

- from various stakeholders, MoP amended the guidelines to accelerate the E-mobility transition in the country vide MoP order dated 14.01.2022.
- iii) Grid Connectivity and Safety regulations for charging stations for electric vehicles: Central Electricity Authority (CEA) has issued amendments to following regulations of CEA with reference to facilitation for charging stations: a. Central Electricity Authority (Technical Standards for Connectivity to the Distributed Generation Resources) Amendment Regulations, 2019. b. Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2019.
 - iv) Ministry of Housing and Urban Affairs (MoHUA) has issued following amendments to building by-laws and Urban and Regional Development Plan Formulation for facilitation of Charging Infrastructure for Electric Vehicles: a. Amendments in Model Building Bye-Laws (MBBL – 2016) for Electric Vehicle Charging Infrastructure. b. Amendments in Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI – 2014) for Electric Vehicle Charging Infrastructure.
 - v) Energy Efficiency Services Limited (EESL), Power Grid Corporation Ltd. (PGCIL) and NTPC Ltd. under Ministry of Power have been engaged in installation of Public Charging Stations (PCS) in the country.

1.3.11 ENERGY CONSERVATION AND EFFICIENCY

1.3.11.1 Performance Achieve and Trade (PAT):

Perform, Achieve and Trade (PAT) scheme is one of the flagship programs of Bureau of Energy Efficiency aimed at reduction in Specific Energy Consumption (SEC) in energy intensive industries. The energy saved by these industries is converted into tradable instruments called Energy Saving Certificates (ESCerts) and are traded at the Power Exchanges.

PAT cycle II, PAT cycle III, IV, V and VI were notified in 2017, 2018, 2019 and 2020 respectively. PAT cycle III was completed on the 31st of March 2020, with the evaluation of 116 new Designated Consumers (DCs) and the monitoring and verification of the energy savings in progress. PAT cycle VI has been notified vide Gazette Notification S.O. 1254 (E) dated 13th April, 2020. Under PAT cycle –VI, 135 new DCs have been notified with a total energy saving target of 1.277 MTOE.

1.3.11.2 Buildings Energy Efficiency Programme (BEEP) of EESL

Building Energy Efficiency Program (BEEP) was launched to implement energy efficiency measures in Government buildings across India. Under this Program 10,451 buildings have been retrofitted with energy efficient equipment like LED Lights, 5 Star rated fans and super-

efficient air-condition. Under this Programme, energy efficiency measures have been implemented in approx. 7,000 railway stations/service buildings and approx. 66 Airports' buildings

1.3.11.3 Unnat Jyoti by Affordable LEDs for All (UJALA)

UnnatJyoti by Affordable LEDs for All (UJALA) was launched on 5th January, 2015 as an attempt to provide energy efficient LED bulbs to consumers. As on date 36.72 Crore LED bulbs have been distributed under UJALA programme. This has resulted in energy saving of 47,691 million units of electricity per annum, peak demand reduction of 9,548 MW and 38.62 million tonnes of CO2 emission reduction annually.

1.3.11.4 Street Lighting National Programme (SLNP)

Street Lighting National Programme (SLNP) was launched to replace conventional street lights with smart and energy efficient LED street lights across India. Till date, EESL has installed over 1.15 crore LED street lights in Urban Local Bodies (ULBs) and Gram Panchayats across India. This has resulted in estimated energy savings of 7.75 billion units kWh per year with avoided peak demand of about 1,300 MW, GHG emission reduction of 5.33 million t CO2 per year and estimated annual monetary savings of Rs.5,523 crore in electricity bills of municipalities.

1.3.11.5 Standards and Labeling (S&L) Programme

The programme aims at providing consumers an informed choice regarding the energy saving potential of various energy consuming appliances. This Programme prescribes minimum energy performance levels for appliances/equipment, rated on a scale of 1 to 5 Star with 5 Star being the most energy efficient ones. As on date, 28 appliances are covered under S&L Programme, out of which 10 appliances are under mandatory regime and remaining 18 are under voluntary regime.

1.3.11.6 Energy Conservation Building Code

ECBC 2017 (Energy Conservation Building Code) was launched in 2017 and is applicable for large commercial buildings with connected load of 100 kW and above or 120 kVA and above. ECBC focuses on building envelope, mechanical systems and equipment including heating, ventilating, and air conditioning (HVAC) system, interior and exterior lighting systems, electrical system and renewable energy.

The Eco Niwas Samhita, Part – I Building Envelope (Energy Conservation Building Code for Residential Sector) is developed and launched on 14th December, 2018 to set minimum building envelope performance standards to limit heat gains (for cooling dominated climates) and to limit heat loss (for heating dominated climate) as well as for ensuring

adequate natural ventilation and day lighting. The code is applicable to all residential use building projects built on plot area ≥ 500 m². In 2018, the government launched Eco-Niwas Samhita 2018(link is external), which is the ECBC for residential buildings, to push for energy efficiency in the residential sector. The code aims for promoting design and construction of homes including apartments and townships to give the benefits of energy efficiency to the occupants.

In the subsequent years, new components will be added to the Eco-Niwas Samhita in the Part-II, which will address other aspects such as, Energy Efficiency in Electro-Mechanical Equipment for Building Operation, Renewable Energy Generation, Embodied Energy of Walling Materials and Structural Systems.

1.3.12 Promotion of Energy Storage system

Ministry of Power (MoP), GoI notification no. 23/16/2020-R&R Part(1) dated 10.03.2022 issued the detailed Guidelines for Procurement and Utilization of Battery Energy Storage Systems as part of Generation, Transmission and Distribution assets, along with Ancillary Services.

CHAPTER 2

REVIEW OF CAPACITY ADDITION DURING THE PERIOD OF 2017-22

2.0 INTRODUCTION

Review of the previous plan is a very useful and powerful way to evaluate strengths, weaknesses, and progress in order to create a strong foundation for the development of future strategic plans and priorities. Review creates a base of knowledge and shared understanding that provides a critical backdrop about decision-making processes, including the setting of priorities, budget setting, dealing with problem arising in the future. It helps to identify projects that have commissioned as per the schedule or ahead of schedule and reasons for the delay in projects.

The COVID-19 pandemic has affected our day-to-day life, businesses, disrupted the world trade and movements. Power sector is also one of the various industries and sectors affected by the pandemic. The generation capacity addition from various sources got adversely impacted in the short run as:

- The strict lockdown to arrest the pandemic halted the constructions activities, due to a lack of manpower.
- Delay in up gradation/transition-related activity in the power sector, due to slow growth of economy and investment by the public and private sector.
- Delay in manufacturing and installation of various projects due to disruption in the global supply chain led to difficulties with the availability of key components leading to delay in execution of projects, for instance, solar segment manufacturing companies faced delays in the procurement of material.
- Reduced revenue for companies due to weak demand which left companies with less capacity for capital expenditure.

In this chapter, review of generation capacity which was scheduled to be added in National Electricity Plan notified in 2018 has been carried out with reasons for the delay of projects which were scheduled to be commissioned during the period 2017-22.

2.1 SCHEDULED GENERATION CAPACITY ADDITION FROM CONVENTIONAL SOURCES

As per the National Electricity Plan notified in 2018, scheduled generation capacity addition from conventional sources was envisaged 51,561.15 MW for the period 2017-22. Details of sector wise and mode wise scheduled capacity addition is given in **Table 2.1** and subsequently in **Exhibits 2.1** and **Exhibits 2.2**.

Table 2.1
Scheduled Capacity Addition from conventional sources for year 2017-22

(Figures in MW)

Source	Central	State	Private	Total
Coal	22900	18340	6615	47855
Gas	0	406.15	0	406.15
Nuclear	3300	0	0	3300
Total	26200	18746.15	6615	51561.15

Note: Large hydro has been categorized as Renewable Energy Source.

Exhibit 2.1

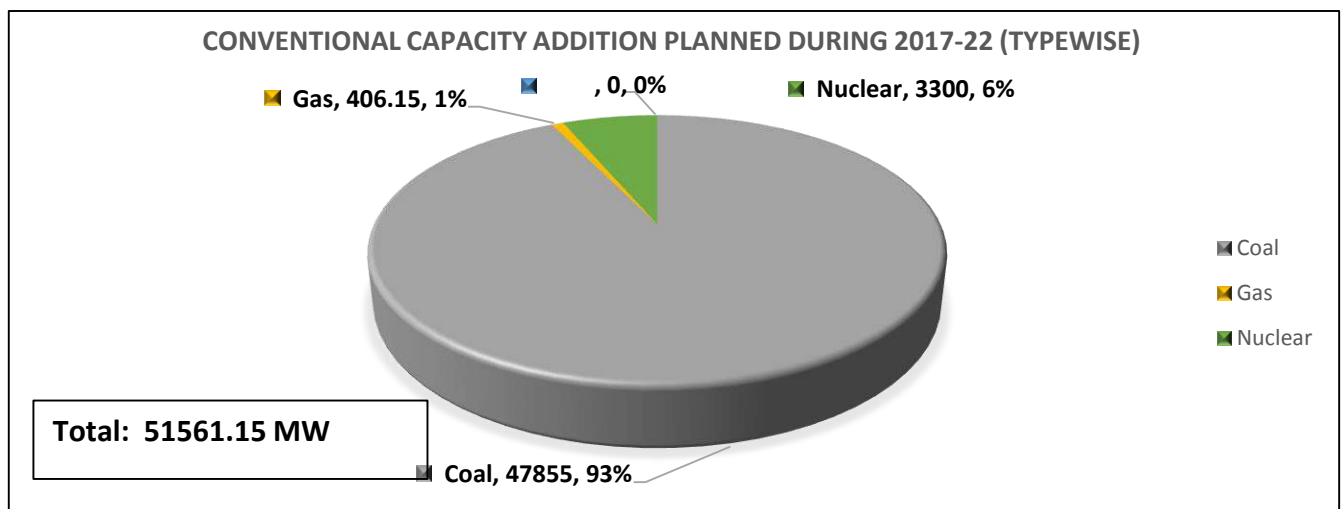
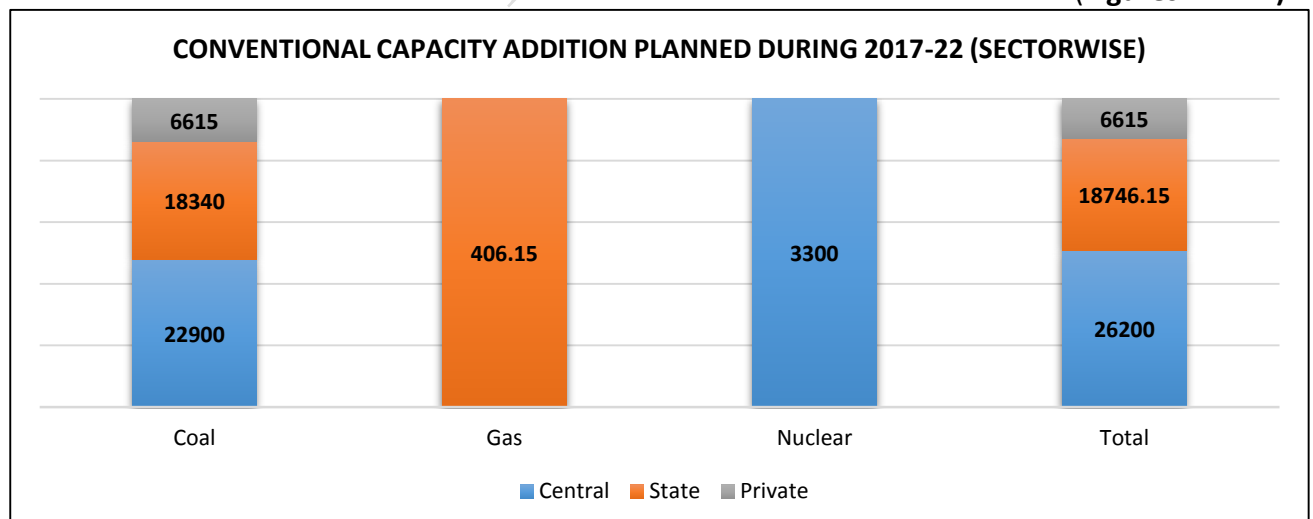


Exhibit 2.2

(Figures in MW)



2.2 GENERATION CAPACITY ADDITION ACHIEVED FROM CONVENTIONAL SOURCES DURING 2017-22

During period, 2017-22 capacity totaling to 30667.91MW from conventional sources has been achieved as on 31.03.2022 comprising of 30562 MW of Coal, 105.91 MW of Gas, and 0 MW of Nuclear. This also includes projects totaling to 726.76 MW which were originally not scheduled for the period 2017-22 but have also been commissioned.

During the period 2017-22, the year wise capacity addition achieved from conventional sources is shown in **Table 2.2**.

Table 2.2
Year wise capacity addition achieved during 2017-22

(Figures in MW)

Year	Source	Thermal			Nuclear	Total
		Coal	Gas	Total		
2017-18	Centre	3670	0	3670	0	3670
	State	1260	0	1260	0	1260
	Private	3780	0	3780	0	3780
	Total	8710	0	8710	0	8710
2018-19	Centre	1960	0	1960	0	1960
	State	2780	69.755	2849.755	0	2849.755
	Private	972	0	972	0	972
	Total	5712	69.755	5781.755	0	5781.755
2019-20	Centre	3940	0	3940	0	3940
	State	2780	0	2780	0	2780
	Private	45*	0	45	0	45
	Total	6765	0	6765	0	6765
2020-21	Centre	4080	0	4080	0	4080
	State	810	36.15	846.15	0	846.15
	Private	0	0	0	0	0
	Total	4890	36.15	4926.15	0	4926.15
2021-22	Centre	2370	0	2370	0	2370
	State	1590	0	1590	0	1590
	Private	525	0	525	0	525
	Total	4485	0	4485	0	4485

*: NIWARI TPP, UNIT-2 (45 MW) HAD ACHIEVED COD ON 20.03.17 BUT THE INTIMATION REGARDING COD WAS RECEIVED IN JUNE'19. THEREFORE, THE PROJECT HAS TAKEN INTO CAPACITY ADDITION ON 06.06.2019 AFTER APPROVAL OF CHAIRPERSON, CEA

During the period 2017-22, sector wise and type wise capacity addition sector wise achieved from conventional sources is shown in **Table 2.3** and shown in **Exhibit 2.3** and **Exhibit 2.4**.

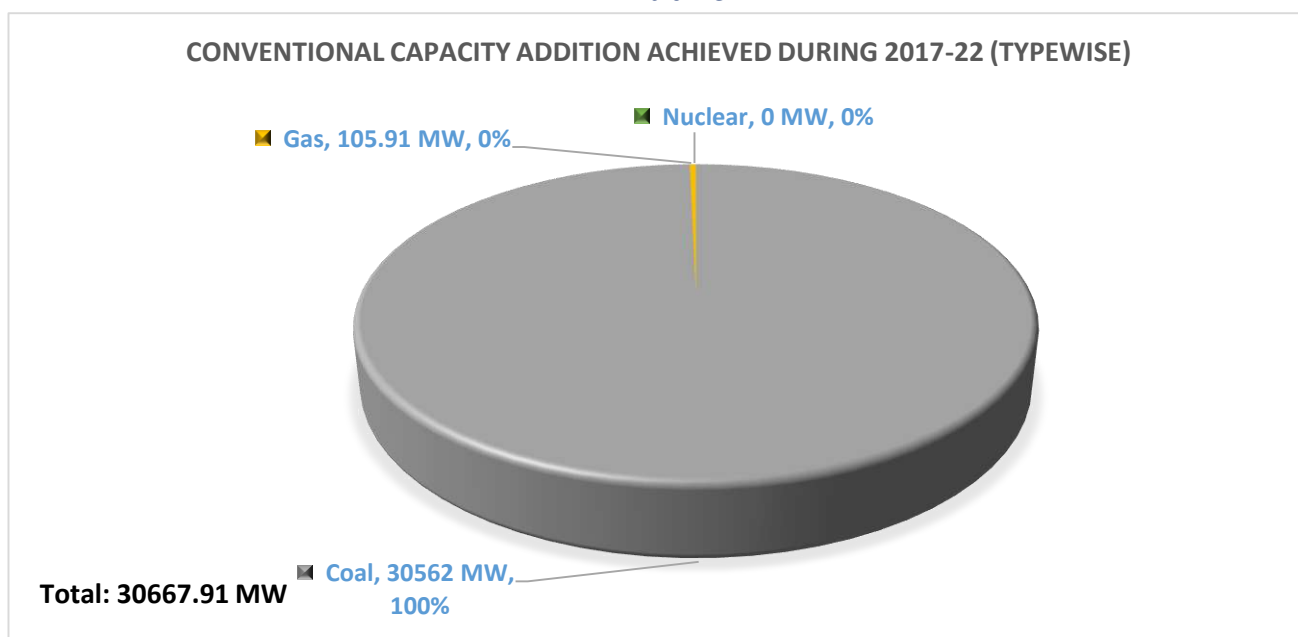
Table 2.3
Capacity addition achieved during 2017-22

(Figures in MW)

Source	Thermal			Nuclear	Total
	Coal	Gas	Total		
Central	16020	0	16020	0	16020
State	9220	105.91	9325.91	0	9325.91
Private	5322*	0	5322	0	5322
Total	30562	105.91	30667.91	0	30667.91

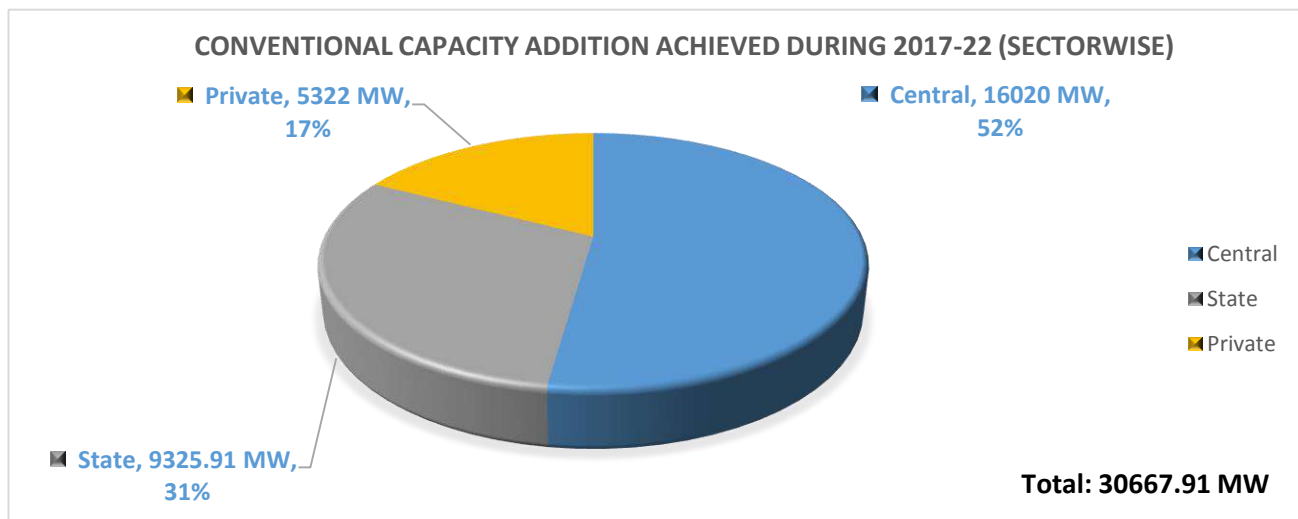
*: NIWARI TPP, UNIT-2 (45 MW) HAD ACHIEVED COD ON 20.03.17 BUT THE INTIMATION REGARDING COD WAS RECEIVED IN JUNE'19. THEREFORE, THE PROJECT HAS TAKEN INTO CAPACITY ADDITION ON 06.06.2019 AFTER APPROVAL OF CHAIRPERSON, CEA

Exhibit 2.3



* Large Hydro considered in RES

Exhibit 2.4



The State wise (Conventional Sources) summary of the capacity added during period 2017-22 is given in **Annexure 2.1** and the list of the commissioned conventional sources projects is given in **Annexure 2.2**.

Out of scheduled generation capacity addition of 51561.15MW to be achieved during the period 2017-22, generation capacity addition totaling to 30667.91 MW is achieved AS ON 31.03.2022, which includes 726.76 MW projects which were not envisaged in NEP,2018. Projects totaling to 21620 MW have slipped on account of various reasons viz. delay in placement of order for main plant, slow progress of civil works, poor geology, legal issues, Covid-19 pandemic etc.

A summary of the total capacity addition during period 2017-22 is given in **Table 2.4**.

Table 2.4
Summary of generation capacity addition during period 2017-22

(Figures in MW)

A	Scheduled Capacity Addition during period 2017-22	51561.15
B	Capacity addition achieved as per schedule (51561.15MW)	29941.15
C	Additional Capacity commissioned which were not envisaged in NEP, 2018	726.76
D	Total Generation Capacity Addition as per the schedule	30667.91
H	Capacity slipped from the scheduled capacity addition during period 2017-22	21620

Out of Scheduled capacity addition of 51561.15MW, a capacity of 21620 MW (41.93% of the target) has slipped during the period. Sector wise and mode wise details of capacity slipped are shown in **Table 2.5**.

Table 2.5
Summary of capacity Slipped during period 2017-22

Sector	Centre	State	Private	Total
Nuclear	3300	0	0	3300
Coal	7380	8990	1950	18320
Total	10680	8990	1950	21620

List of slipped Nuclear and Coal plants which were envisaged to be commissioned in National Electricity Plan, 2018 is mentioned along with the detail of reason of delays in **Annexure 2.3**.

2.3 CAPACITY CONSIDERED FOR RETIREMENT DURING PERIOD 2017-22

Scheduled retirement as per National Electricity Plan 2018, was 22690.5 MW, out of which coal-based capacity of 5,901.5 MW were considered for retirement due to old age and 16,789 MW (101 units) (as on August, 2017) due to not having sufficient space for installation of FGD to control SOx emissions were identified.

Capacity totaling to 10044.295 MW for period (2017-22) have been retired. This includes retired coal and gas-based capacity totaling to 2695.295 MW, which were not envisaged to retire during the period 2017-22.

A summary of the total capacity retired during period 2017-22 is given in **Table 2.6**.

Table 2.6
Summary of Capacity Retired during period 2017-22
(Figures in MW)

A	Scheduled Retirement during the period 2017-22	22690.5
B	Capacity Retired due to Old Age Criteria during period 2017-22 against 5901.5 MW envisaged in NEP 18	4589
C	Capacity retired due to New Environmental Norms during period 2017-22 against 16789MW envisaged in NEP 18	2760
D	Additional Capacity retired during period 2017-22 outside the retired capacity envisaged in NEP 18	2695.295
E	Total Capacity retired during period 2017-22 (B+C+D)	10044.295
F	Capacity which did not retired but was scheduled for Retirement as per Old Age Criteria during period 2017-22(5901.5 MW-B)	1312.5
G	Capacity which did not retired but was scheduled for Retirement due to New Environmental Norms during period 2017-22(16789MW-C)	14029

List of plants retired during period 2017-22 is given in **Annexure 2.4**.

List of plants which were envisaged to get retired in National Electricity Plan, 2018 but do not get retired during period 2017-22 is attached in **Annexure 2.5**.

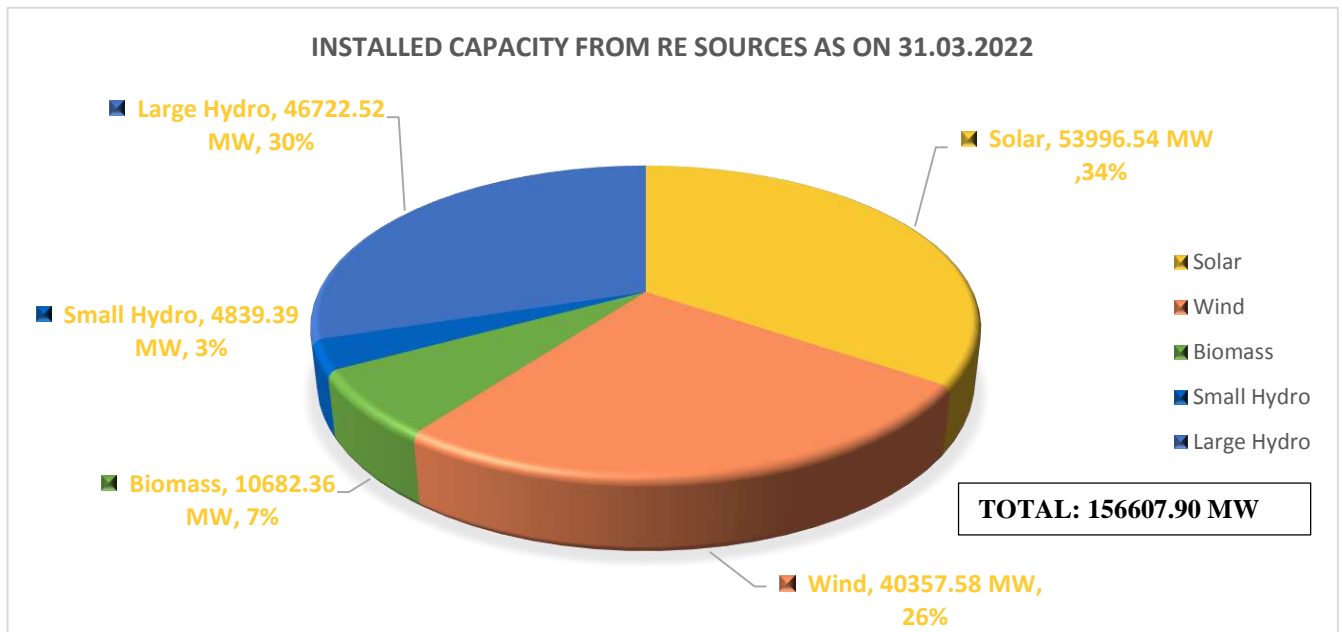
2.4 CAPACITY ADDITION FROM RENEWABLE ENERGY SOURCES DURING 2017-22

The installed capacity from renewable energy sources in the country is 156607.9 MW including large hydro as on 31.03.2022. Source wise installed capacity of renewable energy sources is shown in **Table 2.7** and **Exhibit 2.5**.

Table 2.7
Installed capacity of Renewable energy sources as on 31-03-2022
(Figures in MW)

Source	Capacity
Large Hydro (including PSP)	46722.52
Solar	53996.54
Wind	40357.58
Biomass & Waste to Energy	10682.36
Small Hydro	4848.9
Total	156607.90

Exhibit 2.5



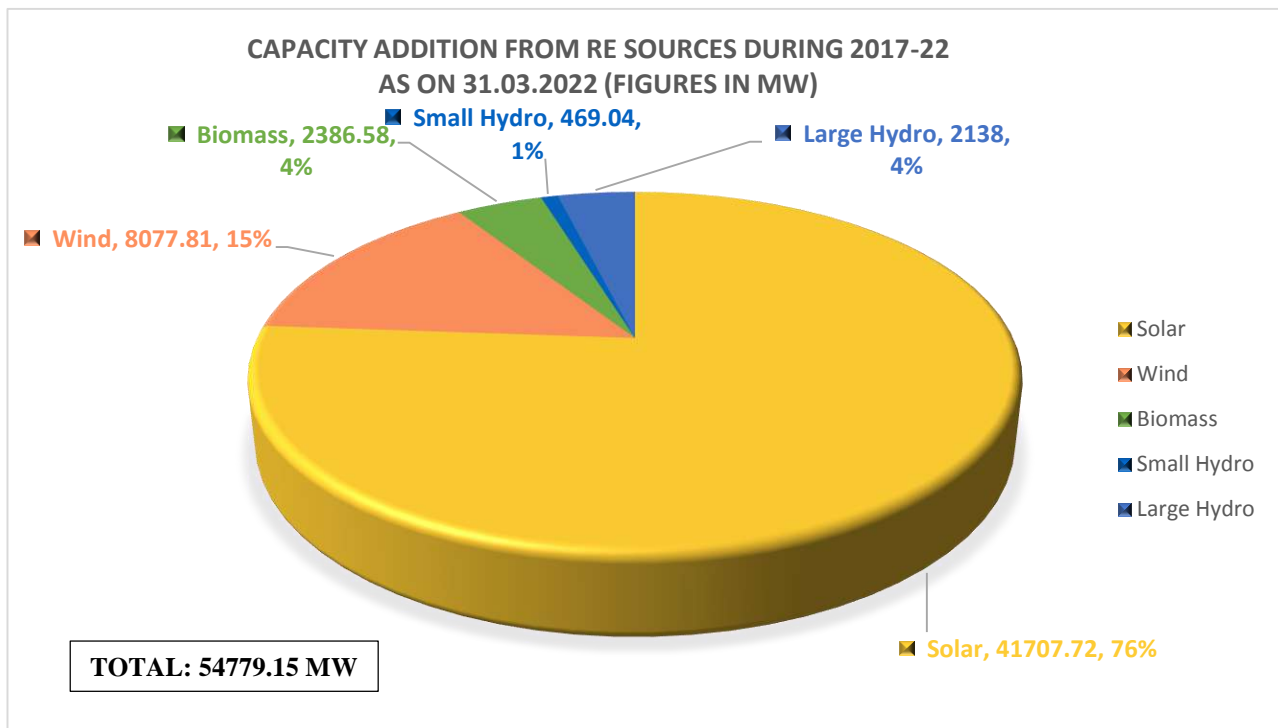
As on 31.03.2022, a capacity addition of 54,779.15 MW from renewable energy sources including large hydro has been achieved during the period 2017-2022. The details of capacity added source wise during 2017-22 is given in **Table 2.8** and **Exhibit 2.6**.

Table 2.8
Capacity addition from Renewable Energy Sources during 2017-22
As on 31.03.2022

(Figures in MW)

Source	Capacity
Large Hydro (including PSP)	2138
Solar	41707.72
Wind	8077.81
Biomass & Waste to Energy	2386.58
Small Hydro	469.04
Total	54779.15

Exhibit 2.6



During period, 2017-22 capacity totaling to 2138 MW from Large Hydro sources has been achieved as on 31.03.2022 comprising of 1100MW of Central Sector, 341 MW of State Sector and 697 MW of Private Sector. This also includes projects totaling to 100 MW which were at various stages of construction and originally not scheduled for the period 2017-22 but have also been commissioned. The list of the commissioned Large Hydro projects is given in **Annexure 2.2**.

Out of Scheduled capacity addition of 6839.5MW from Large Hydro Projects for period 2017-22, a capacity of 4801.50 MW is to be slipped during the period for the year 2017-22, comprising of 2884MW of Central Sector, 1775.5 MW of State Sector and 142 MW of Private Sector. List of slipped Large Hydro plants which were envisaged to be commissioned in National Electricity Plan, 2018 is mentioned along with the detail of reason of delays in **Annexure 2.4**.

2.5 MAJOR REASONS FOR SLIPPAGE OF PROJECTS DURING 2017-22

There are various reasons for slipping of plants during period 2017-22, with most important being the COVID-19 pandemic, which halted the construction activities during the strict lockdown conditions to arrest the pandemic. It has resulted into reduced revenue for companies due to weak demand, which left companies with less capacity for capital expenditure. The global supply chain also was disrupted which affected imports of various key components which resulted in delay of execution of the projects.

Broad Reasons for delay of projects for Hydro, Coal projects are mentioned below and reasons for delay for individual projects are attached in detail in **Annexure 2.4**.

Hydro Projects

- Delay in award of works
- Land Acquisition
- Environment and Forest issues
- Rehabilitation & Resettlement
- Natural Calamities
- Law & order problem & Local issues
- Contractual problems
- Geological uncertainties
- Difficult Terrain & Poor Accessibility
- Funds constraints with Contractor
- Force Majeure Risk
- Issues related to Quarry / Crushers Plants
- Inter-state issues
- Court / NGT / NCLT Cases.
- Teething trouble during commissioning

Thermal Projects

- Problems in acquisition of land for construction of power plant, ash dyke, raw water reservoir, corridor for pipelines, Railway siding etc. and Right of Way /Right of Use for raw water pipe line, ash slurry disposal pipelines and transmission lines etc.
- Local agitations including aspects such as R&R issues, labor disputes and law and order problems. Further, ethnic violence in some specific regions has also resulted in long interruptions at work site.
- Delay in timely availability of railway transport system and healthiness/load carrying capacity of road transport system for smooth transportation of equipment and fuel to the plant site.
- Change in State policies viz. in respect of sand mining, extraction of ground water etc. during plant construction period.
- Issues in timely availability of startup power at site.
- Issues in timely completion of power evacuation system and capacity of transmission system to evacuate full power generated at the plant.
- Shortage of Natural Gas
- Cost overruns on account of delay in timely completion of power projects
- Issues in availability of adequate finances from banks and financial institutions for completion of projects leading to cost overruns/increased cost of the plant.
- Poor performance of main contractor and sub-vendors including BoP sub-vendors for various reasons/issues involved.
- Contractual disputes resulting in termination of contract and re-tendering etc. resulting in project delays and cost overrun.
- Natural calamities and extreme weather conditions including heavy rains, cyclones etc., specifically in coastal areas.
- Not signing of long term PPA with DISCOMs and non-fulfillment of PPA conditions by the project developers. In some cases, even no PPA is available for sale of power from the power plant.

- Delay in availability of Consent to Establish, Consent to Operate (CTO) from respective State Governments.
- Court / NGT / NCLT Cases.

2.6 CONCLUSIONS

- During the period 2017-22, the capacity addition achieved from conventional sources is 30,667.91 MW.
- During the period 2017-22 as on 31.03.2022 the capacity addition from RE sources is 54,779.15 MW including large hydro.
- There has been considerable slippage in the Coal, Hydro and Nuclear capacity addition envisaged during the period 2017-22 with COVID-19 being the major reason resulting in delay.

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Annexure 2.1

**STATE-WISE SECTOR-WISE CAPACITY FROM CONVENTIONAL SOURCES COMMISSIONED DURING
2017-22**

(Figures in MW)

S.NO	STATE	CENTRAL	STATE	PRIVATE	TOTAL
1	DELHI	0	0	0	0.00
2	HARYANA	0	0	0	0.00
3	HIMACHAL PRADESH	0	0	0	0.00
4	JAMMU & KASHMIR	0	0	0	0.00
5	PUNJAB	0	0	0	0.00
6	RAJASTHAN	0	2640	0	2640.00
7	UTTAR PRADESH	2640	660	660	3960.00
8	UTTARAKHAND	0	0	0	0.00
9	CHANDIGARH	0	0	0	0.00
SUB TOTAL NR		2640	3300	660	6600.00
10	CHHATTISGARH	1600	0	2220	3820.00
11	GUJARAT	0	800	0	800.00
12	MAHARASHTRA	1320	0	960	2280.00
13	MADHYA PRADESH*	2920	1320	645*	4885.00
14	GOA	0	0	0	0.00
15	DAMAN & DIU	0	0	0	0.00
16	DADRA & NAGAR HAVELI	0	0	0	0.00
SUB TOTAL WR		5840	2120	3825	11785.00
17	ANDHRA PRADESH	0	510	0	510.00
18	TELANGANA	0	1970	0	1970.00
19	KARNATAKA	800	0	0	800.00
20	KERALA	0	0	0	0.00
21	TAMIL NADU	1000	0	525	1525.00
22	PUDUCHERRY	0	0	0	0.00
SUB TOTAL SR		1800	2480	525	4805.00
23	BIHAR	3890	0	0	3890.00
24	JHARKHAND	0	0	0	0.00
25	ODISHA	1600	1320	0	2920.00
26	SIKKIM	0	0	0	0.00
27	WEST BENGAL	0	0	312	312.00
SUB TOTAL ER		5490	1320	312	7122.00
28	ARUNACHAL PRADESH	0	0	0	0.00
29	ASSAM	250	105.91	0	355.91
30	MANIPUR	0	0	0	0.00
31	MIZORAM	0	0	0	0.00
32	MEGHALAYA	0	0	0	0.00
33	NAGALAND	0	0	0	0.00

34	TRIPURA	0	0	0	0.00
SUB TOTAL NER		250	105.91	0	355.91
35	ANDMAN & NICOBAR	0	0	0	0.00
36	LAKSHDWEEP	0	0	0	0.00
ALL INDIA TOTAL		15360	8395.91	5322	30667.91

*: NIWARI TPP, UNIT-2 (45 MW) HAD ACHIEVED COD ON 20.03.17 BUT THE INTIMATION REGARDING COD WAS RECEIVED IN JUNE'19. THEREFORE, THE PROJECT HAS TAKEN INTO CAPACITY ADDITION ON 06.06.2019 AFTER APPROVAL OF CHAIRPERSON, CEA

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