

India's Energy Overview

DECEMBER 2022



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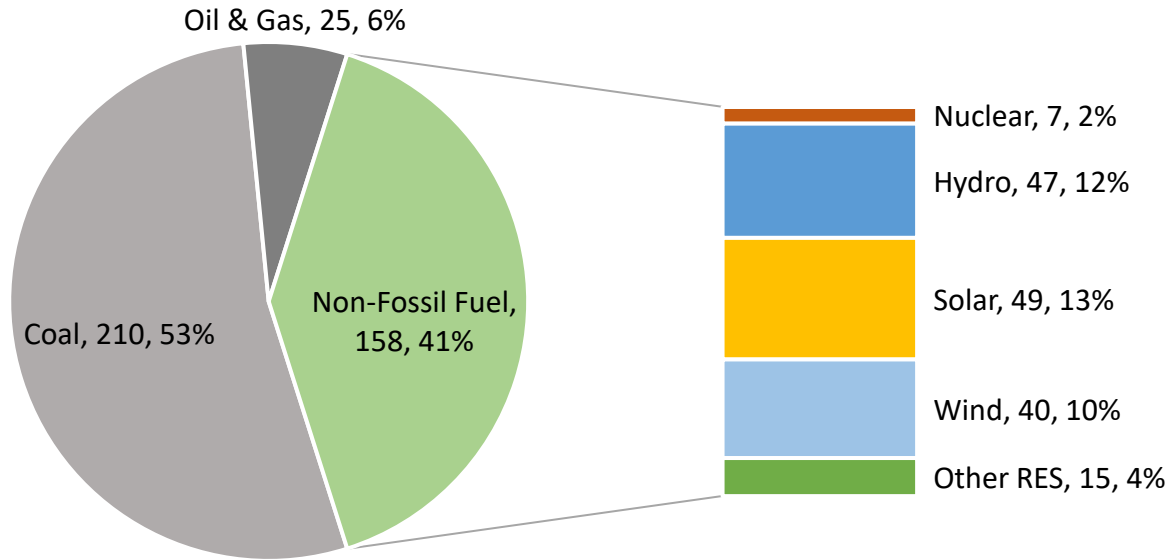


Key Highlights or Announcements of December 2022



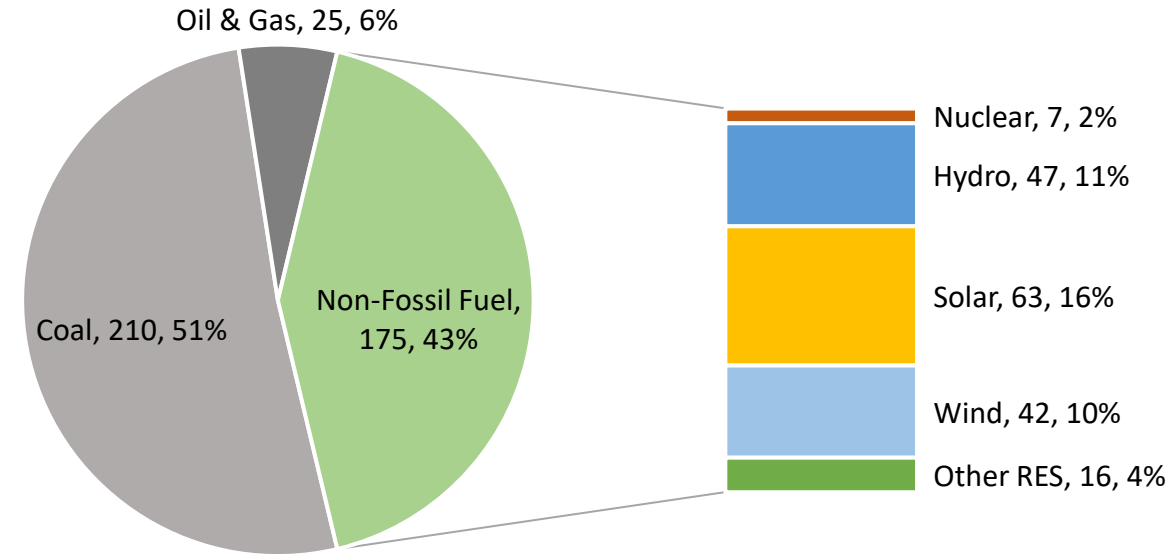
India's Electricity Capacity Mix (1/4)

December 2021



Total Capacity: 393 GW

December 2022



Total Capacity: 410 GW

*Capacity Numbers are in GW

- India added 18 GW of installed capacity in 2022. Out of this, 14 GW was alone contributed by Solar and another 2 GW by wind. This marks the highest RE capacity addition as compared to previous years.
- Currently (as on Dec-2022), the share of non-fossil-based electricity capacity is 43% against the set target of 50% non-fossil capacity by 2030.
- As on Dec-2022, India's renewable energy capacity (including large hydro) stood at 168 GW out of 410 GW.



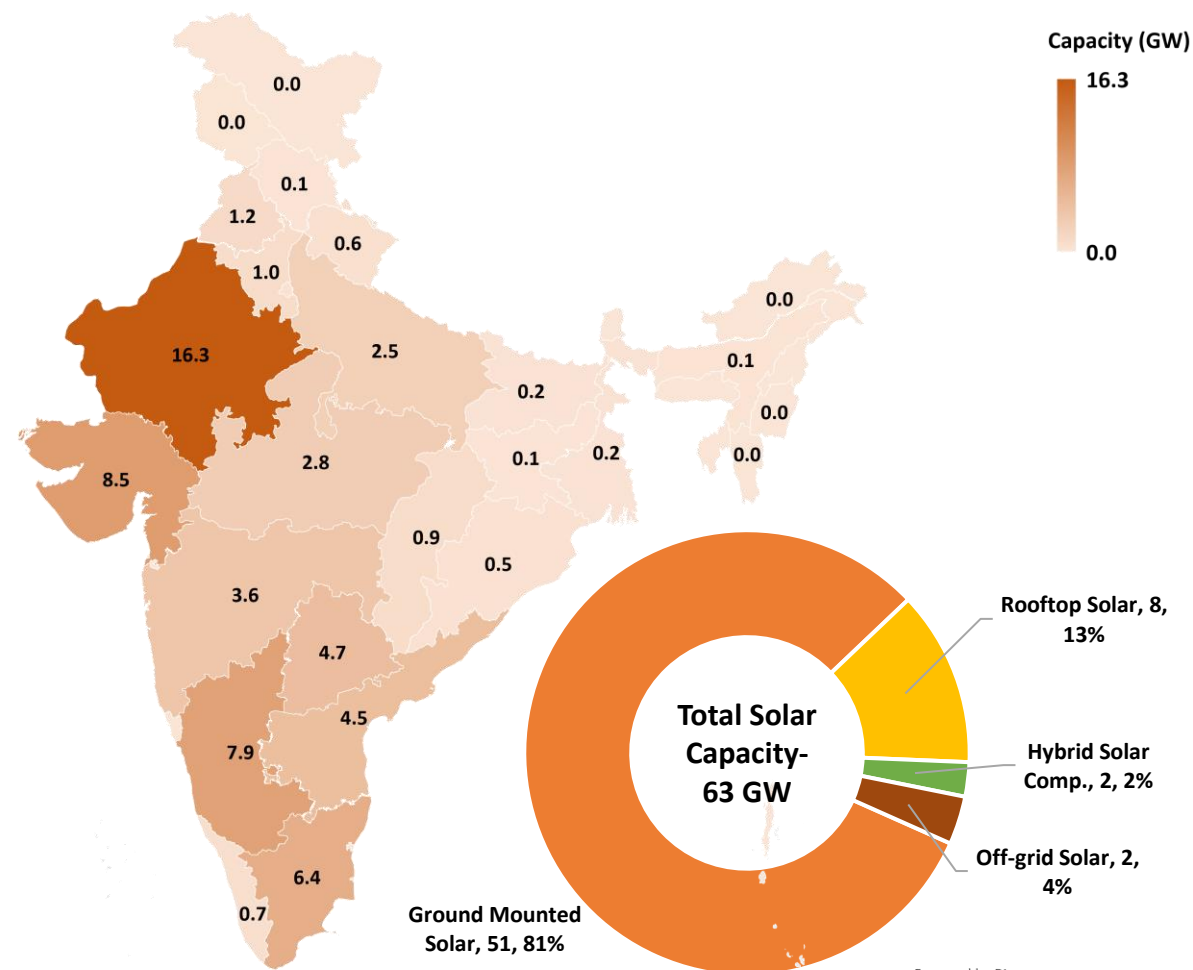
India's Electricity Capacity Mix (2/4)

State-wise Solar Installed Capacity as on December 2022

State-wise installed capacity of Solar Power

States	Ground Mounted	Rooftop	Solar Component in Hybrid	Off Grid	Total Solar Power
Rajasthan	13.40	0.84	1.58	0.52	16.34
Gujarat	6.25	2.21	0.00	0.05	8.50
Karnataka	7.45	0.40	0.00	0.03	7.89
Tamil Nadu	5.98	0.37	0.00	0.06	6.41
Telangana	4.36	0.28	0.00	0.01	4.65
Andhra Pradesh	4.27	0.16	0.00	0.09	4.52
Maharashtra	2.09	1.39	0.00	0.17	3.65
Madhya Pradesh	2.46	0.23	0.00	0.09	2.77
Uttar Pradesh	2.07	0.26	0.00	0.15	2.49
Punjab	0.83	0.24	0.00	0.08	1.15
Haryana	0.27	0.42	0.00	0.31	0.99
Chhattisgarh	0.51	0.05	0.00	0.39	0.94
Kerala	0.29	0.38	0.00	0.02	0.69
Uttarakhand	0.30	0.26	0.00	0.01	0.58
Others	0.89	0.59	0.00	0.25	1.73
All India	51.43	8.08	1.58	2.22	63.30

Solar Capacity as on December 2022 (in GW)



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Source: MNRE
GW: Giga Watt

Others include- Andaman & Nicobar, Arunachal Pradesh, Assam, Bihar, Chandigarh, Dadar & Nagar Haveli, Daman & Diu, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Ladakh, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Puducherry, Sikkim, Tripura, West Bengal, Others

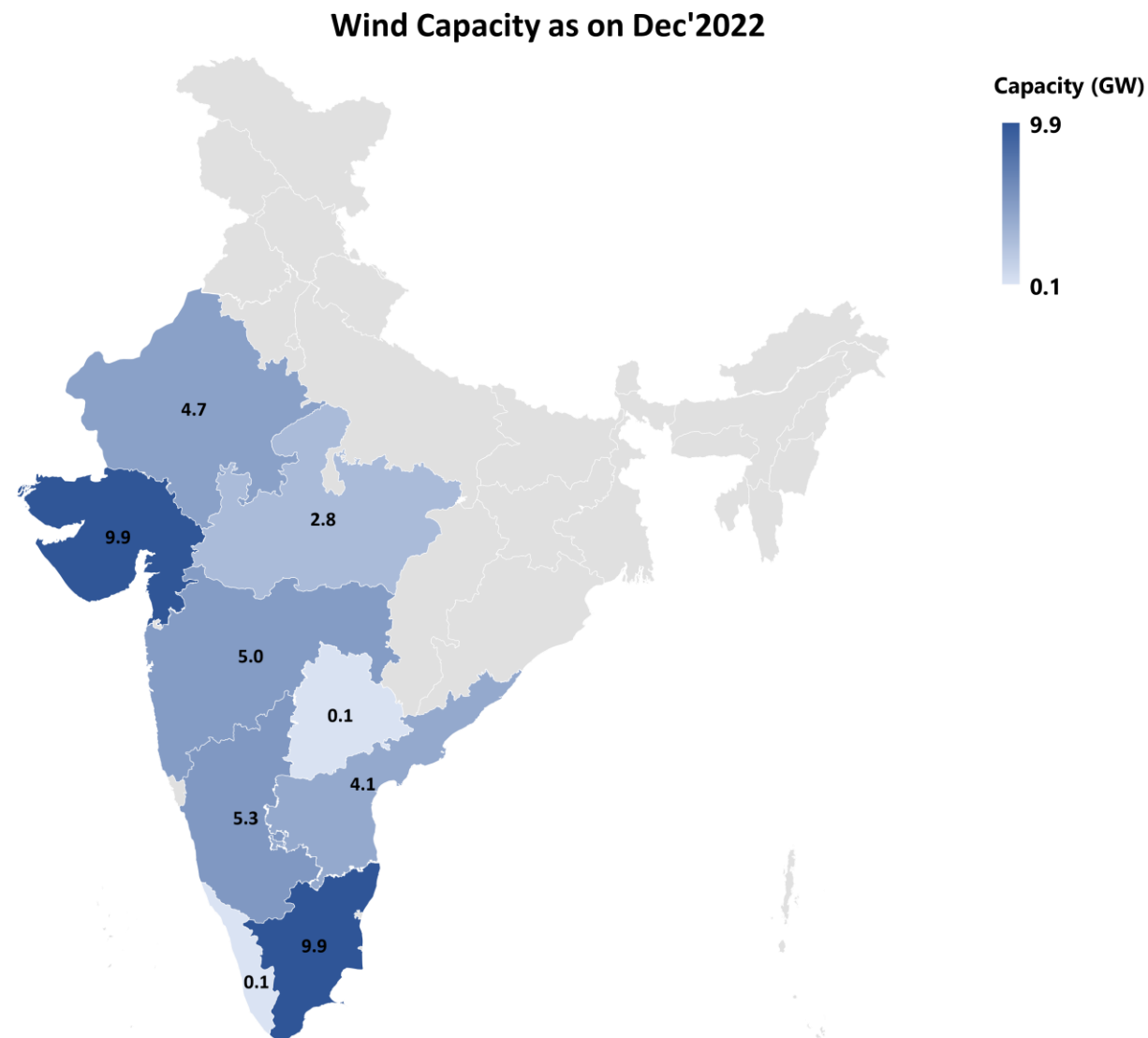




India's Electricity Capacity Mix (3/4)

State-wise Wind Installed Capacity as on December 2022

State-wise installed capacity of Wind Power	
States	Installed Capacity (GW)
Tamil Nadu	9.94
Gujarat	9.90
Karnataka	5.27
Maharashtra	5.01
Rajasthan	4.68
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
India Total	41.93

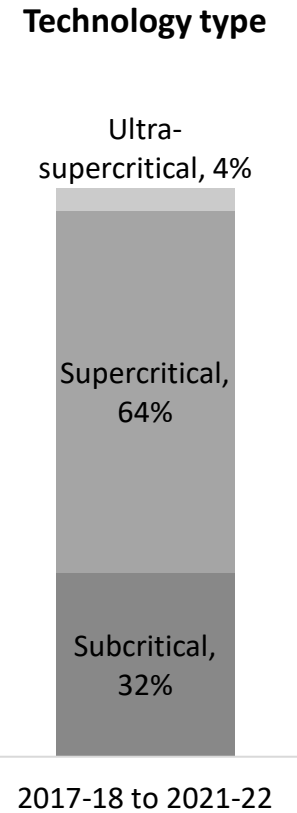
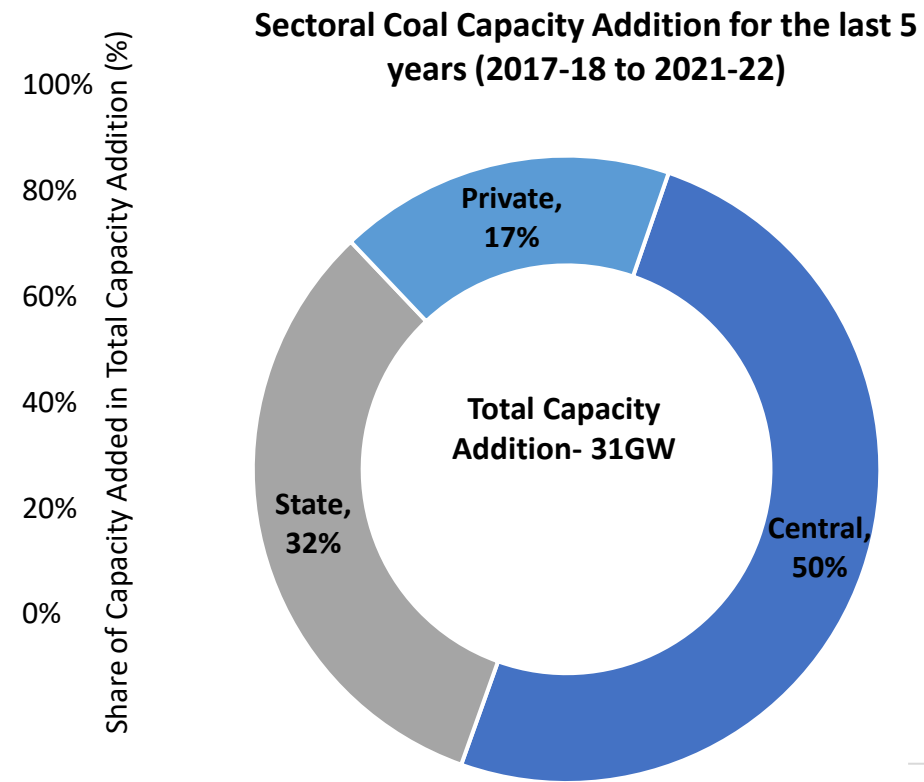
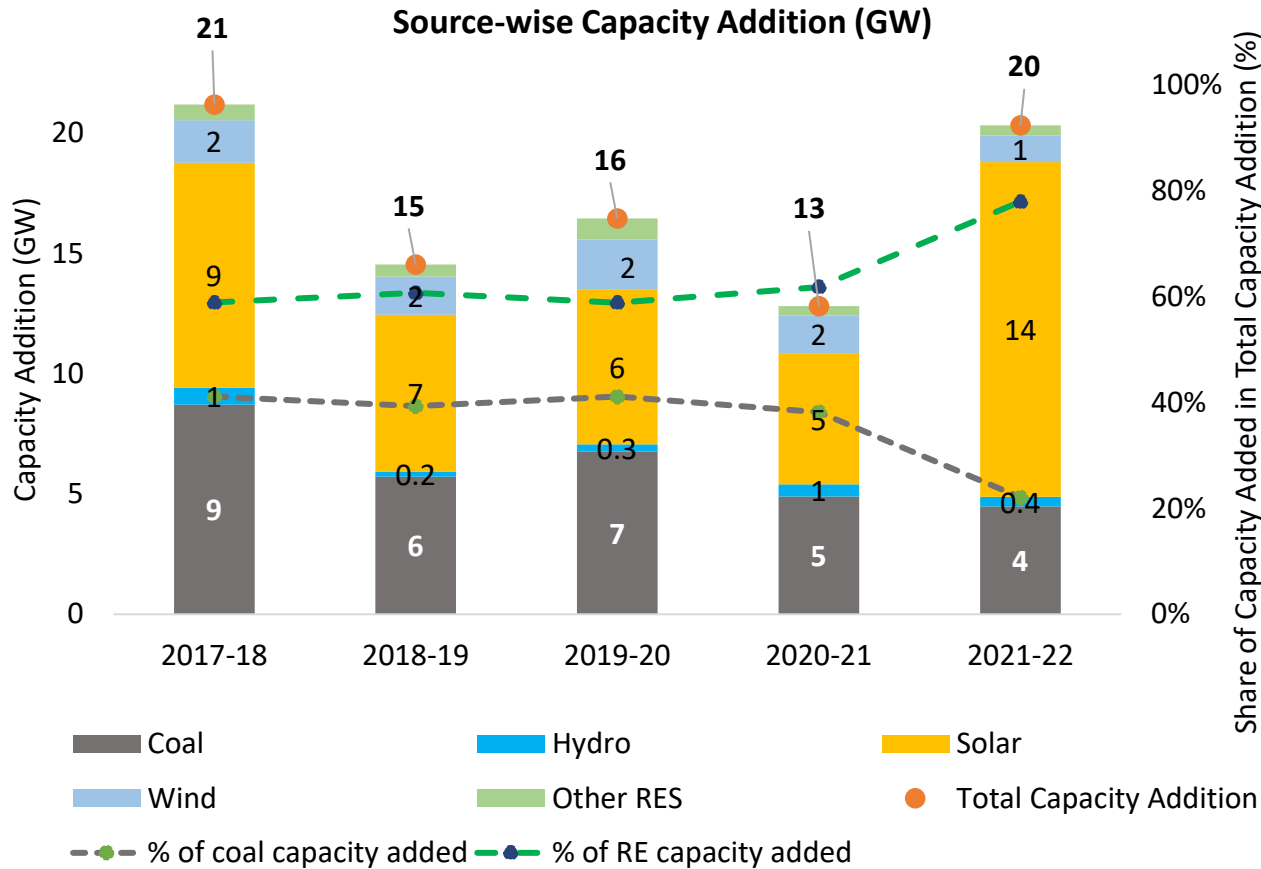


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India's Electricity Capacity Mix (4/4)

Source-wise Capacity Addition in the last 5 years



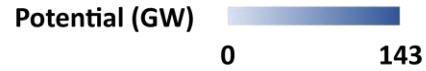
- A total of 55 GW of generation capacity has been added in RE (Hydro, solar, wind, and other) over the past 5 years, whereas the coal capacity addition during the same period was 31 GW, mostly in the central sector (50%).
- The share of RE addition in total capacity addition is increasing over the years (from 59% in 2017-18 to 78% in 2021-22).



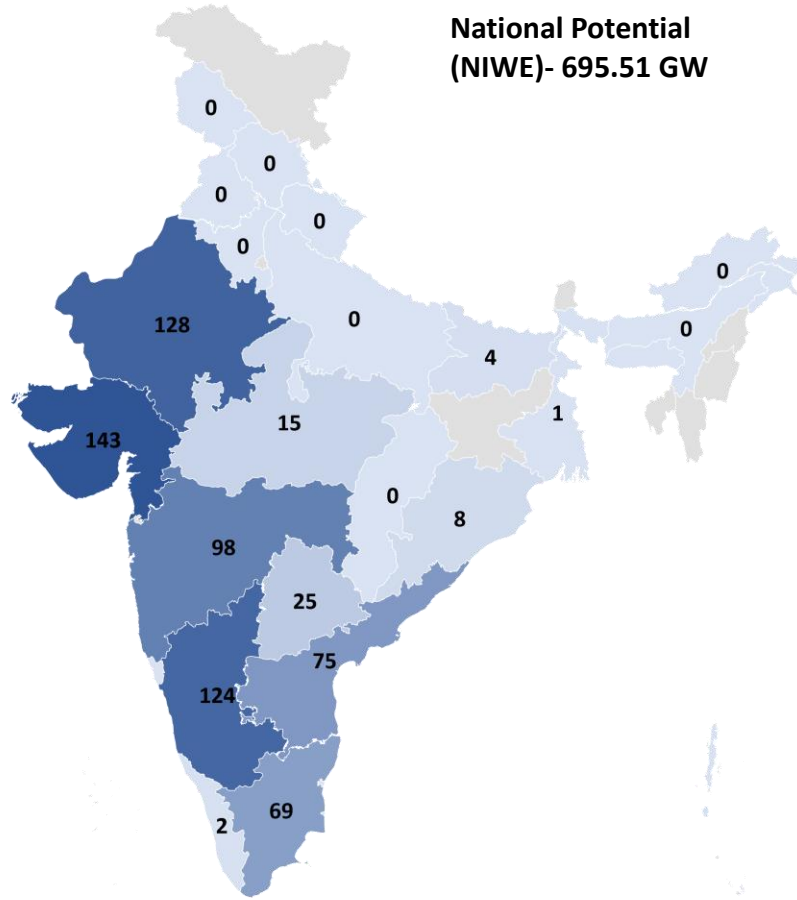
RE Potential and Installed Capacity (1/2)

RE potential in states as on December 2022

Wind Potential at 120m agl



National Potential (NIWE)- 695.51 GW

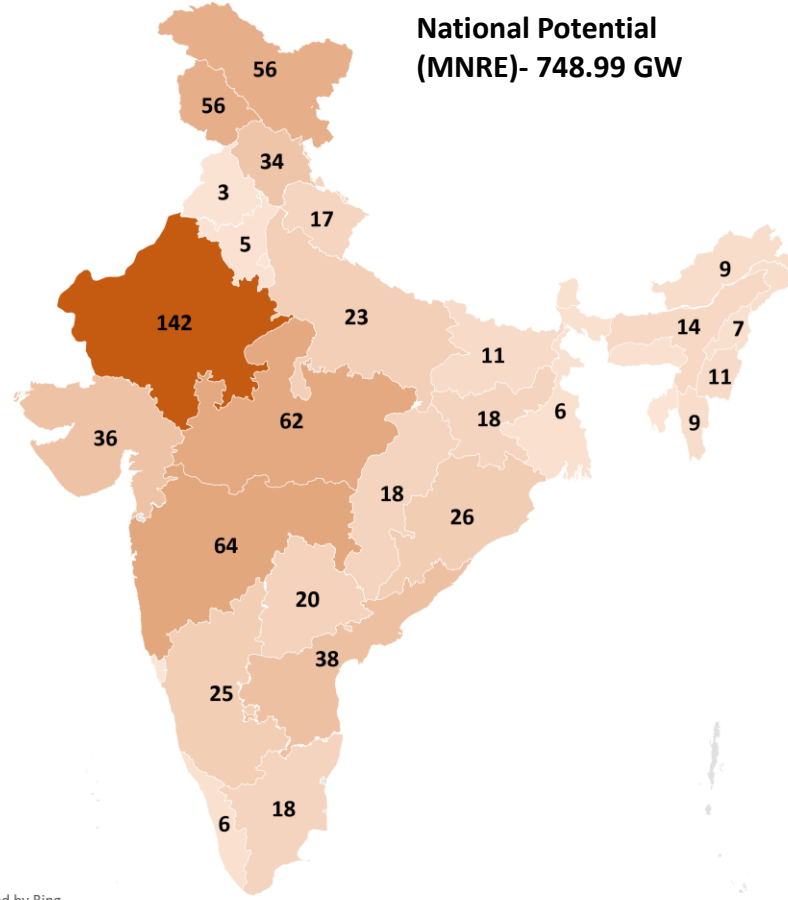


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Solar Potential

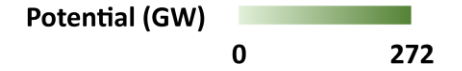


National Potential (MNRE)- 748.99 GW

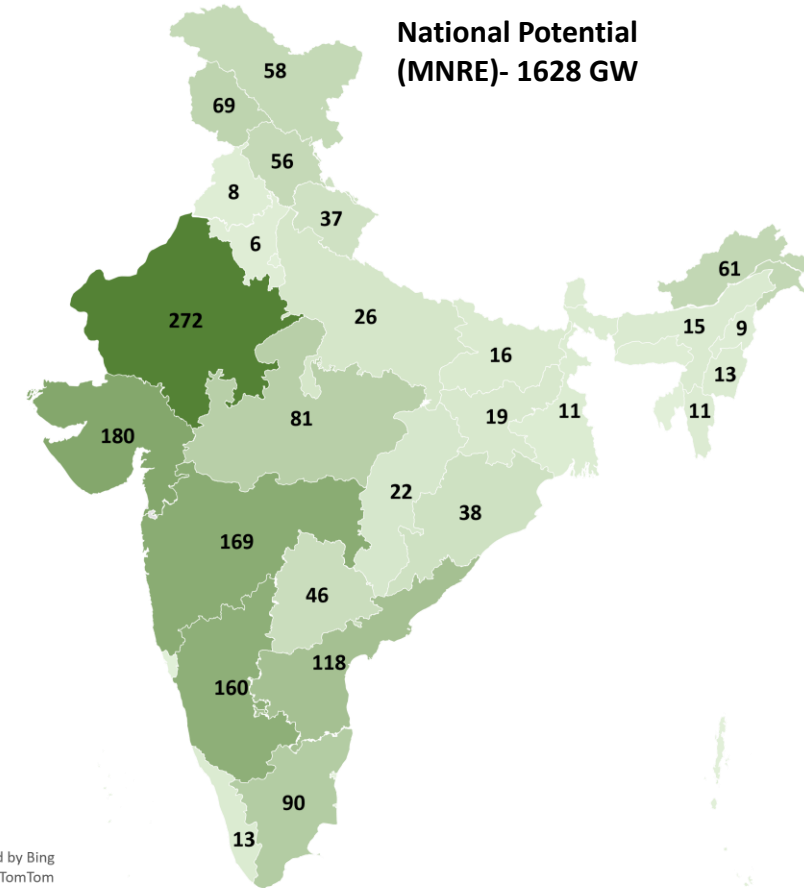


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Renewable Energy Potential (all sources including large Hydro)



National Potential (MNRE)- 1628 GW



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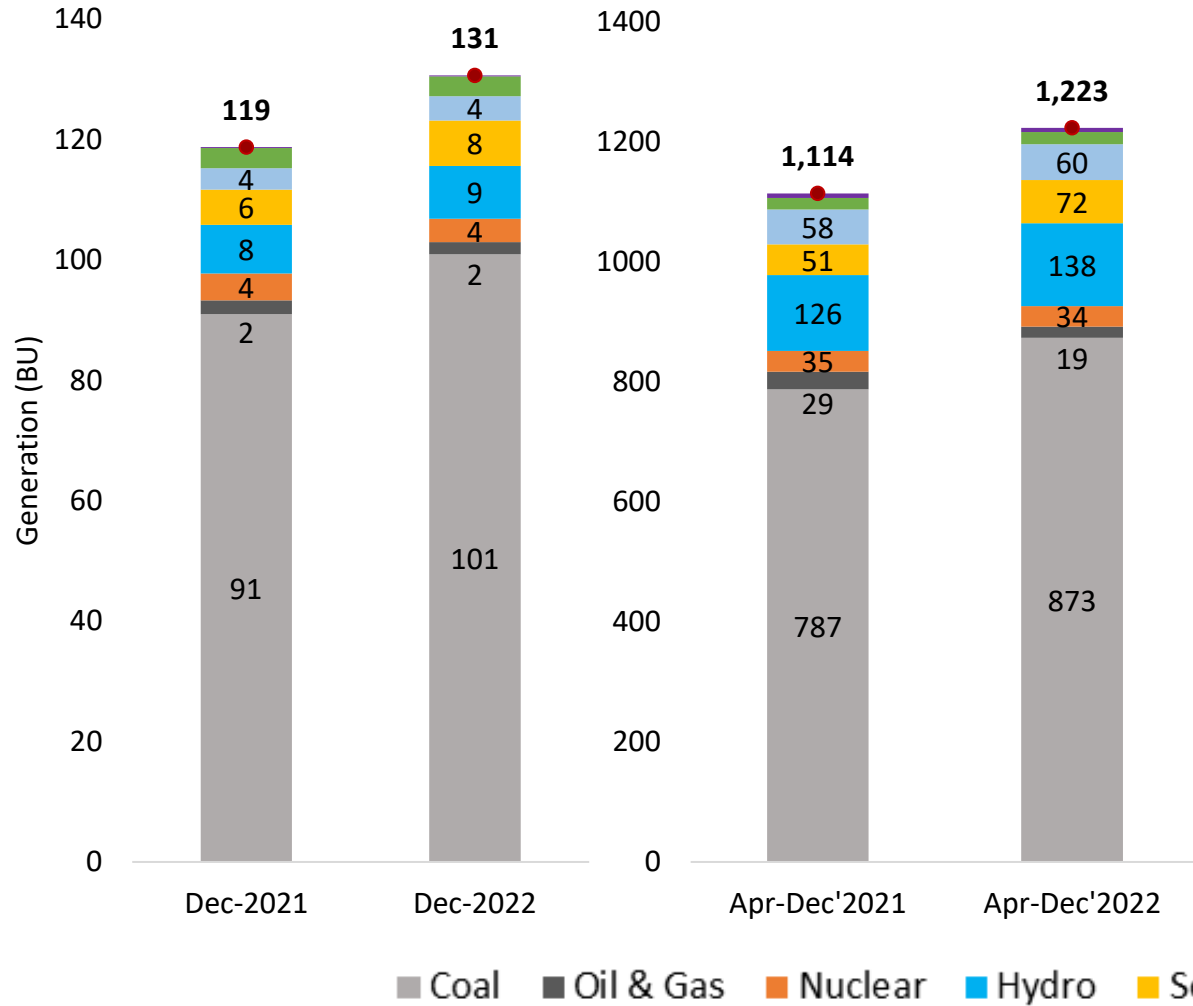


Source: Vasudha Analysis
Note: 1. Renewable Energy includes solar, wind, biopower, small-hydro, and hydro.
2. In the Wind map, the blank states show that they don't have any wind potential.

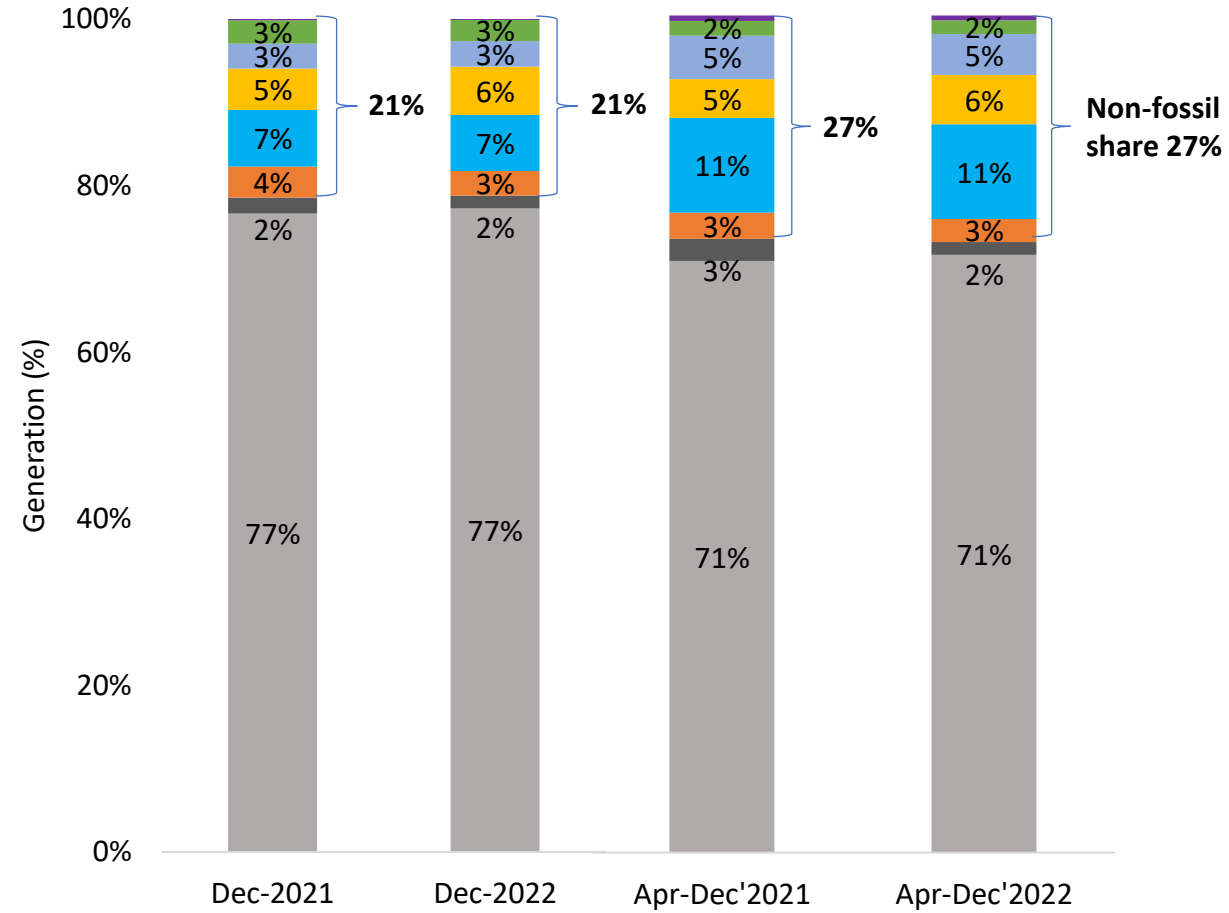


India's Electricity Generation Mix (1/2)

Source-wise Generation Mix (BU)



Source-wise Generation Mix (%)

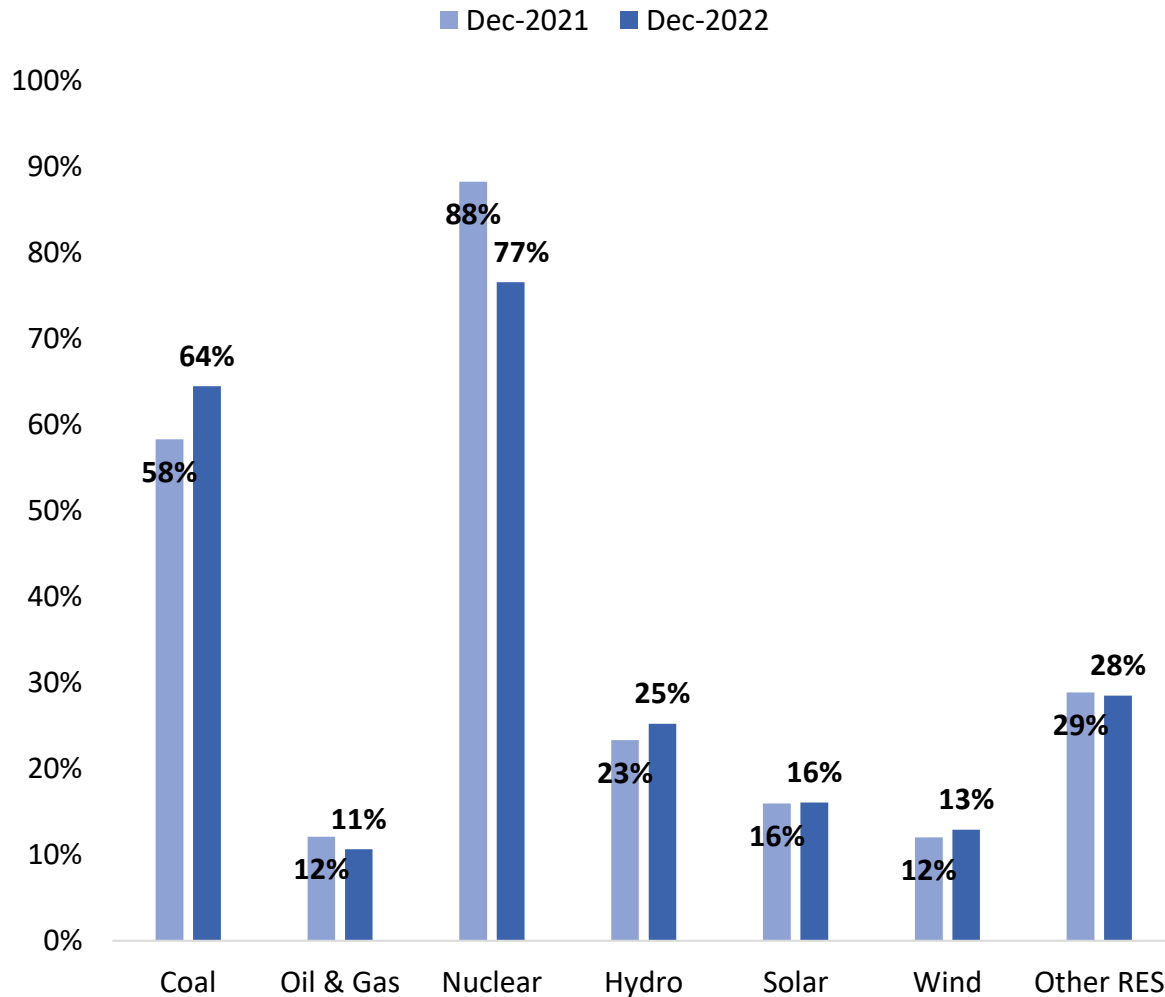


Source: CEA
 BU- Billion Units
 Note: Dec-2022 numbers are provisional.

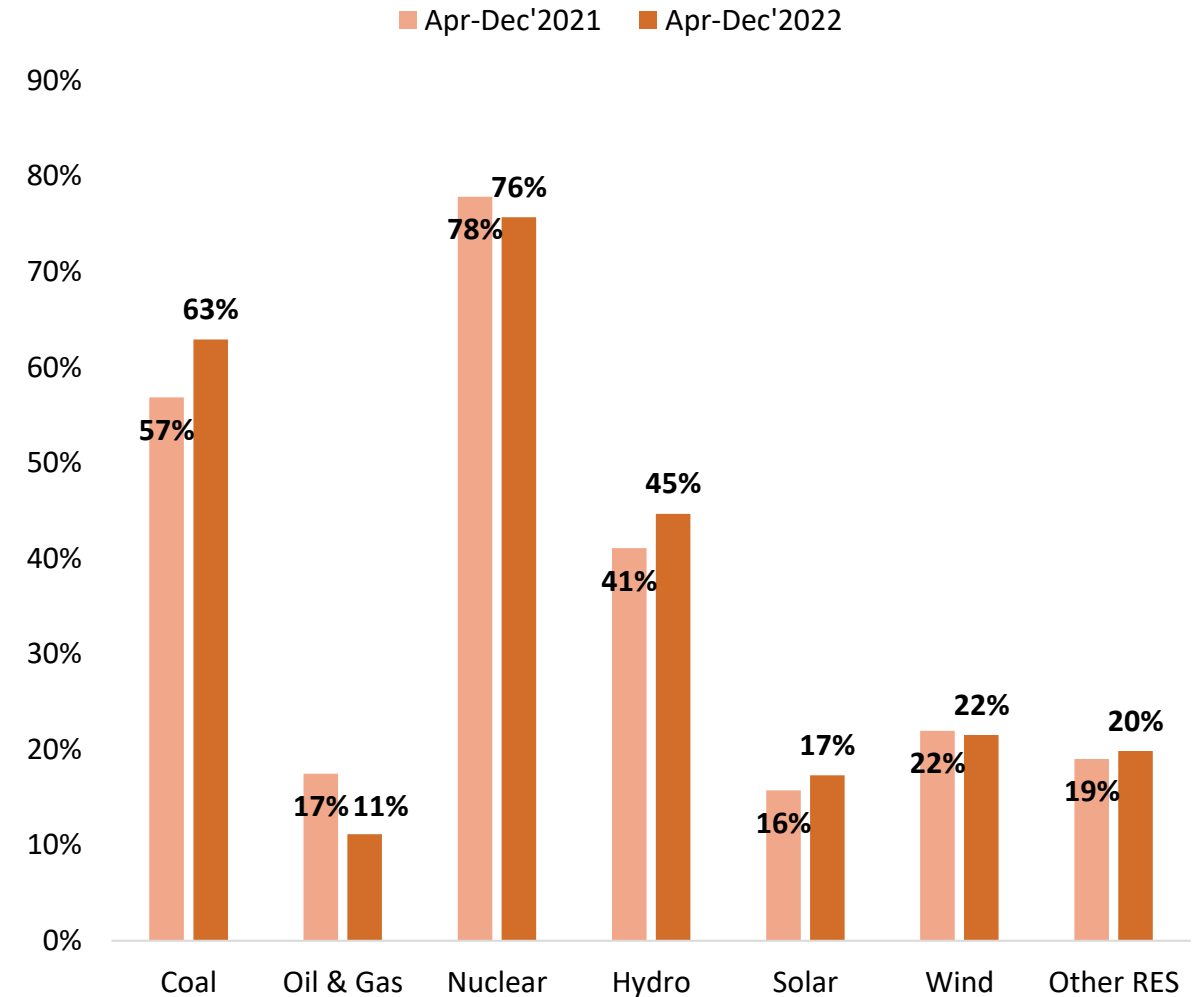


India's Electricity Generation Mix (2/2)

Source-wise Monthly PLF/CUF



Source-wise PLF/ CUF in Apr-Dec



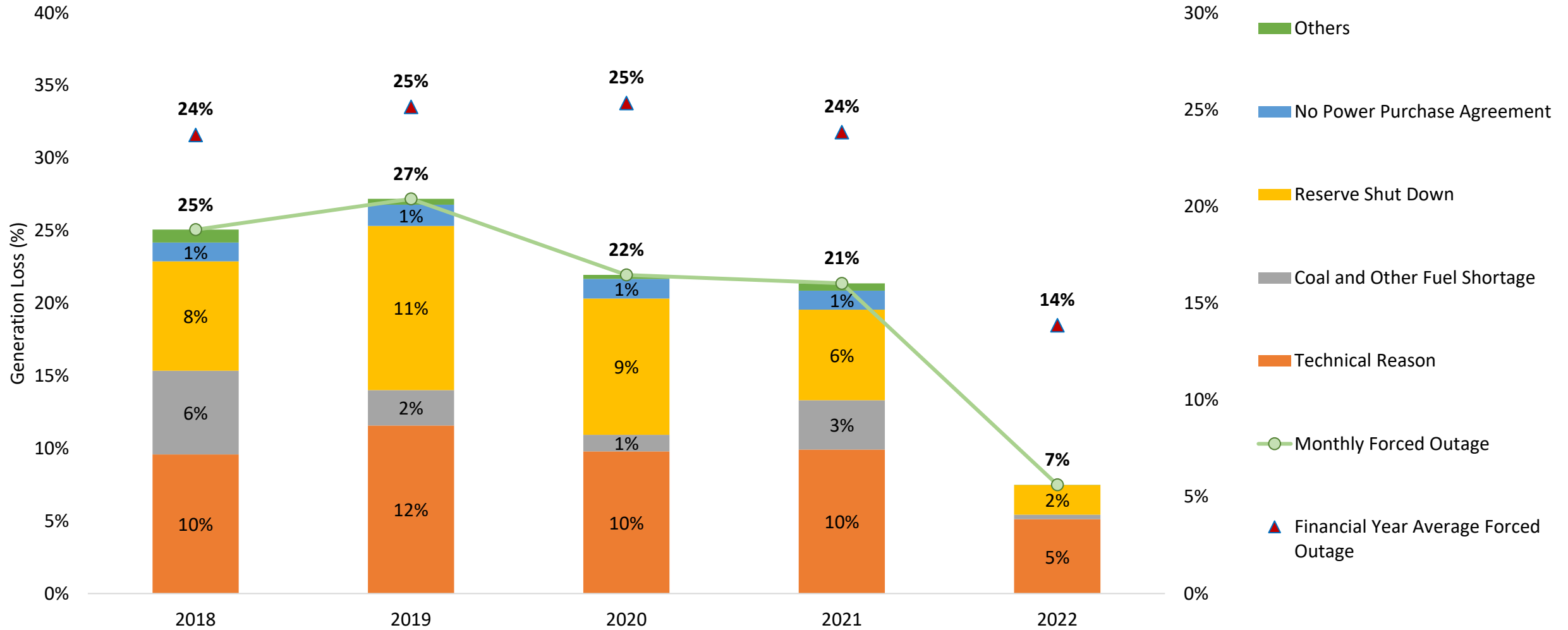
Source: CEA
PLF: Plant Load Factor CUF: Capacity Utilization Factor
Note: Dec-2022 numbers are provisional.





Coal Generation Loss and Reasons for Forced Outages

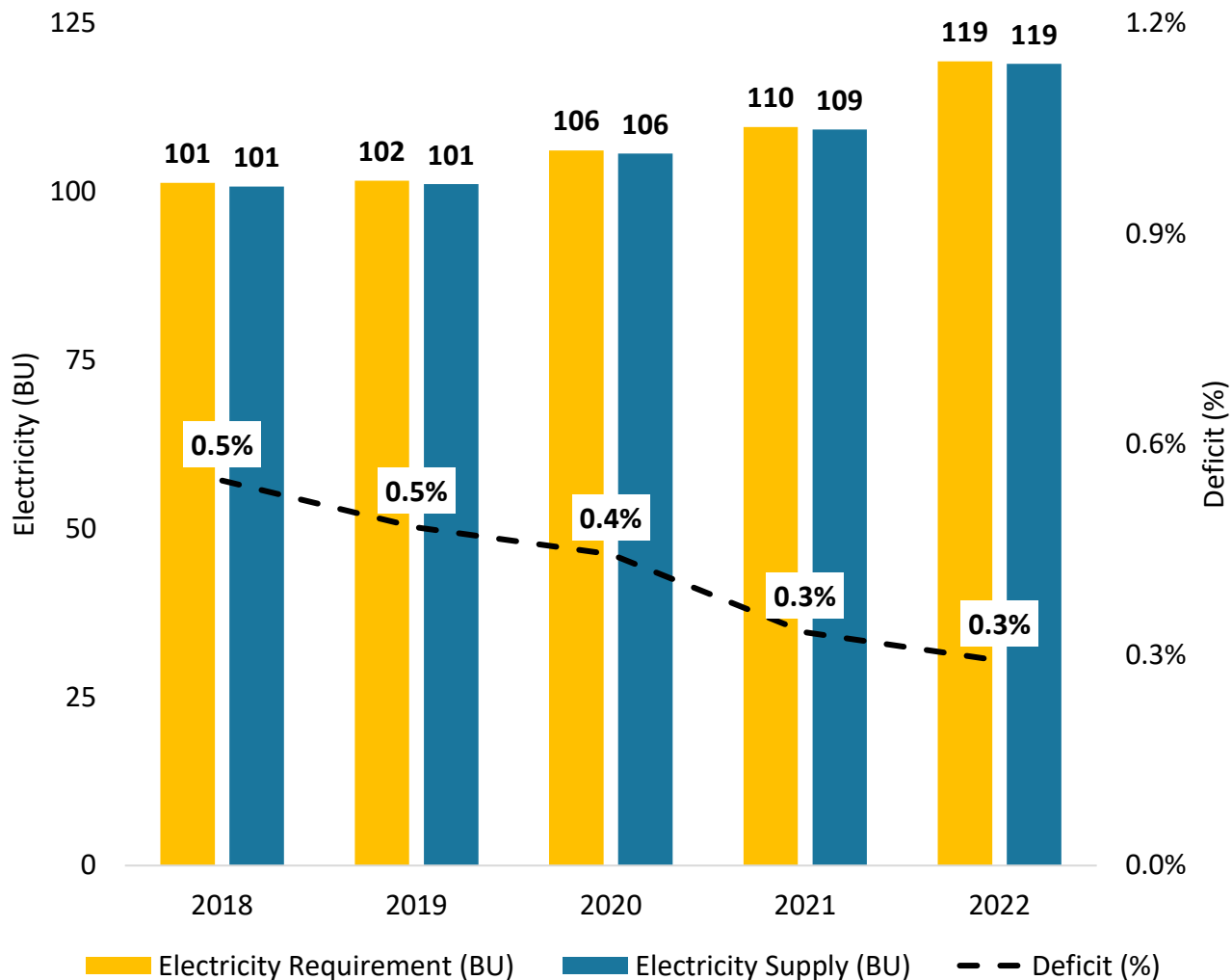
Forced Outages for December



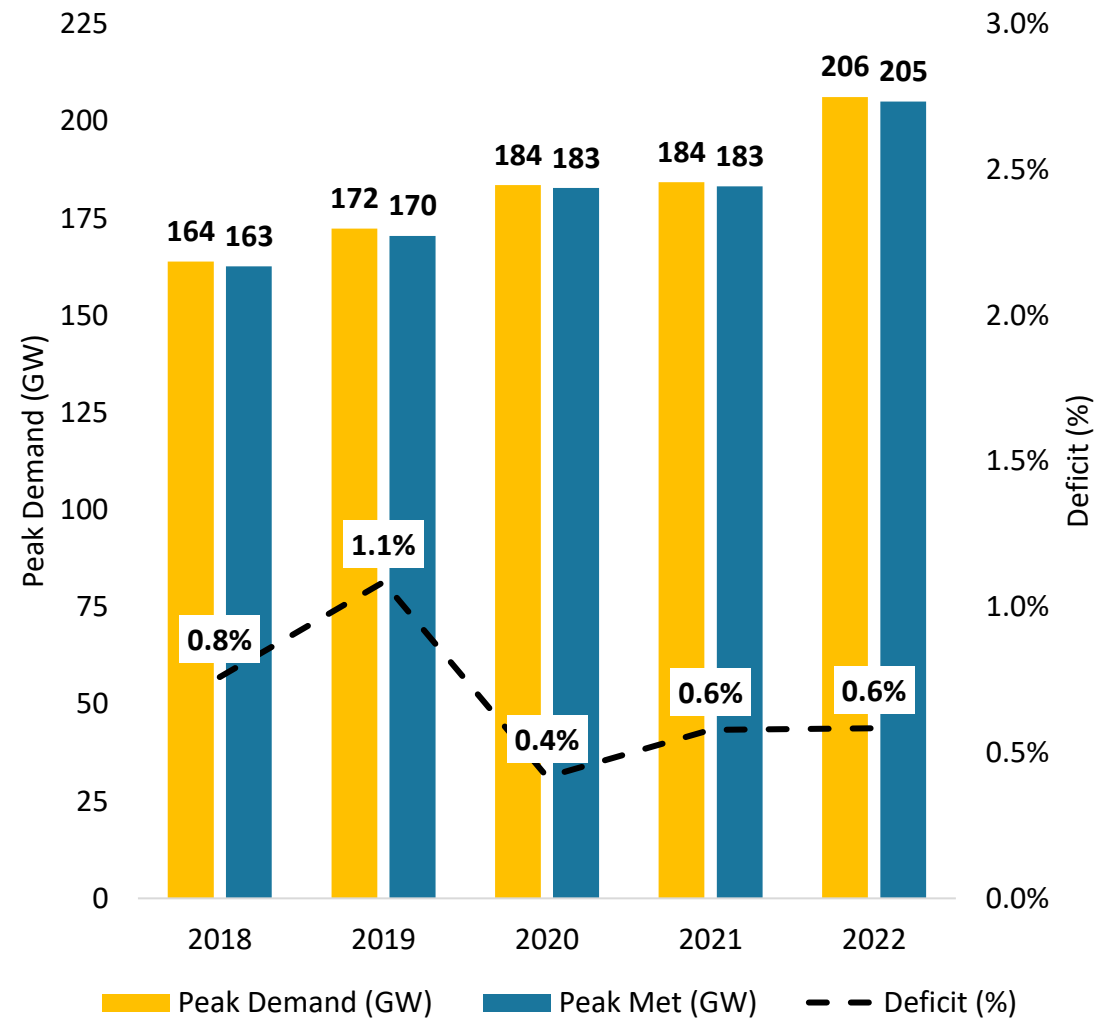


India's Electricity Demand & Supply Position (1/3)

Electricity Supply Position in December for last 5 years



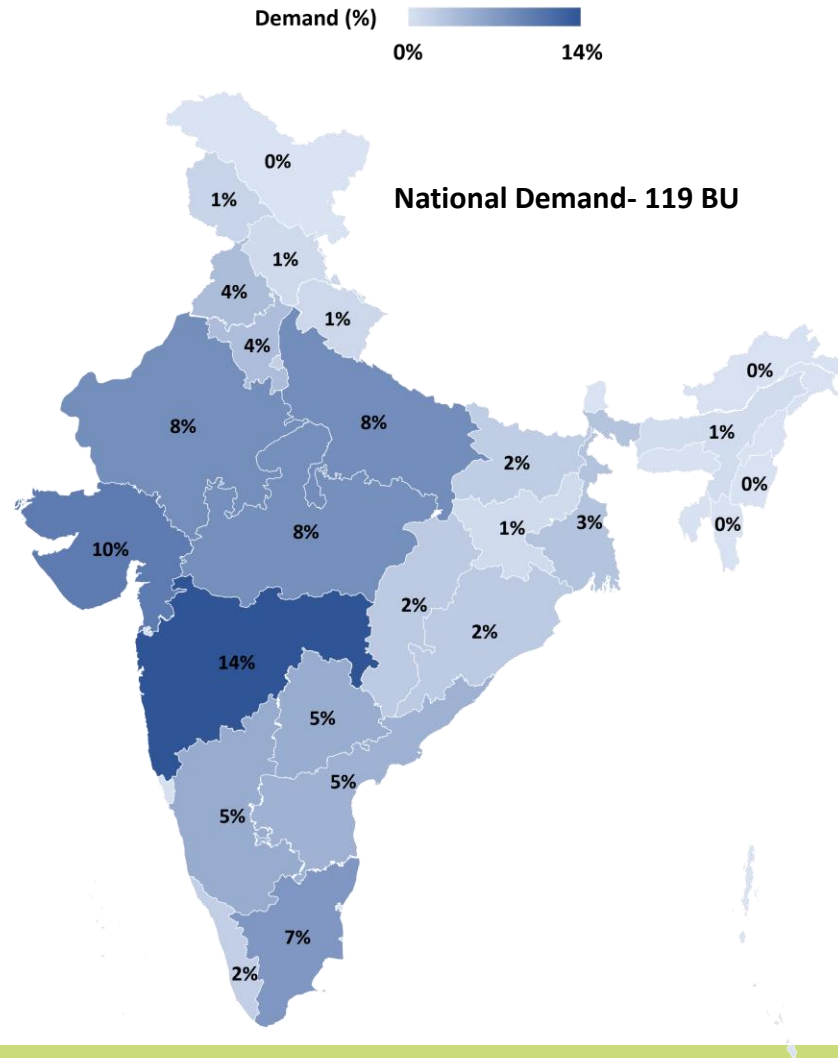
Peak Demand Position in December for last 5 years



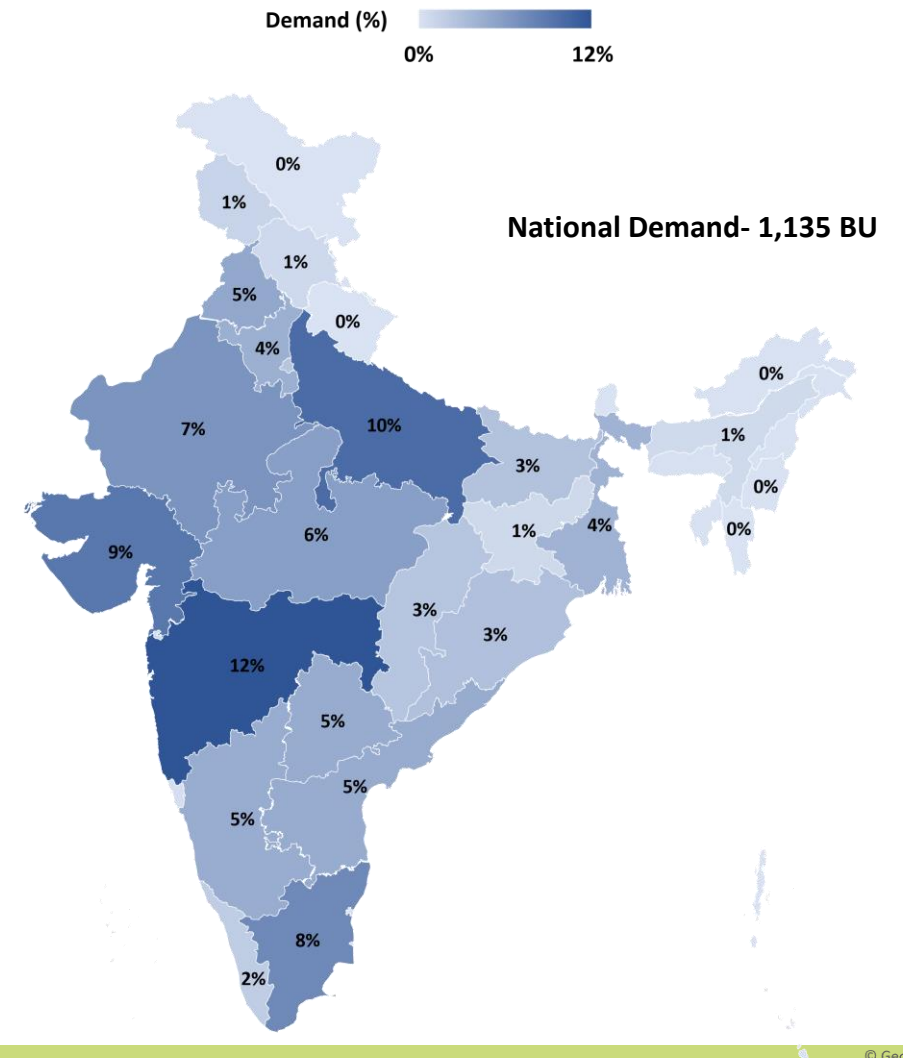


India's Electricity Demand & Supply Position (2/3)

State-wise Electricity Demand Share in Dec-2022 (%)



State share in National Demand Share in Apr-Dec'2022 (%)



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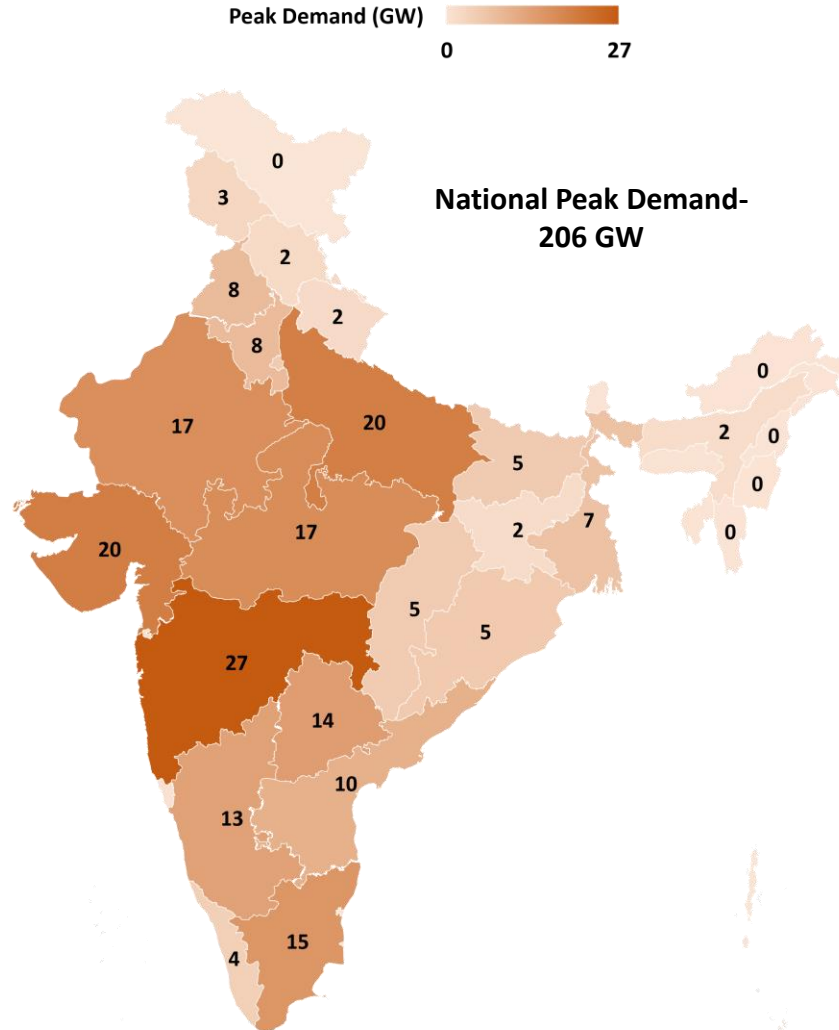
Source: CEA
Note: Dec-2022 numbers are provisional.



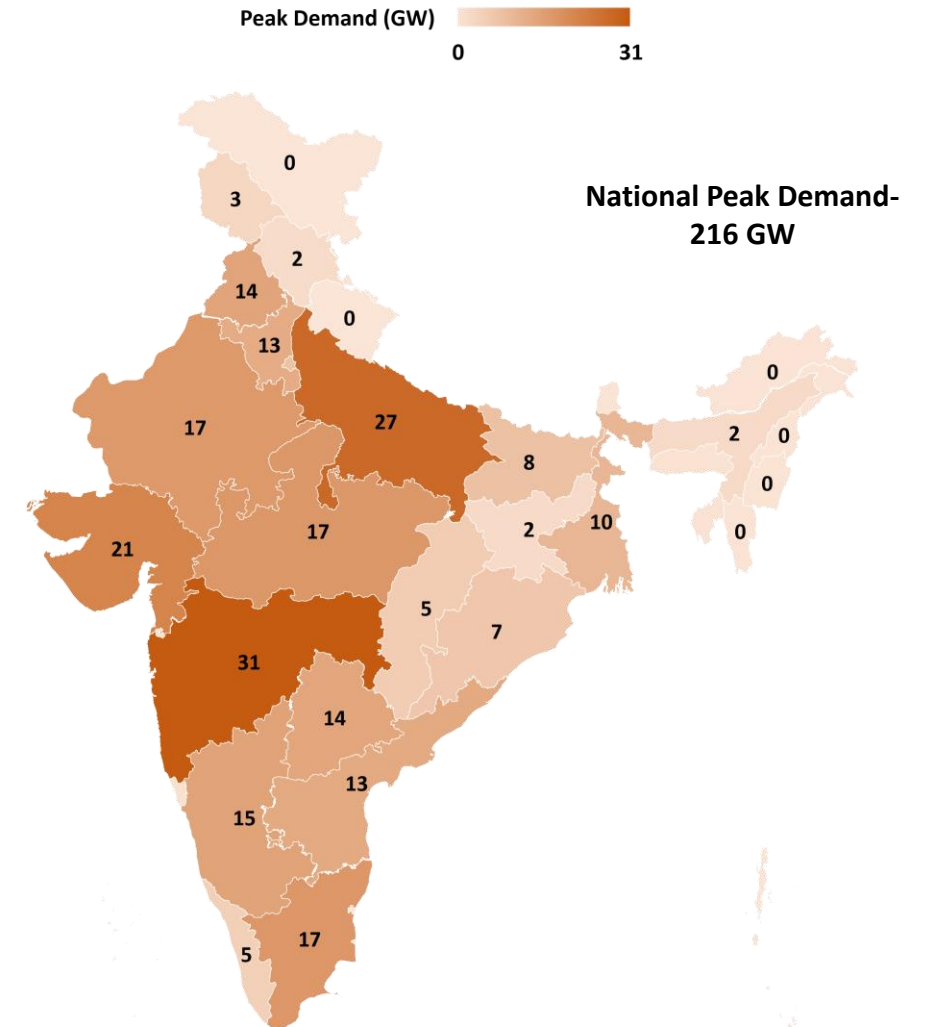


India's Electricity Demand & Supply Position (3/3)

State-wise Peak Demand in Dec-2022 (GW)



State Peak Demand in Apr-Dec'2022 (GW)



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Source: CEA

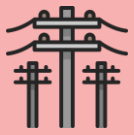
Note: Dec-2022 numbers are provisional.

The numbers presented in the maps are the peak demand of states, which may have occurred at different time stamps than peak demand at the National level.

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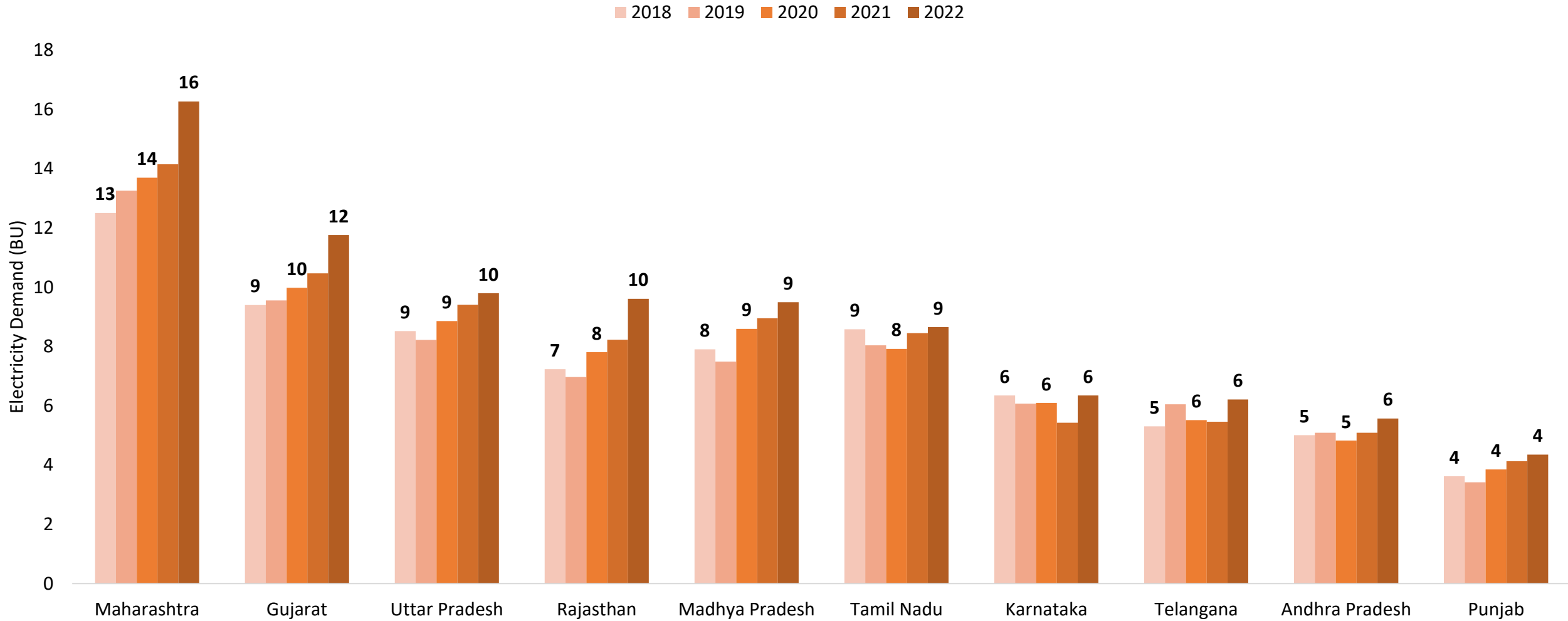
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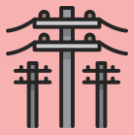




Monthly Electricity Demand of the top 10 states (1/2)

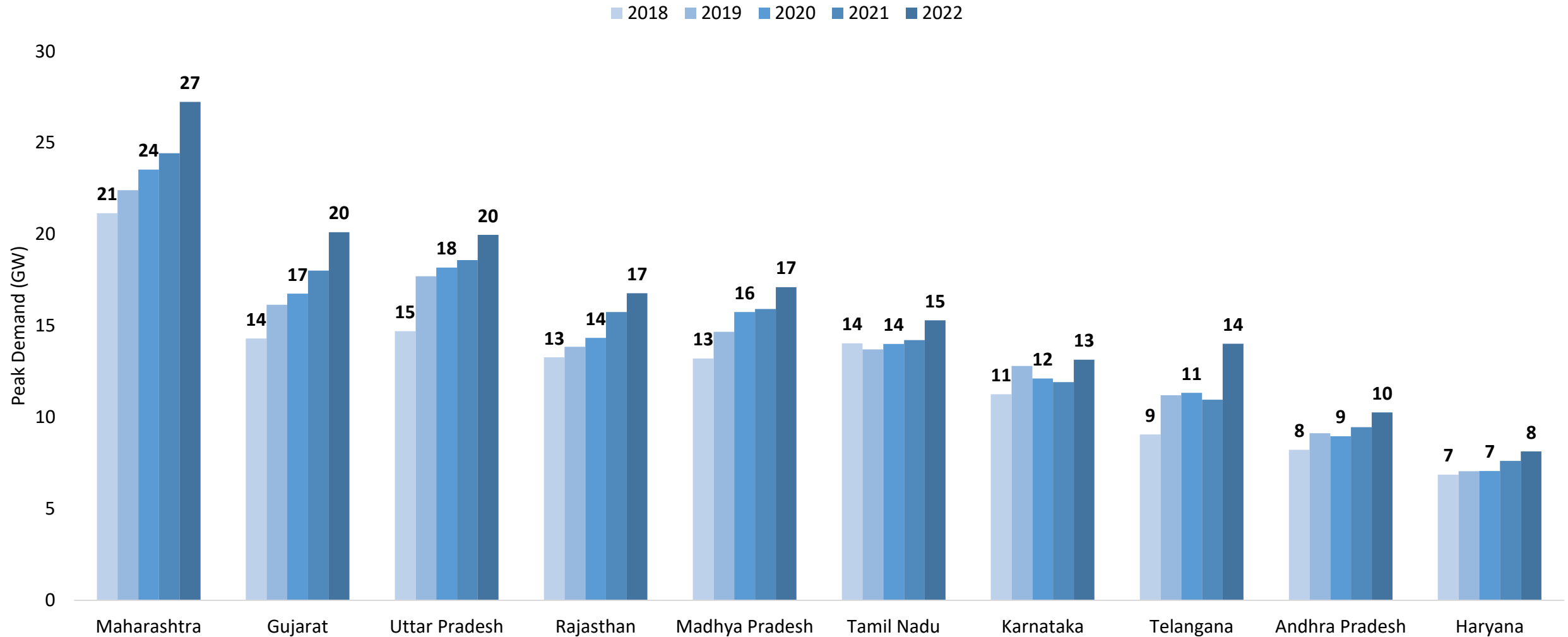
States with Highest Electricity Demand in December for last 5 years





Monthly Electricity Demand of the top 10 states (2/2)

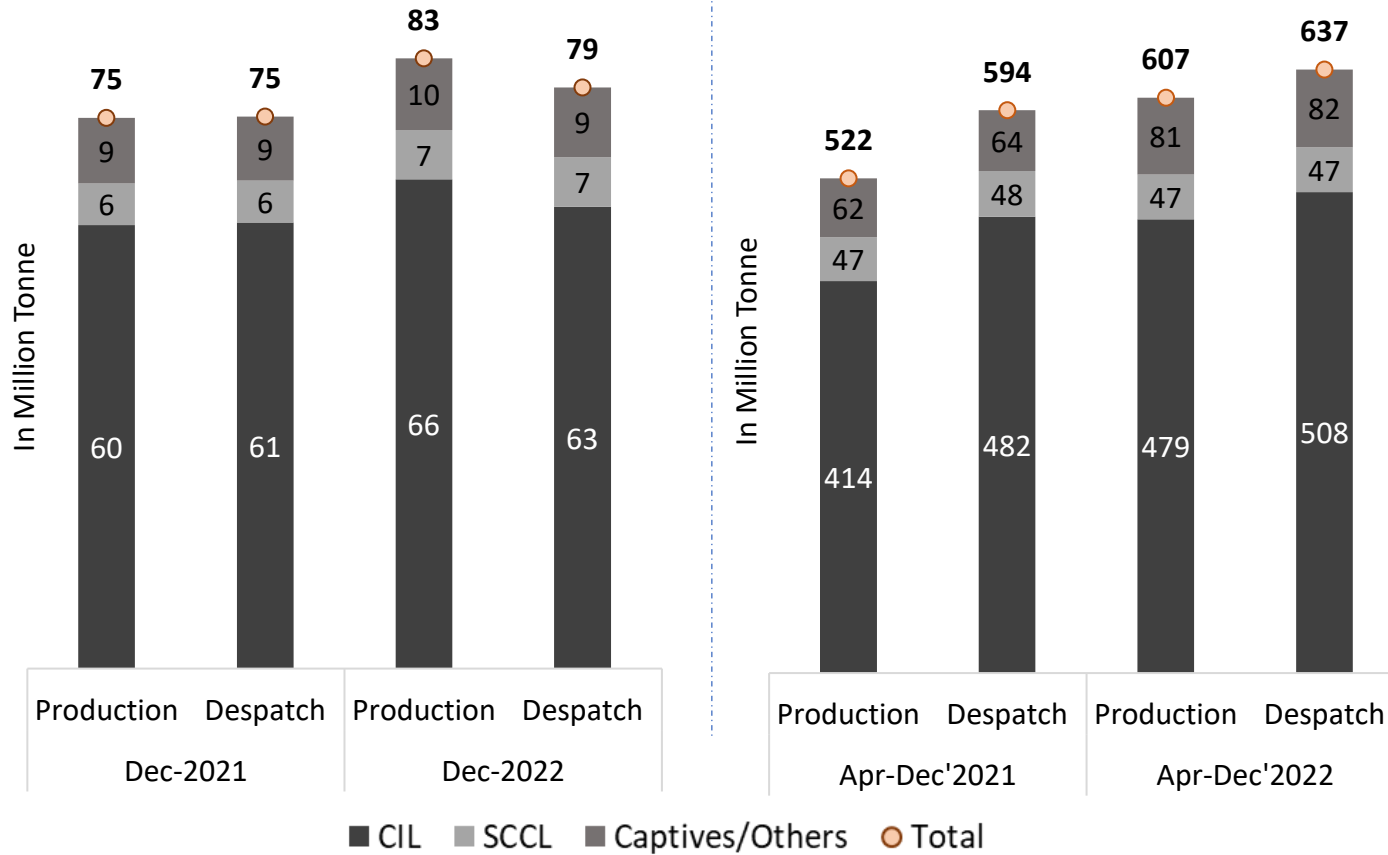
Monthly Peak Demand in December for last 5 years (GW)





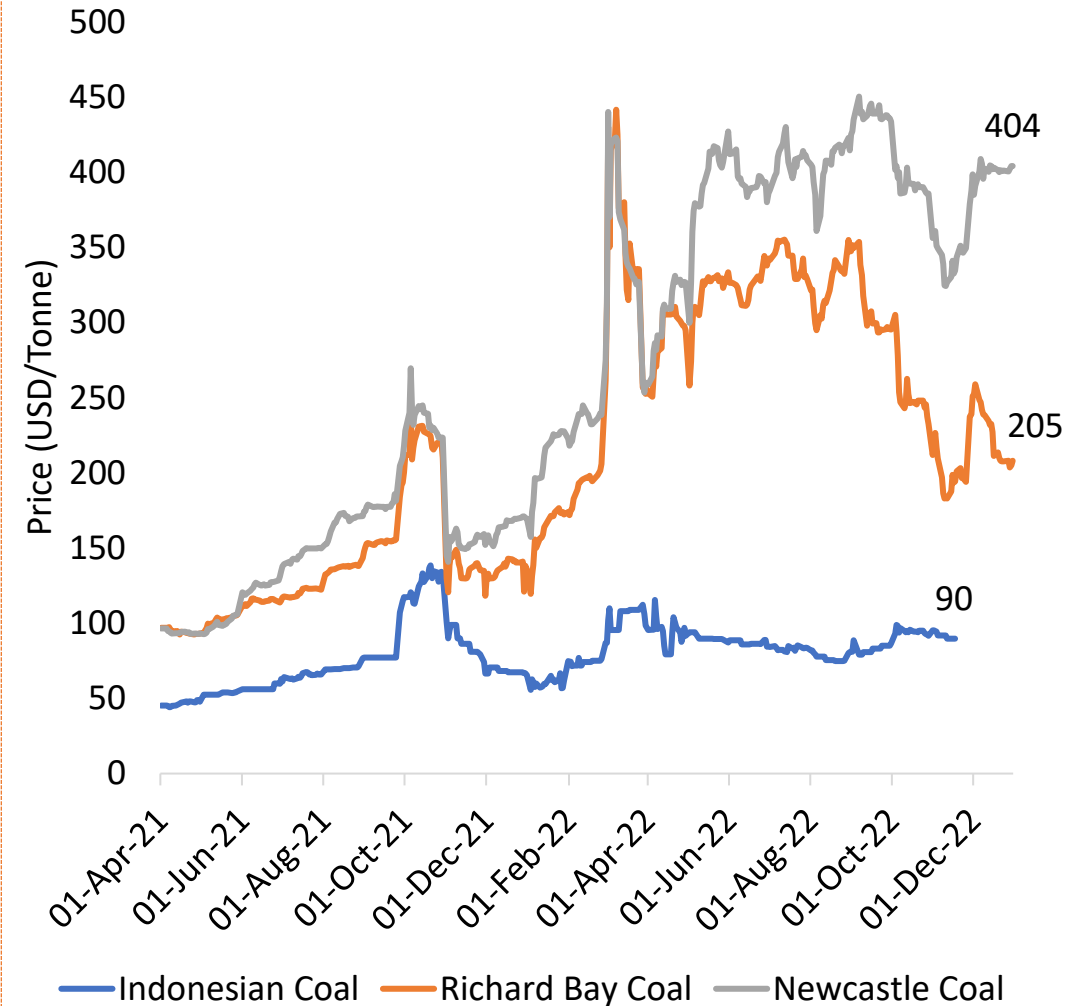
Monthly Coal Statistics

Monthly Coal Statistics



India's coal production increased in Dec-2022 (83 MT) by 11% as compared to Dec-2021 (75 MT). Similarly, the coal despatch increased by 5% in December this year as compared to Dec-2021.

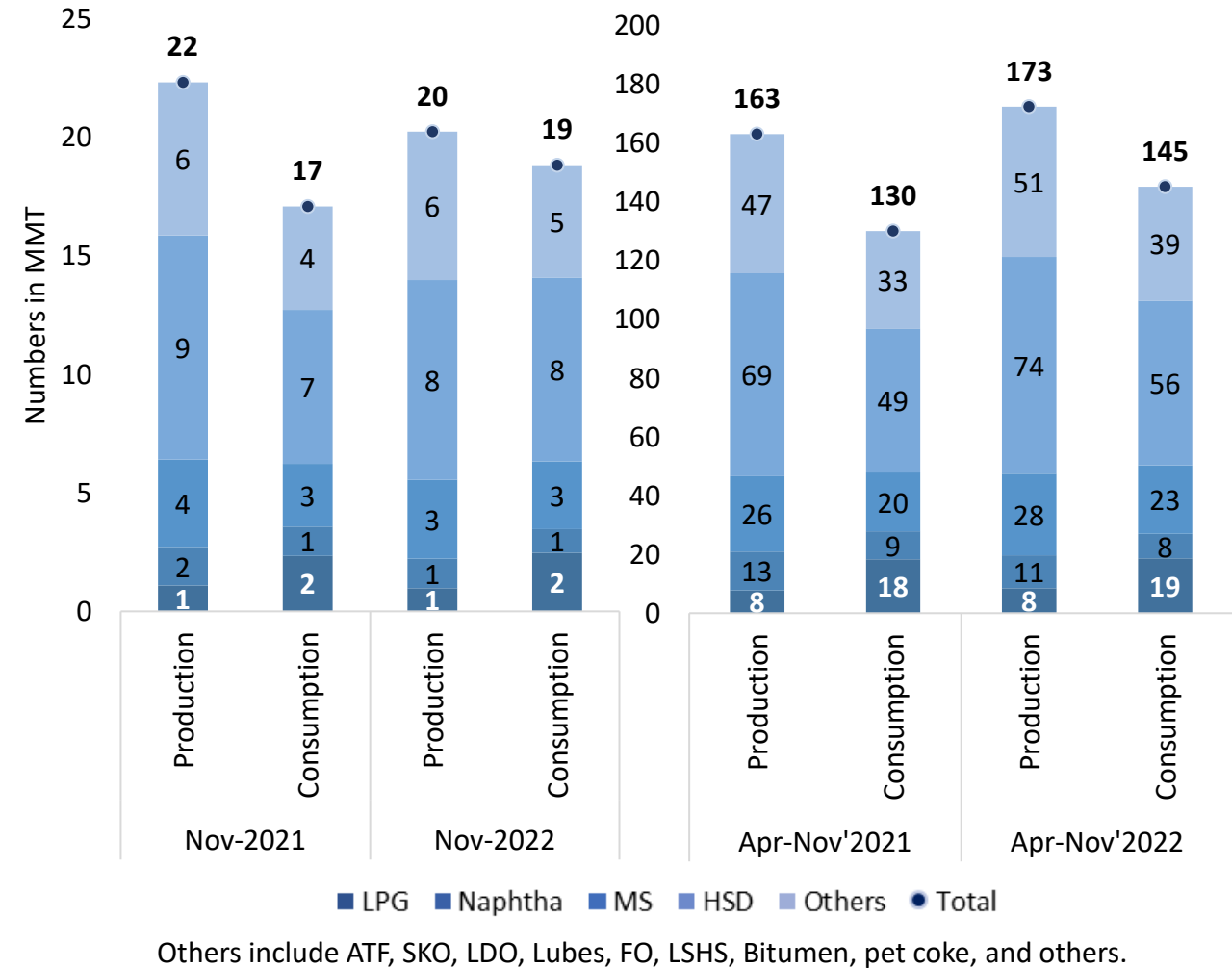
International Coal Prices



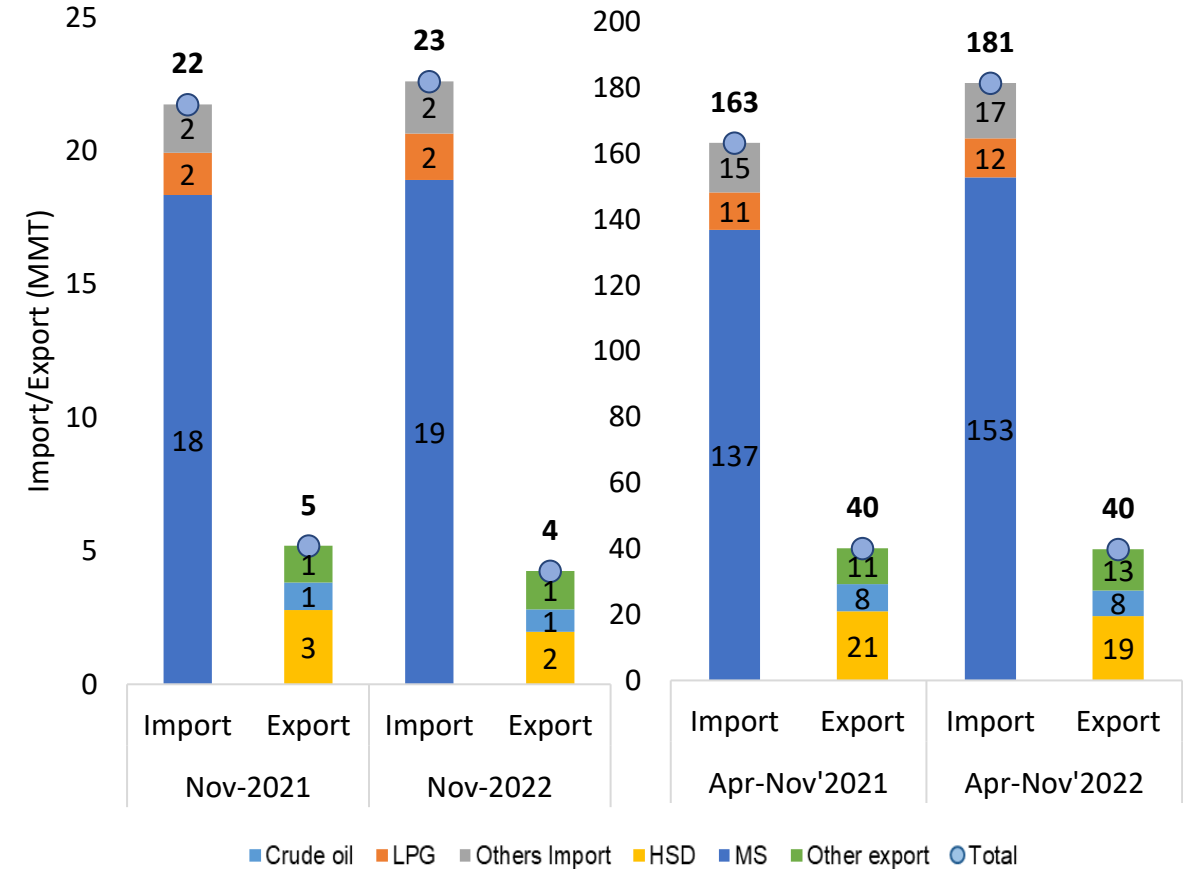


Petroleum Products Market Scenario (1/3)

Petroleum Product-wise Production & Consumption (MMT)



Petroleum Product-wise Import & Export (MMT)



*Other Imports include Naphtha, MS, ATF, SKO, HSD, LDO, Lubes, FO, Bitumen, pet coke, and Others.

*Other Exports include LPG, Naphtha, ATF, SKO, Lubes, FO, Bitumen, pet coke, and Others.

Source: PPAC

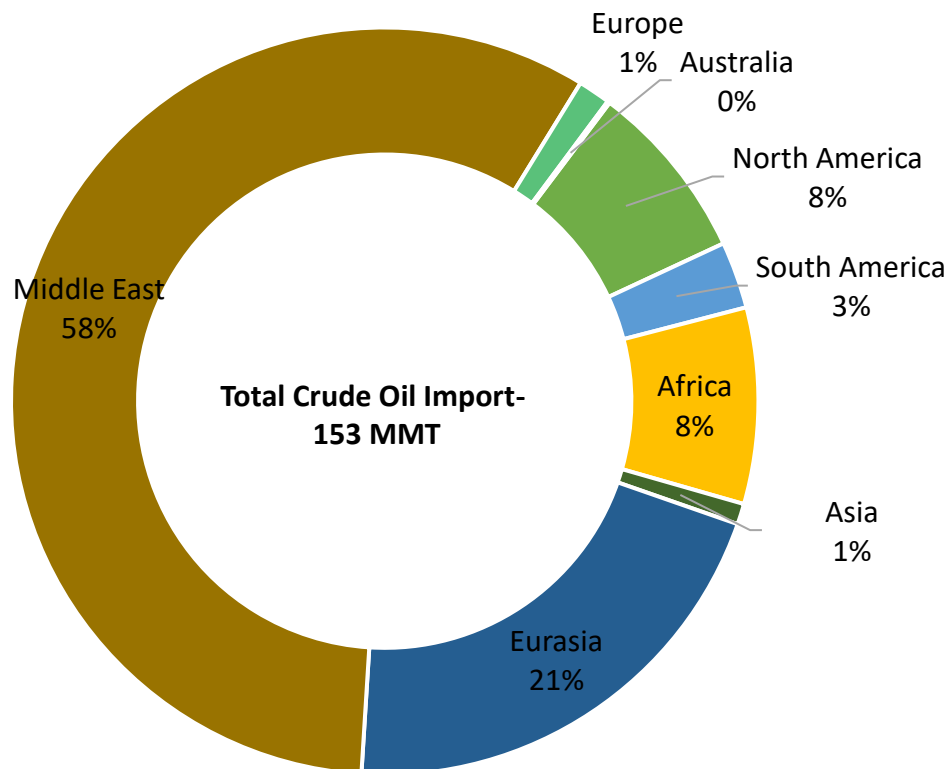
Abbreviations: ATF- Aviation Turbine Fuel, FO- Furnace Oil, HSD- High-Speed Diesel, LDO- Light Diesel Oil, MS- Motor Spirit (Petrol), SKO- Superior Kerosene Oil, LSHS- Low Sulphur Heavy Stock, LPG- Liquefied Petroleum Gas, MMT- Million Metric Tonnes





Petroleum Products Market Scenario (2/3)

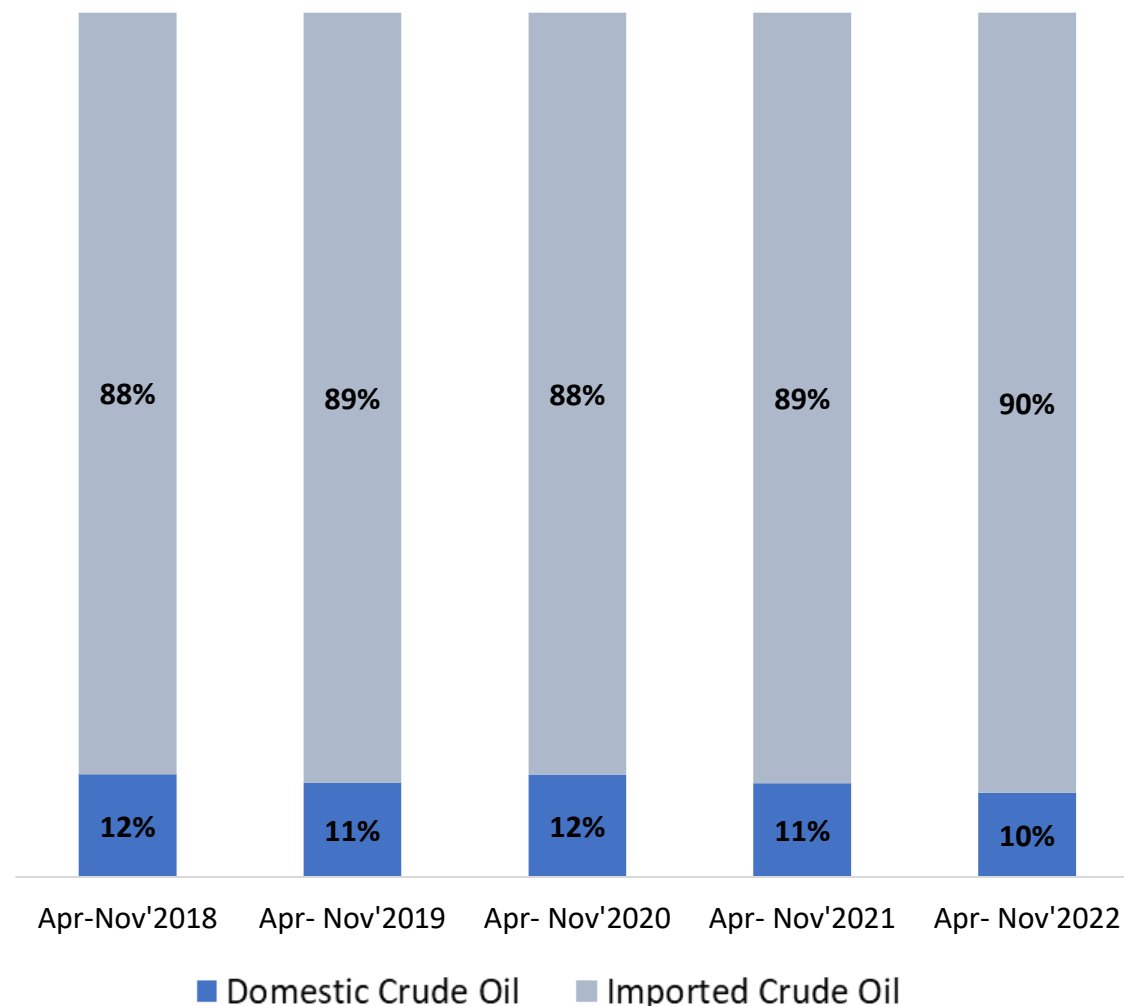
Region-wise Share in Import of Crude Oil (April-November 2022)



•Crude oil imports increased by 11.6% during Apr-Nov 2022 as compared to the import in corresponding period of the previous year

•Crude oil imports from OPEC countries decreased to 62.5% of total imports during Apr-Nov 2022 as compared to 70.9% during Apr-Nov 2021.

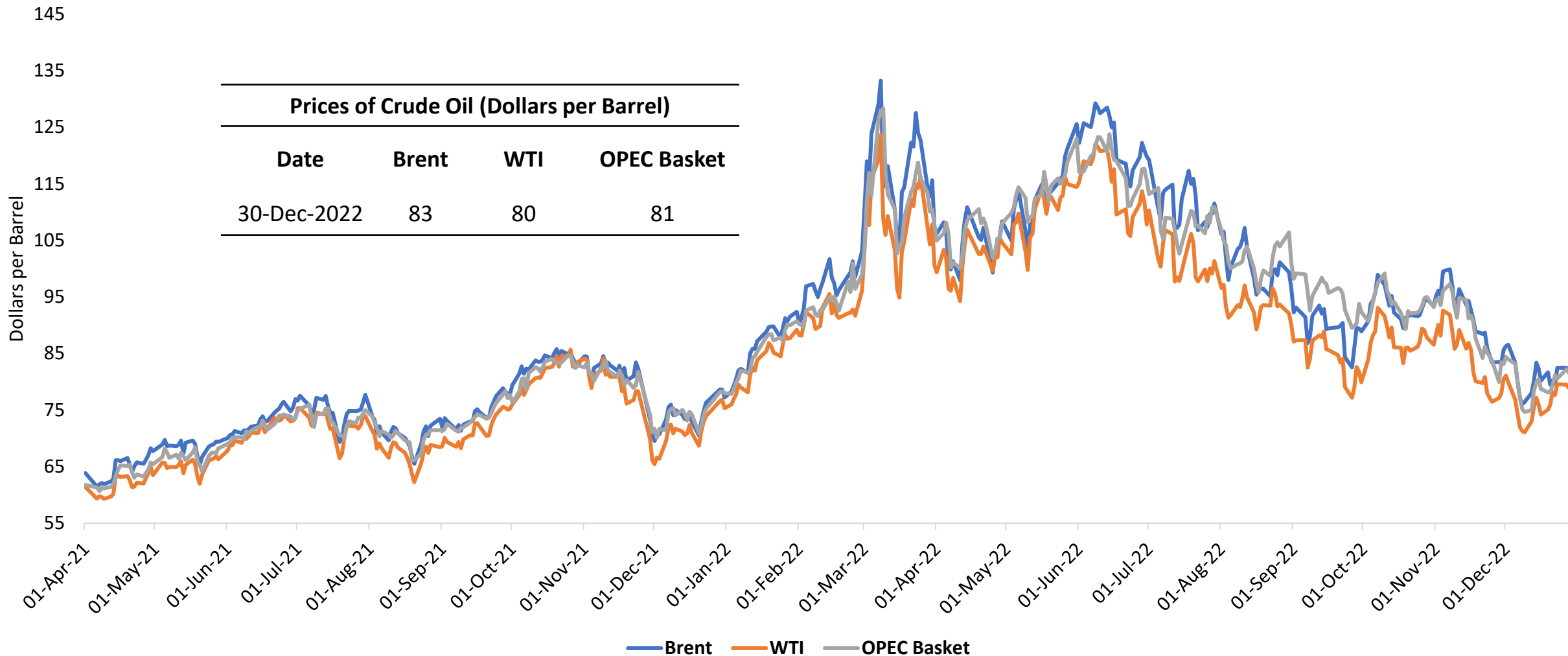
Domestic and Imported Crude Oil share for the last 5 years





Petroleum Products Market Scenario (3/3)

Daily Prices of Crude Oil



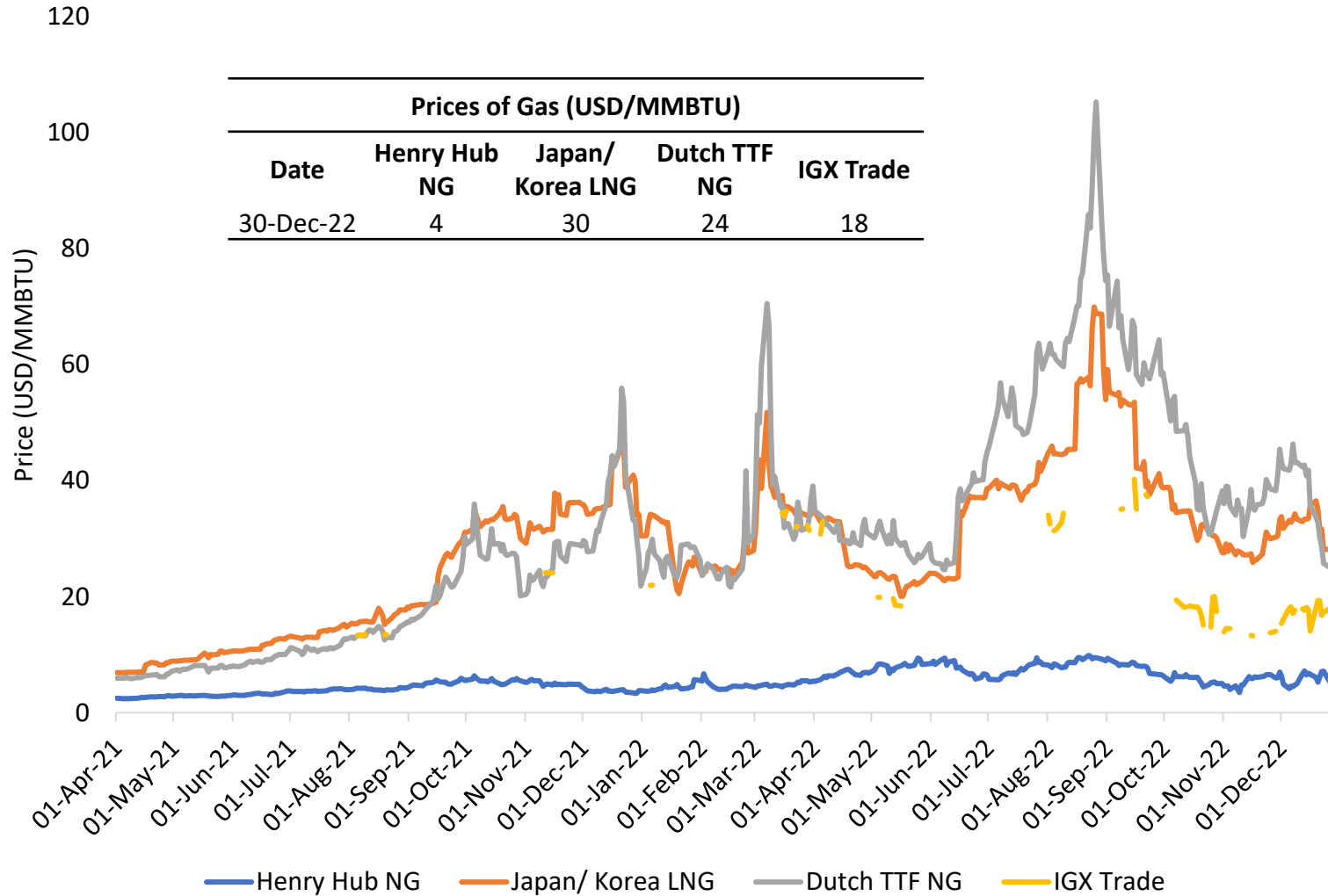
Sources: U.S. Energy Information Administration (EIA) and Organization of the Petroleum Exporting Countries (OPEC), MoPNG, and PPAC
WTI- West Texas Intermediate



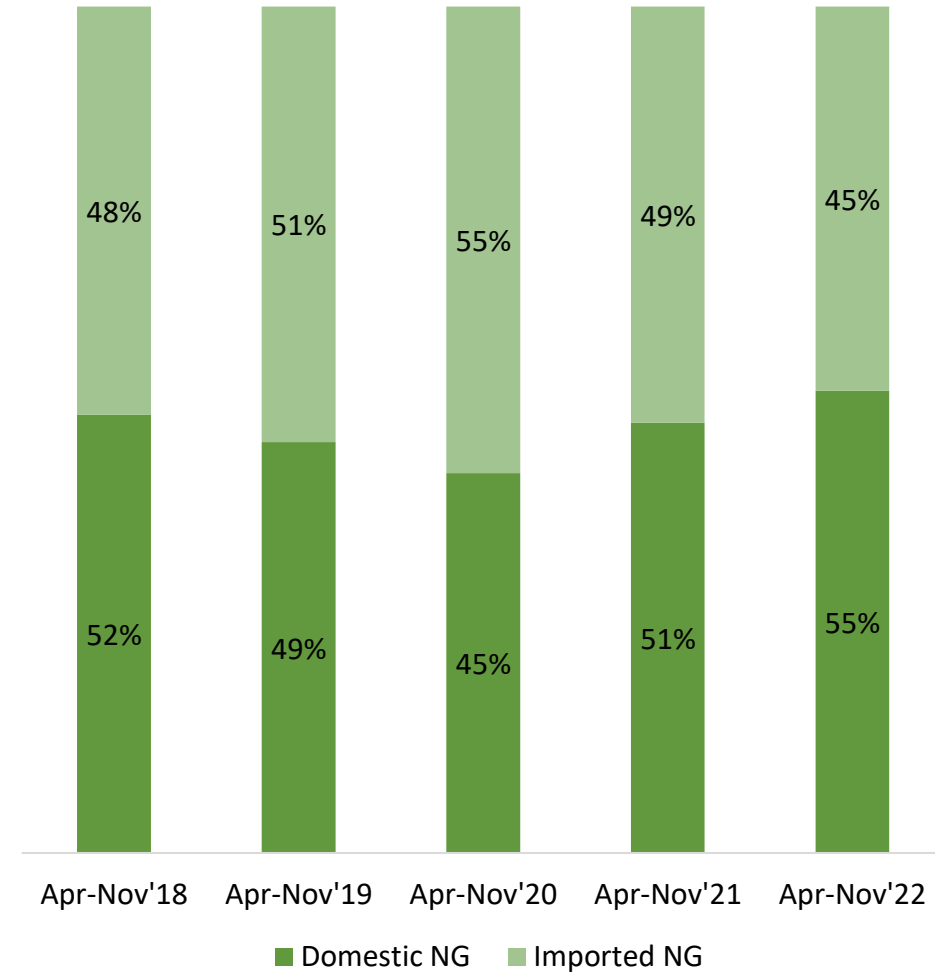


Gas Market Scenario

Gas Daily Market Price



Domestic and Imported Natural Gas share for last 5 years



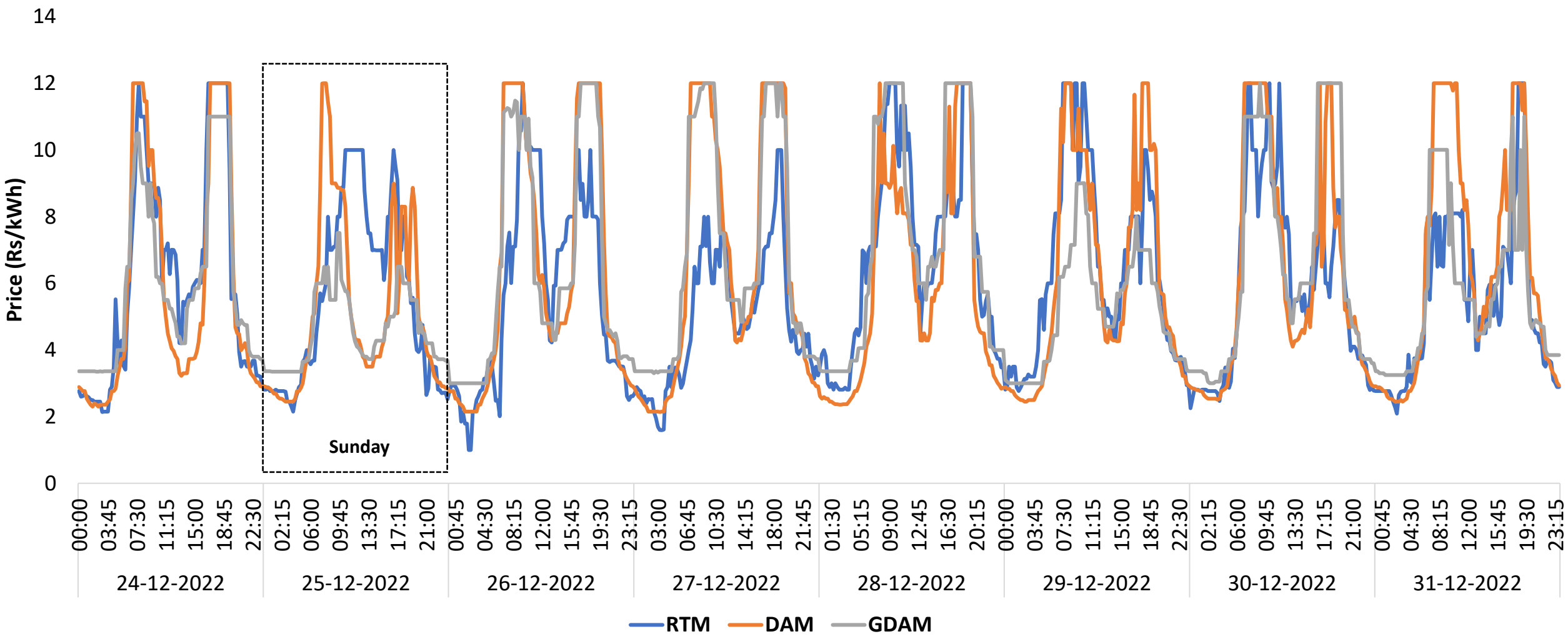
Sources: EIA, Indian Gas Exchange (IGX)
 NG- Natural Gas, LNG- Liquefied Natural Gas
 NOTE: The data for IGX is not available for these dates.





IEX Market Snapshot

Market Clearing Prices at the interval of 15 minutes



Source: IEX
 RTM: Real-Time Market, DAM- Day Ahead Market, GDAM- Green Day Ahead Market
 NOTE: CERC has imposed a cap of Rs 12/kWh on the power trading exchange markets.





Recent Interventions to promote Renewable Energy

Solar

Under the [PLI scheme](#), the GOI has announced INR 19,500 crores to incentivize the manufacturing of domestic solar PV modules.

[CFA/ subsidy](#) is available for residential solar rooftop projects up to 10kW.

CFA is applicable under [RTS Phase II](#) for residential consumers in rural areas under the VNM arrangement up to 3kW.

The [inter-state transmission charges](#) are waived for 25 years for the projects being commissioned before 30th June 2025.

The [updated RPO](#) compliance supports solar integration of up to 33.57% of the electricity purchased by DISCOMs/states till the year 2029-30.

[PM KUSUM scheme](#) has been extended till Mar'26 to install pump sets up to 15 HP in selected areas.

Wind

Reverse auctions have been scrapped for wind projects. A traditional two-part (technical and financial) bid system has been put in place.

To support [off-shore wind](#), SECI will invite bids for up to 4GW to set up offshore wind plants off the coast of Tamil Nadu and Gujarat.

The [inter-state transmission charges](#) are waived for 25 years for the projects being commissioned before 30th June 2025.

The [updated RPO](#) compliance supports WIND integration of up to 6.94% of the electricity purchased by DISCOMs/states till the year 2029-30.

The [draft National Repowering Policy](#) for wind power projects is released for the optimum utilization of wind energy resources by maximizing energy (kWh) yield per sq. km of the wind project areas.

BESS

[PLI scheme](#) unveiled for setting up 50 GWh ACC battery storage with an outlay of ₹18,100 crores.

Under the [Waste Management Rules 2022](#), the disposal of waste batteries in landfills and incineration is prohibited and the recycling of waste batteries is made mandatory.

[CERC](#), under RRAS regulation, has allowed the use of energy storage in secondary and tertiary ancillary support.

The [Energy Storage Obligation](#) of DISCOMs is pegged at 4.0% up to 2029-30.

The [pilot projects](#) are:

- i. 1.4 MW SPV Project with 1.4 MWh BESS in Lakshadweep.
- ii. 50 MWp SPV Project with 20 MW/50 MWh BESS in Phyang, Ladakh
- iii. 100 MW SPV Project with 40 MW/120 MWh BESS in Chhattisgarh.

Green Hydrogen (H₂)

[National Green Hydrogen Mission](#) was approved by the Cabinet in January 2023. The mission aims to meet the target of 5 million metric tonnes of green hydrogen production by 2030. The initial outlay for the Mission will be INR 19,744 crores.

MOP has released the [Green Hydrogen Policy](#) under which the inter-state transmission charges are waived for 25 years of the projects being commissioned before 30th June 2025.

MNRE has proposed using [green H₂ in Direct Reduced Iron \(DRI\) production](#) by partly replacing natural gas with H₂ in gas-based DRI plants.

The pilot projects are*-

- i. 25kW AC hydrogen grid at NETRA that includes a 500kW PEM electrolyzer
- ii. 5MW PEM electrolyzer at NTPC Vindhyachal.

NOTE: We have tried to compile only the major interventions (last 2 years), however, a number of initiatives have been taken to support decarbonization.

PLI: Production Linked Incentive, CFA: Central Finance Assistance, VNM: Virtual Net Metering, ACC: Advanced Chemistry Cell, OIL: Oil India Limited, RPO: Renewable Purchase Obligation

*Vasudha Foundation Event on Green Hydrogen in India: Prospects and Opportunities, held on 11th October 2022.



Key Highlights or Announcements of December 2022 (1/2)

1. Union Minister for Power and MNRE unveiled the plan for “[Transmission System for Integration of over 500 GW RE Capacity by 2030](#)“. This plan is a major step towards the achievement of the goal of integrating 500 GW of non-fossil fuel-based capacity by 2030 by providing a broad plan of the required transmission system for having 537 GW of Renewable Energy capacity (detailed below) by the year 2030. Major highlights are-

Category	Capacity (MW)
RE Capacity already Commissioned (as on 31.10.2022)	1,65,943
66.5 GW RE capacity to be integrated to ISTS network (8.861 GW RE capacity already commissioned and included in Sl. No. 1 above)	57,639
Additional RE capacity totaling to 236.58 GW (55.08 GW + 181.5 GW) to be integrated to ISTS network	2,36,580
Margin already available in ISTS sub-stations which can be used for integration of RE capacity	33,658
Balance RE capacity to be integrated to intra-state system under Green Energy Corridor – I (GEC-I) Scheme	7,000
RE capacity to be integrated to intra-state system under Green Energy Corridor - II (GEC-II) Scheme	19,431
Additional Hydro Capacity likely by 2030	16,673
Total (RE)	5,36,924

- The planned additional transmission system for having 500 GW of RE capacity at an estimated cost of 2.44 lakh crore.
- The length of the transmission lines and sub-station capacity planned under ISTS for integration of additional wind and solar capacity by 2030 has been estimated as 50,890 ckm and 4,33,575 MVA respectively at an estimated cost of Rs 2,44,200 crores.



Key Highlights or Announcements of December 2022 (2/2)

2. The [Energy Conservation \(Amendment\) Bill, 2022](#) was passed by Rajya Sabha on 12th December 2022. The bill seeks to:
 - mandate the use of non-fossil sources, including Green Hydrogen, Green Ammonia, Biomass, and Ethanol for energy and feedstock
 - establish Carbon Markets
 - Issuance of Energy Saving Certificates
 - bring large residential buildings within the fold of Energy Conservation regime
 - enhance the scope of the Energy Conservation Building Code to Energy Conservation and Sustainable Building Code
 - amend penalty provisions
 - increase members in the Governing Council of Bureau of Energy Efficiency
 - empower the State Electricity Regulatory Commissions to make regulations for the smooth discharge of its functions.



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