UNIT V

OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS

1 **What are the components of solar energy?**

1. 1.Collector
2. Storage unit

2 **Define demand factor?**

- Demand factor is defined as the ratio of maximum demand to connected load.
- Connected load is the sum of ratings in kW of equipment installed in the consumer's premises.
- Maximum demand is the maximum load, which a consumer uses at any time.

3 **Define load curve?**

Load curve is a graphical representation between load in kW and time in hours. It. shows variati6n of load at the power station. The area under the load curve -represents the energy generated in a particular period.

4 **Define load factor?**

Load factor is defined as the ratio of average load to the peak load (or) maximum demand.

5 **What includes fixed cost?**

Fixed cost includes the following cost.

1. Cost of land
2. Cost of building
3. Cost of equipment
4. Cost of installati6n
5. Interest
6. Depreciation cost
7. Insurance
8. Management cost

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7 **What includes operating cost?**

Operating cost includes the following cost.

1. Cost of fuel
2. Cost of operating labour,
3. Cost of maintenance labours and materials.
4. Cost of supplier like

Water for feeding boilers, for condenser and for general use.

Lubrication oil and, grease.

Water treatment chemicals.

8 **What is the need of depreciation cost?**

Depreciation cost is the amount to be set aside per year from the income of the plant to meet the depreciation caused by the age of service, wear and tear of the machinery and equipments. Depreciation amount collected every year helps in replacing and repairing the equipment.

9 **What is concentration ratio?**

Concentration ratio is defined as the ratio between the aperture area and the receiver Absorber area of the collector.

10 **List the various types of solar energy collectors.**

1.Stationary collectors (or) Non- concentrating

(a) Flate plate collectors

(b) Compound parabolic collectors

(c) Evaculated tube collectors

2.Sun tracking concentrating collector

(a) single axis tracking

(b) Two-axis tracking

11 **List any four applications of solar collectors.**

1.Solar water heating

2. Solar space heating systems

3. Solar refrigeration

4. Industrial process heat systems

12 **List the four important solar systems.**

1.Low temperature cycles using flat plat collector or solar pond

2.Power tower or central receiver system

3.Distributed collector system

4. Concentrating collectors for medium and high temperature cycle

13 **List the advantages of solar Energy.**

1.Solar energy is free from pollution

2.They collect solar energy optically and transfer it to a single receiver, thus minimizing thermal-energy transport requirements

3. They typically achieve concentration ratios of 300 to 1500 and so are highly Efficient both in collecting energy and converting it to electricity.

4.The plant requires little maintenance or help after setup

5. It is economical

14 **List any four disadvantages of solar energy.**

1.Avilable in day time only

2.Need storage facilities

3.It needs a backup power plant

4.Keeping back up plants hot includes an energy cost which includes coal burning

15 **List the classification of OTEC based on location.**

1. Land based plant
2. Shelf based plant
3. Floating plant

16 **List the classification of OTEC based on cycle.**

1.Open cycle

2.Closed cycle

3.Hybrid cycle

17 **List any four disadvantages of OTEC.**

1. Degradation of heat exchanger performance as dissolved gases.
2. Degradation of heat exchanger performance by microbial fouling
3. Improper sealing
4. Parasitic power consumption by exhaust compressor

18 **List any four benefits of OTEC.**

1.Airconditioning

2.Chilled soil agriculture

3.Aquaculture

4.Desalination

19 **List the various components of wind energy system.**

1.Rotor

2.Gearbox

3.Enclosure

4.Tailvane

20 **What are the two basic design of turbines?**

1.Vertical axis (or) Egg beater style

2.Horizontal axis (propeller style) machines

21 **Write down the various types of wind power plants.**

1.Remote

2.Hybrid

3.Grid connected

22 **List any four advantages of wind turbine.**

1.Inexhaustible fuel source

2.No pollution

3.Excellent supplement to other renewable source

4.Its free

23 **List the disadvantages of wind power generation.**

1.Low energy production

2.Expensive maintenance

24 **What are the various ways of creating tidal energy?**

1.Tidal Barrager

2.Tidal fences

3.Tidal turbines

25 **List the various types of turbines used in tidal power station.**

1.Buld turbine

2.Rim turbine

3.Tubular turbines

26 **What are the components of tidal power station?**

1.Barrage

2.Turbines

3.Sluices

4.Embankments

27 **List any four advantages of tidal power generation.**

1.Renewable and sustainable energy

2.No liquid or Solid pollution

3.Little visual impact

4.Reduces dependence upon fossil fuels

28 **List the limitations of tidal energy.**

1.Orientation problem

2.Requires storage devices

3.Available at a lower rating and time

4.High capital cost

29 **What are the main parts of geothermal power plant?**

1.Production well

2.Vaporizer

3.Circulating pump

4.Expansion turbine

5.Generator

6.Condenser

7.Transformer

30 **What are the classifications of geothermal energy conversion system?**

1.Single cycle geothermal power plant

2.Binary cycle power plant

31 **What are the advantages of geothermal energy?**

1.Cheaper

2.Versatile in its use

3.Delivers greater amount of energy

32 **What are the disadvantages of geothermal energy?**

1. Drilling operation is noisy

2. It needs large areas of exploitation of geothermal energy

3. Low overall power production efficiency.

33 **What are the classifications of MHD system?**

1.Open cycle systems

2. Closed cycle systems

(a) Seeded inert gas systems

(b)Liquid metal systems

34 **What are the advantages of MHD systems?**

1. Large amount of power is generated

2. No moving parts, so more reliable.

3.Closed cycle system produces power, free of pollution

4. Ability to reach its full power as soon as started.

35 **List the classification of oil injection system.**

(a) Common rail injection system

(b) Individual pump injection system

(c) Distributor system

36 **List the disadvantages of MHD systems.**

1.Needs very large magnets(high expenses)

2.Very high friction and heat transfer losses

3.It suffers from the reverse flow of electrons through the conducting fluids around the ends of the magnetic field.

37 **What are the applications of geothermal energy?**

1.Generation of electric power

2.Space heating for building

3.Industrial process heat

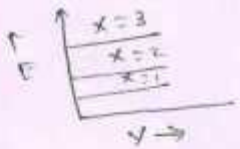
Unit - 5

1. Elucidate the objectives & requirement to Tariff & general form of Tariff

The various Tariffs used for charging the consumer as per their energy consumed as per their energy consumed

1. Demand rate -

Type of charging the charging depend only on connected load & Fixed number of hours of use / month



The rate expresses the charge per unit of demand of consumer

Here no metering & manpower are required for charging

In that unit energy cost decreases

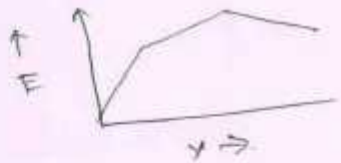
2. straight line meter rate

$E = B_1 Y$

(a) consumer using no energy

(b) rate of energy is Fixed.

3. Block meter rate



$E = B_1 Y_1 + B_2 Y_2 + B_3 Y_3 + \cdots$

$B_3 < B_2 < B_1$

$Y_1 + Y_2 + Y_3 + \cdots = Y$

level of $Y_1, Y_2, Y_3 \cdots$ decided

Hopkinson demand rate of Two Part Tariff

$E = A + BY$ method of charging depend upon the maximum demand.

Explain briefly the various methods use to calculate depreciation cost

Depreciation cost:-

* Amount to be set a side per year from income to meet depreciation caused by age of service wear tear of machinery.

Power plant * equipment in plant will have certain period of useful life after use of it loses it by or became absolute * needs replacement.

Methods used to calculate depreciation cost

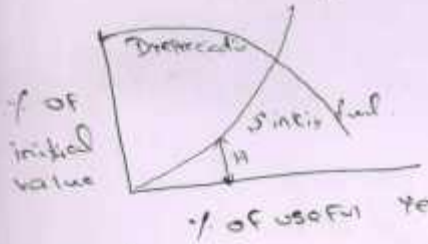
(i) Straight line method.
(ii) Sinking fund
(iii) Diminishing value

Straight line Method:-

→ Simplest to commonly used based on assumption that depreciation occur uniformly

$$A = \frac{P-S}{n}$$

P - capital cost of equip
S - Salvage value



Sinking fund:-

$= A * Ai = A(1+i)$

$= A(1+i) +$ interest on $A(1+i)$

$= A(1+i) + A(1+i)$

$= A(1+i)^2$

$= A(1+i)^{n-1}$

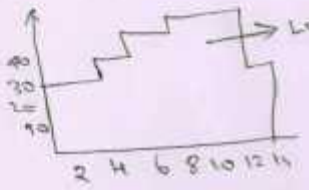
3) The Loads on power Plant w.r.t 24 hrs are

Time in hrs	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load in MW	40	50	60	50	70	80	40

(i) Draw load curve & Find load factor

(ii) If load above 60 mW taken by stand by unit

(a)



Energy generated = Area under load curve

$= 40\times6 + 50\times2 + 60\times4 + 50\times2 + 70\times4 + 80\times4 + 40\times2$

$= 1360$ mWh

Avg load $= \frac{1360}{24} = 56.667$ mW

Load factor $= \frac{\text{Avg load}}{\text{Max. demand}} = \frac{56.667}{80} = 0.708$

If load above 60 mW supplied unit of 20mW

$= 10\times4 + 20\times4 = 120$ MW/hr

Time during stand by unit

$70-60 = 10$ mW, $80-60 = 20$ mW

$= 4+4 = 8$ hrs

Avg load $= \frac{120}{8} = 15$ mW

Load factor $= 15/20 = 0.75$

Use factor $= \frac{\text{Energy generated}}{\text{Plant capacity} \times \text{operating hrs}}$

$= \frac{120}{20\times8} = 0.75$

* The yearly duration curve of certain plant can be considered as straight line 400 MW to 100 MW Power supplied with one generating unit of 250 MW capacity & two units of 125 MW

Determine

(a) Installed capacity (b) Load Factor (c) capacity Factor

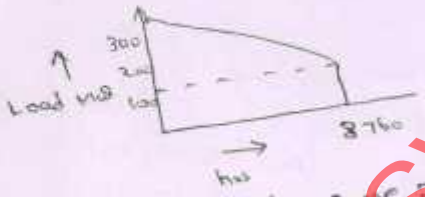
(d) Max. demand (e) utilizati°

Soln

(a) Installed capacity = $250 + 125 \times 2 = 500$ MW

(b) Load Factor = $\frac{\text{Avg load}}{\text{Max. demand}}$

Avg load = $\frac{\text{Area under load curve}}{\text{No of hours in Period}}$



Area under load curve = $100 \times 8760 + \frac{1}{2}(400-100) \times 8760$

= 2190000 MW/hr

Avg load = $\frac{2190000}{8760} = 250$ MW

Load Factor = $\frac{250}{400} = 0.625$

(c) capacity Factor = $\frac{\text{Avg load}}{\text{Plant capacity}} = \frac{250}{500} = 0.5$

Max. demand = 400 MW

Utilisation Factor = $\frac{\text{Max. demand}}{\text{Rated capacity}} = \frac{400}{500}$

= 0.8