

Internal Assessment Test - I

Sub:	POWER SYSTEM PLANNING						Code:	18EE824		
Date:	11/03/2023	Duration:	90 mins	Max Marks:	50	Sem:	8th A & B	Branch:	EEE	
Answer Any FIVE FULL Questions										
								Marks	OBE	
									CO	RBT
1	Explain the need and importance of load forecasting in power system? Mention different techniques of load forecasting.						10	CO1	L2	
2	Explain in detail the planning process? Also enumerate the components of Planning.						10	CO1	L2	
3	With a block diagram explain the least cost utility planning.						10	CO2	L2	
4	Write a short note on i) Rural Electrification Investment ii) Credit - Risk Assessment						10	CO1	L1	
5	Explain integrated power generation planning.						10	CO1	L2	
6	Explain unloading a system.						10	CO1	L2	

CCI

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PSP IAT I QP & Solution

1. Explain the need and importance of load forecasting in power system? Mention different techniques of load forecasting.

Need and Importance:

- **Forecasting: systematic procedure for quantitatively defining future loads.**
- **Demand forecast**
 - To determine capacity of generation, transmission and distribution required
- **Energy forecast**
 - To determine the type of generation facilities required.
- **Classification depending on the time period:**
 - **Short term** (daily, hourly)
 - **Intermediate** (seasonal, yearly)
 - **Long term** (supply side/demand side resource management)

Techniques:

- **Moving average :**
 - **arithmetic or weighted average** of a no. of points of the series
 - A minimum of **two years** of past energy consumption is desirable, if seasonal effects are present.
 - more the **history**, the better
- **Trend projections :**
 - A **trend line is fitted** into the **mathematical equation**
 - it is projected into the future **using the equation**
 - **study of the past** behavior and **mathematical modeling** & **extrapolation of the future behavior**
- **Trend projections : Two general approaches :**

1. Regression analysis :

- **Fitting of continuous math functions** through actual data to achieve least overall error

2. Fitting of a sequence on discontinuous lines / curves

- Prevalent in **short term forecasting**

2. Explain in detail the planning process? Also enumerate the components of Planning.

- Process of taking **careful decision**.
- Process of **selecting vision**, values, **mission** and objectives, decide plan to achieve them.
- Input for planning is **quality** of systematic **thought** that goes into **decision**.
- Process of establishing power industry is **time** consuming and **capital** intensive.
- Planning saves **project time** and utilizes **resource economically**
- Planning should consider

- I. 1.uncertainty about future
- II. alternative action choices
- III. goals and constraints

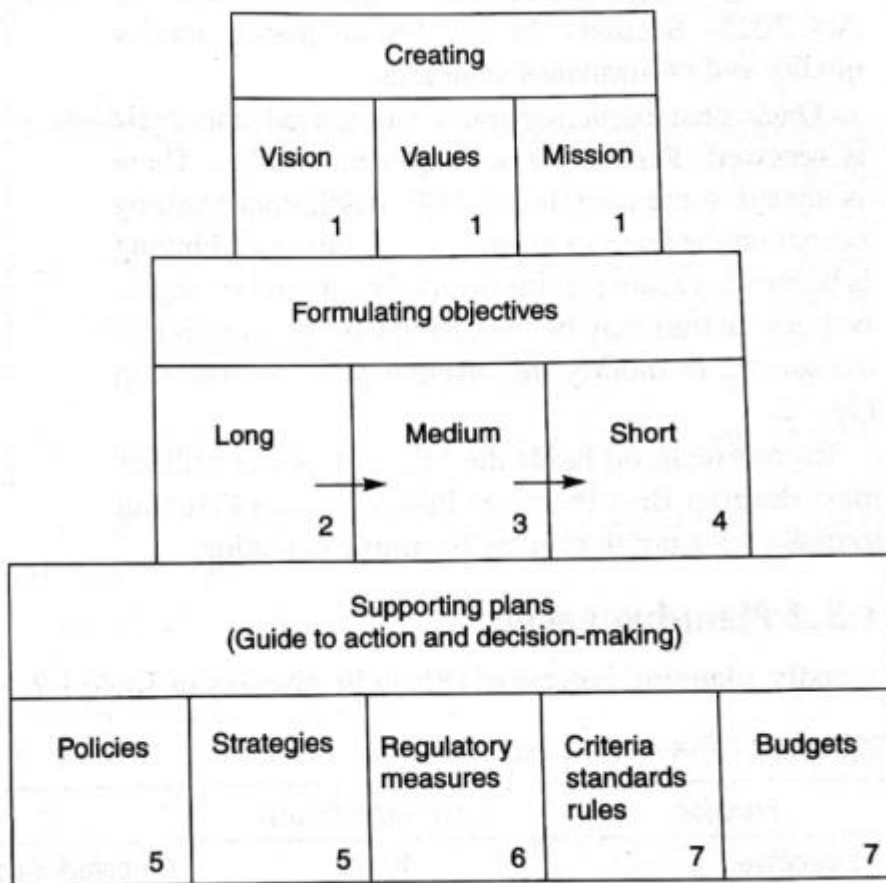


Fig. 1.1 Components of the planning process

It consists of **three** cyclical components

Learning about the environment related issues and possible future scenarios to identify :

- a. Strategically goals
- b. Decision criteria and constraints

c. Technological needs and opportunities.

Thinking about existing plans, associated costs and risks.

This involves

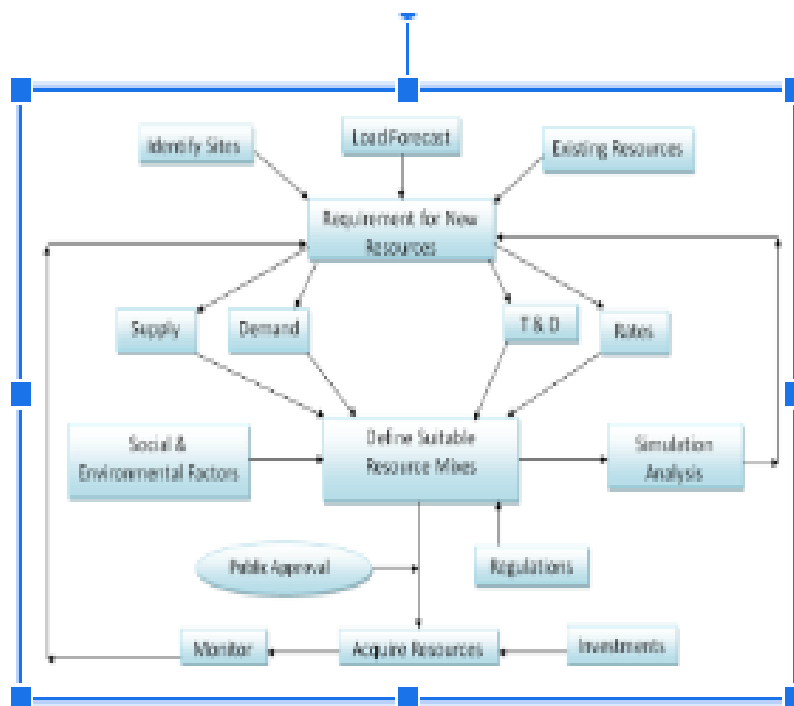
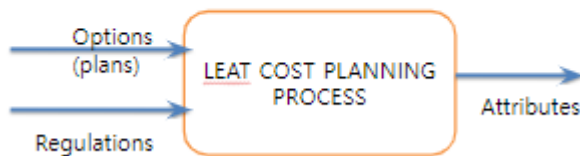
- a. Investment of resources
- b. Unforeseen factors
- c. Reliability of outcome

Preferred plans based on support analysis

3. With a block diagram explain the least cost utility planning.

LEAST COST UTILITY PLANNING

The logic for least-cost planning



Process of least cost planning

Evaluation :

- **All options** should be **assessed in a consistent manner** for a full cycle
- Once initial **evaluation is complete**, **environmental , economic factors** should be studied – avoids losing out on options with high impact

- Non cost factors should be evaluated – variability of factors, alternative solutions based on factor variation

Investments on power systems :

- **Capital cost**
- **Interest on capital**
- **Fuel cost**

Operational and maintenance cost – loss dependent

4. Write a short note on i) Rural Electrification Investment ii) Credit - Risk Assessment
i) Rural Electrification Investment

- Indirect socio –economic advantages
- **NCAER** analysis says Benefit cost ratio is > 1
- Power economy committee of CEA accepted benefit-cost analysis , and taken that into consideration during **sanctions and execution** of schemes

- ii) Credit - Risk Assessment

- Someone has to be **responsible to pay the debt**
- 1. Construction stage :** completion risk \downarrow \rightarrow positive cash flow
 - 2. Operational stage:**
 - a. Fuel
 - b. Revenue Return

5. Explain integrated power generation planning.

INTEGRATED RESOURCE PLANNING

- Utilities have to evaluate all **supply side & demand side** options.

1. Supply side options :

- a. Better **technology**
 - **conventional plants** combustion turbines ,low emission
 - **clean coal , Flue gas desulphurization etc.**
- b. Increasing **role of renewables**
 - broaden the scope of non-conventional sources
- c. **Increasing** availability of **generating stations**
- d. Efficient operation **of regional and national grid**

e. **Strengthening** of existing **T & D** systems (by adding new links & capacitor banks) to **reduce loss** and **improve voltage profiles**

INTEGRATED RESOURCE PLANNING

2. Demand side options :

- a. Taking **energy conservation methods**
- b. Maintaining **consumer PF** should be made mandatory (not less than **0.95 lagging**)
- c. **Load management /staggering**
 - improving generating stations load factor

d. Time of day tariff – peak / night / other time

e. **Captive power** generation

f. **Checking pilferage**

6. Explain unloading a system.

Unloading of system

Energy saving through resource planning :

1. Evaluate demand and supply side options and **rank** according to cost effectiveness

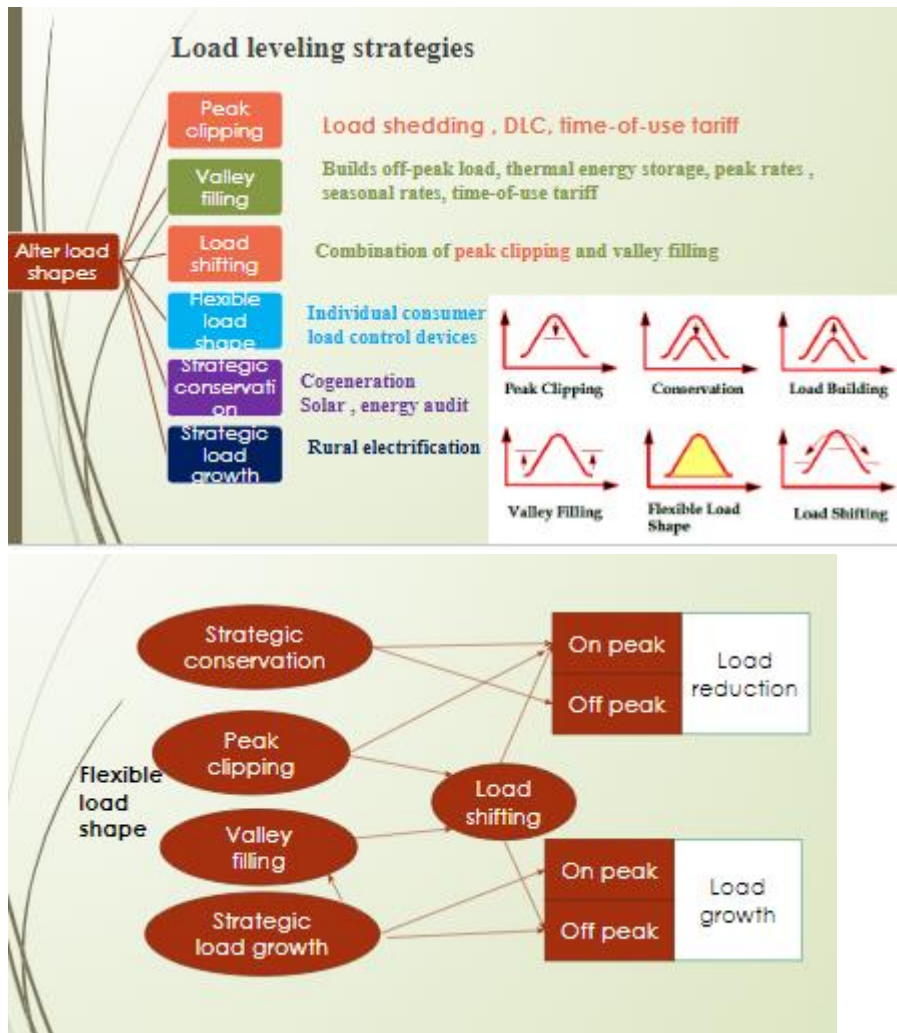
a. long-term plan : vision , utility's expectation in terms of capacity from sources, new construction ,purchases and DSM

b. Short term(5 yrs) : Very specific programs (installation of capacitors, routing new circuits for future use)

2. Demand side management

3. Private participation





Supply side options:

- I. Pricing options: interruptible tariffs, load limiter tariffs,
- II. time differentiated tariffs etc

- III. Metering and communication facilities

Pricing mechanism is better option concerned to both consumer and power boards

Better option compared to **power cuts and peak period**

In South Korea 3 time differentiated tariffs are present

- 1. peak rate
- 2. Partial peak rate
- 3. Off peak rate

Initially 5:2:1 followed by 7:2.5:1 and 2.33:1.55:1

KEPCO took 18 months preparatory period to explain new tariff to consumers