TPS Planning Studies

Integrated resource planning and **least cost planning** are options that include evaluations of both supply-side and demand-side options.

Each system planning study is tailored for a specific system and may meet specific requirements of a regulating agency or financial lending institution.

However, several basic activities and tasks are common to most system planning studies such as:

1. **Load Forecasting**
2. **Demand-Side Management**
3. **Supply-Side Alternatives**
4. **Production Cost Analysis**
5. **Selection of a Least-Cost Plan**

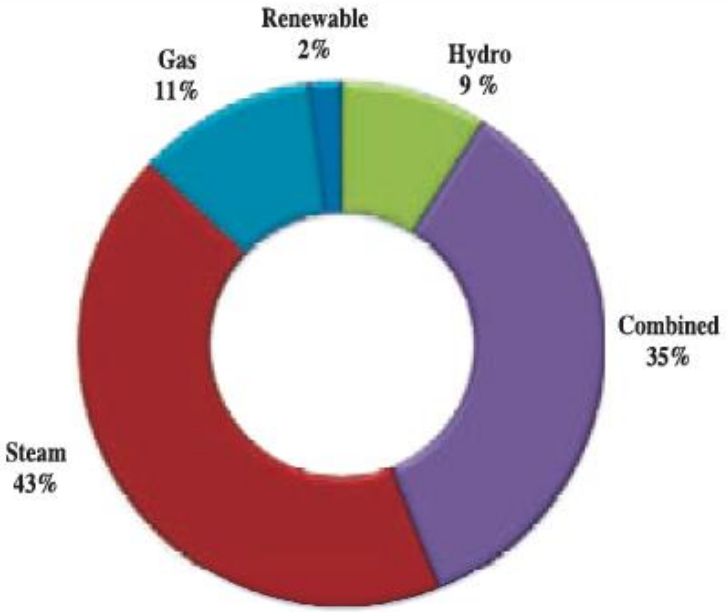
TPS Planning Studies (Load Forecasting)

Load forecasts can be made on an aggregate system basis for generation expansion planning or on a geographical basis for transmission planning. Several alternate methods are appropriate for forecasting electric loads. Forecasts for strategic planning require models with maximum explanatory power to produce moderate- to long-term projections of system energy (megawatt-hour, MWh) and peak demand (megawatts, MW). Strategic planning forecasts necessarily devote less attention to random short-term fluctuations to more correctly identify the major long-term relationships. For this reason, long-term relationships are likely to be less accurate in any 1 year than is a short-term forecast. However, year-to year fluctuations from the forecast should be distributed randomly and handled operationally rather than allowed to influence long-term facilities planning.

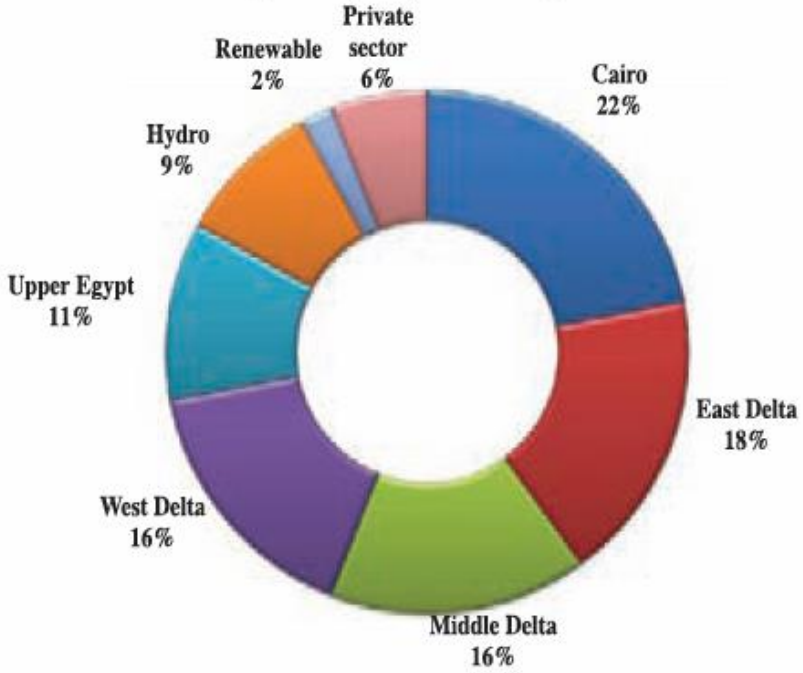
TPS Planning Studies (Load Forecasting)

According to Egyptian Electricity Holding Company (Annual Report 2013-2014)

Installed Capacity by Type %



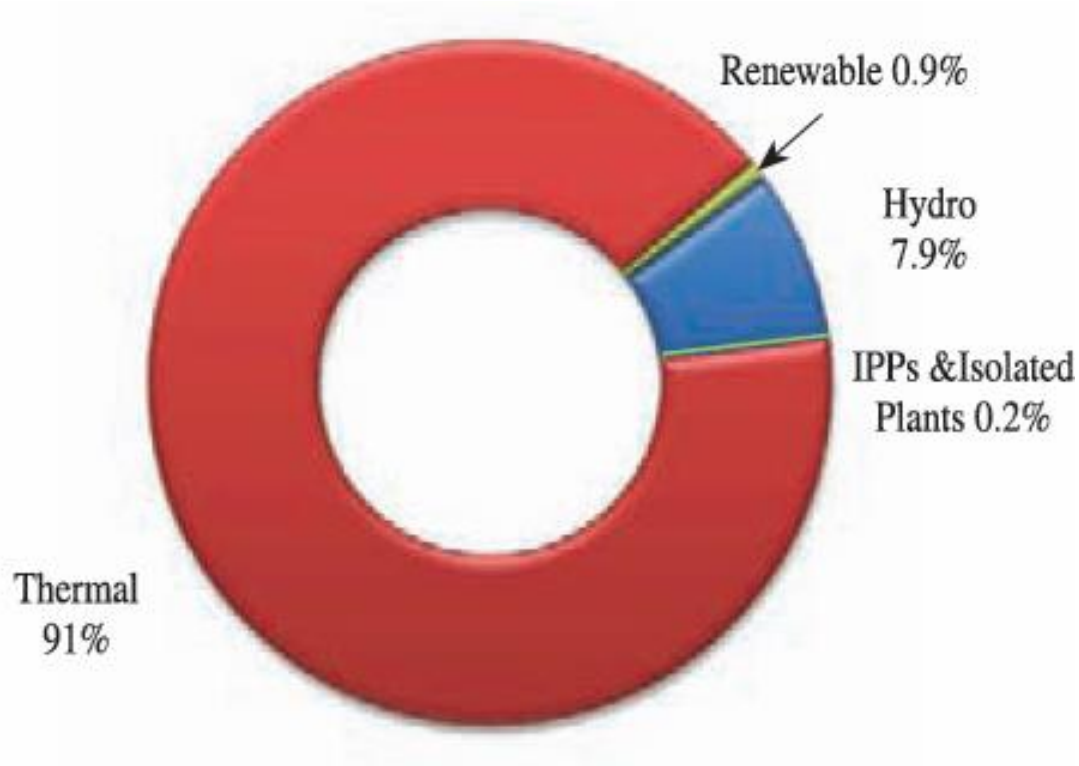
Installed Capacity by Companies %



Installed Capacity Development by type of Generation (MW)

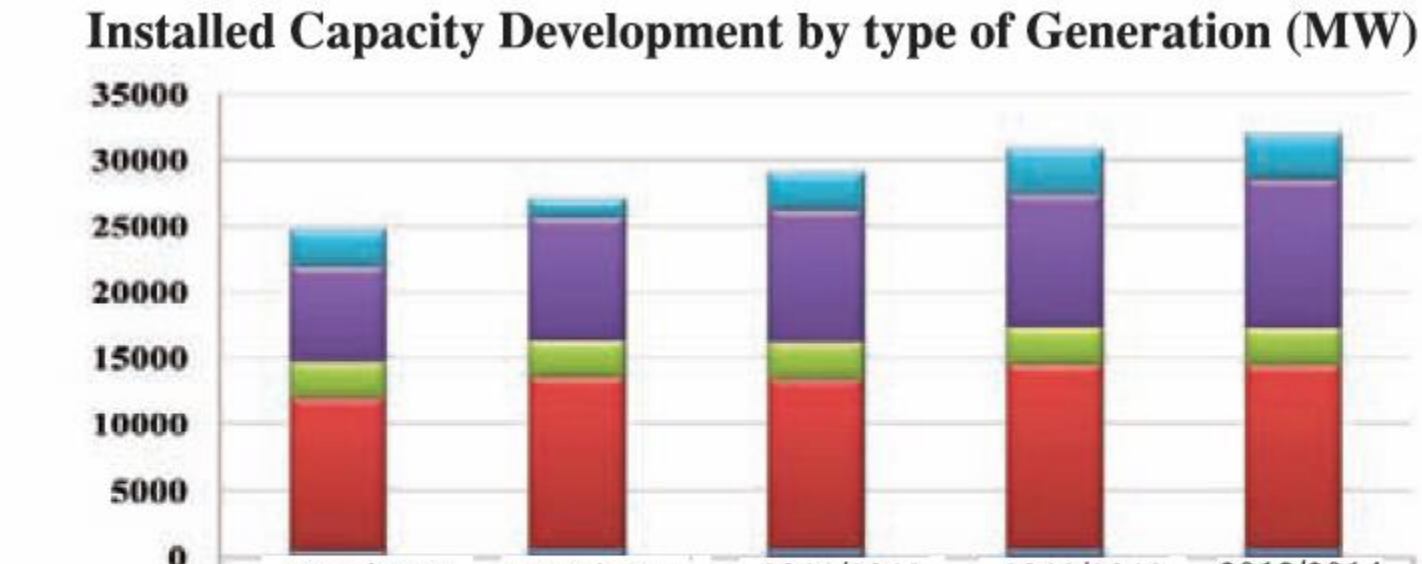
TPS Planning Studies (Load Forecasting)

According to Egyptian Electricity Holding Company (Annual Report 2013-2014)



TPS Planning Studies (Load Forecasting)

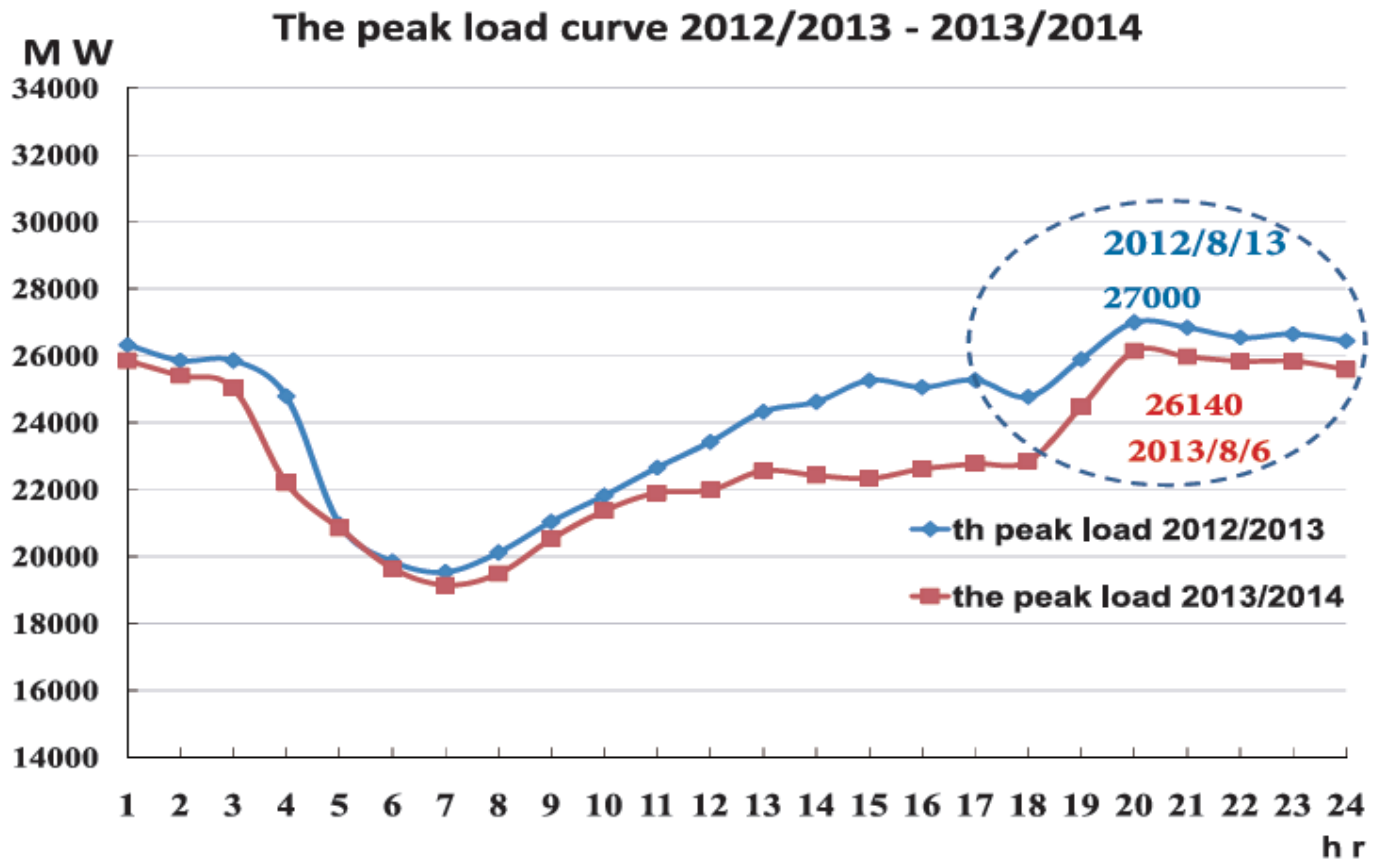
According to Egyptian Electricity Holding Company (Annual Report 2013-2014)



	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Gas	2841	1376	2826	3425	3415
C cycle	7136	9328	10078	10080	11330
Hydro	2800	2800	2800	2800	2800
Steam	11458	12859	12684	13808	13783
Renewable	490	687	687	687	687
Total	24725	27050	29075	30800	32015

TPS Planning Studies (Load Forecasting)

According to Egyptian Electricity Holding Company (Annual Report 2013-2014)



TPS Planning Studies (Load Forecasting)

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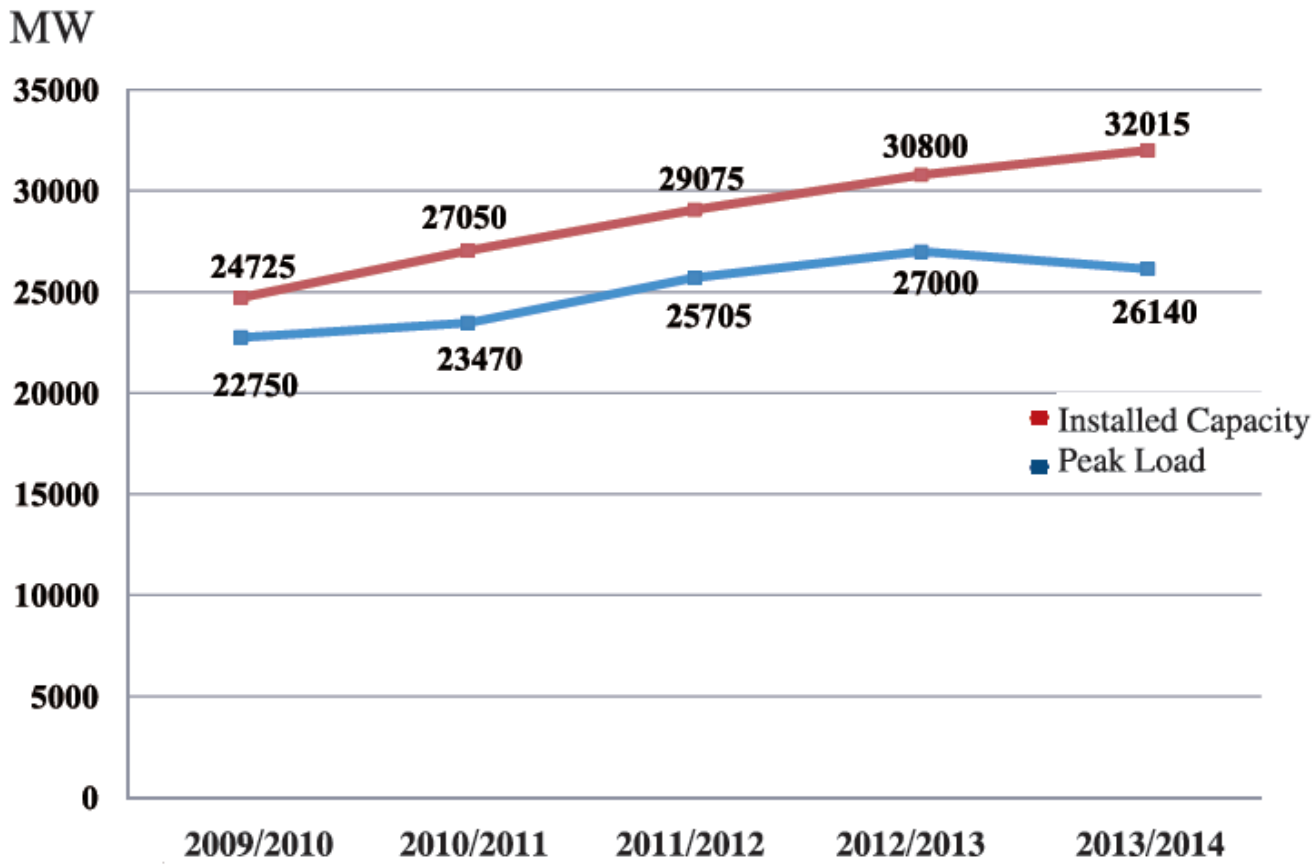
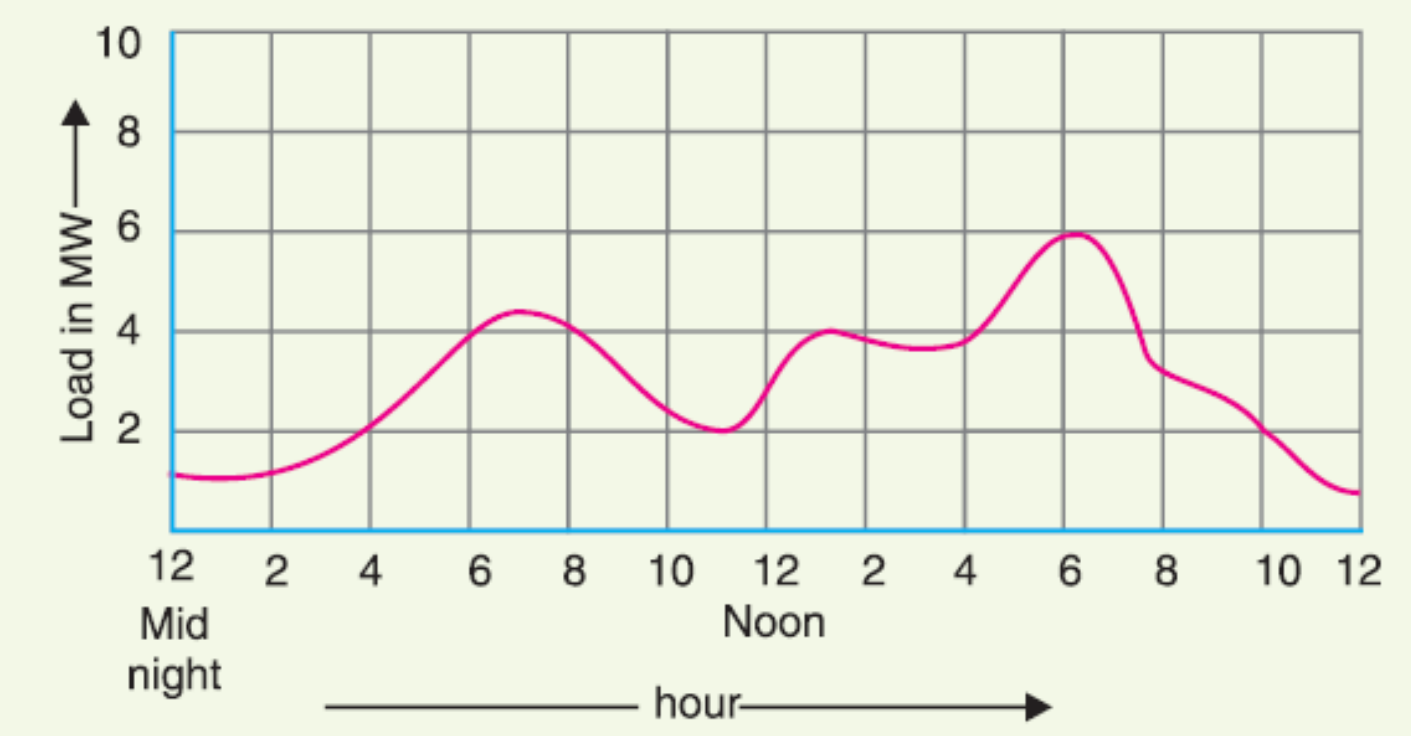


TPS Planning Studies (Load Forecasting)

Important Terms and Factors

Load Curve



A typical daily load curve of a power station

TPS Planning Studies (Load Forecasting)

Important Terms and Factors

Load Curve

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

The load on a power station is never constant; it varies from time to time. These load variations during the whole day (i.e., 24 hours) are recorded half-hourly or hourly and are plotted against time on the graph.

The curve thus obtained is known as **daily load curve** as it shows the variations of load w.r.t. time during the day.

The **monthly load curve** can be obtained from the daily load curves of that month. For this purpose, average values of power over a month at different times of the day are calculated and then plotted on the graph.

The monthly load curve is generally used to fix the rates of energy. The yearly load curve is obtained by considering the monthly load curves of that particular year. The yearly load curve is generally used to determine the annual load factor.

TPS Planning Studies (Load Forecasting)

Important Terms and Factors

Load Curve 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.

(*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.

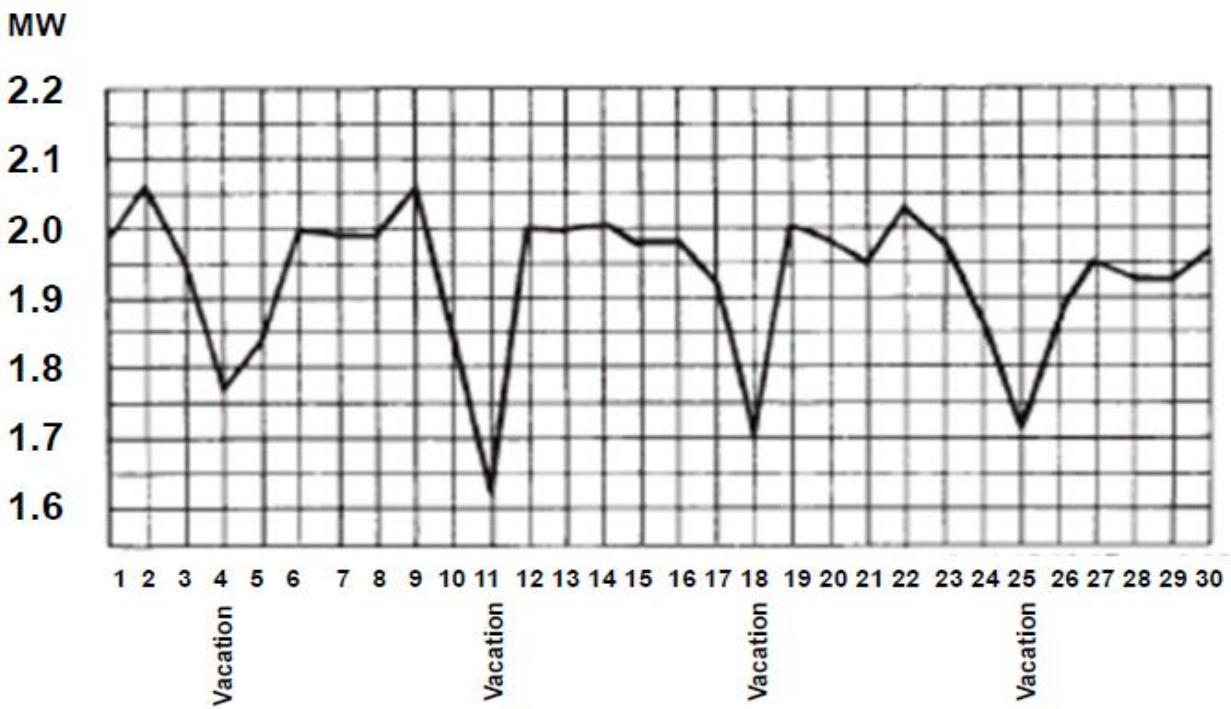
(*vi*) The load curve helps in selecting the size and number of generating units.

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

TPS Planning Studies (Load Forecasting)

Important Terms and Factors

Load Curve Importance



This is not a Monthly load curve; just a daily peak load for a month

TPS Planning Studies (Load Forecasting)

Important Terms and Factors

Connected load: It is the sum of continuous ratings of all the equipments connected to supply system.

Maximum demand: It is the greatest load demand on the power plant during a given period. (The station should be capable of meeting this maximum demand).

Demand factor: It is the ratio of maximum demand to the connected load.

$$Demand\ Factor = \frac{\text{Maximum demand}}{\text{Connected Load}} \quad (<1)$$

Average load or average demand: 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.

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

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

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

TPS Planning Studies (Load Forecasting)

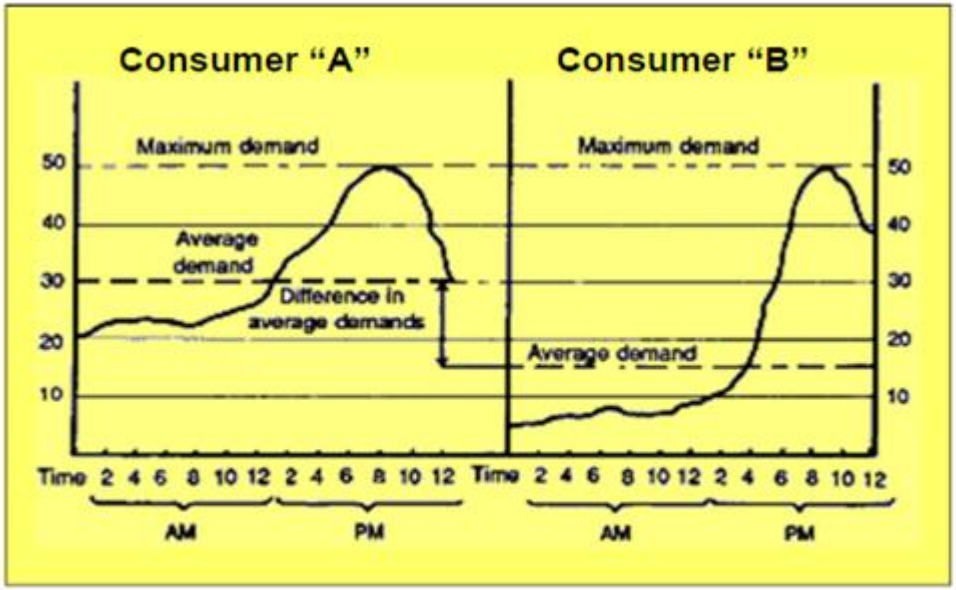
Important Terms and Factors

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,

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



$$L.F._A = \frac{30}{50} = 0.6 \qquad L.F._B = \frac{15}{50} = 0.3$$

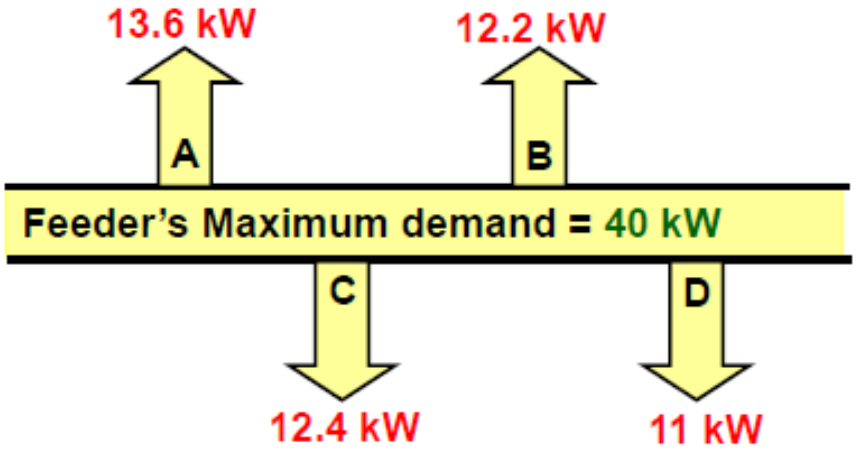
Both consumers use *same maximum demand* and accordingly require *same investment in capacity*, but each have *different manner* in using this capacity, indicated by their load factors.

TPS Planning Studies (Load Forecasting)

Important Terms and Factors

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.,

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



$$D.F. = \frac{49.2\ kW}{40\ kW} = 1.23$$

As consumers' maximum demands are not simultaneous; The power station's maximum demand is less than the sum of individual consumers' maximum demands.


Thank You