

2021 WITNESSES THE LARGEST EVER INCREASE IN GLOBAL ELECTRICITY DEMAND

- **12.5% Increase in CO₂ emission from Electricity Generation in India in 2021**
- **Coal will continue to provide major portion of Electricity Generation in India in this decade also**

Prepared by : K Asokan, Director, InSDES

International Energy Agency (IEA) in its recently published document “Electricity Market Report” has said that Global Electricity Demand grew by 6% in 2021. It is the largest ever annual increase in absolute terms (1540 Twh) and the largest percentage rise since 2010 after the financial crisis. According to the report the electricity demand was boosted by a rapid economic recovery combined with more extreme weather conditions than in 2020. The Industrial sector contributed the most to the demand growth, followed by Commercial sector. The report further added that Coal fired Electricity Generation reached an all time peak, growing by 9% the fastest since 2011. CO₂ emissions from electricity generation rose by 7%, a record high. Gas fired generation grew by 2%, Nuclear power generation increased by 3.5% and Renewable generation grew by 6%.

As per the report, around half of the global growth took place in China. China's demand increased by 10% . In India also, the electricity demand grew by an estimated 10%. In US and Europe demand in 2021 recovered to reach the level before the pandemic in 2019.

In this report IEA points out that today's policy settings are insufficient to cut emissions. Massive changes are needed in terms of energy efficiency and low carbon supply for the electricity sector to fulfil its critical role in decarbonising the energy system.

12.25% Increase in CO₂ emission from Electricity Generation in India

Analysis of data available in the website of POSOCO shows that electricity requirement in India increased by 9.74% in 2021 compared to 2020. The increase in absolute terms is 118.908 BU. India's Peak Electricity Demand touched the all time high mark of 200570 MW on 7th July 2021. This is 9.7% higher than last year's 182888 MW. Due to the Coal shortage India experienced

Power supply shortages in September and October 2021. Several states resorted to power cut and load shedding to tide over the situation.

IEA in its Electricity Market Report has pointed out the following reasons for the Coal shortage in India:

1. Rapidly growing demand and interruption to Coal supply, both domestic and International
2. Coal stock at power plants was not adequately built up before monsoon season. This resulted in extremely low stocks, with more than 80% of India's Coal fired power plants reaching critical levels in October, with less than a week of coal supply remaining.
3. Heavy monsoon period affected both the operation of local mines and transport of coal to power plants.

Generation from Coal / Lignite fired plants increased by 13.45% (121.802 BU), Gas fired generation decreased by 26.8% (13.186 BU), Nuclear generation increased by 0.3% (0.109 BU) and Renewable generation increased by 5.1% (15.185 BU). Total generation from combustion of fossil fuels increased by 11.4% (108.616 BU) in 2021 compared to that of 2020. As a result, CO₂ emission from electricity generation increased by 12.25% in 2021.

Total Electricity generation in India during 2021 was 1413.401 BU. Generation from Coal / Lignite plants was 1027.28 BU (72.7%) and that from Gas fired plants was 36.031 BU (2.5%). Nuclear plants supplied 39.711 BU (2.8%) and electricity generation from Renewable Sources including Hydro was 310.4 BU (22%). The share of generation from fossil fuel sources was 75.2% and that from non-fossil fuel based sources was 24.8% during the year 2021.

In the climate summit at Glasgow (COP 26) held during November 2021 our Prime Minister Sri Narendra Modi declared a five fold strategy termed as Panchamrita. These five points are :

1. India's non-fossil energy capacity will reach 500GW by 2030.
2. The country will meet 50% of its electricity requirements with Renewable Energy by 2030.
3. It will reduce its total projected carbon emission by a Billion Tonne by 2030.
4. India will cut the carbon intensity of its economy to less than 45%.
5. Country will achieve Net Zero emission by 2070.

In India 40-45% of the total CO₂ emission are from Power sector. This is because of the fact that more than 75% of the Electricity generation in our Country is done by combustion of fossil fuels. In order to fulfil the above commitments the share of non-fossil based electricity generation in total electricity generation is to be increased considerably.

The total power generation installed capacity in India as on 31-12-2021 was 393.4 GW comprising of 235.2 GW (59.8%) fossil fuel and 158.2 GW (40.2%) non-fossil fuel based capacity. With this we were able to fulfil our commitments to achieve 40% electric power installed capacity from non-fossil sources as per the Intended Nationally Determined Contribution (INDC) submitted to UNFCCC in October 2015, prior to the Paris Climate Summit (COP 21) in 2015. Even though we have achieved more than 40% share of non-fossil based capacity, the share of electricity generation from it was only 24.8% in 2021.

As per our commitment in COP26, we need to increase the present capacity of 158 GW of non-fossil based generation to 500 GW by 2030.

All India electricity generation installed capacity estimated as per the National Electricity Plan announced in January 2018 is 479.4 GW (comprising of 236.38 GW Non-fossil based stations) as on 31-03-2022 and 619 GW (comprising of 355.18 GW non-fossil based stations) as on 31-03-2027. In the report on Optimal Generation Capacity Mix for 2029-30 released by CEA in January 2020, the likely installed capacity by the end of 2029-30 is given as 817.25 GW of which the non-fossil fuel based capacity is 525.25 GW. So if everything goes as planned we will exceed the target of 500 GW non-fossil based electricity generation capacity by 31-03-2030. Regarding the target fixed for 31-03-2022, we were able to achieve 66.8% only as on 31-12-2021.

As per the CEA, report likely gross generation by 2029-30 is 2518 BU comprising of 1357.7 BU (54%) from Coal and Lignite and 35.4 BU (1.4%) from gas, 113 BU (4.5%) from Nuclear and 1011.9 BU (40.1%) from Renewables including Hydro.

The energy mix proposed by CEA for 2029-30 is not sufficient to fulfil the commitments of meeting 50% of our electricity requirement with Renewable Energy by 2030. The RES capacity estimated as per the CEA's

report by the end of 2029-30 is 506.3 GW. Minimum 650 GW of RES capacity is required for meeting 50% of Electricity needs by 2030. The present RE capacity is 151.4 GW only. So we need to add atleast 500 GW of RE capacity including Hydro within next eight years. Even though the share of electricity generation from Coal is likely to decrease from the present 74% to 54% in 2030, its quantum increases from 1027 BU to 1358 BU. This shows that Coal will continue to provide major portion of electricity generation in India in this decade also.

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Annexure

Table 1. Global Electricity Demand in Twh

	2019	2020	2021	Growth in 2020		Growth in 2021	
				Qty.	%	Qty.	%
World	25028	24904	26444	(-) 124	(-) 0.5	1540	6.2

Source : InSDES Compilation of data available in IEA Electricity Market Report Jan 2022 available at <https://www.iea.org/reports/electricity-market-report-january-2022>

Table 2. Global Electricity Generation in Twh and CO₂ emission in Million Tonne

Source	2019	2020	2021	Growth Rate 2020	Growth Rate 2021
Nuclear	2790	2682	2777	(-) 3.9%	3.5%
Coal	9914	9520	10337	(-) 4%	8.6%
Gas	6346	6276	6410	(-) 1.1%	2.1%
Other Non-Renewables*	980	994	1023	1.4%	3%
Total Renewables	7015	7449	7913	6.2%	6.2%
Total Generation in Twh	27044	26921	28437	2.5%	5.7%
Total Emission in Million Tonne	12603	12192	13022	(-) 3.3%	6.8%

*Other Non Renewables includes Oil, Waste and other non renewable energy sources.

Source : InSDES Compilation of data available in IEA Electricity Market Report Jan 2022 available at <https://www.iea.org/reports/electricity-market-report-january-2022>

Table 3. Peak Demand & Electricity Requirement in India

	2019	2020	2021	Growth in 2020		Growth in 2021	
				Qty.	%	Qty.	%
Peak Demand in MW & Date on which it occurred	182610	182888	200570	278	0.15	17682	9.7
	30/05/19	30/12/20	07/07/21				
Requirement in BU	1294.8	1260.1	1379	(-) 34.7	(-) 2.7	118.9	9.4
MU / Day	3547.3	3442.92	3778.18	(-)104.38	(-)2.94	335.26	9.74

Source : InSDES Compilation of data available at <https://www.posoco.in/reports>

Table 4. Source wise Generation in India in BU and CO₂ emission in Million Tonne

Source	Generation in BU			CO ₂ emission in Million Tonne		
	2019	2020	2021	2019	2020	2021
Coal	922.641	880.122	1000.604	876.51	836.12	950.57
Lignite	29.314	25.356	26.676	37.52	32.46	34.15
Gas, Naphta & Diesel	44.695	49.217	36.031	22.35	24.61	18.01
Nuclear	37.246	39.602	39.711	--	--	--
Hydro	159.759	164.440	162.282	--	--	--
RES	124.902	130.754	148.097	--	--	--
Total	1318.557	1289.491	1413.401	936.4	893.2	1002.7

Source : InSDES Compilation of data available at <https://www.posoco.in/reports/daily-reports>

Table 5. All India Installed Capacity as on 31-12-2021 in MW

Source	MW	% Share
Coal	203189.5	51.65
Lignite	6620.0	1.68
Gas	24899.51	6.33
Diesel	509.71	0.13
Thermal Total	235218.72	59.79
Nuclear	6780	1.72
Hydro	46512.22	11.82
RES	104878.53	26.66
Grand Total	393389.46	

Source : InSDES Compilation of data available at <https://cea.nic.in/reports/monthly-reports/installed-capacity-reports>

Table 6. Estimated Installed Capacity as per National Electricity Plan 2018 & Optimal Generation Capacity Mix Report of CEA

Source	National Electricity Plan		As on 31.03.2030 (As per CEA Report)
	31.03.2022	31.03.2027	
Coal	2,17,302	2,38,150	2,66,911
Gas	25,735	25,735	25,080
Hydro	51,301	63,301	71,128 [*]
Nuclear	10,080	16,880	18,980
RES	1,75,000	2,75,000	4,35,155
Total	4,79,419	6,19,066	8,17,254

*Hydro including 10,151 MW Pumped Storage Plants

Source : InSDES Compilation of data available in National Electricity Plan 2018 and Report on Optimal Generation Mix for 2029-30 released by CEA in Jan. 2020

[https://cea.nic.in/wings/planning/Integrated resource Planning Division/Other Reports](https://cea.nic.in/wings/planning/Integrated%20resource%20Planning%20Division/Other%20Reports)

Table 7. Likely Generation in 2029-30 as per Optimal Generation Capacity Mix Report of CEA

Source	Generation in BU	Share %
Coal + Lignite	1357.7	54
Gas	35.4	1.4
Hydro + PSS	211.0	8.4
Nuclear	113.0	4.5
Wind	309.1	12.3
Solar	484.2	19.2
Biomass + SHP	7.2	0.3
Total	2517.6	

Source : InSDES Compilation of data available in National Electricity Plan 2018 and Report on Optimal Generation Mix for 2029-30 released by CEA in Jan. 2020

[https://cea.nic.in/wings/planning/Integrated resource Planning Division/Other Reports](https://cea.nic.in/wings/planning/Integrated%20resource%20Planning%20Division/Other%20Reports)