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Internal Assessment Test - I

Sub:	POWER SYSTEM PLANNING							Code:	18EE824
Date:	16/03/2024	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 **CI** **HOD**

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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.uncertinity about future

II. alternative action choices

III. goals and constraints

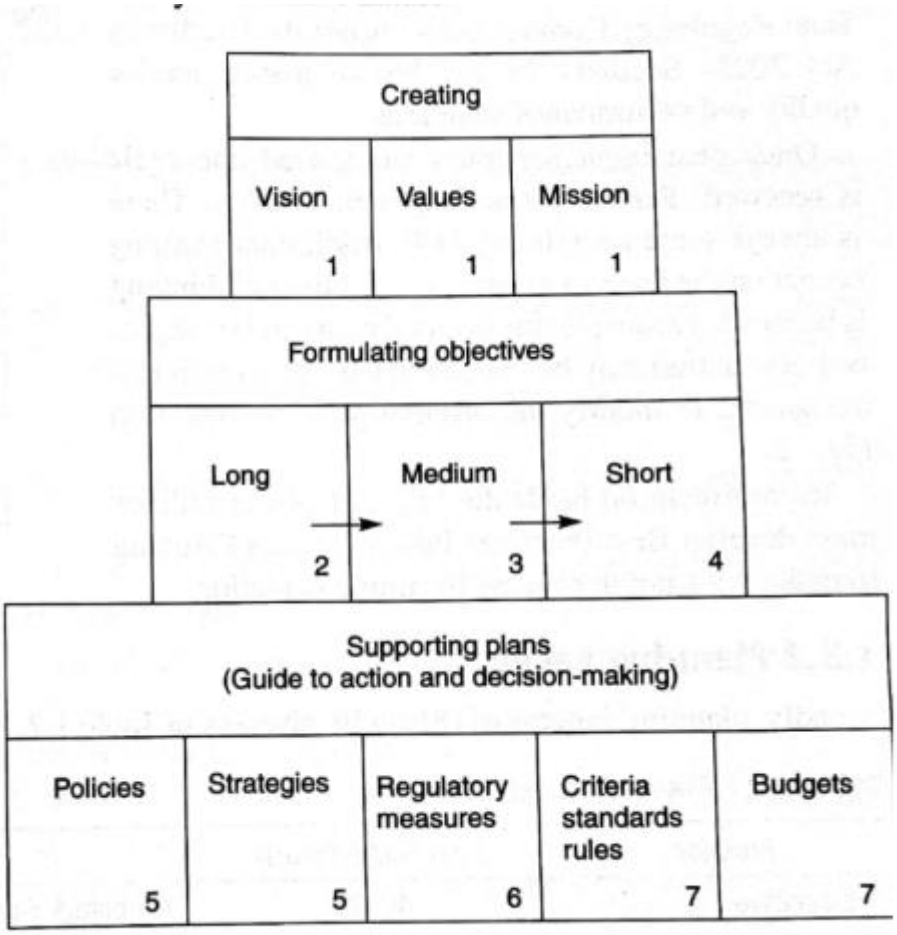


Fig. 1.1 *Components of the planning process*

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

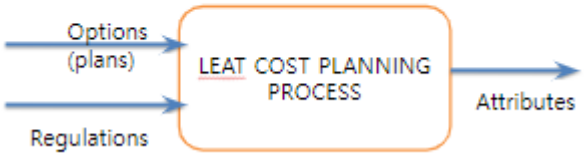
c. Reliability of outcome

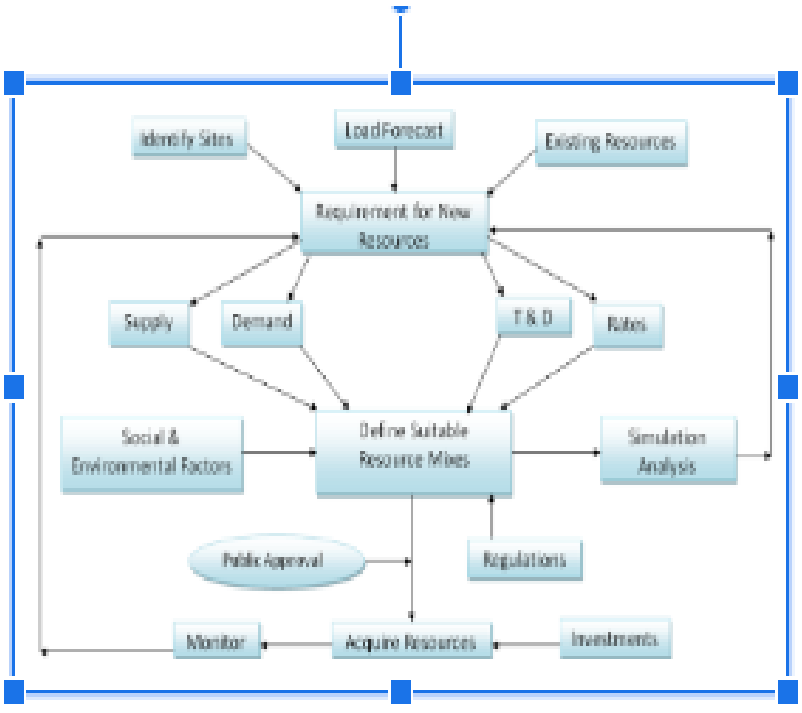
Preferred plans based on support analysis

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 loosing out on options with high impact

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

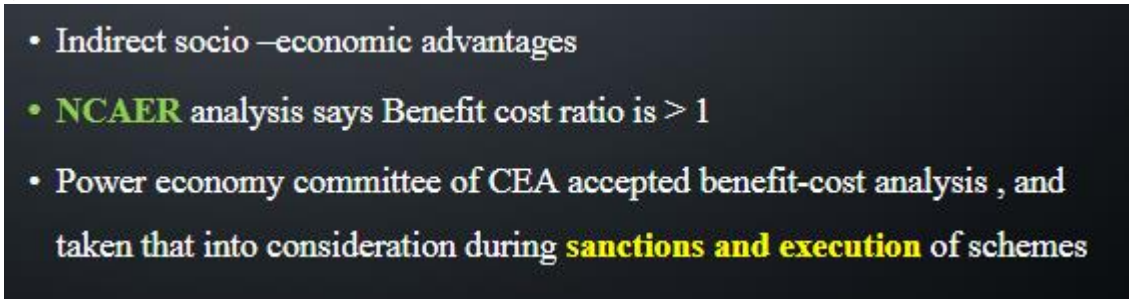
Investments on power systems :

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

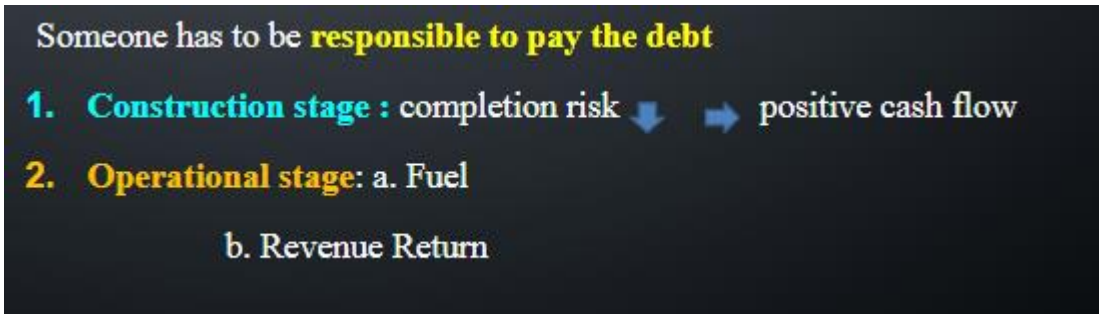
Operational and maintenance cost – loss dependent

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

i) Rural Electrification Investment



ii) Credit - Risk Assessment



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**

NTEGRATED 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 :

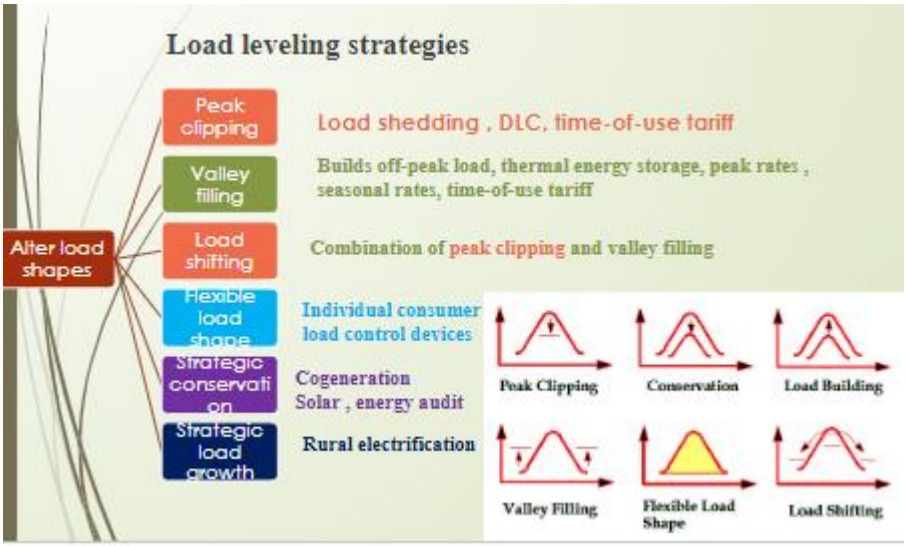
1. **Evaluate** demand and supply side options and **rank** according to cost effectiveness

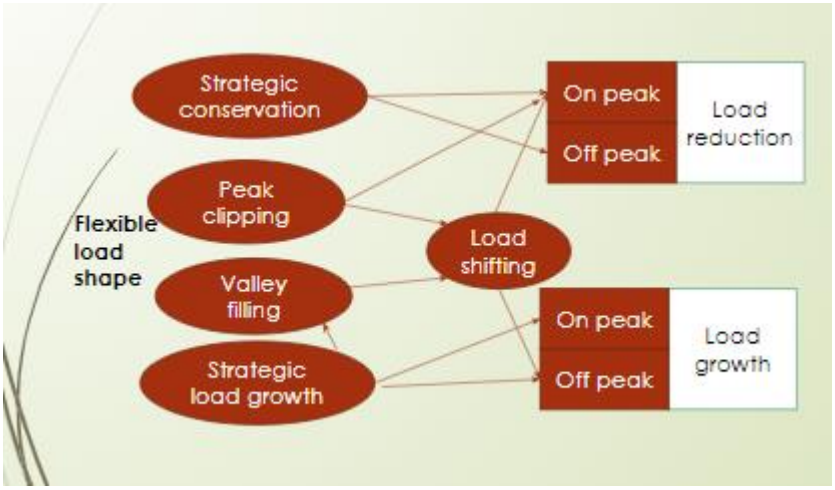
a. long-term plan : vision , utility's expectation in terms of capacity from sources, new construction ,purchases and DSM

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