

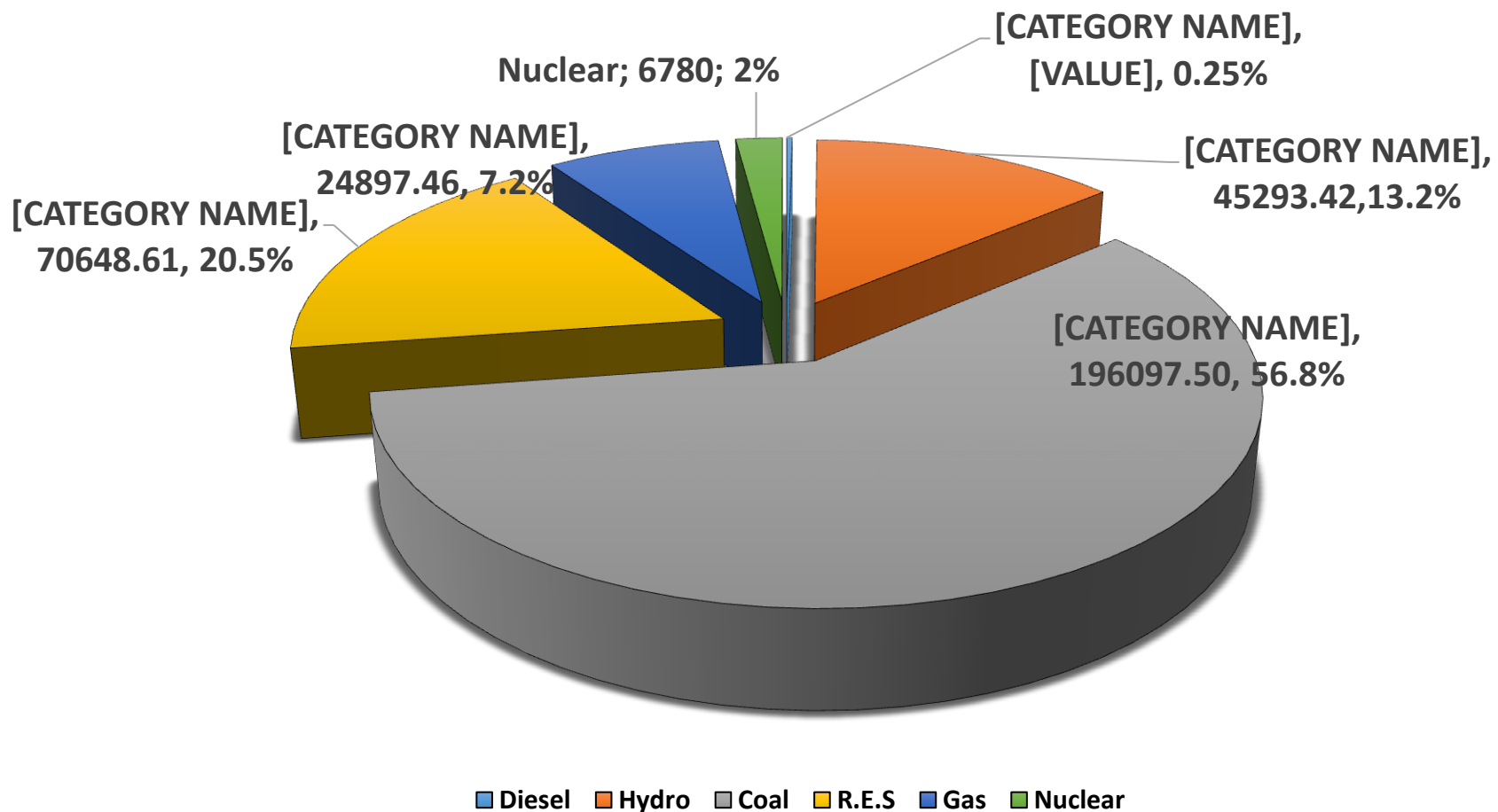


Power Sector Scenario and Flexibility requirements

30-11-2018

INSTALLED CAPACITY

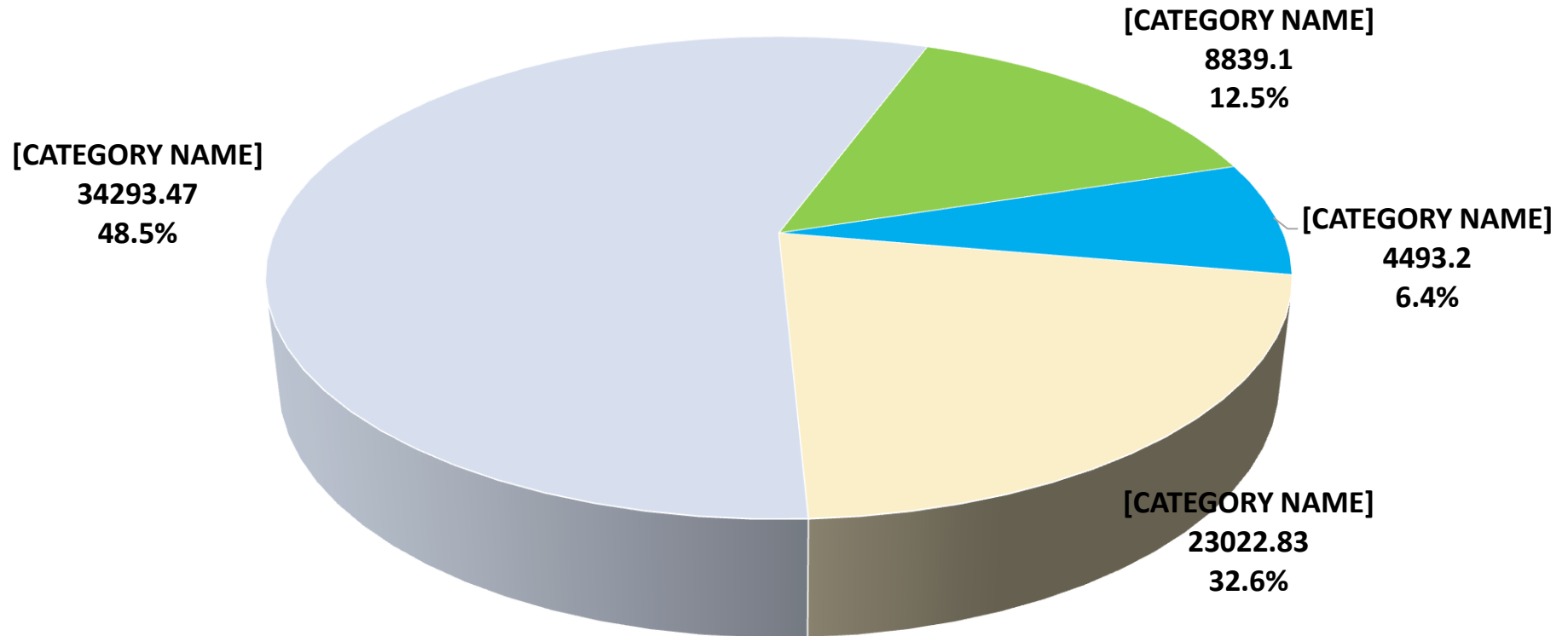
Fuel-wise Total All India Installed Capacity (MW) As on 30.09.2018



TOTAL: 344718.61 MW

INSTALLED CAPACITY- RES

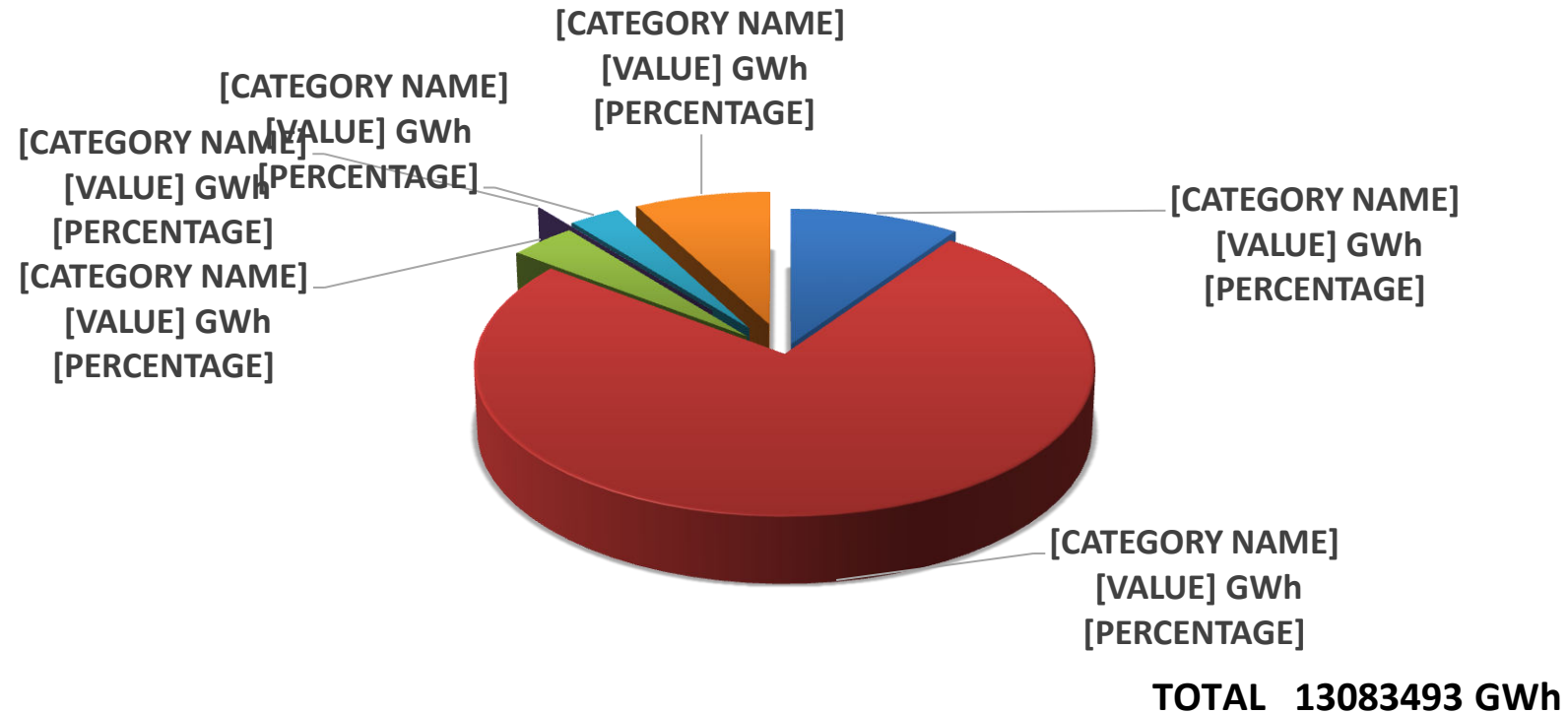
**RES Installed capacity in MW
as on 30.06.2018**



Total : 70648.6 MW

GENERATION(2017-18)

Gross Electricity Generation in India Modewise -
(Utilities)
(31.03.2018)*

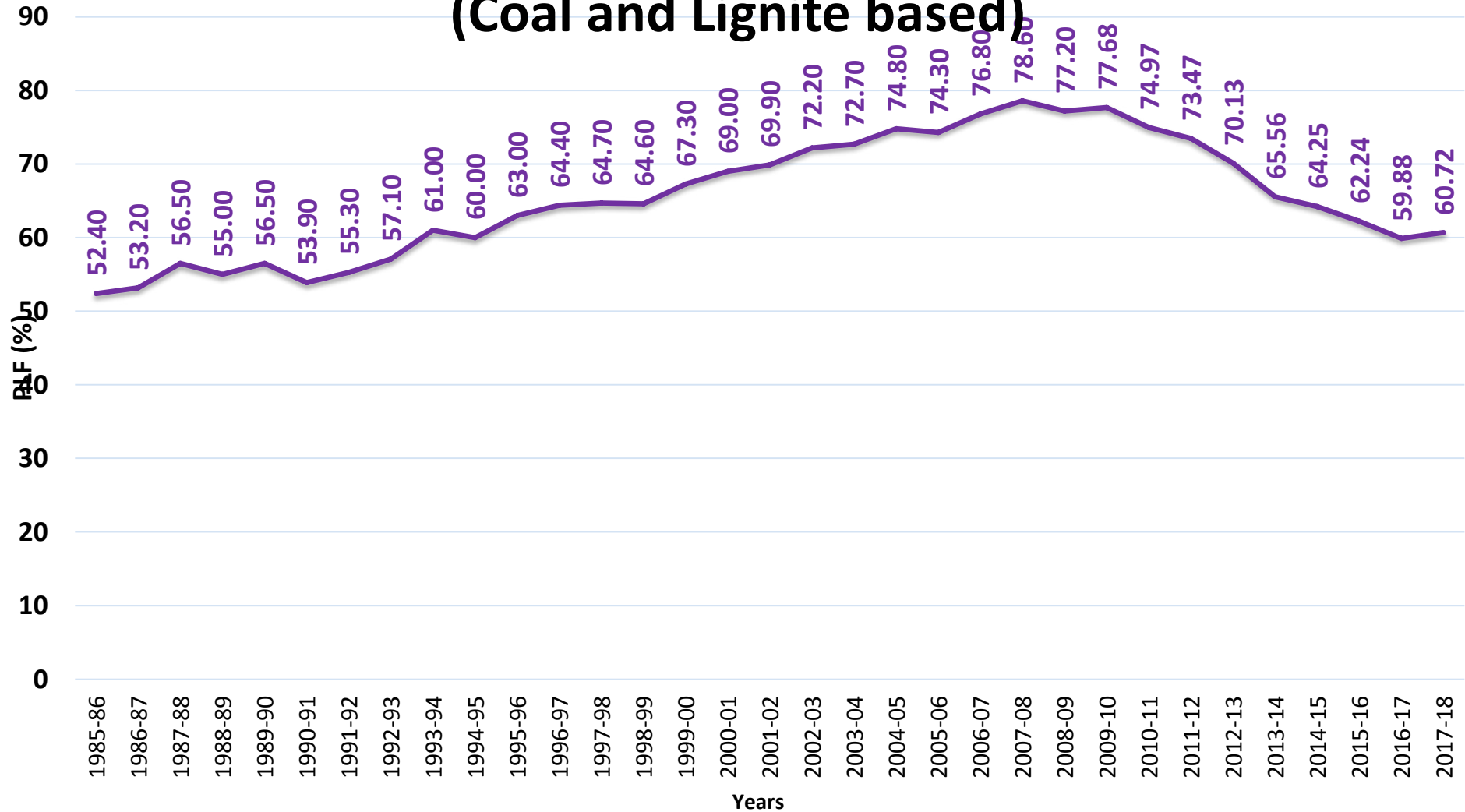


* Provisional

■ Hydro ■ Coal ■ Gas ■ Diesel ■ Nuclear ■ R.E.S.

ALL FIGURES IN GWh

All India PLF (%) of Thermal Power Stations (Coal and Lignite based)



NATIONAL ELECTRICITY PLAN

National Electricity Plan (NEP) includes

- **Review of the current Plan (12th Plan : 2012-17)**
- **Demand Projections for the years 2021-22 and 2026-27**
- **Capacity addition requirement from conventional sources**
- **Integration of Renewables**

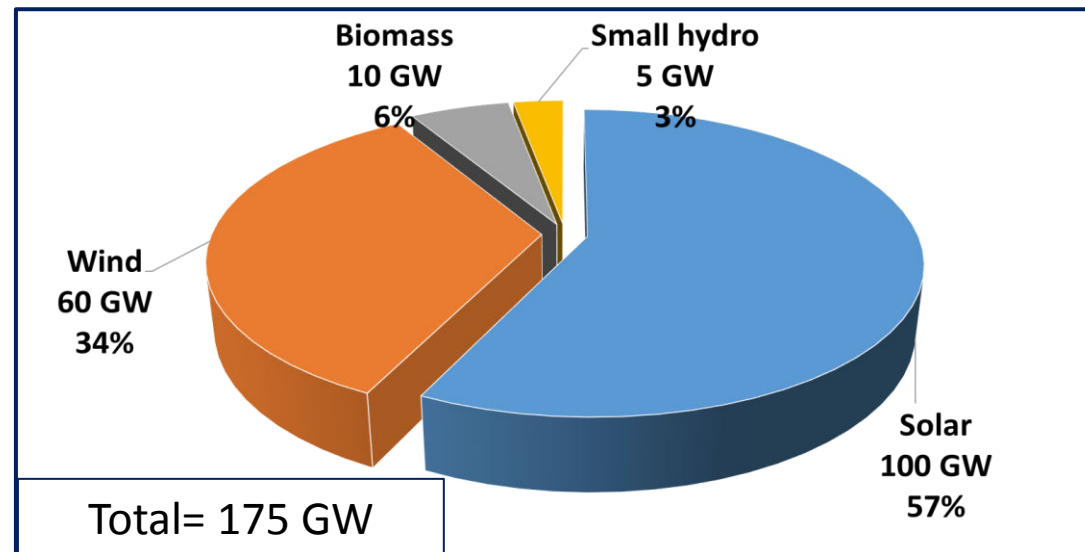
DEMAND

Year	Peak Demand (GW)	Energy Requirement (BU)
2021-22	225.7	1,566
2026-27	298.8	2,047

DEMAND REDUCTION DUE TO DSM

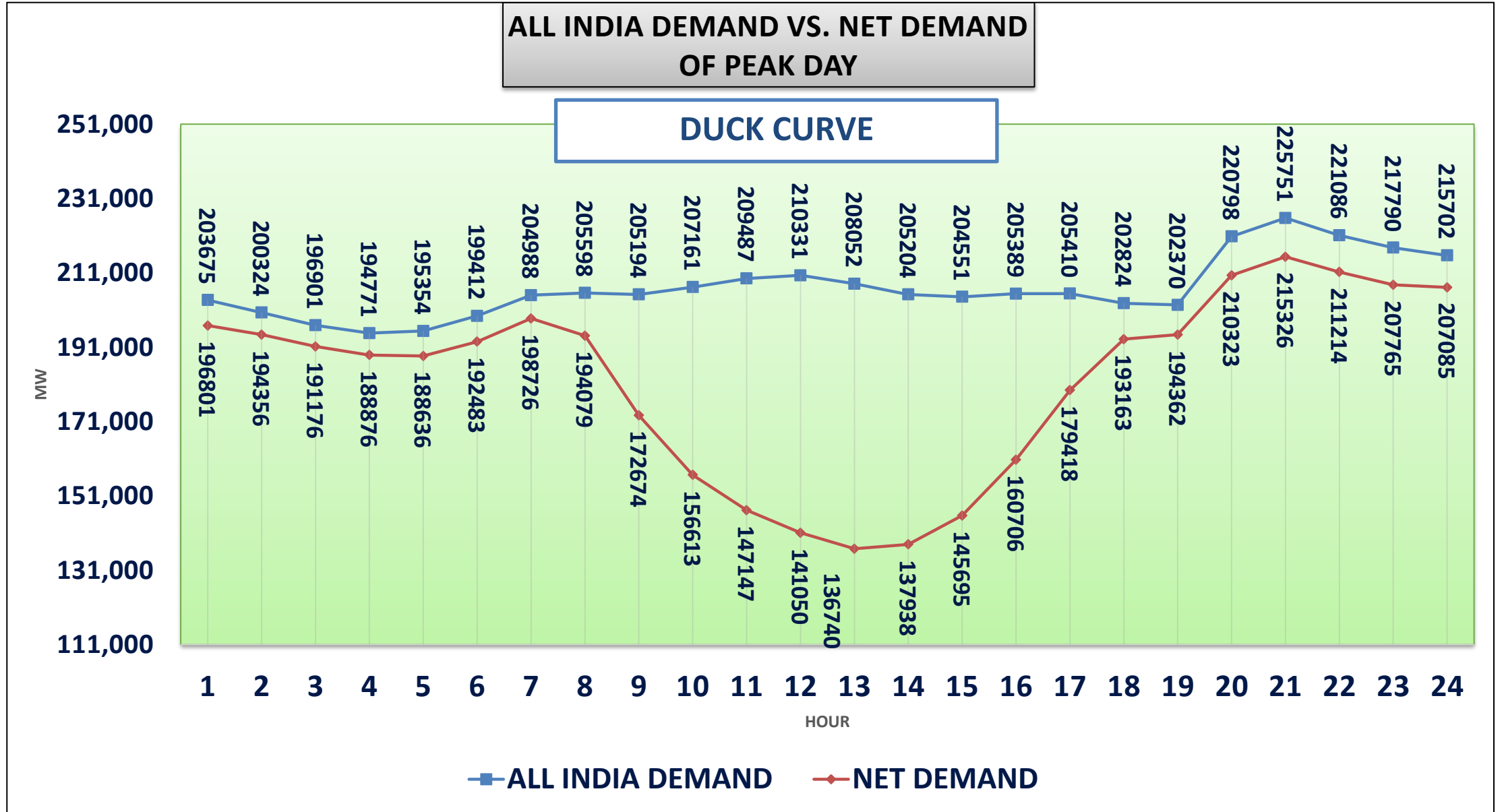
Year	Energy Requirement (BU)	Peak Requirement (GW)
2021-22	206	9
2026-27	273	12

RES INSTALLED CAPACITY BY MARCH,22

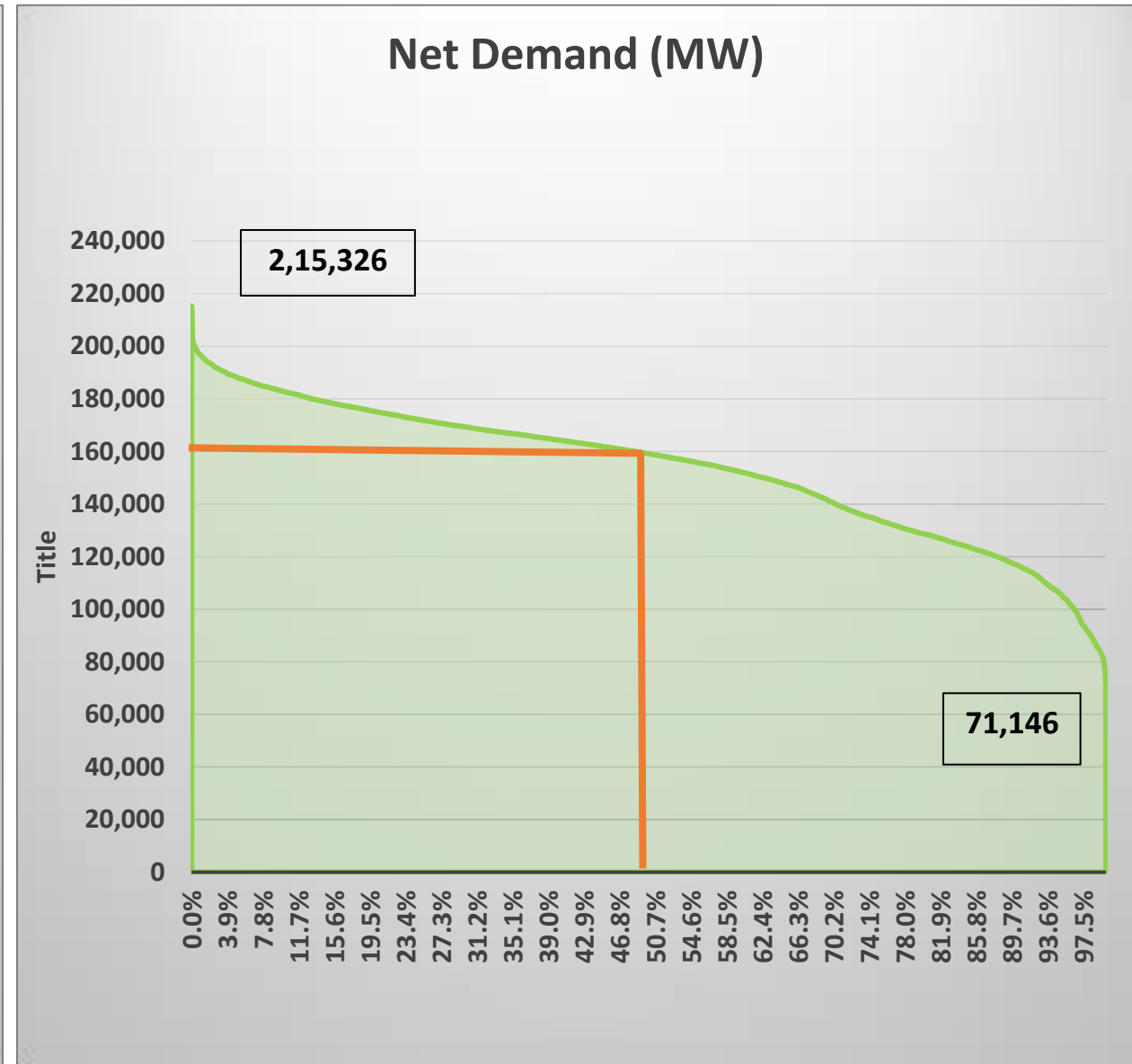
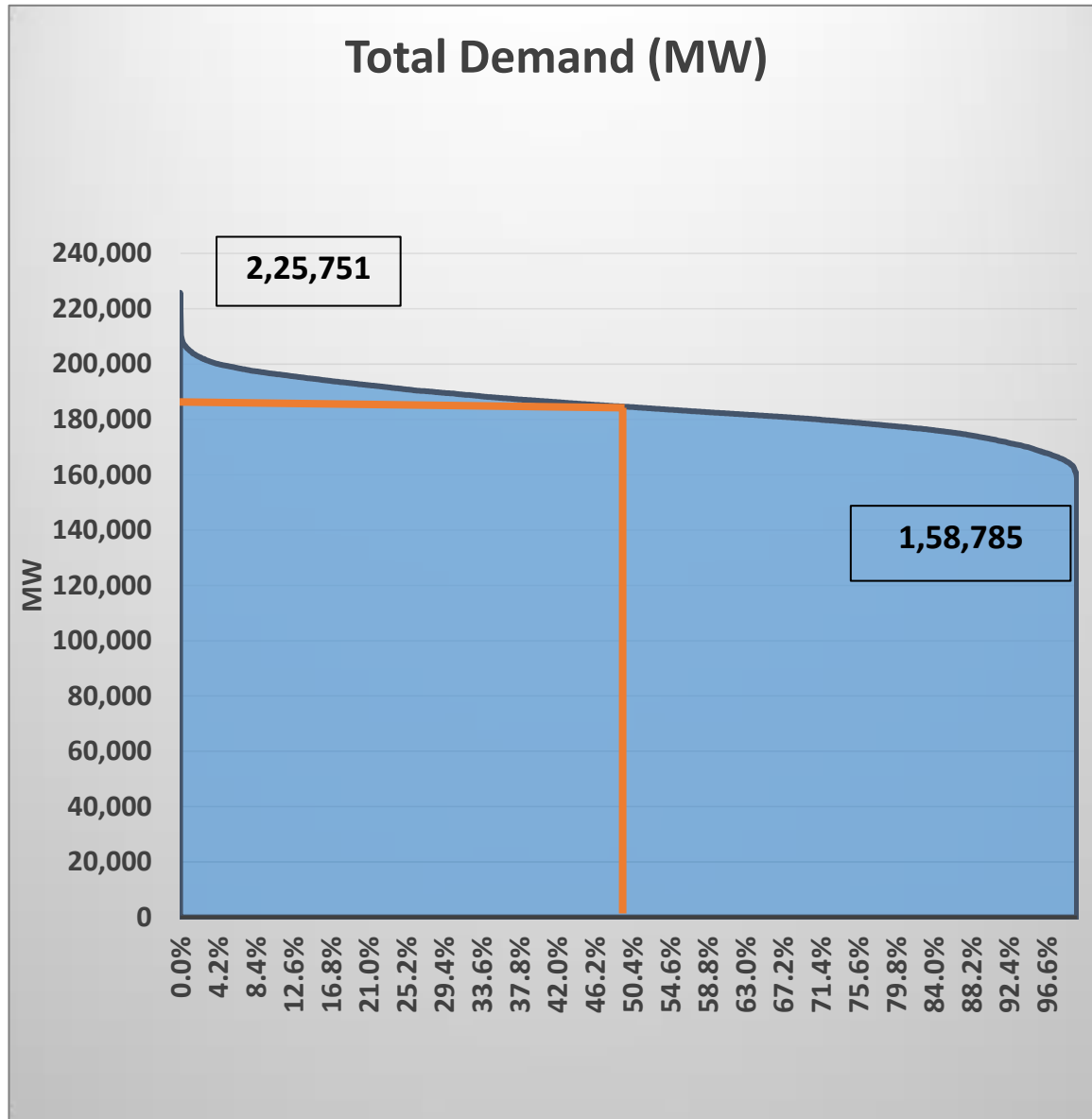




TYPICAL ALL INDIA DEMAND & NET LOAD CURVE (2021-22)



ALL INDIA LOAD DURATION CURVES (2021-22)



BASE CASE(2017-22) ASSUMPTIONS

DEMAND(CAGR 6.18%)

Year	Peak Demand (GW)	Energy Requirement (BU)
2021-22	225.7	1,566

Capacity addition considered

Years	Committed Capacity (MW)			Coal based Capacity under construction (MW)	RES Capacity by March, 2022 (MW)	Retirement of Coal Based Plants (2017-22) (MW)
	Hydro	Nuclear	Gas			
2017-22	6,823	3,300	406	47,855	175,000	22,716

BASE CASE(2017-22) RESULT

Additional Coal based capacity Requirement during 2017-22 (MW)*	Coal Based Generation (Gross) (GWh)	Expected PLF% during 2021-22 During 2017-22*
6445	1072	56.5%

*Actual coal based capacity addition required during 2017-22 is 6,445 as per study even though 47,855 MW are expected to come between 2017-22. However, this addition of 47,855 MW of coal based capacity during 2017-22 would bring down the PLF as indicated in the result.

BASE CASE(2022-27) ASSUMPTIONS

DEMAND(CAGR 5.51%)

Year	Peak Demand (GW)	Energy Requirement (BU)
2026-27	298.8	2,047

Capacity addition considered

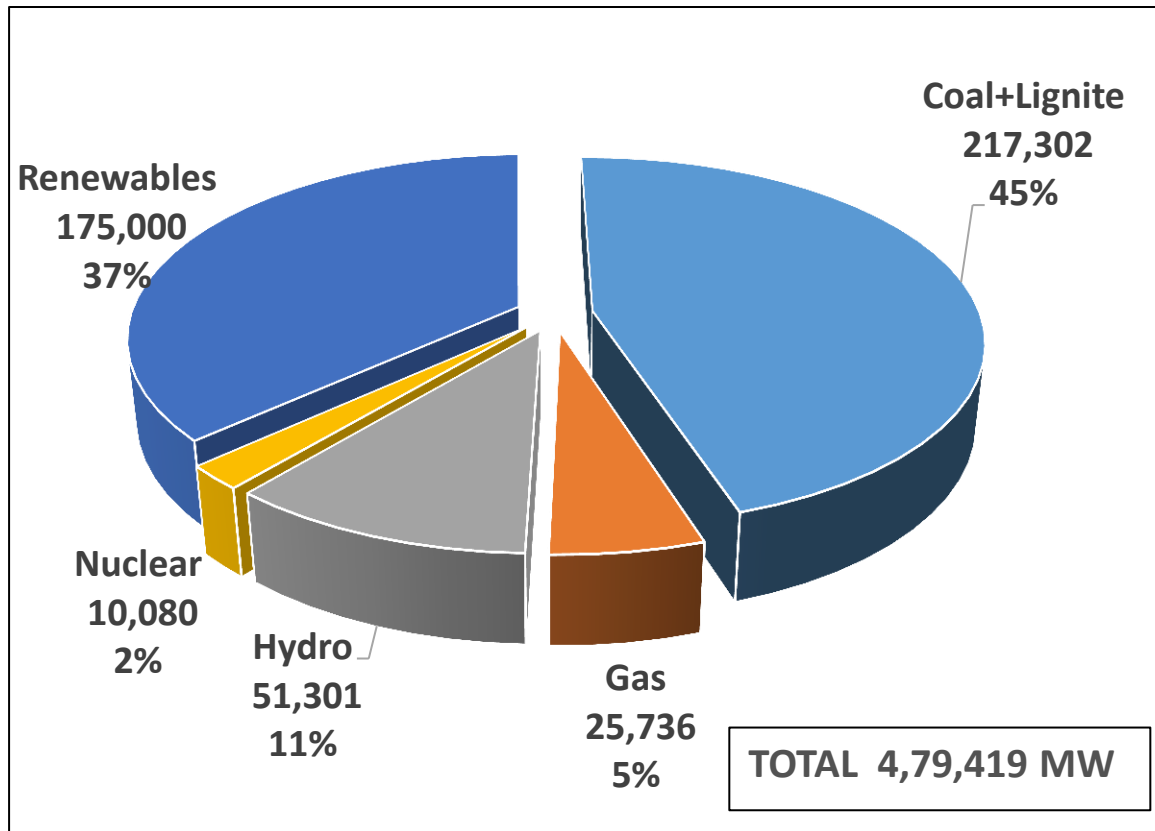
Years	Committed Capacity (MW)			Coal based Capacity under construction during 2017-22 (MW)	RES Capacity by March, 2027 (MW)	Retirement of Coal Based Plants (2022-27) (MW)
	Hydro	Nuclear	Gas			
2022-27	12,000	6,800	0	47,855	275,000	25,572

BASE CASE(2022-27) RESULT

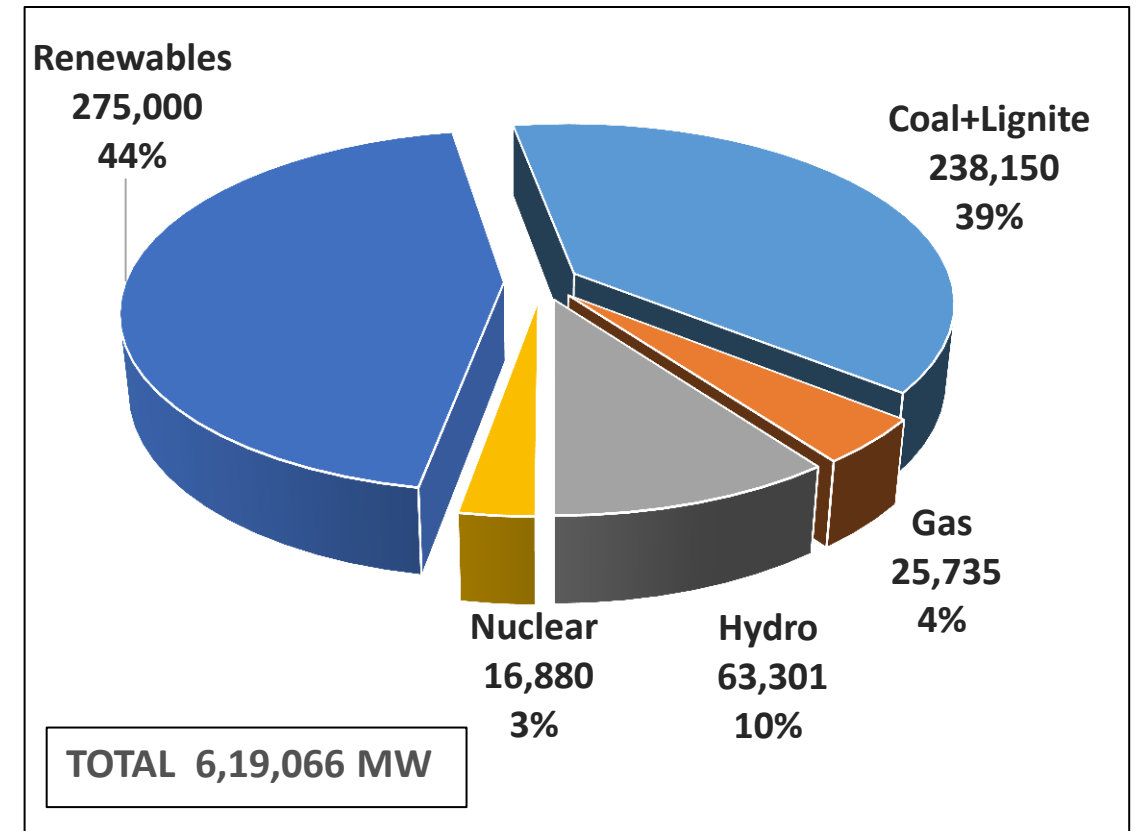
Additional Coal based capacity Requirement during 2022-27 (MW)	Coal Based Generation (Gross) (GWh)	Expected PLF% during 2026-27
46,420	1259	60.5%

Projected Installed Capacity(Base Case)

March,2022



March,2027



ALL FIGURES IN MW



CONCLUSIONS

- 1. The share of energy generation from Renewable energy sources is going to increase from 7 % at present to around 20% of the total energy requirement by the year 2022.**
- 2. India has committed to increase the share of installed capacity of Non-fossil fuel in the to be 40% by 2030.**



ISSUES

However, increase in generation from RE sources with the variability associated with RE generating sources will lead to

- Reduction in the PLF and Efficiency of Coal based plants .
- Conventional Generators to be more flexible. This may require retro-fitting of old coal based units
- Increase in O&M costs of conventional generators due to flexible operation
- Future capacities to have fast ramping up and ramping down capabilities



Need of Flexibility in Coal based Power stations

- **The amount of Renewable energy produced directly depends on the nature. Thus, the output varies both seasonally and daily.**
- **There are short term variations due to weather conditions like clouds or rainfall.**
- **Normally generation from a solar plant gradually increases after dawn and reaches a maximum around noon and then gradually decreases and becomes “Zero” with the advent of evening.**
- **To adjust energy produced from RE sources, coal based power stations needs to be flexible.**

Thank You