approx.}$$

(*iii*) Decreases percentage line drop

$$\text{\%age line drop} = \frac{J \rho\, l}{V} \times 100$$

Limitations of high transmission voltage

(*i*) The increased cost of insulating the conductors

(*ii*) The increased cost of transformers, switchgear and other terminal apparatus.

- For the same power, same material and same length, if the operating voltage is increased by 'n' times then the area of the cross section of the conductor is $a_2 = \frac{1}{n} a_1$

$$P = VI\cos\phi$$

$$V_2 = nV_1 \quad \text{and } I_2 = \frac{I_1}{n}$$

$$\text{Also } I_1 \;\alpha\; a_1 \qquad I_2 \;\alpha\; a_2$$

$$\therefore a_2 = \frac{a_1}{n}$$

- For the same power, same material, same length and same loss, if the operating voltage is increased by 'n' times then the area of the cross section of the conductor is $a_2 = \frac{1}{n^2} a_1$

$$\text{Power Loss}, P = I^2 R = I^2 \frac{\rho l}{a}$$

$$P = VI\cos\phi$$

$$\text{After simplification}, a = \frac{K}{V^2 Cos^2\phi}$$

Let $\cos\phi$ is constant then

$$a = \frac{1}{V^2} \qquad a_2 = \frac{a_1}{n^2}$$

Questions – 1M

(i) Primary transmission is done by 3-phase ....wire a.c. system.

(a) 3 (b) 4 (c) 2 (d) 1

(ii) The .... distribution is done by 3-phase, 4-wire a.c. system. (*primary, secondary*)

(*iii*) The greater the power to be transmitted, the .... is the economic transmission voltage. (*smaller, larger*)

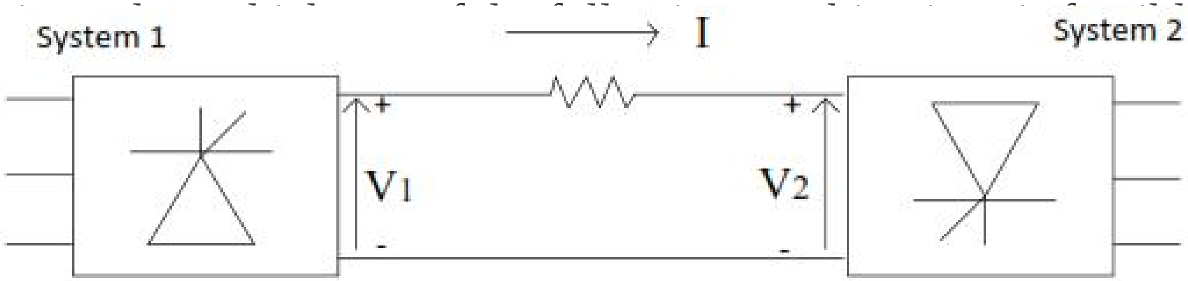
(iv) The annual charge of a transmission line can be expressed as $P1 + P2$ .... (a, $1/a$)

(*v*) The economic transmission voltage .... the distance of transmission (depends upon, does not depend upon)

ANSWERS

(*i*) a (*ii*) secondary (*iii*) larger (*iv*) *a* (*v*) depends upon.

1. Consider a HVDC link which uses thyristor based line-commutated converters as shown in the figure. For a power flow of 750 MW from System 1 to System 2, the voltages at the two ends, and the current, are given by: V1 =500 kV, V2 =485 kV and *I* =1.5 kA. If the direction of power flow is to be reversed (that is, from System 2 to System 1) without changing the electrical conne ?



(GATE -2015)

(A) V1=-500 kV, V2=−485 kV and I =1.5 kA
(B) V1=−485 kV, V2=−500 kV and I =1.5 kA
(C) V1=500 kV, V2=485 kV and I =−1.5 kA
(D) V1=−500 kV, V2=−485 kV and I =−1.5 kA

Show Answer

Answer : (B) V1=−485 kV, V2=−500 kV and I =1.5 kA

2. Base load power plants are GATE -2015

P: wind farms Q: run-of-river plants

R: nuclear power plants S: diesel power plants

(A) P, Q and S only (B) P,R and S only (C) P, Q and R only

- (D) Q and R only

Show Answer

Answer : (C) P, Q and R only