Introduction Of Power Plant Engineering

Syllabus of PPE

UNIT:I

- **Introduction**: Power and energy, classification of sources of energy, review of thermodynamic cycles related to power plants, General layout of modern thermal power plant, Site selection, and Present status of power generation in India.
- **High Pressure Boilers & Accessories**:Unique features and advantages of high pressure boilers, LaMont, Benson, Loeffler, Schmidt– Hartmann, Velox, supercritical, Supercharged and fluidized bed combustion boiler. Different types of super–heaters, Re–heaters, economizers, Air pre–heaters, Methods of superheat control, Corrosion in boilers and its prevention.

UNIT-II

- **Coal & Ash Handling Systems:** Coal handling storage of coal, Burning systems, Types of stokers their working, Pulverized fuel handling systems, Unit and central systems, Pulverized mills- ball mill, Bowl mill, Ball &race mill, Impact or hammer mill, Pulverized coal burners, Oil burners. Necessity of ash disposal, Mechanical, Hydraulic, pneumatic and steam jet ash handling system, Dust collection and its disposal, Mechanical dust collector, Electrostatic precipitator.
- **Draught System:** Natural draught- estimation of height of chimney, Maximum discharge, Condition, Forced, Induced and balanced draught, Power requirement by fans.
- **Condensers and Cooling Towers:** Types of condensers, sources of air in condenser, Effects of air leakage, Methods of obtaining maximum vacuum in condenser, Dalton’s law of partial pressure, vacuum & condenser efficiency, Mass of cooling water required, Air pump-Edward air pump. Necessity of cooling ponds and cooling towers, Condenser water cooling systems, Types of cooling towers, cooling ponds.

UNIT-lll

Diesel Power Plant: Essential components of diesel power plant, Different systems like fuel supply system, Engine cooling system, Engine lubrication system, Exhaust system, Engine starting and stopping system.

Nuclear Power Plant: Nuclear fusion and fission, Chain reaction, Nuclear fuels, Components of nuclear reactor, Classification of reactors, Pressurized water reactor, Boiling water reactor, Gas cooled reactor, CANDU reactor, Fast breeder reactor, Nuclear waste and its disposal, Nuclear power plants in India.

UNIT-IV

Combined Cycle Power Plants: Arrangement of combined cycle, Repowering system, combined cycle with gas production from coal, Combined cycle with PFBC system, Analysis of combined cycle plant, Performance of combined cycle, Advantages of combined cycle.

Economics of Power Generation: Load curves, Load duration curves, Connected load, Maximum load, Peak load, base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, Cost of power plant, Performance and operating characteristics of power plant, Tariff for electric energy.

Overview of POWERPLANT IN INDIA

- More than 59% of India's electricity generation capacity comes from thermal power plants,
- And about 85% of the country's thermal power generation being coal-based.

- **Sources of energy:**

Primary energy sources		Secondary energy sources
Coal, Oil, Nuclear fuels, Water	→	Electricity
Wood	→	Heat
Candles, Oil lamps	→	Light

- Conventional sources of energy → Non-renewable sources of energy

Non-conventional sources of energy → Renewable sources of energy

- Fossil fuels → Coal, Oil, Natural gas

Power Plant: Power plant is an assembly of equipments that produces and delivers mechanical and electrical energy.

Types of power plant

1. Non-conventional Energy Source

a. Solar energy

b. Wind energy

c. Geothermal energy

d. Tidal energy

e. Biomass energy

2.Conventional Energy Sources

a. Solid, Liquid and gaseous fuels

b. Hydraulic energy

Classification of Power plants

- Power plants using conventional (non-renewable) sources of energy

  - **Steam power plant**
  - **Nuclear(Atomic) power plant**
  - **Diesel power plant**
  - **Gas power plant**
  - **Hydro electric(Hydel) power plant**

- Power plants using Non-conventional(renewable) sources of energy

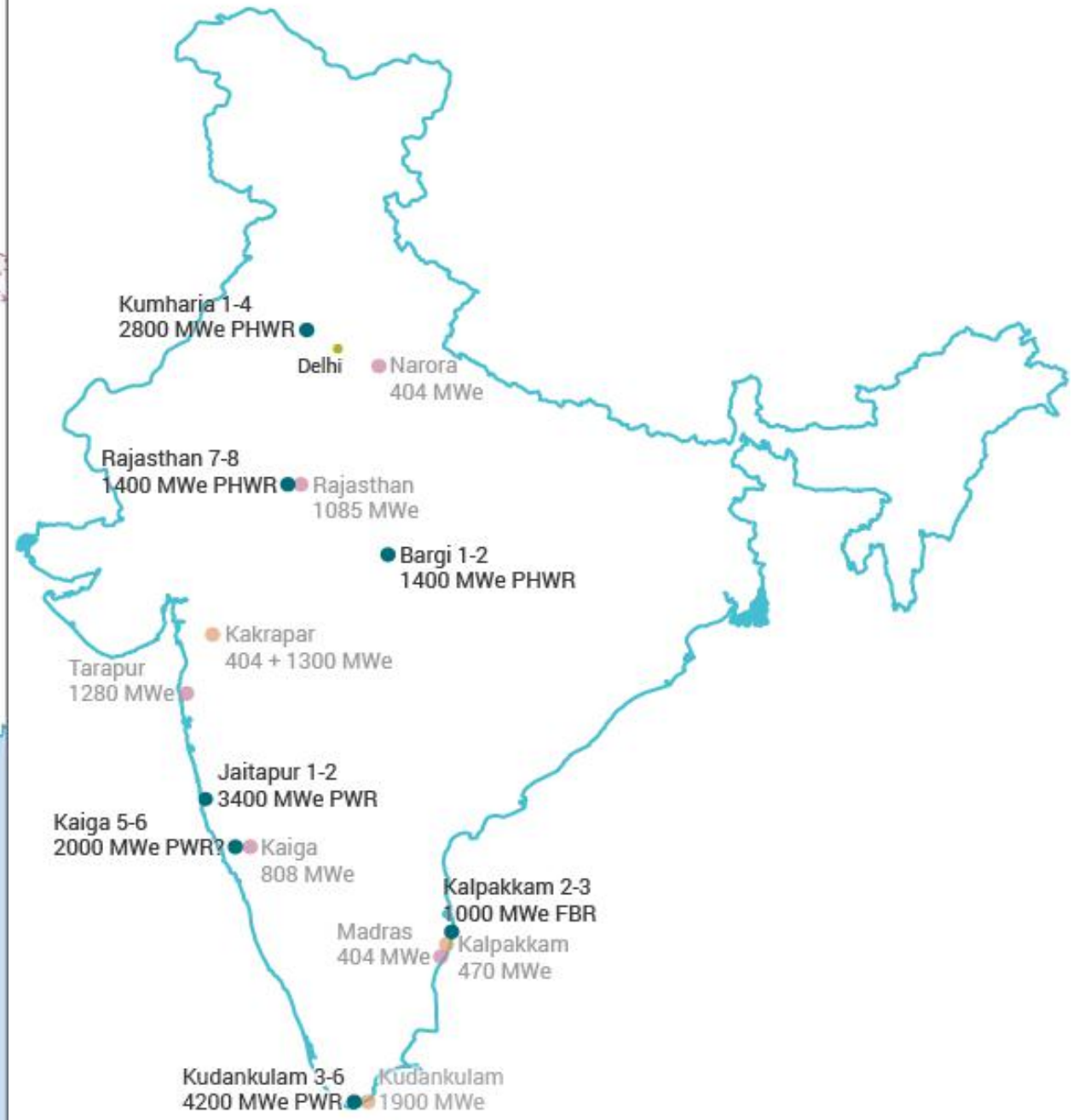
  - Solar thermal power plant
  - Wind powered generation(aerogeneration)
  - Wave power plant
  - Tidal power plant
  - Geothermal power plant
  - Bio-mass power plant
  - Oceanthermal power plant

INDIAN POWER SCENARIO GENERATION BY)

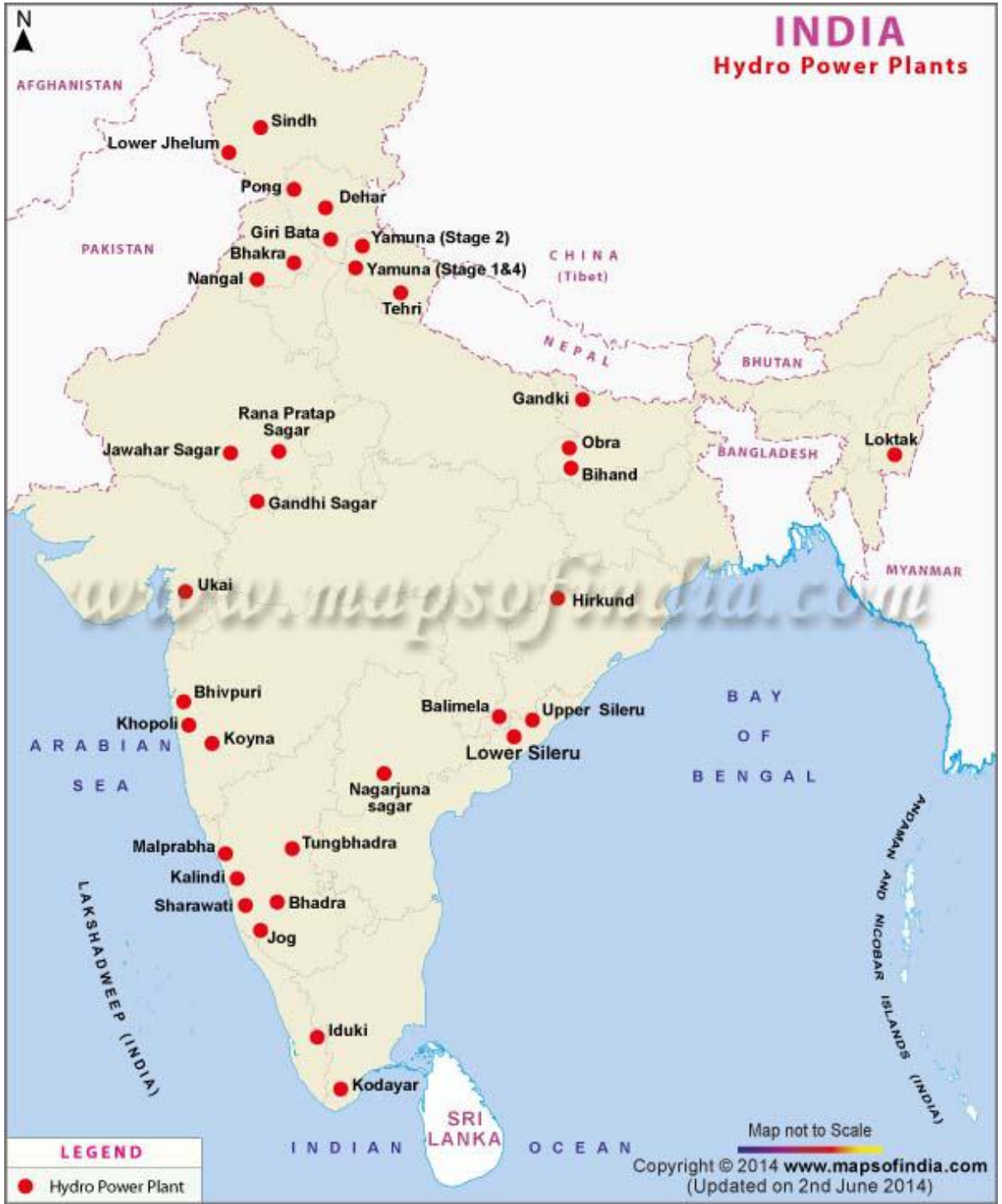
- 58.7 % - Coal
- 25.4 % - Hydro
- 10.7 % - Gas based
- 02.5 % - Nuclear
- 2.7 % - Non- Conventional & Diesel

POWERPLANT NAME	PLANT CAPACITY	FUEL	STATE
Vindhyachal Thermal Power Station	4,760MW	Coal	Madhya Pradesh
Mundra Thermal Power Station	4,620MW	Coal	Gujarat
Mundra Ultra Mega Power Plant Coastal Gujarat Power Limited	4,000MW	Coal	Gujarat
Talcher Super Thermal Power Station	3,000MW	Coal	Odisha
Sipat Thermal Power Plant	2980MW	Coal	Chhattisgarh
NTPC Dadri	2637MW	Coal & Gas Fire	Uttar Pradesh
NTPC Ramagundam	2600MW	Coal	Andhra Pradesh
Korba Super Thermal Power Plan	2600MW	Coal	Chhattisgarh
Rihand Thermal Power Station	2,500MW	Coal	Uttar Pradesh
Jharsuguda Thermal Power Plant	2400MW	Coal	Odisha

Planned Nuclear Power Plants in India



Source: World Nuclear Association


INDIA
Hydro Power Plants
N
AFGHANISTAN
PAKISTAN
CHINA
(Tibet)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
Sindh
Lower Jhelum
Pong
Dehar
Giri Bata
Yamuna (Stage 2)
Bhakra
Yamuna (Stage 1&4)
Nangal
Tehri
Gandki
Rana Pratap Sagar
Jawahar Sagar
Obra
Bihand
Loktak
Gandhi Sagar
Ukai
Hirkund
Bhivpuri
Khopoli
Koyna
Balimela
Upper Sileru
Lower Sileru
Nagarjuna sagar
Malprabha
Tungbhadra
Kalindi
Sharawati
Bhadra
Jog
Iduki
Kodayar
ARABIAN SEA
BAY OF BENGAL
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)
SRI LANKA
INDIAN OCEAN
Map not to Scale
LEGEND
Hydro Power Plant
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(Updated on 2nd June 2014)

SITE SELECTION FOR POWER PLANT

A few important factors to be considered for the selection of site for thermal plants are listed below:

- Availability of Fuel
- Ash Disposal Facility
- Space Requirements
- Nature of Land
- Availability of Water
- Transport Facilities
- Availability of a Labour
- Public Problems
- Size of the Plant