

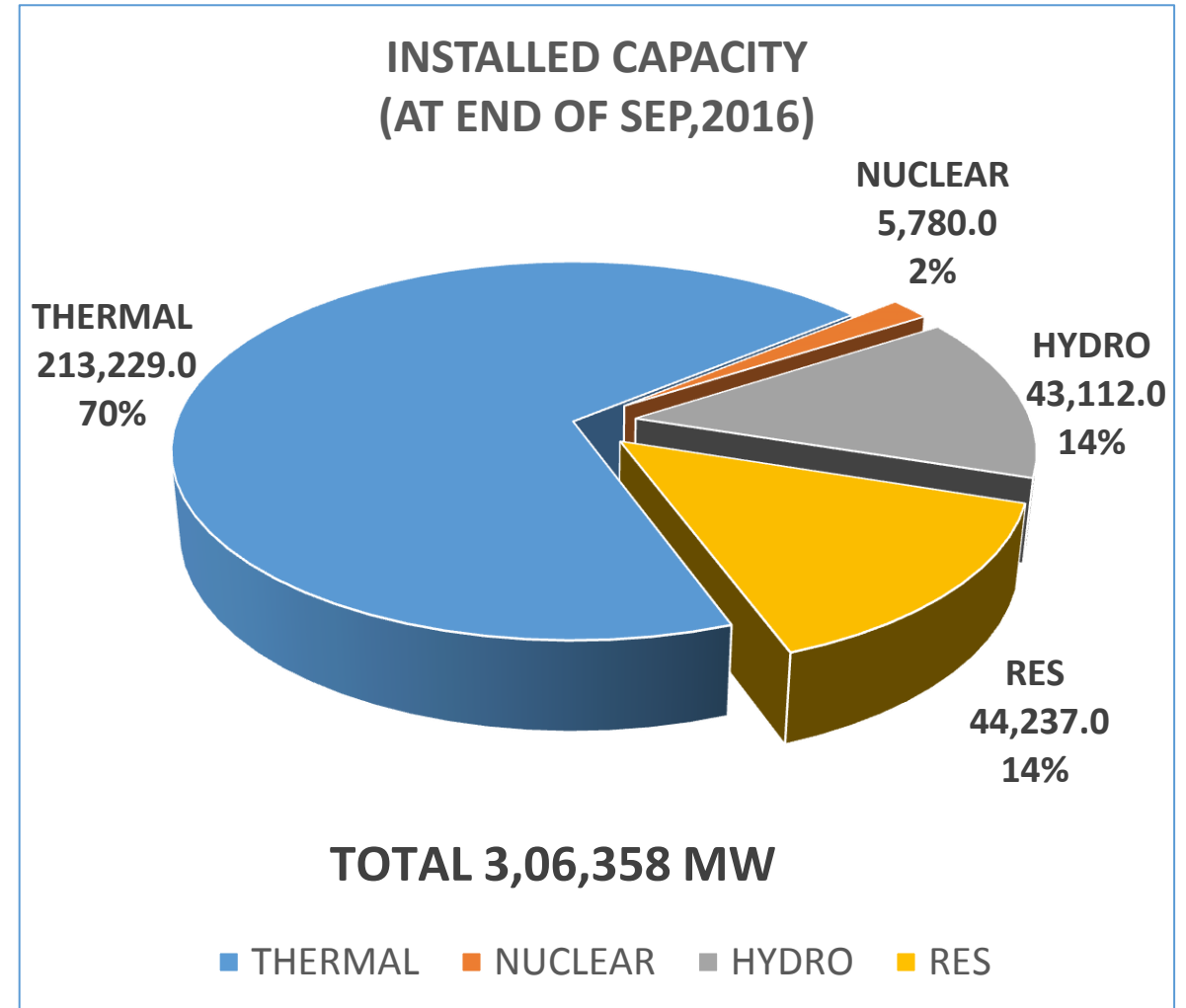
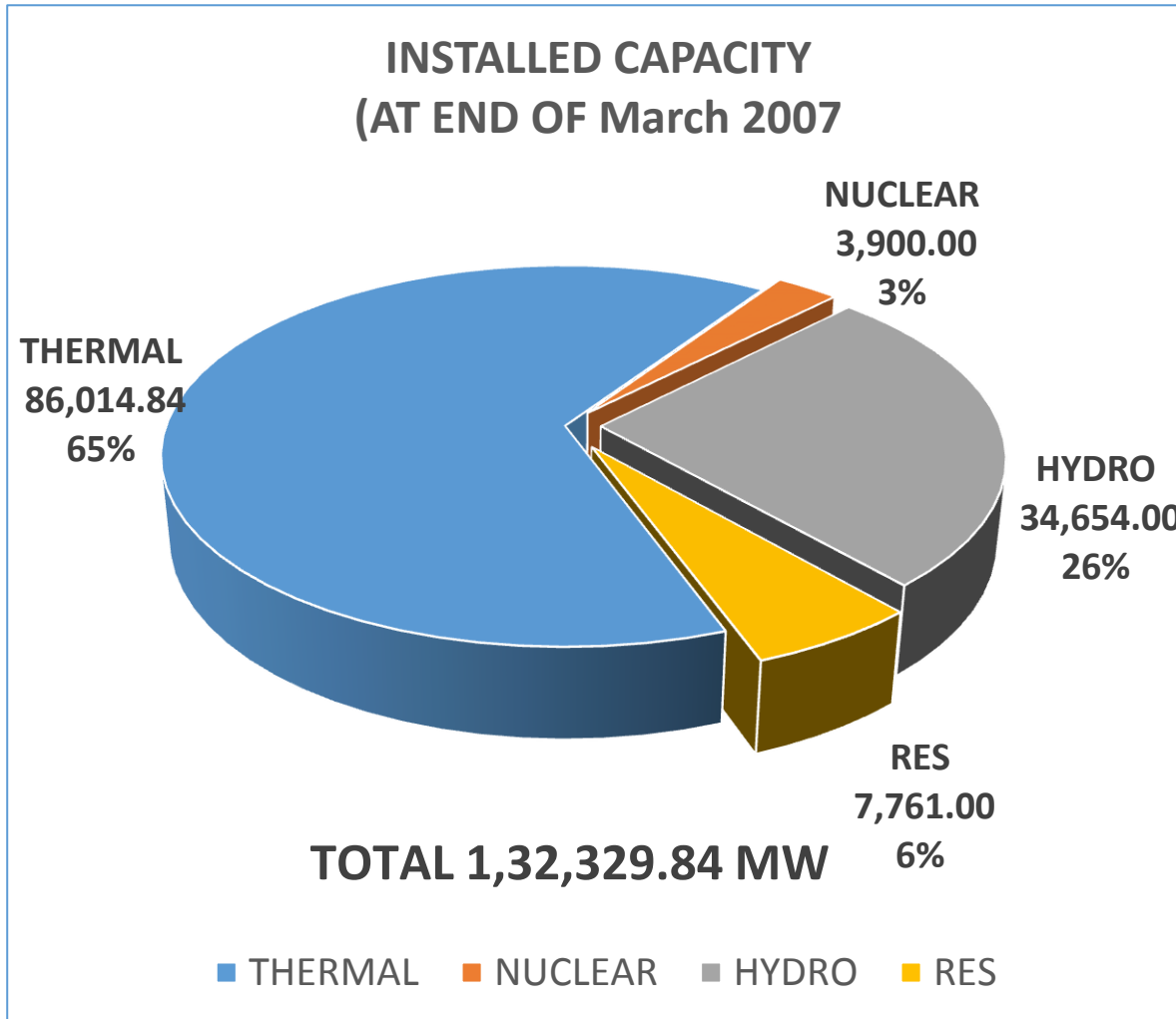
INDIAN POWER SECTOR ROAD MAP

NEW DELHI
16.12.2016

GROWTH SO FAR

GROWTH OF ALL INDIA INSTALLED CAPACITY(CATEGORY WISE)

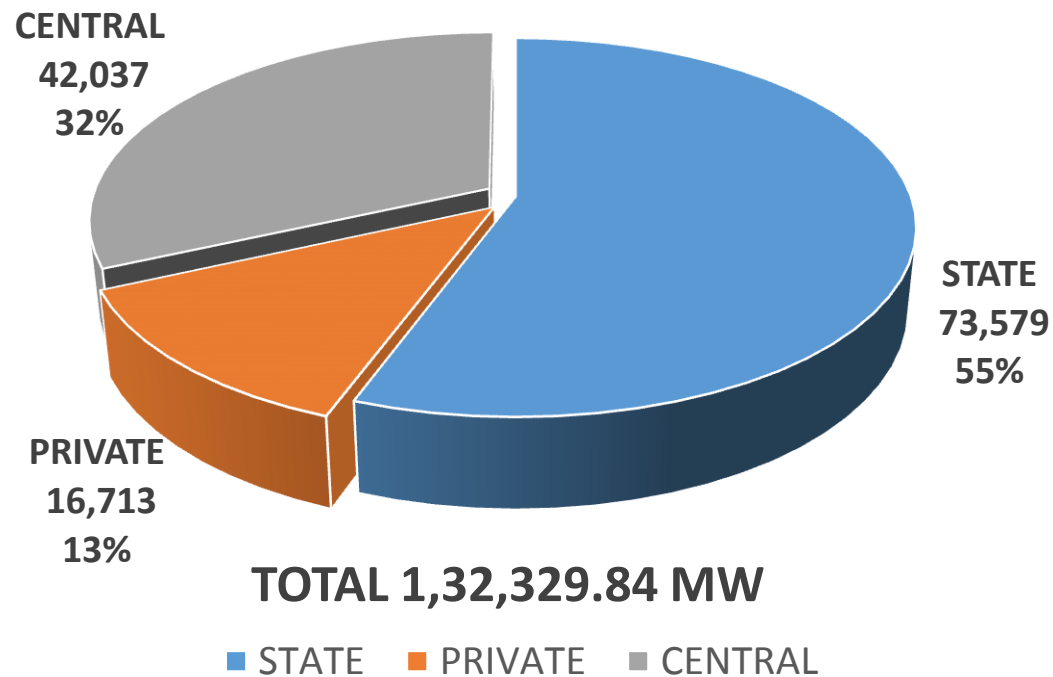
(FIGURES IN MW)



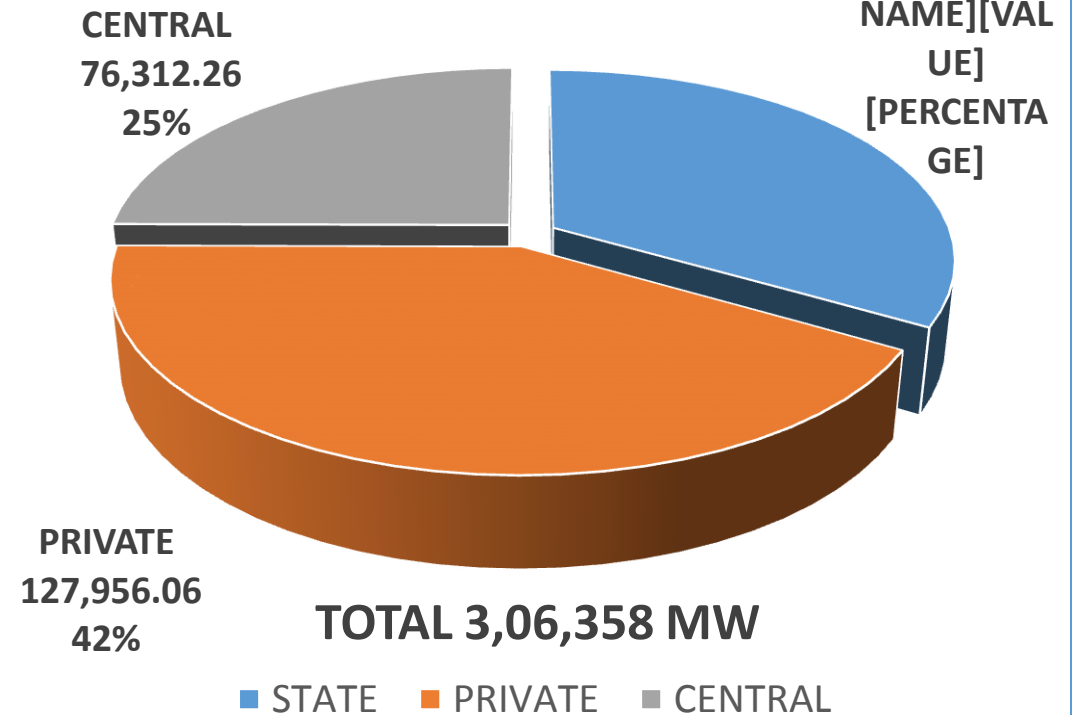
(FIGURES IN MW)

GROWTH OF ALL INDIA INSTALLED CAPACITY(SECTOR WISE)

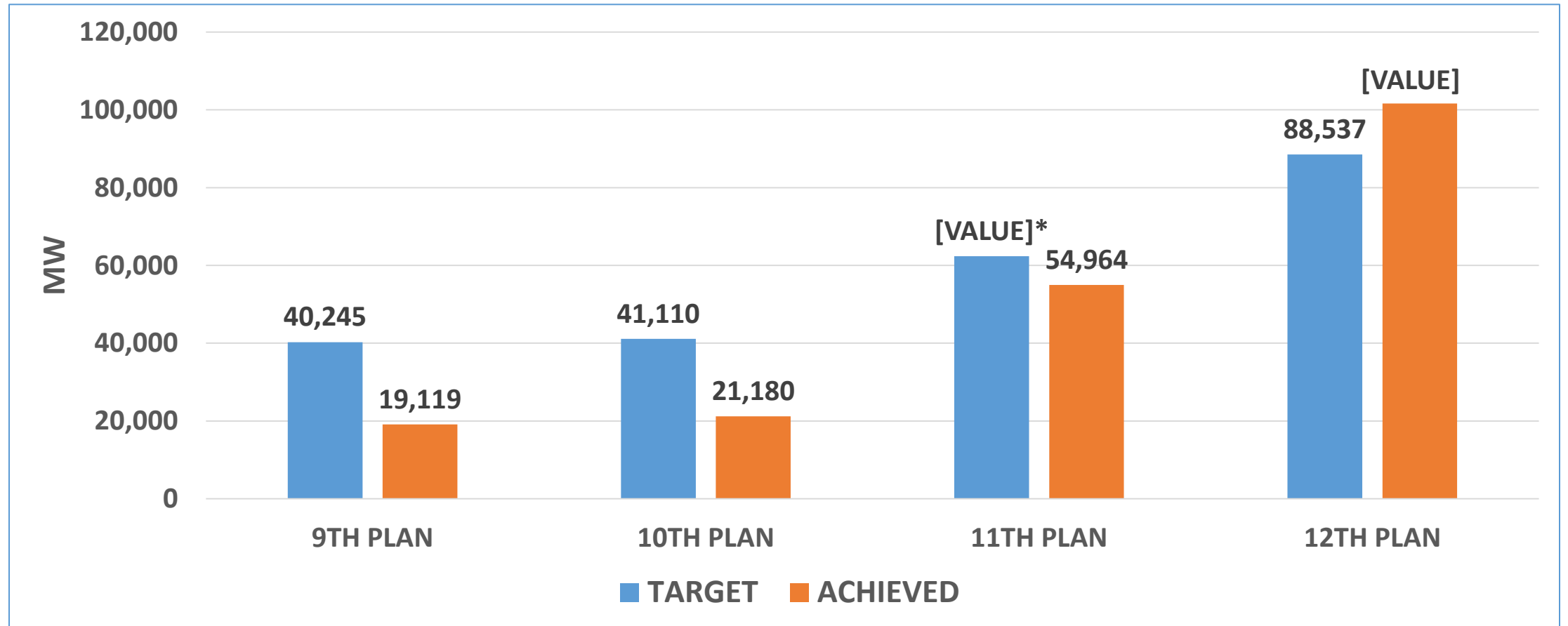
INSTALLED CAPACITY
(AT END OF March 2007)



INSTALLED CAPACITY
(AT END OF SEPTEMBER, 2016)



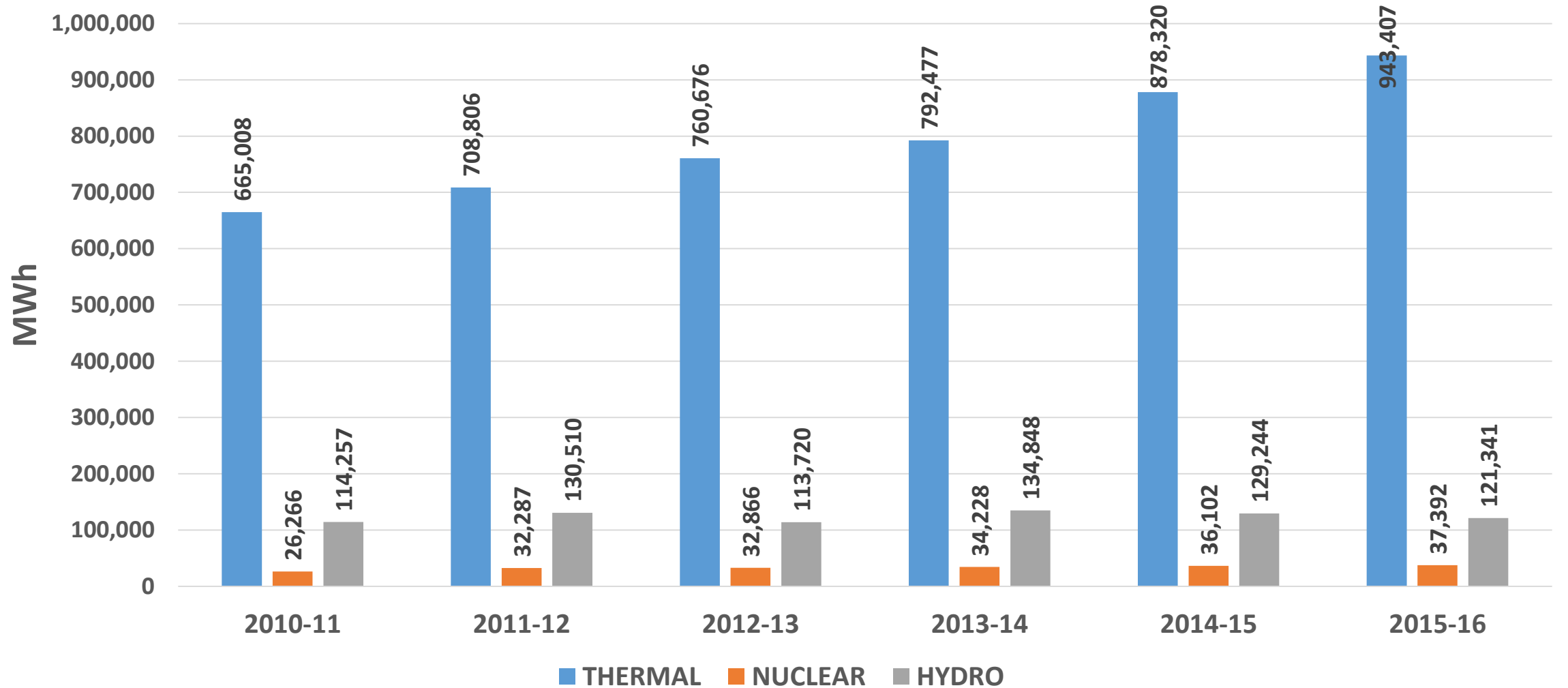
PLANWISE ALL INDIA CONVENTIONAL CAPACITY ADDITION TARGET VS ACHIEVEMENT



*AS PER MID TERM APPRAISAL

(FIGURES IN MW)

GROWTH OF ALL-INDIA CATEGORY WISE ACTUAL GENERATION

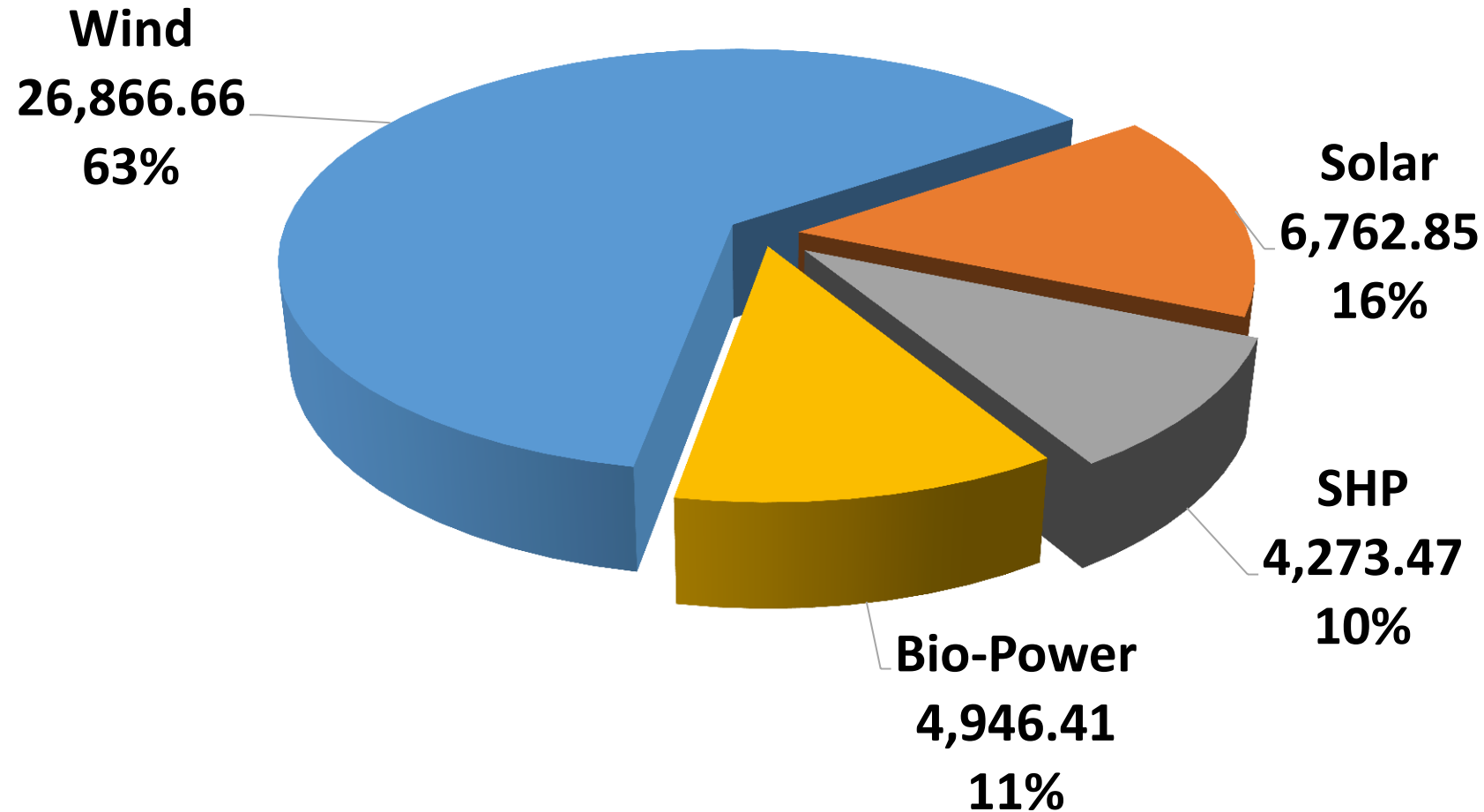


(FIGURES IN MWh)

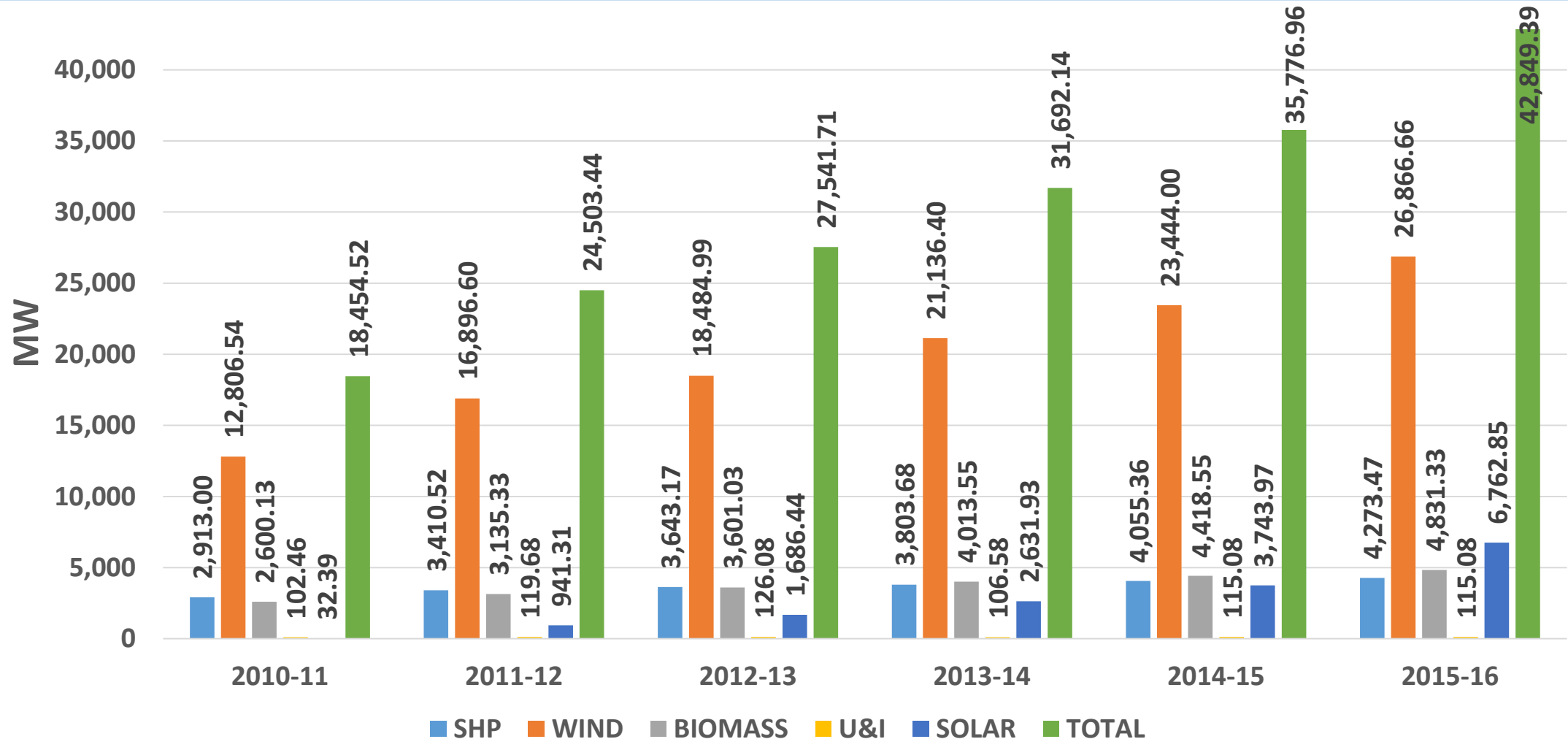
INSTALLED CAPACITY OF RES

(as on 31.03.2016)

ALL FIGURES in MW

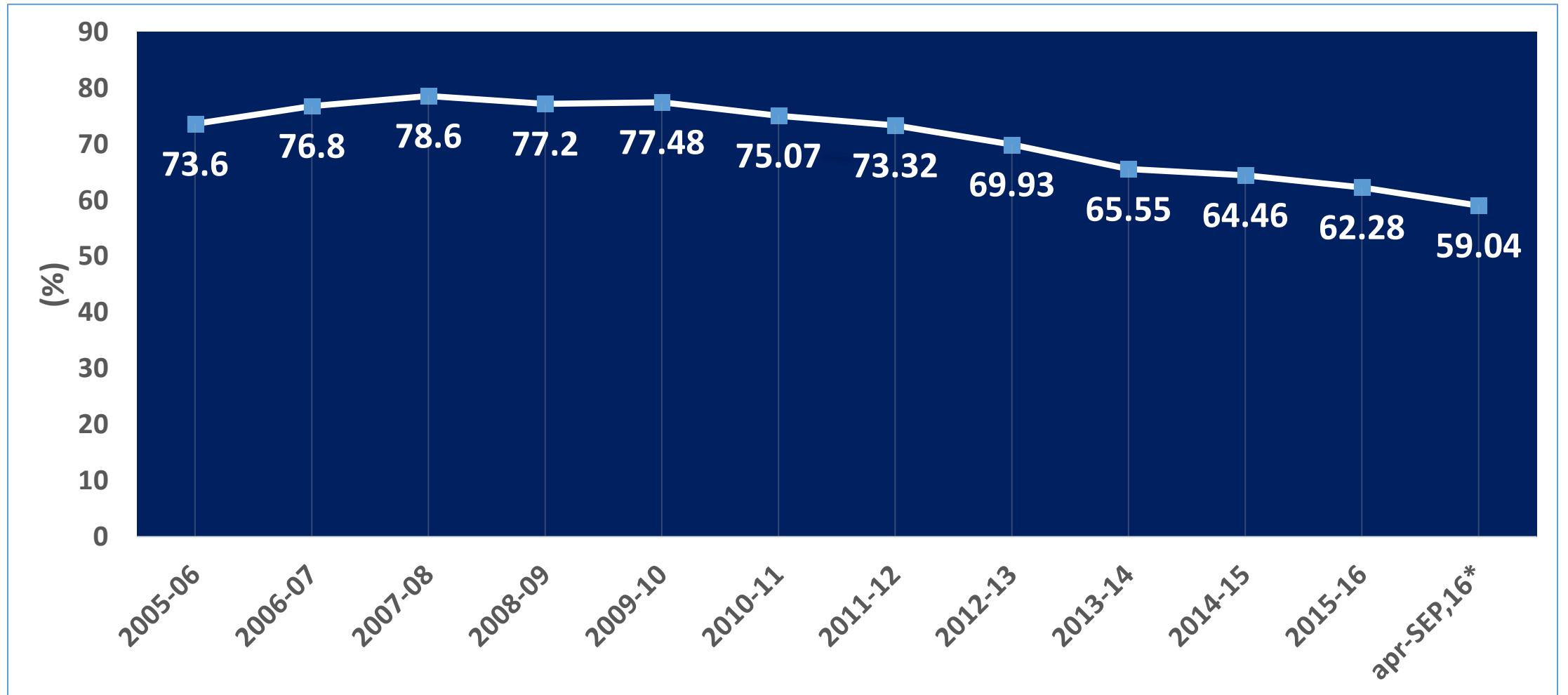


GROWTH OF ALL INDIA INSTALLED CAPACITY OF RES (CATEGORY WISE)



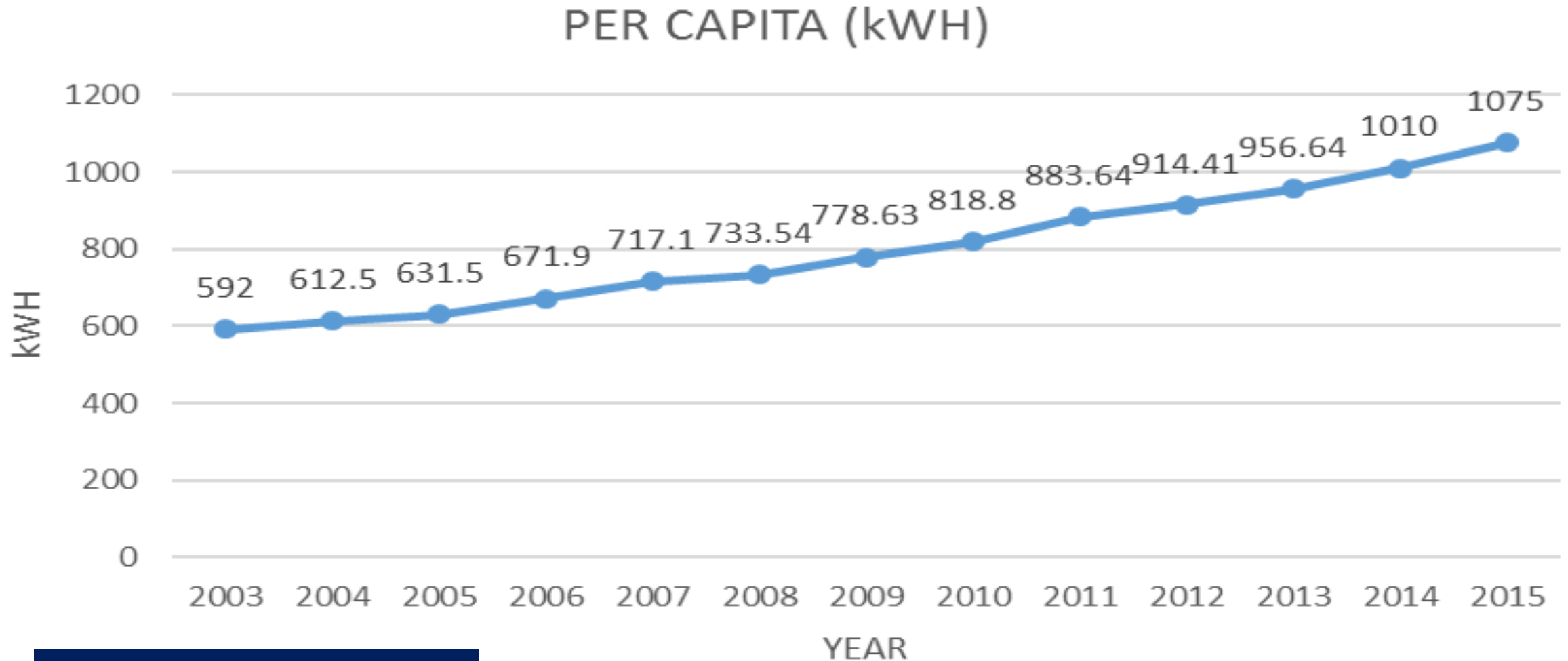
(FIGURES IN MW)

ALL INDIA THERMAL PLF (%)



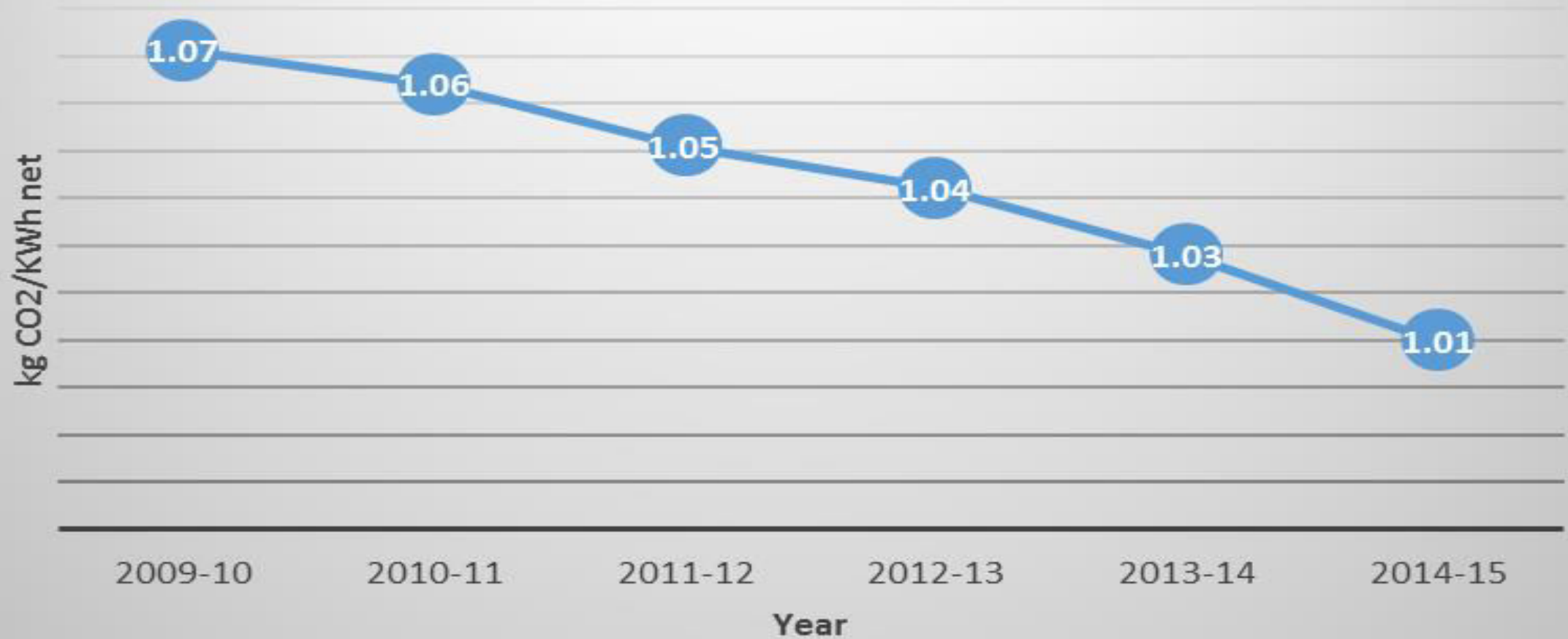
* PROVISIONAL

ALL INDIA ANNUAL PER CAPITA CONSUMPTION OF ELECTRICITY



16.3 in 1947

Average Emission rate from coal based power stations in kgCO₂/KWh net

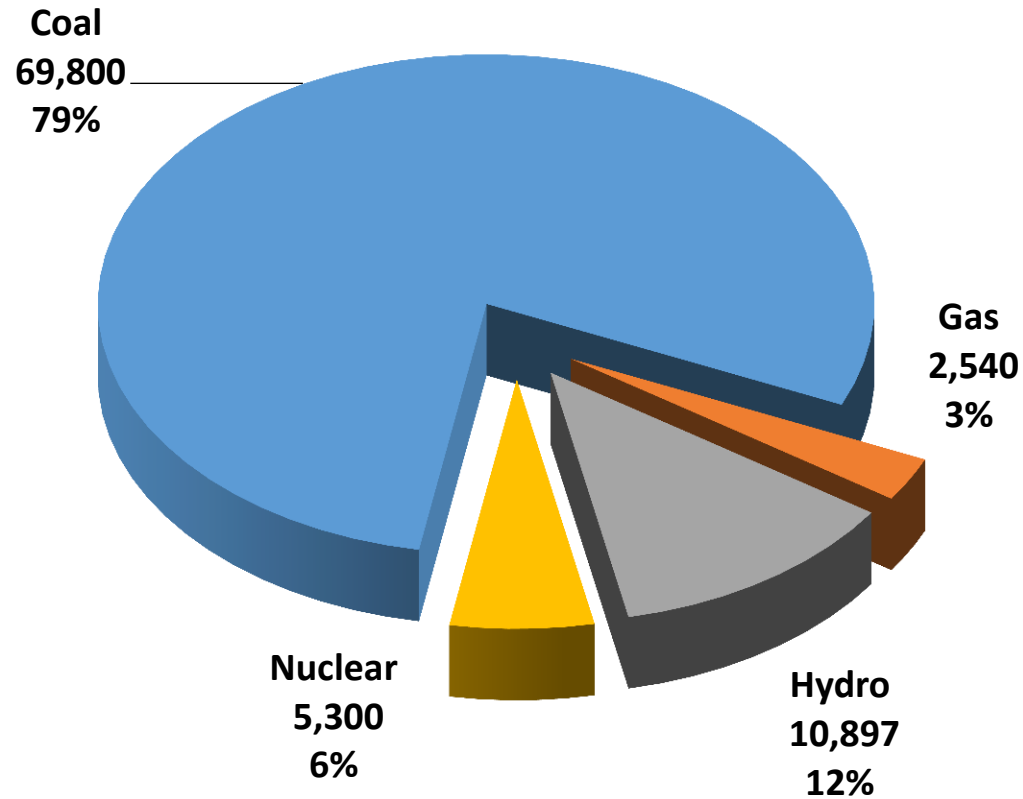


12th Plan Achievements

CONVENTIONAL CAPACITY ADDITION 2012-17 (Type wise)

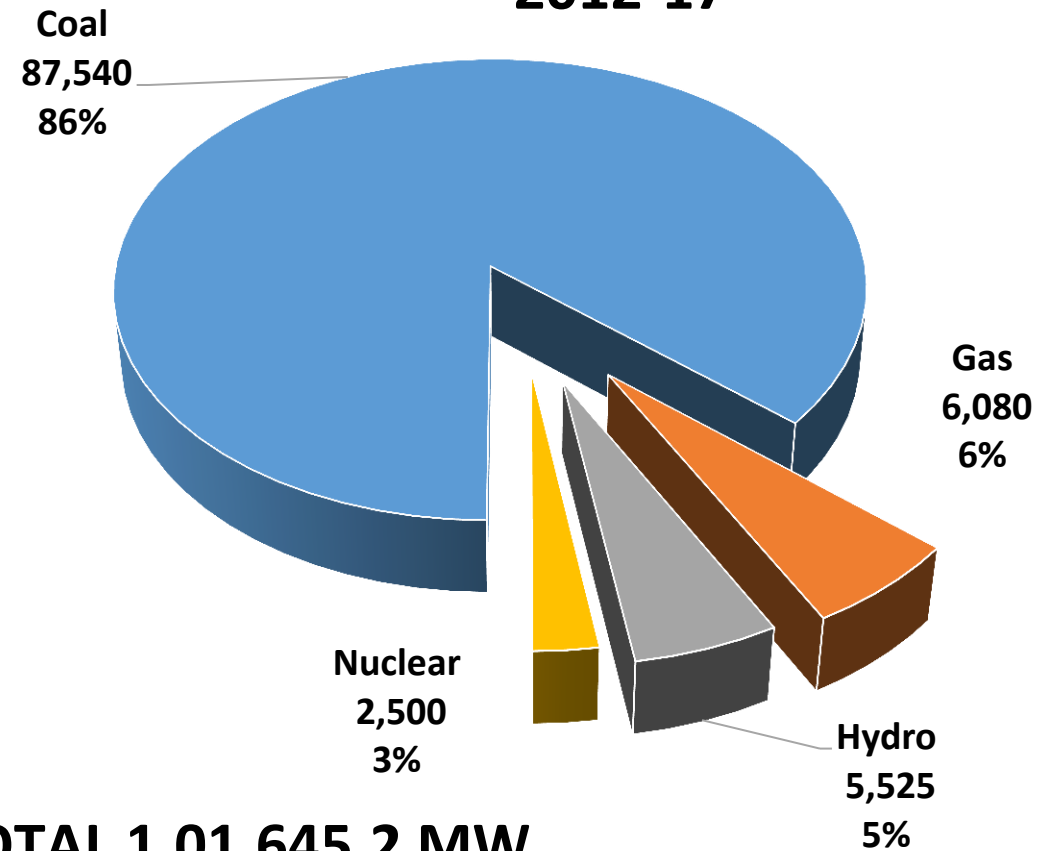
FIGURES in MW

12TH PLAN TARGET



TOTAL 88,537 MW

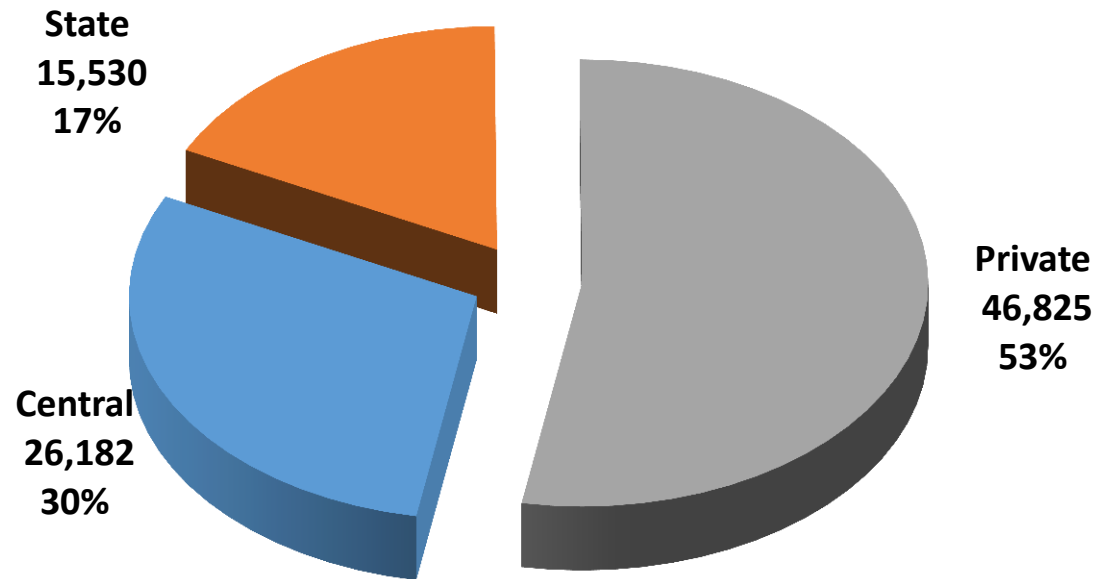
LIKELY CAPACITY ADDITION 2012-17



TOTAL 1,01,645.2 MW

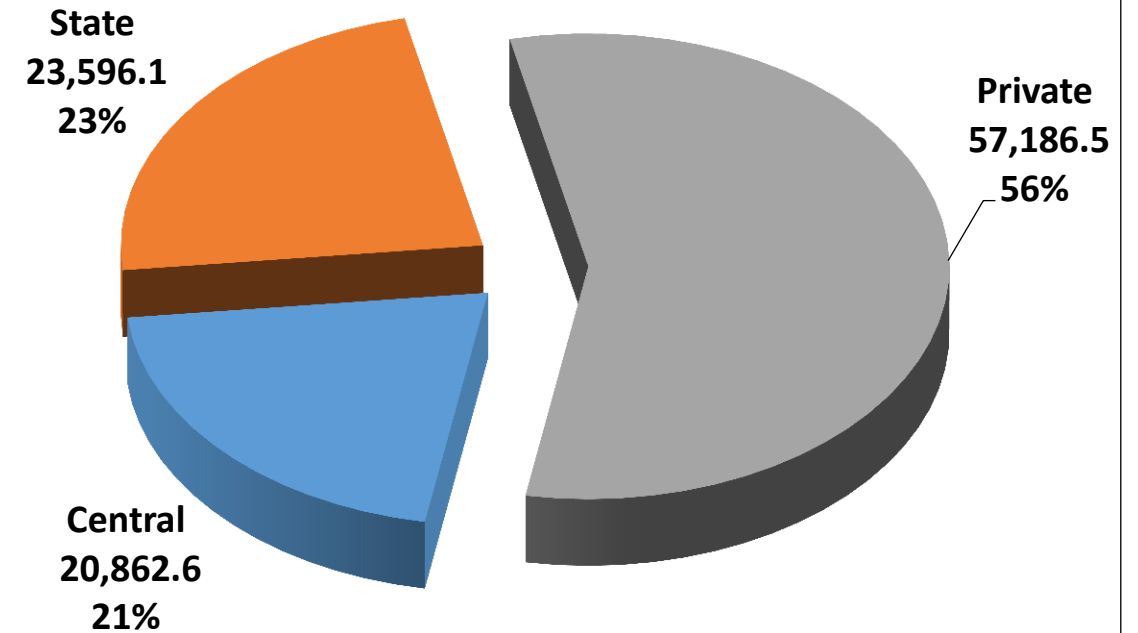
CONVENTIONAL CAPACITY ADDITION 2012-17 (Sector Wise)

12TH PLAN TARGET



TOTAL: 88,537 MW

LIKELY 12TH PLAN ACHIEVEMENT



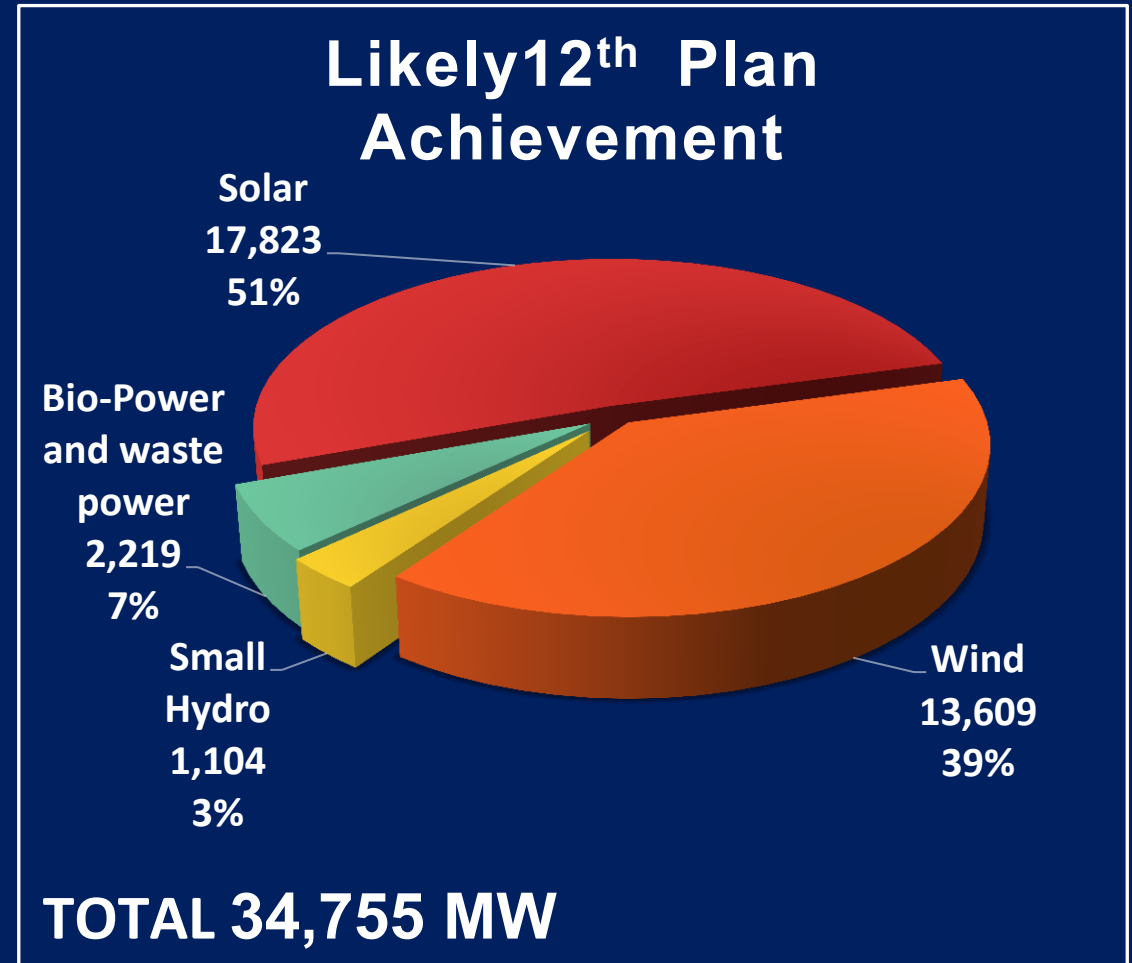
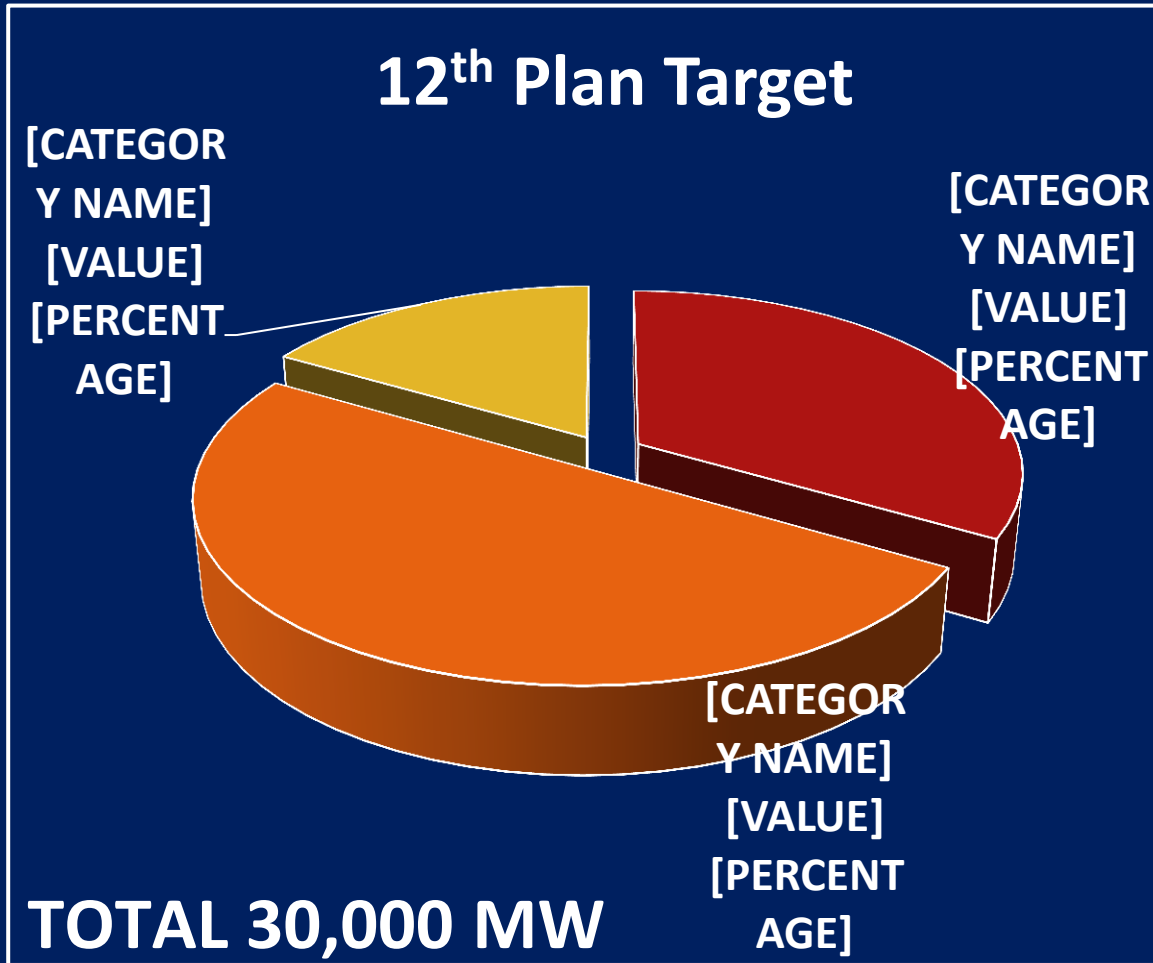
TOTAL: 101,645 MW

(FIGURES IN MW)

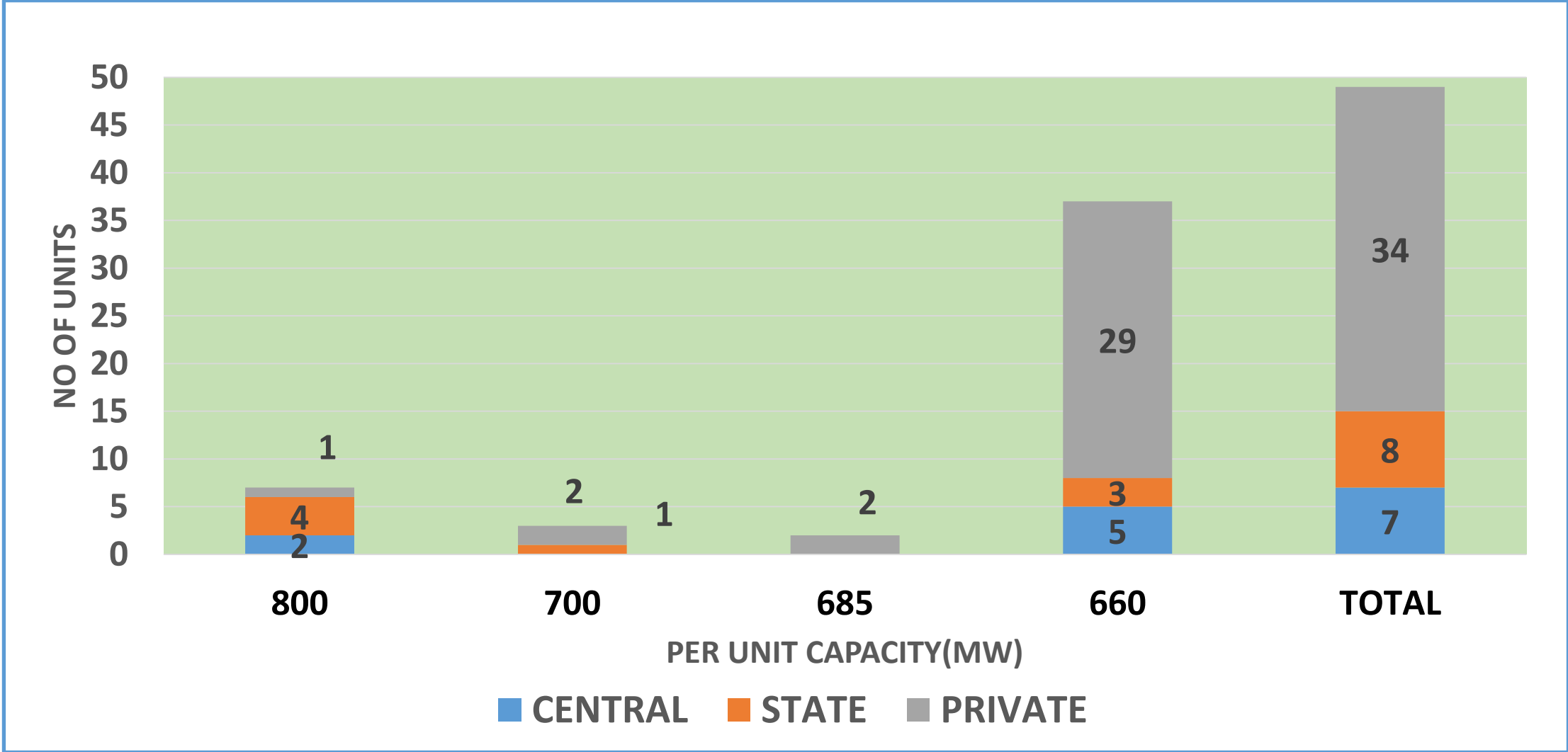


SUMMARY OF RENEWABLE CAPACITY ADDITION (2012-17)

FIGURES in MW



NO OF SUPER CRITICAL UNITS (SECTOR WISE) (likely in 2012-17)



FUTURE SCENARIO (2017-22)

ALL INDIA DEMAND PROJECTIONS (2021-22)

YEAR	ENERGY REQUIREMENT (BU)	PEAK DEMAND (GW)	REDUCTION DUE TO DSM		DEMAND AFTER DSM	
			ENERGY REQUIREMENT (BU)	PEAK DEMAND (GW)	ENERGY REQUIREMENT (BU)	PEAK DEMAND (GW)
2021-22	1748	244	137(7.83%)	9(3.68%)	1611	235

Committed capacity addition

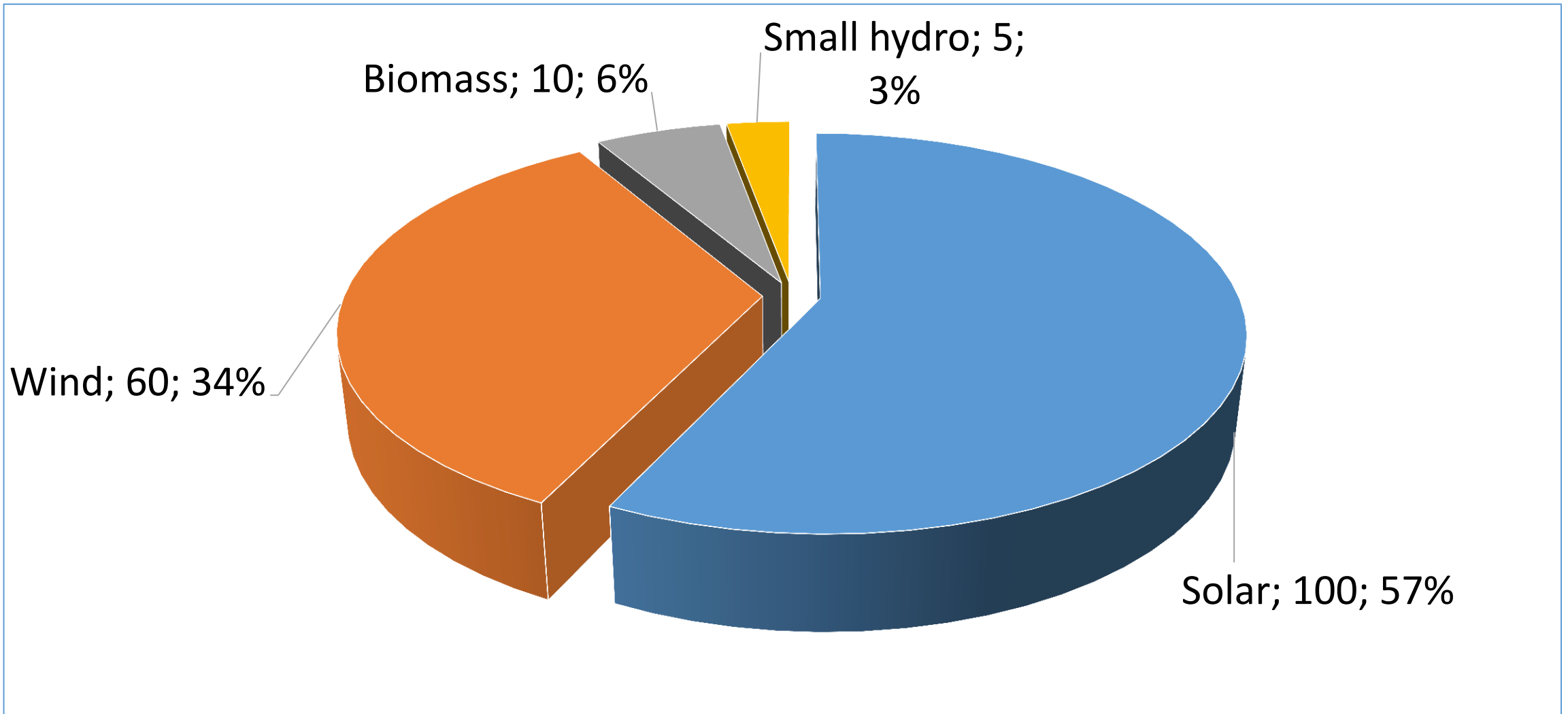
Conventional :

22470 MW (Hydro:15330 MW , Gas : 4340 MW, Nuclear:2800 MW)

Renewable:

175000 MW by 2022 (Solar : 100000 MW, Wind: 60000 MW, Biomass-10000 MW, Small Hydro :5000 MW)

RENEWABLE ENERGY TARGET BY 2022 (175 GW)



(FIGURES IN GW)

LIKELY ALL INDIA CAPACITY ADDITION AND PLF OF THERMAL PLANTS (2017-22)

Scenario (RES IC by 2022)	Committed Hydro (MW)	Committed Nuclear (MW)	Committed Gas (MW)	Additional Coal Based Capacity Required (MW)	Coal Based Generation (Gross) (GWh) +++	PLF of Coal Based Plants (%)	RES Energy Contribution (GWh) in Total Energy requirement **
175GW	15330	2800	4340	0	1018	60.3* (47.9)	327 (20.3%)
150GW				0	1071	63.4 (50.4)	286 (17.7%)
125GW				0	1122	66.4 (52.8)	245 (15.2%)

• PLF has been computed based on the requirement of nil capacity addition from coal based power plants. Since a coal based capacity of 50,025 MW is under construction and likely to yield benefits during 2017-22., figures in bracket indicate PLF% including 50,025 MW.

+++ assuming Auxiliary Power consumption of coal stations as 6.5% ** Includes Solar, Wind, Bio mass and Small Hydro Generation

LIKELY CAPACITY ADDITION (MW) DURING THE YEARS 2017-22

HYDRO		15,330
THERMAL		
	COAL	50,025
	GAS	4,340
	TOTAL	54,365
NUCLEAR		2,800
RENEWABLES		115326
TOTAL		187821

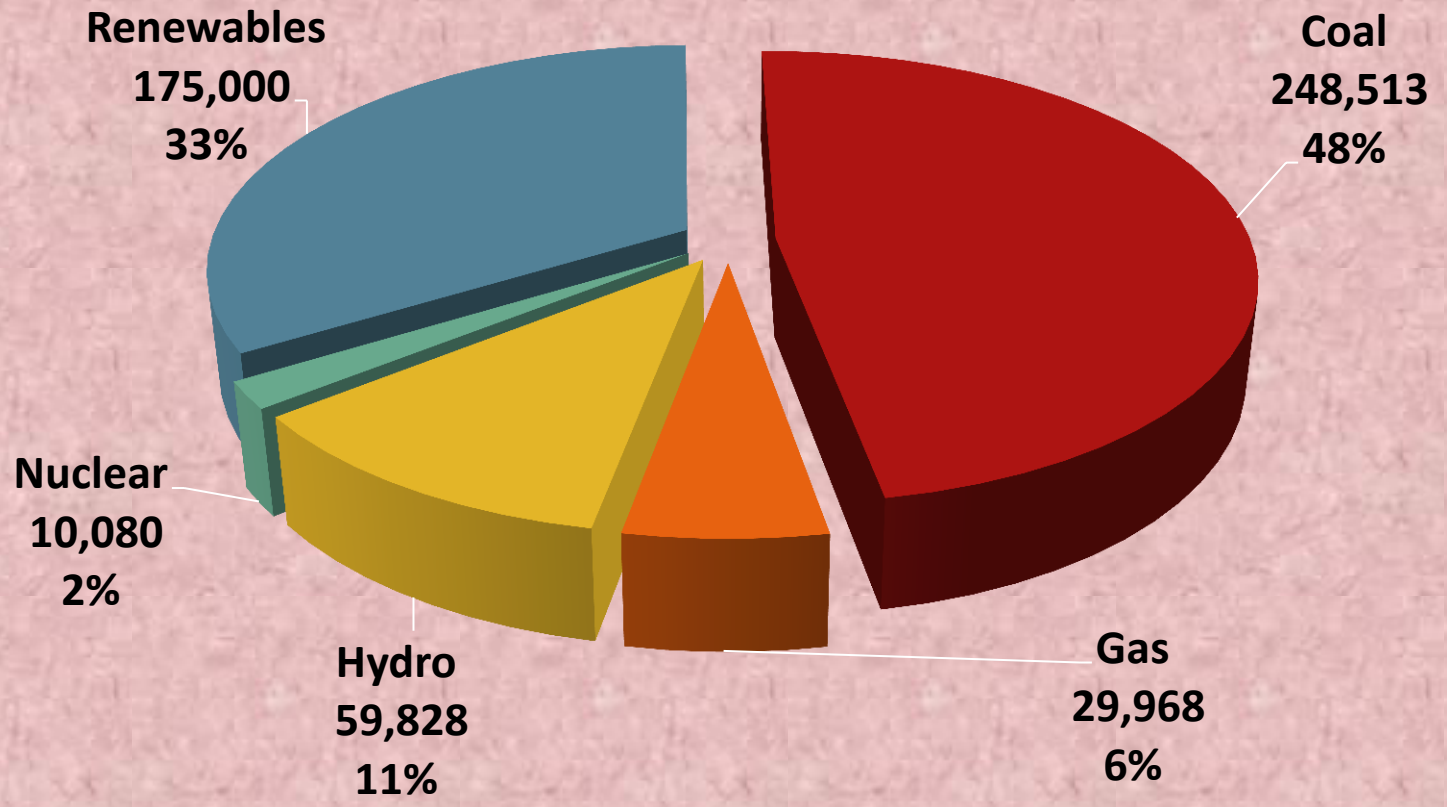


LIKELY INSTALLED CAPACITY

LIKELY INSTALLED CAPACITY BY END OF 2021-22

ALL FIGURES in MW

TOTAL 5,23,389 MW



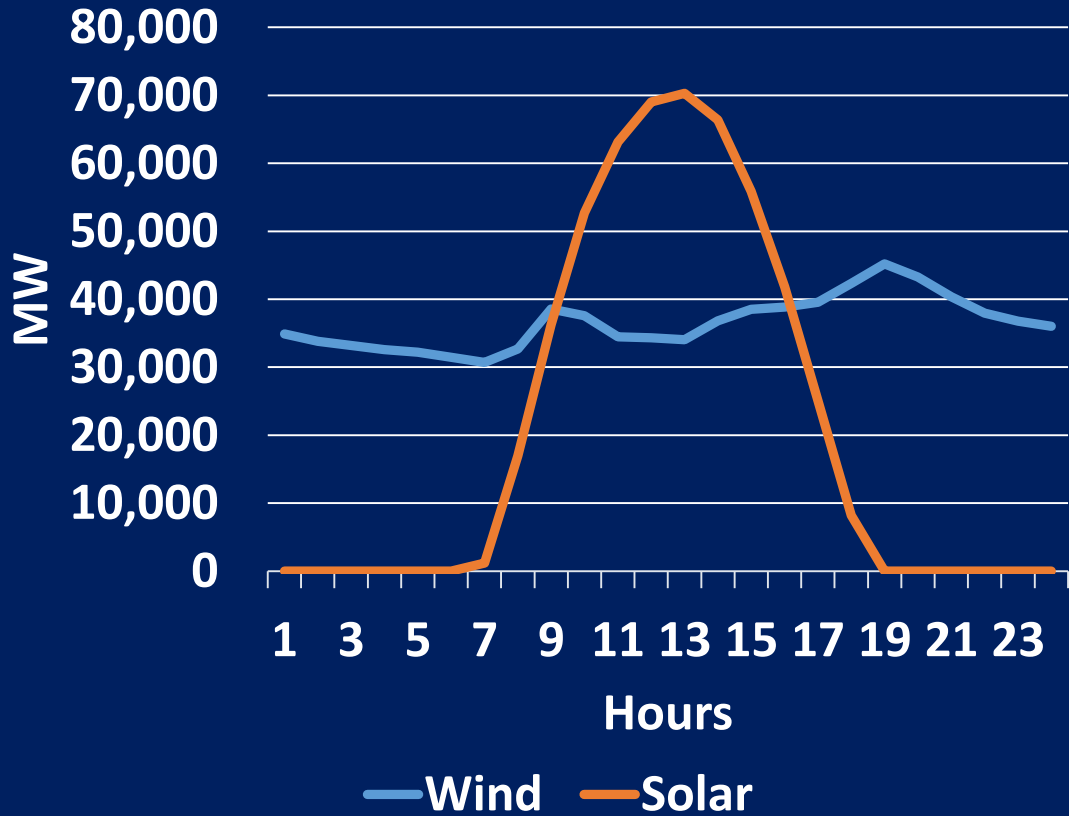
Including 50,025 MW of Coal based capacity addition currently under construction

Challenges in Integration of Renewables

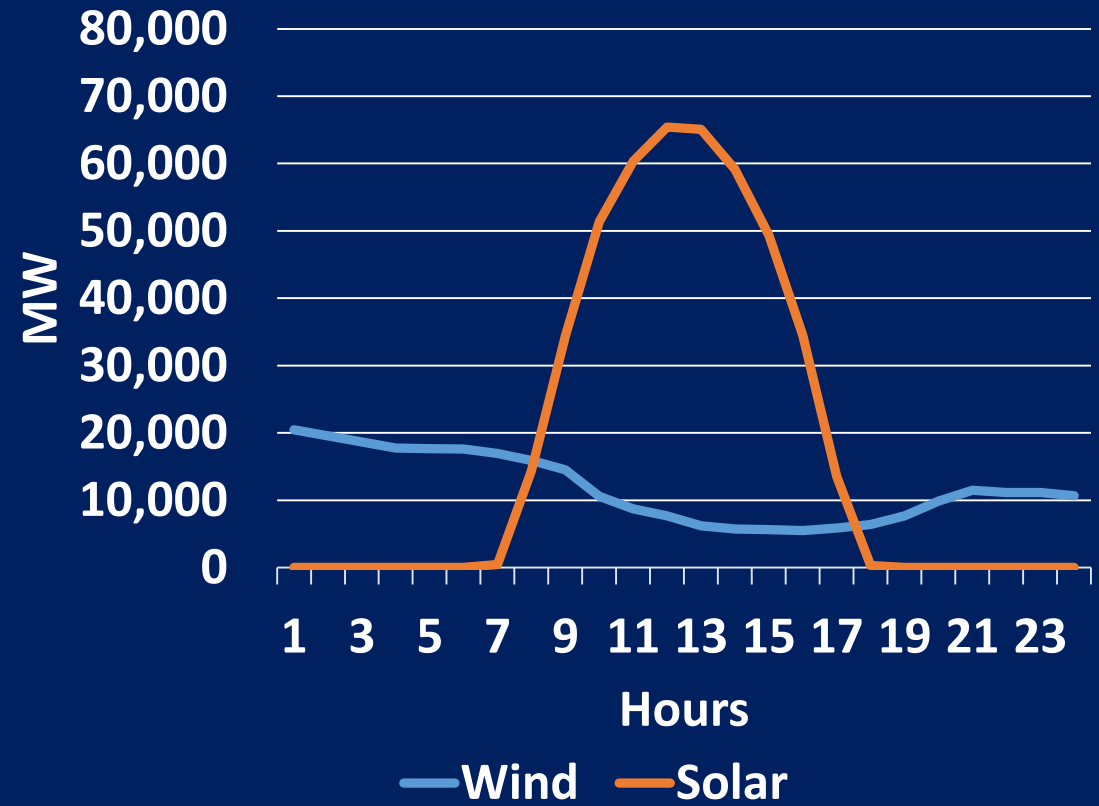


TYPICAL ALL INDIA GENERATION PROFILE OF SOLAR AND WIND GENERATION

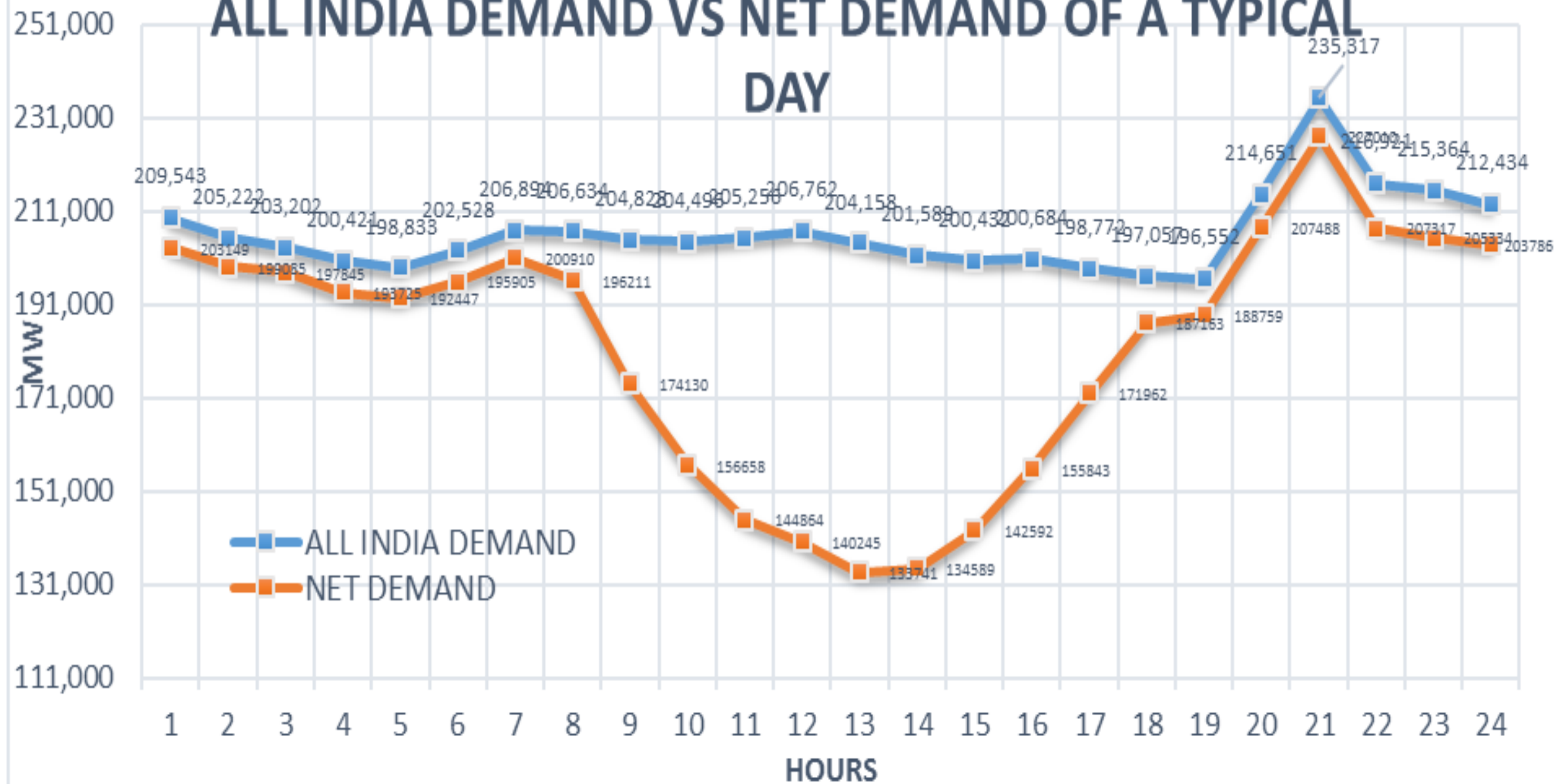
High Wind Months



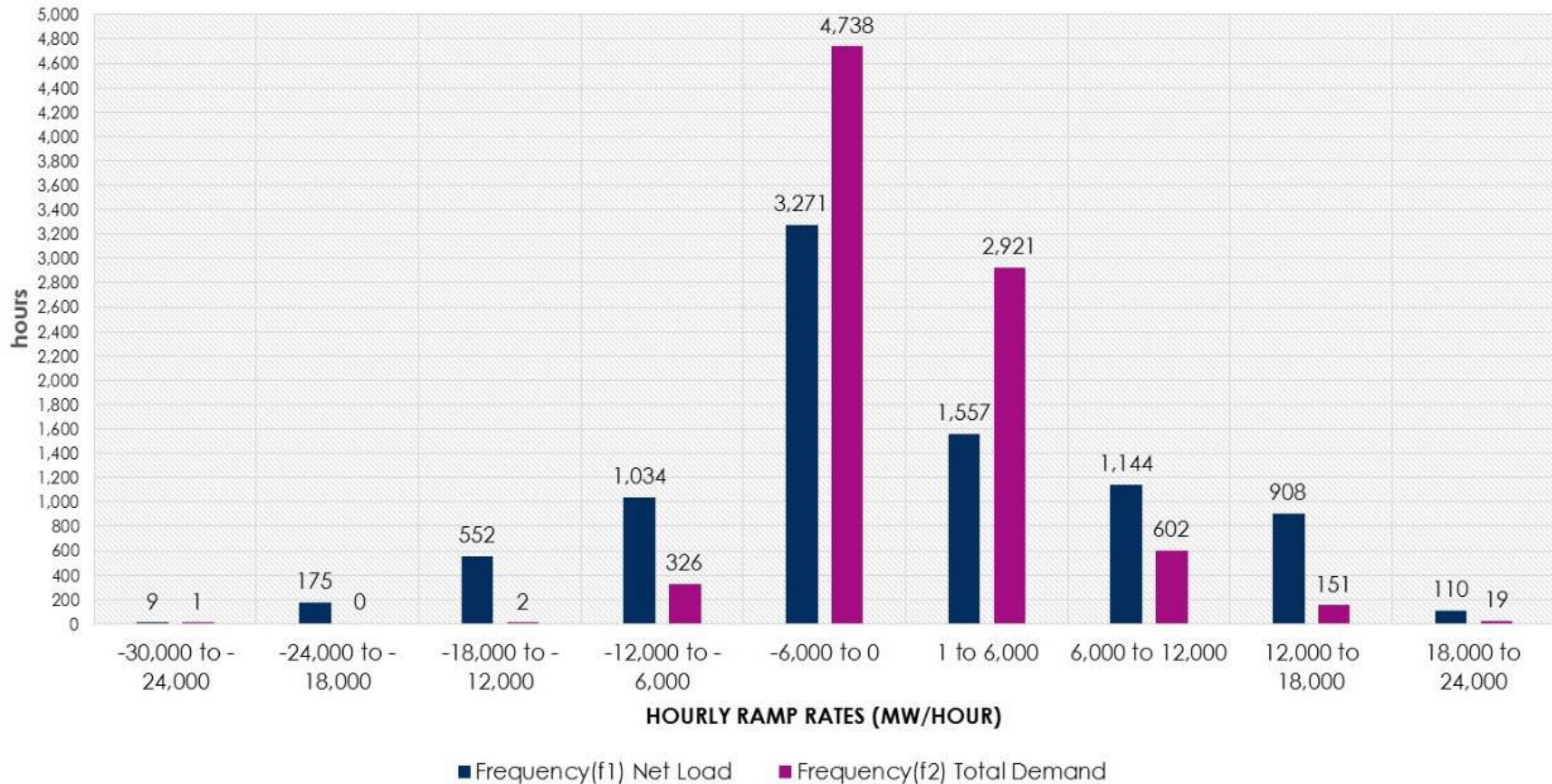
Low Wind Months



ALL INDIA DEMAND VS NET DEMAND OF A TYPICAL DAY



Frequency Distribution of Ramp over the year





PROJECTED CO₂ EMISSIONS FROM GRID CONNECTED POWER STATIONS

YEAR	Projected Total Carbon Emissions [#] (Million Tones)	Emission Rate* (KgCO ₂ /kWh)
2015-16	859	0.732
2021-22	983	0.581

* Including RES Generation.

Estimated



CARBON EMISSION INTENSITY FROM POWER SECTOR

India's Intended Nationally Determined Contribution (INDC)

- To reduce the emissions intensity of its GDP by 33% to 35 % by 2030 from 2005 level.

YEAR	2005	2022
Emission intensity from grid connected power stations (kgCO ₂ /Rs GDP)	0.0155479	0.0088617
Reduction in Emission Intensity (Base 2005)		43.00%

Note: The percentage may change depending on actual capacity addition and retirements.



LIKELY INSTALLED CAPACITY VS. SHARE OF FOSSIL FUEL

India's Intended Nationally Determined Contribution (INDC)

➤ 40 % cumulative power installed capacity from non-fossil fuels by 2030.

Year	Installed Capacity(IC) (GW)	IC of Fossil Fuel (GW)	IC of Non-Fossil Fuel (GW)	% of Non-Fossil Fuel in IC
March,2016	302.0	210.6	91.4	30.0%
March,2022 (likely)	523.4	278.5	244.9	46.8%

Note : 1. Non-Fossil fuels includes Hydro , Nuclear and RES sources.

2. The percentage share may change depending on actual capacity addition and retirements.

3. Includes 50,025 MW of Coal based capacity addition currently under construction and likely to yield benefits during 2017-22

THANK YOU