

India's Energy Overview

November 2023

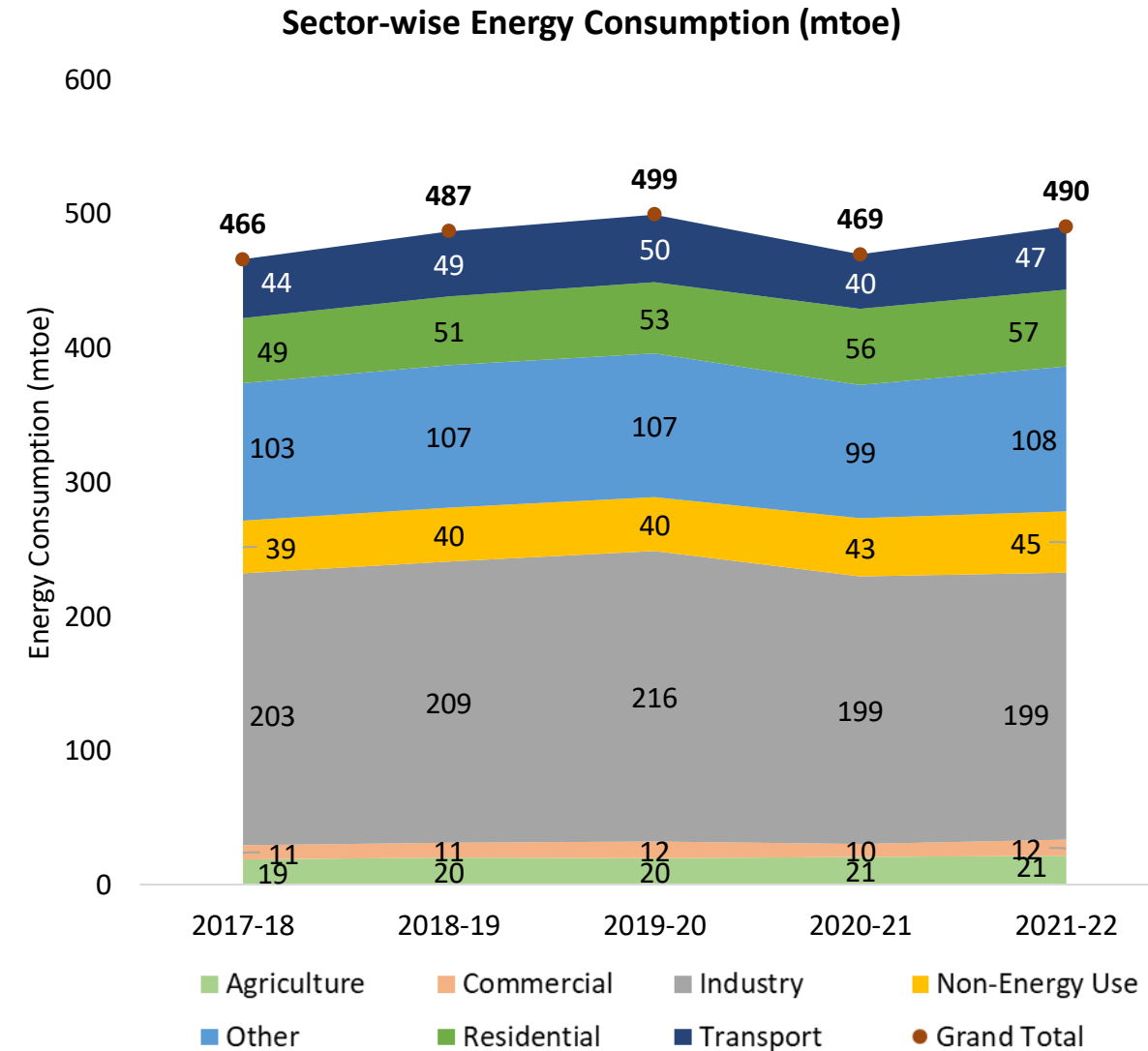
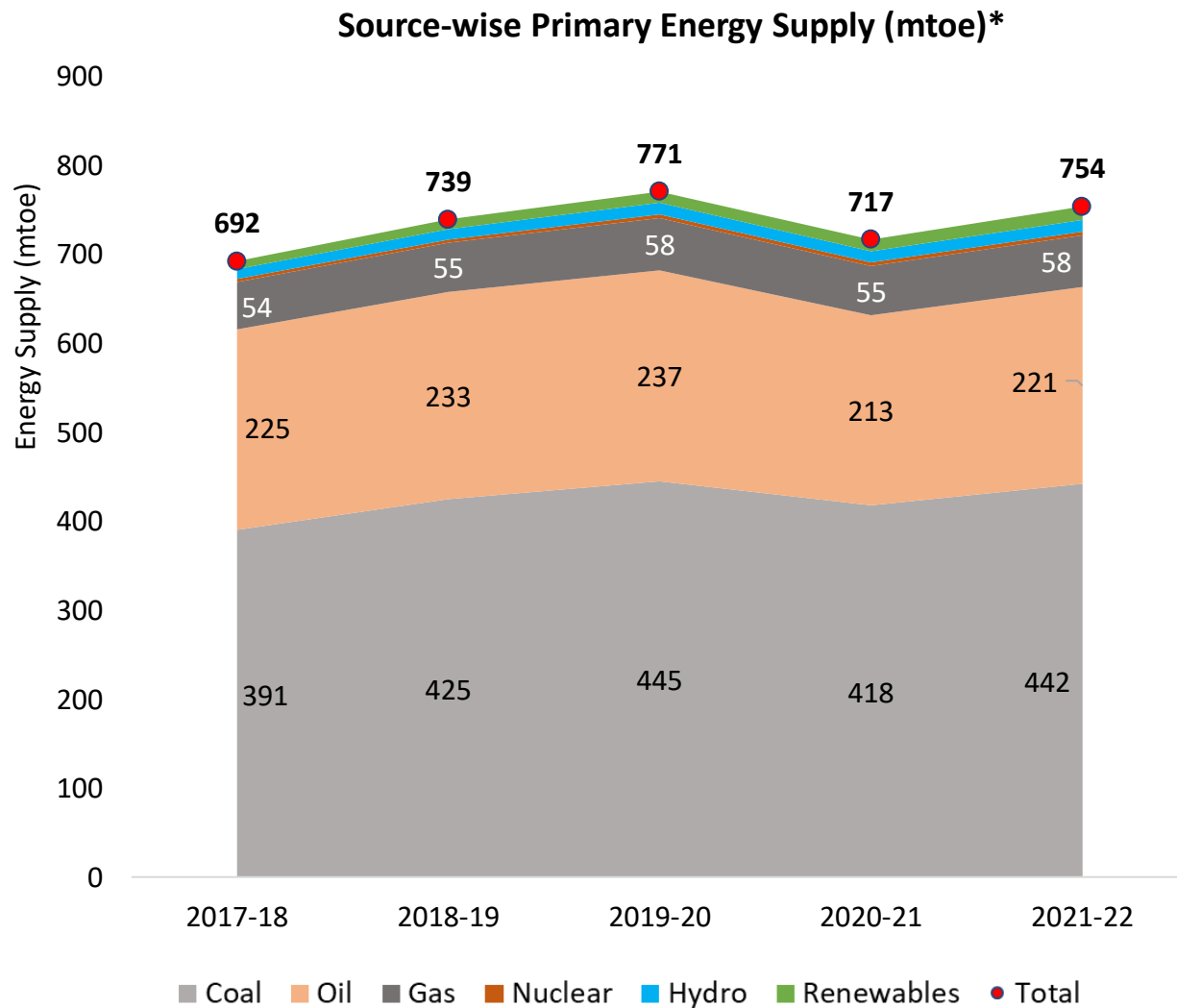


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Green ways for a good earth!

Contents

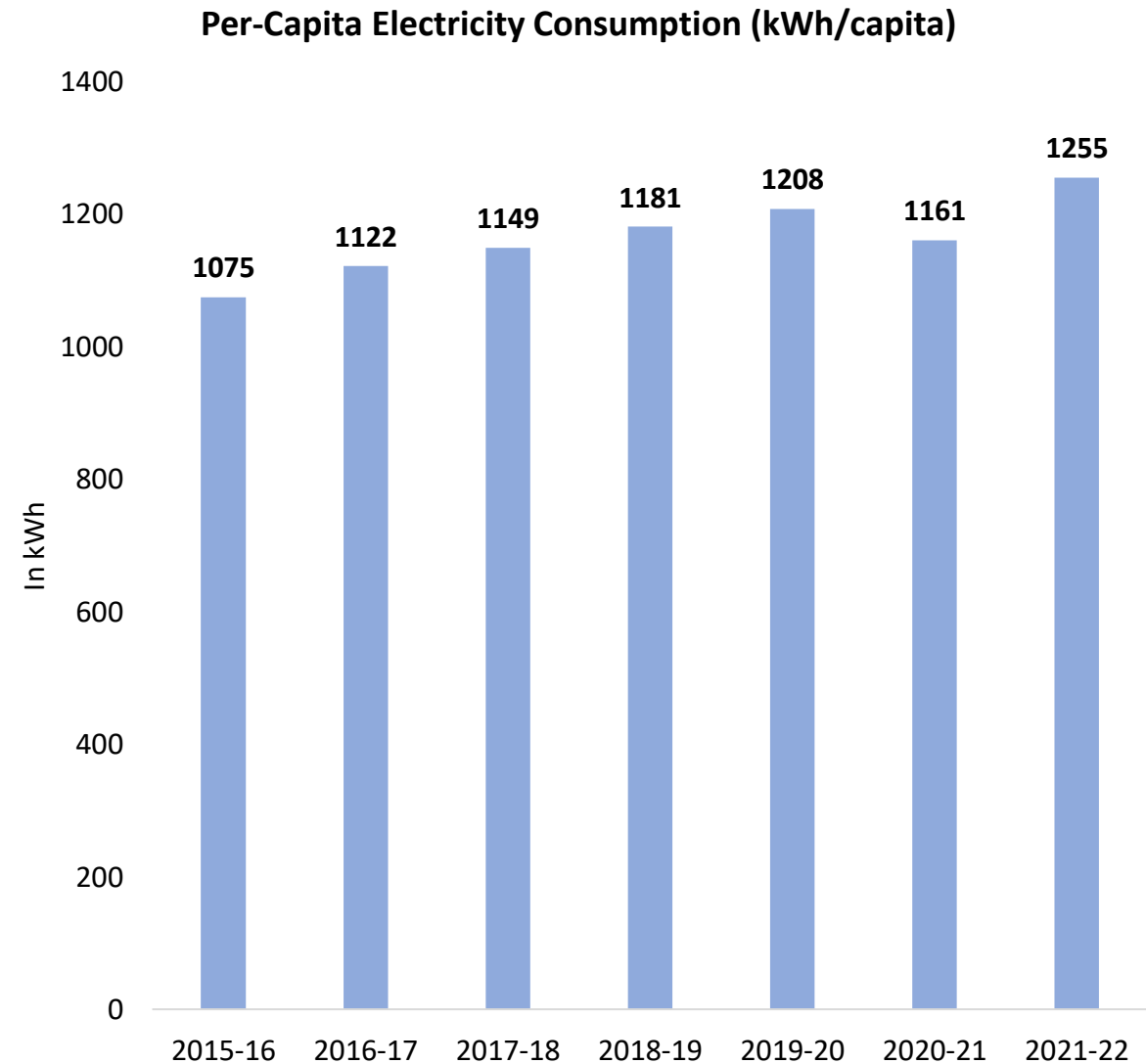
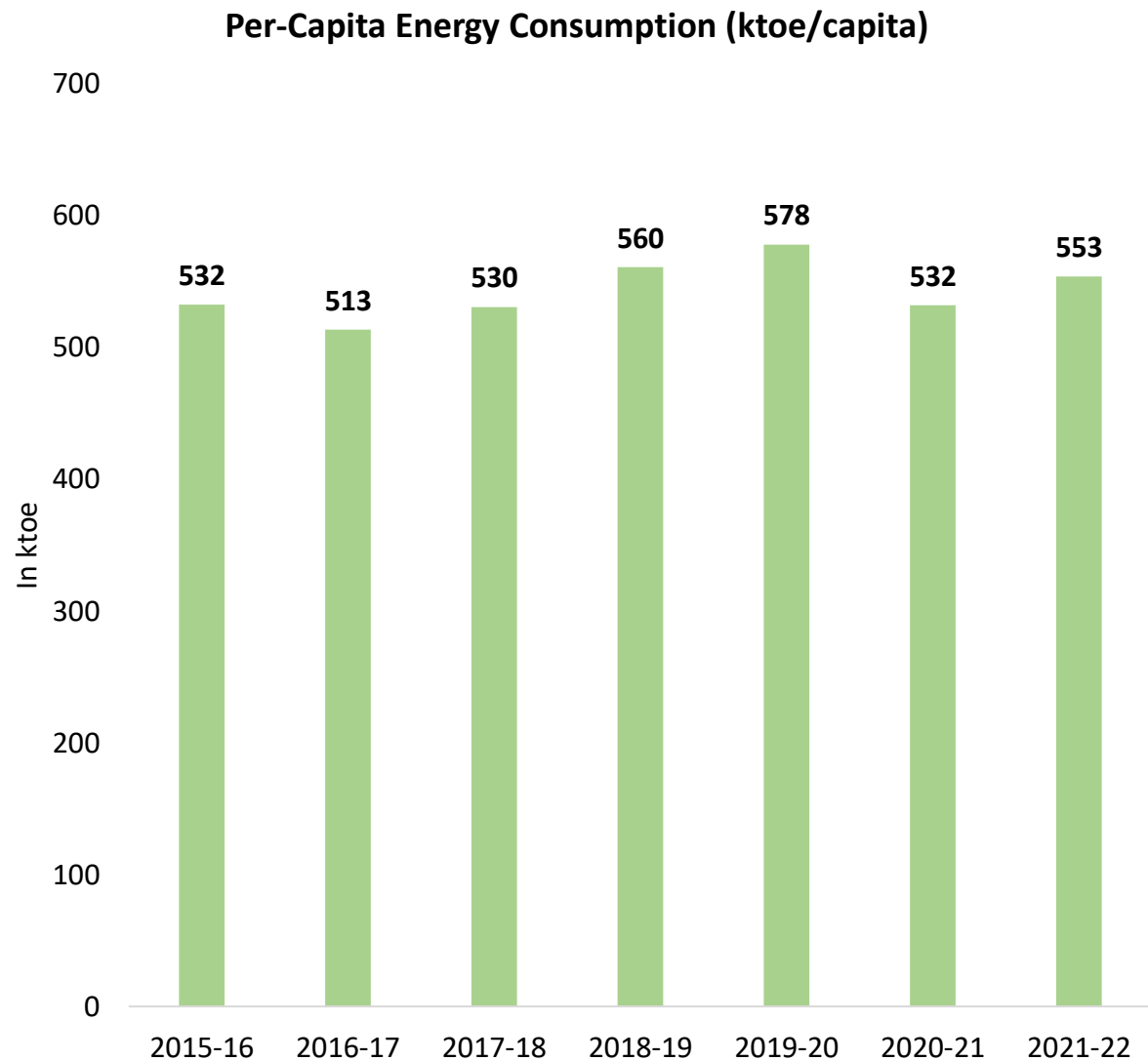
1. Primary Energy Mix for 2021-22
2. Per-Capita Energy and Electricity Consumption
3. India's Electricity Capacity Mix (Utility-scale)
4. India's Electricity Addition in last 5 years
5. State-wise Solar Installed Capacity
6. State-wise Wind Installed Capacity
7. RE Potential and Installed Capacity
8. India's Electricity Generation Mix
9. Source-wise PLF/ CUF
10. Thermal Generation Loss and Reasons for Forced Outages
11. Indian Electricity Exchange (IEX) Market Snapshot
12. National and State-level Electricity Demand
13. India's Monthly Electricity Requirement and Supply
14. Monthly Electricity Demand for the top 5 states
15. National and State-level Peak Electricity Demand
16. India's Monthly Peak Electricity Demand and Supply
17. Monthly Peak Electricity Demand for the top 5 states
18. Monthly Coal Statistics
19. Petroleum Products Market Scenario
20. Daily Prices of Crude Oil
21. Gas Market Scenario
22. Daily Prices of Gas
23. Status of Electric Mobility in India
24. Recent Interventions to Promote Renewable Energy
25. Key Highlights or Announcements of November 2023

Primary Energy Mix* in India



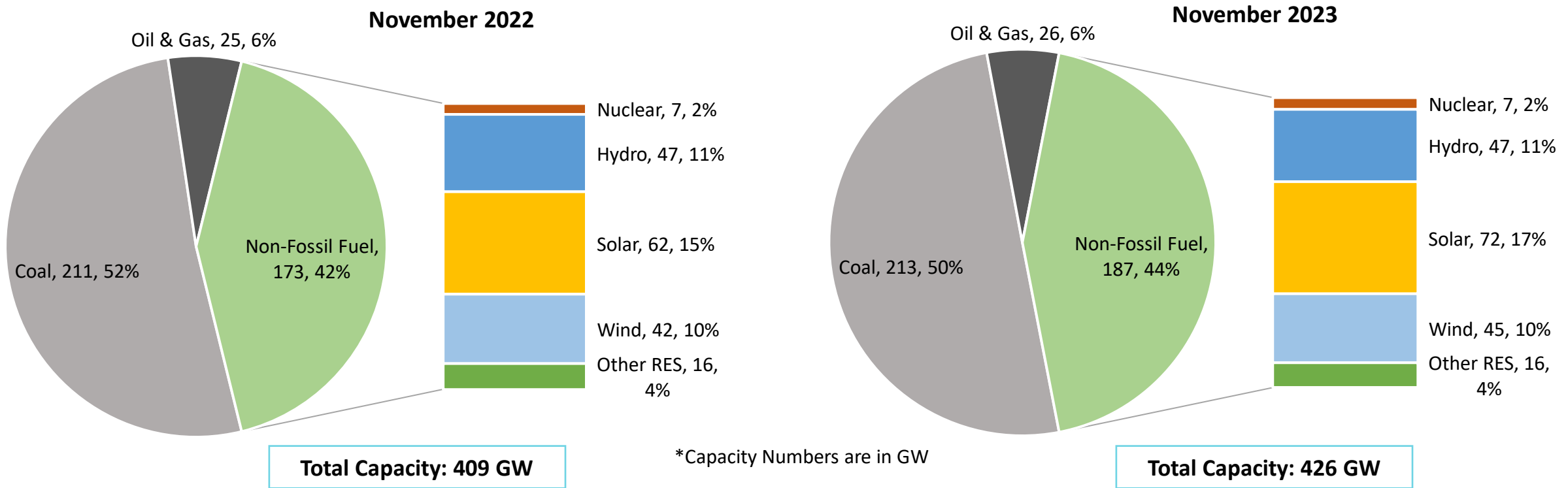
*Excluding biofuels, waste, and other non-commercial source of energy

Per-Capita Energy and Electricity Consumption



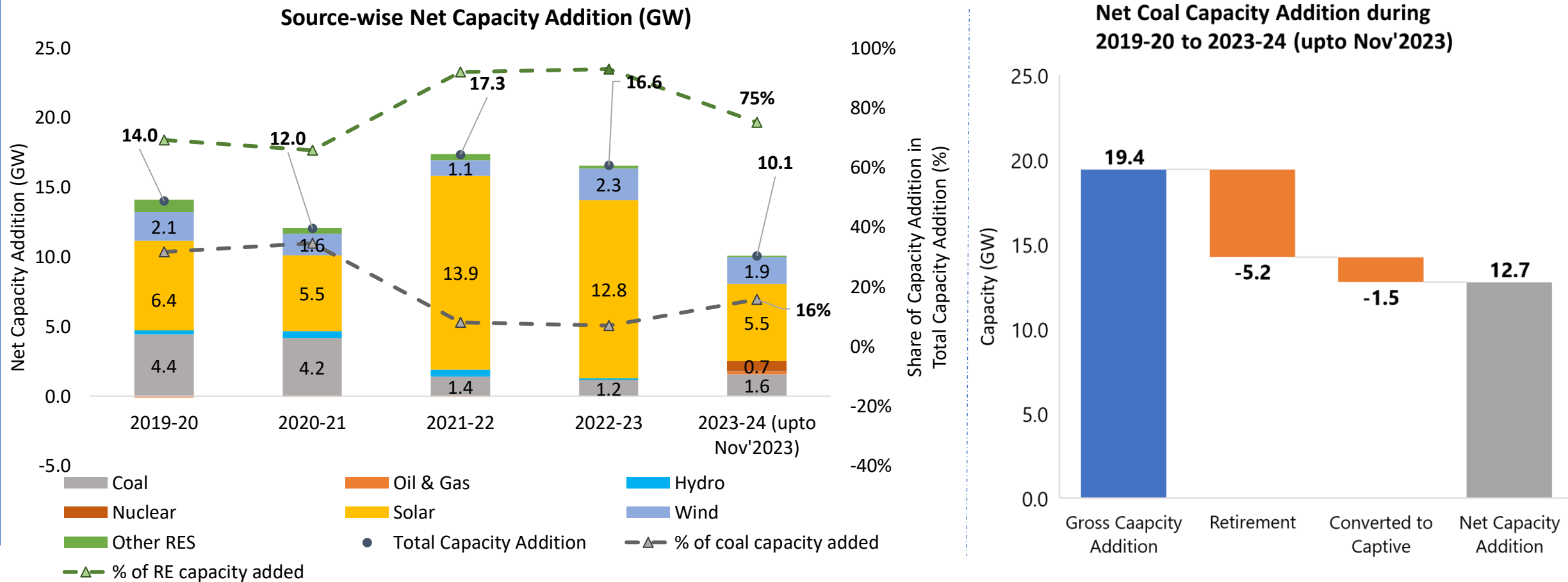
Note: Per Capita energy consumption is calculated on energy supply basis.

India's Electricity Capacity Mix (Utility-scale)



- India's electricity generating capacity is 426 GW as on Nov'2023 [coal 213 GW (50%), solar 72 GW (17%), hydro 47 GW (11%), and wind 45 GW (10%)].
- As on Nov'2023, the share of non-fossil-based electricity capacity is 44% against the set target of 50% non-fossil capacity by 2030.
- As on Nov'2023, India's renewable energy capacity (including large hydro) stood at 180 GW out of 426 GW.

India's Electricity Capacity Addition in last 5 years



- A total of 57 GW of generation capacity has been added in RE (Hydro, solar, wind, and other RES) over the past 5 years, whereas the net coal capacity addition during the same period was 13 GW, mostly in the central sector.
- The share of RE addition in total capacity has shown an increasing trend (from 69% in 2019-20 to 93% in 2022-23).

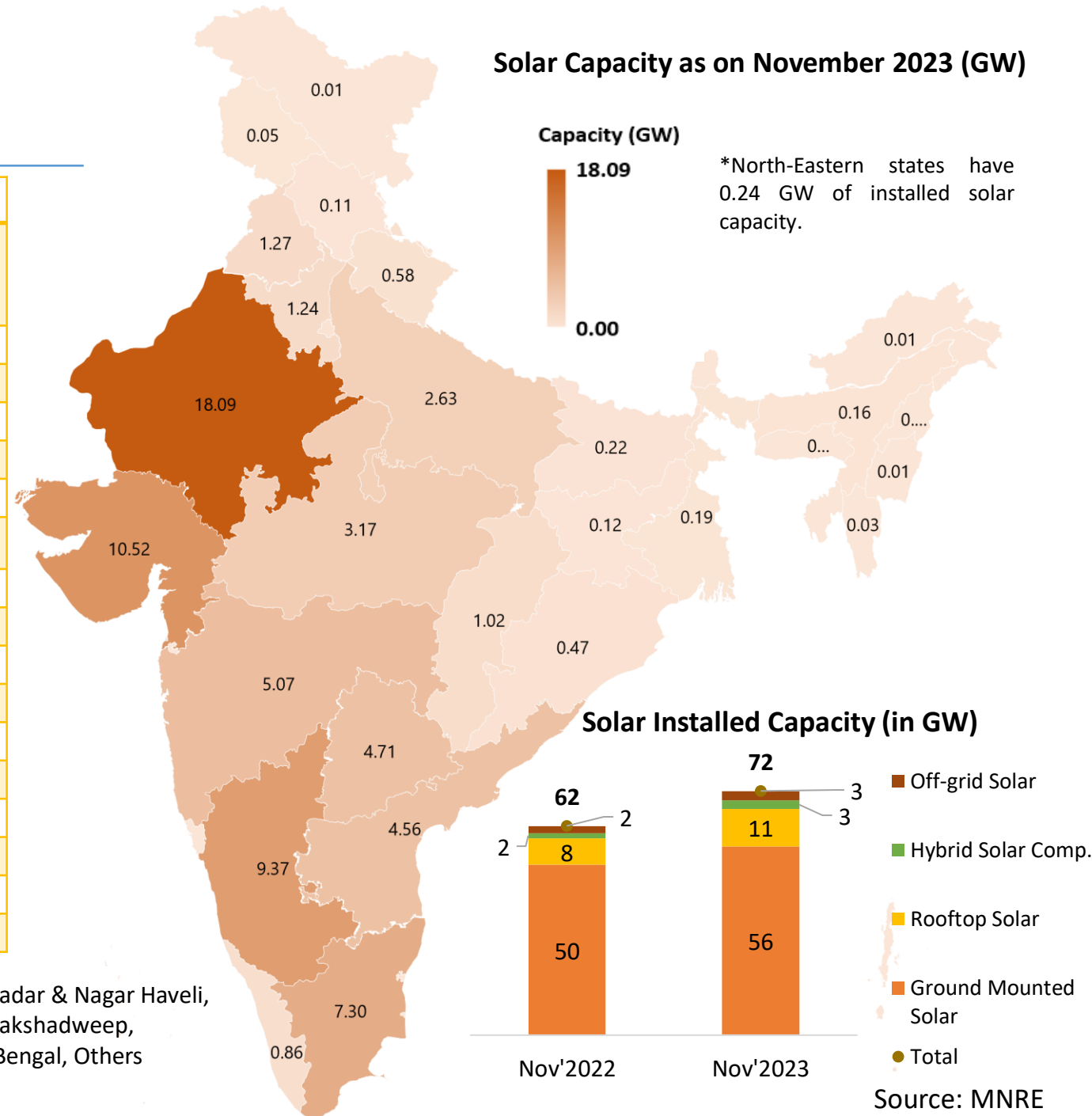
State-wise Solar Capacity

as on November 2023

State-wise installed capacity of Solar Power (GW)					
States	Ground Mounted	Rooftop	Solar Component in Hybrid	Off Grid	Total Solar Power
Rajasthan	14.5	1.0	2.0	0.6	18.1
Gujarat	7.0	2.9	0.6	0.1	10.5
Karnataka	7.8	1.6	0.0	0.0	9.4
Tamil Nadu	6.8	0.4	0.0	0.1	7.3
Maharashtra	3.1	1.7	0.0	0.3	5.1
Telangana	4.4	0.3	0.0	0.0	4.7
Andhra Pradesh	4.3	0.2	0.0	0.1	4.6
Madhya Pradesh	2.8	0.3	0.0	0.1	3.2
Uttar Pradesh	2.1	0.3	0.0	0.2	2.6
Punjab	0.9	0.3	0.0	0.1	1.3
Haryana	0.3	0.5	0.0	0.5	1.2
Chhattisgarh	0.6	0.1	0.0	0.4	1.0
Kerala	0.3	0.5	0.0	0.0	0.9
Uttarakhand	0.3	0.3	0.0	0.0	0.6
Others	0.9	0.7	0.0	0.3	1.9
All India	56.0	11.1	2.6	2.7	72

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

Solar Capacity as on November 2023 (GW)

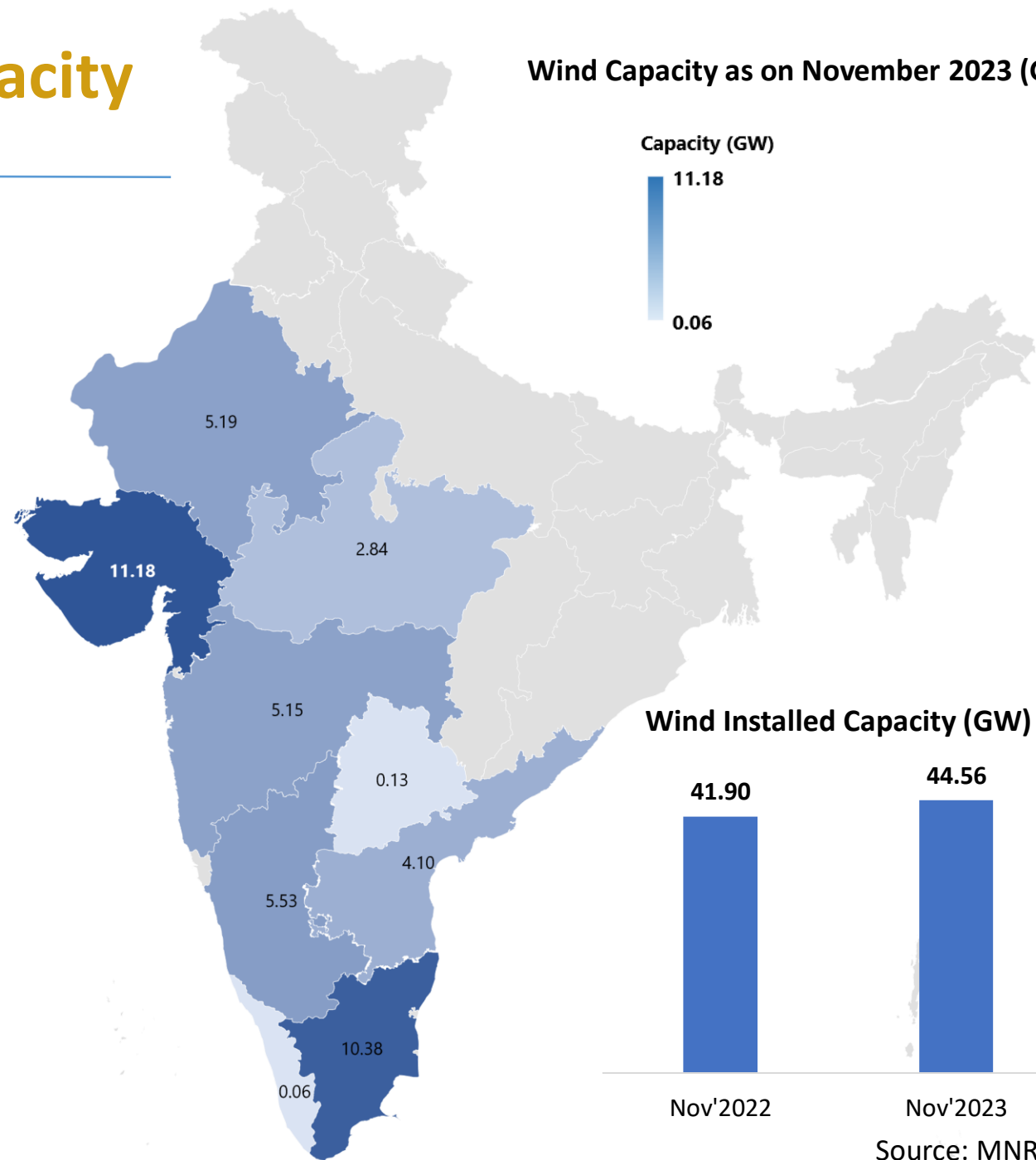


State-wise Wind Onshore Capacity

as on November 2023

Wind Capacity as on November 2023 (GW)

State-wise installed capacity of Wind (Onshore) Power	
States	Installed Capacity (GW)
Gujarat	11.18
Tamil Nadu	10.38
Karnataka	5.53
Rajasthan	5.19
Maharashtra	5.15
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
India Total	44.56

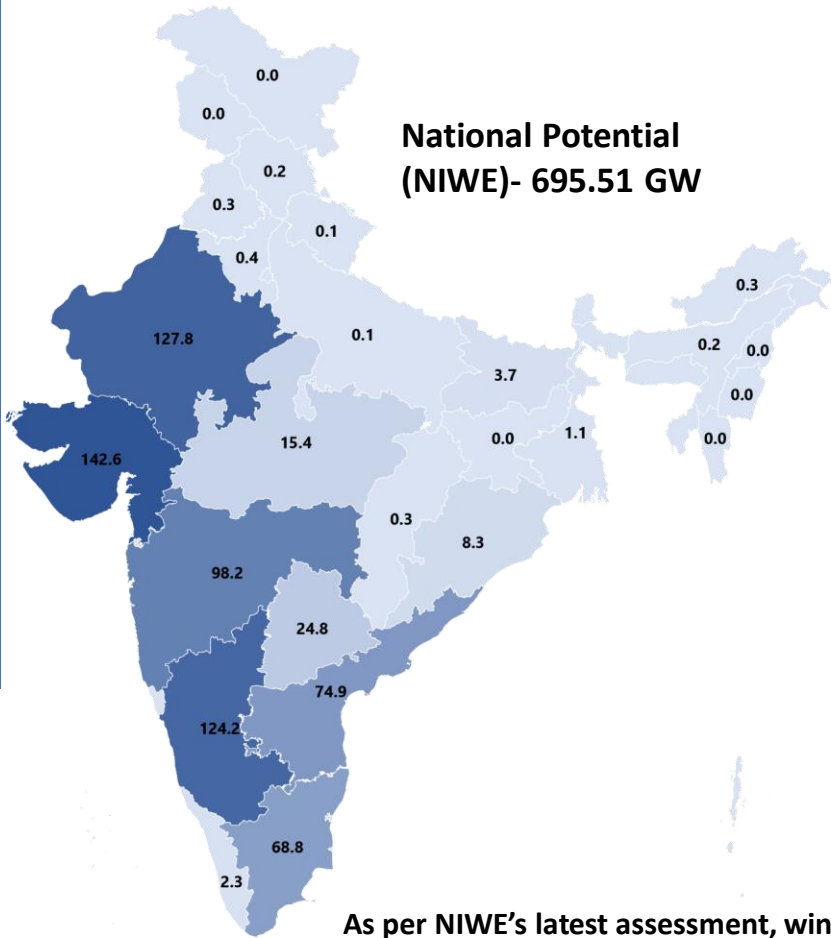


RE Potential and Installed Capacity (1/2)

RE potential in the state

Wind Onshore Potential at 120m agl

State Potential (GW) 0.0 142.6

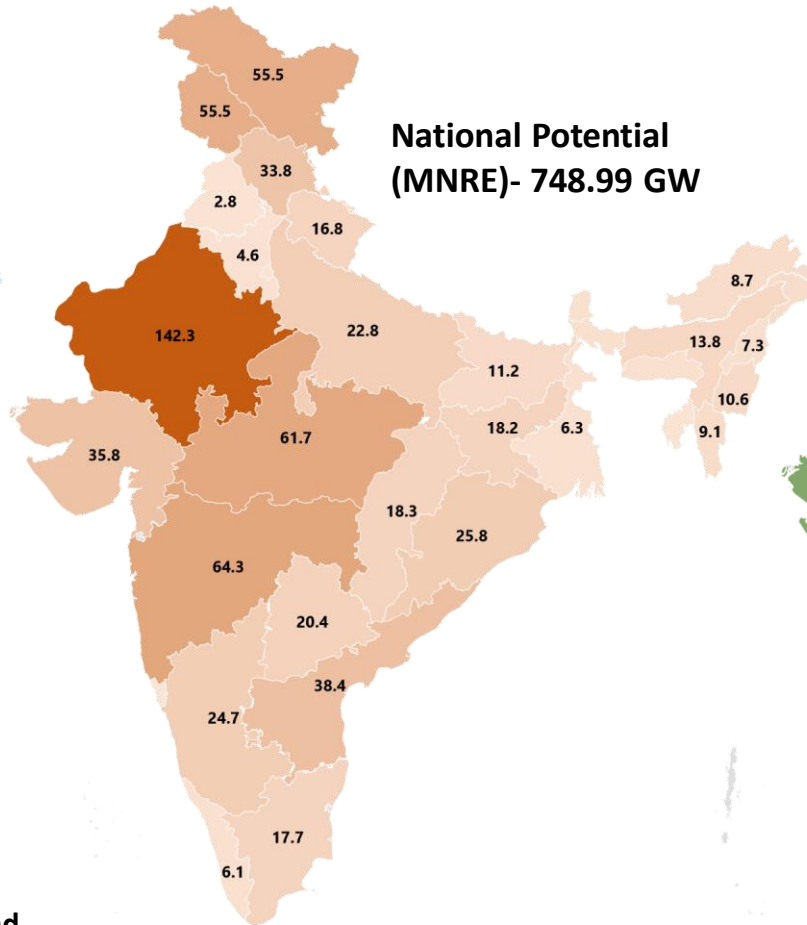


National Potential (NIWE)- 695.51 GW

As per NIWE's latest assessment, wind potential at 150m agl is 1164 GW.

Solar Potential

State Potential (GW) 0.9 142.3

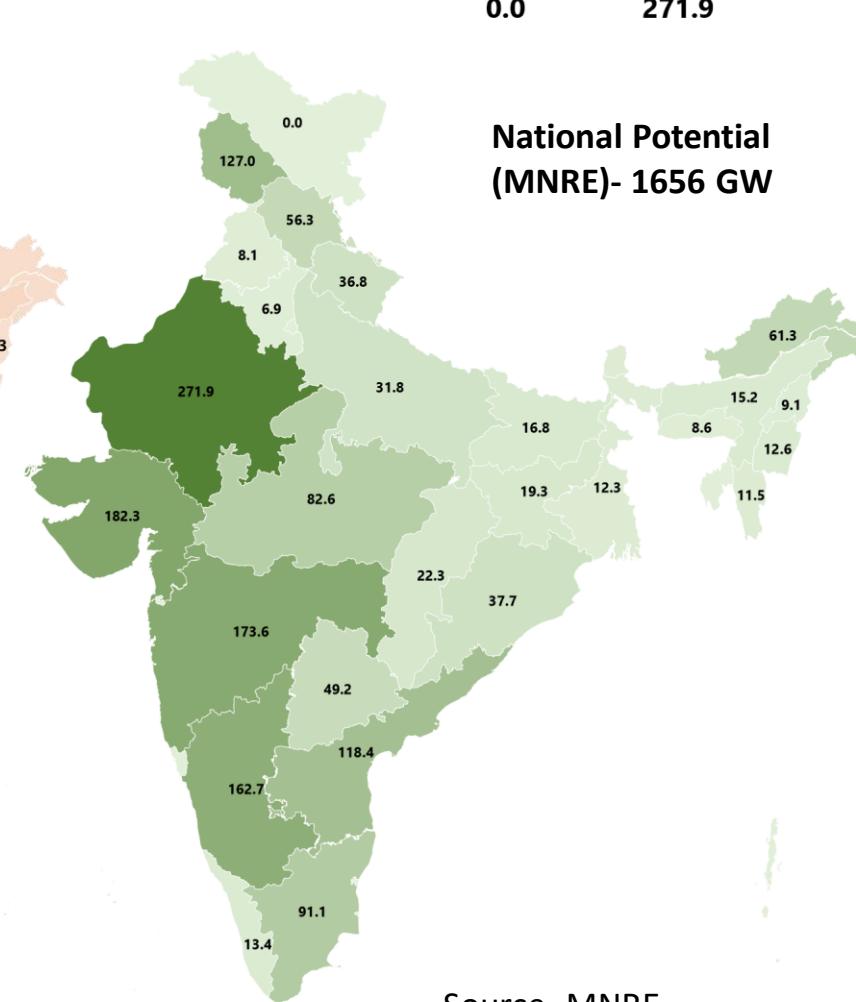


National Potential (MNRE)- 748.99 GW

Market potential for SPV rooftop is 124 GW.

Renewable Energy Potential (all sources including large Hydro)

State Potential (GW) 0.0 271.9



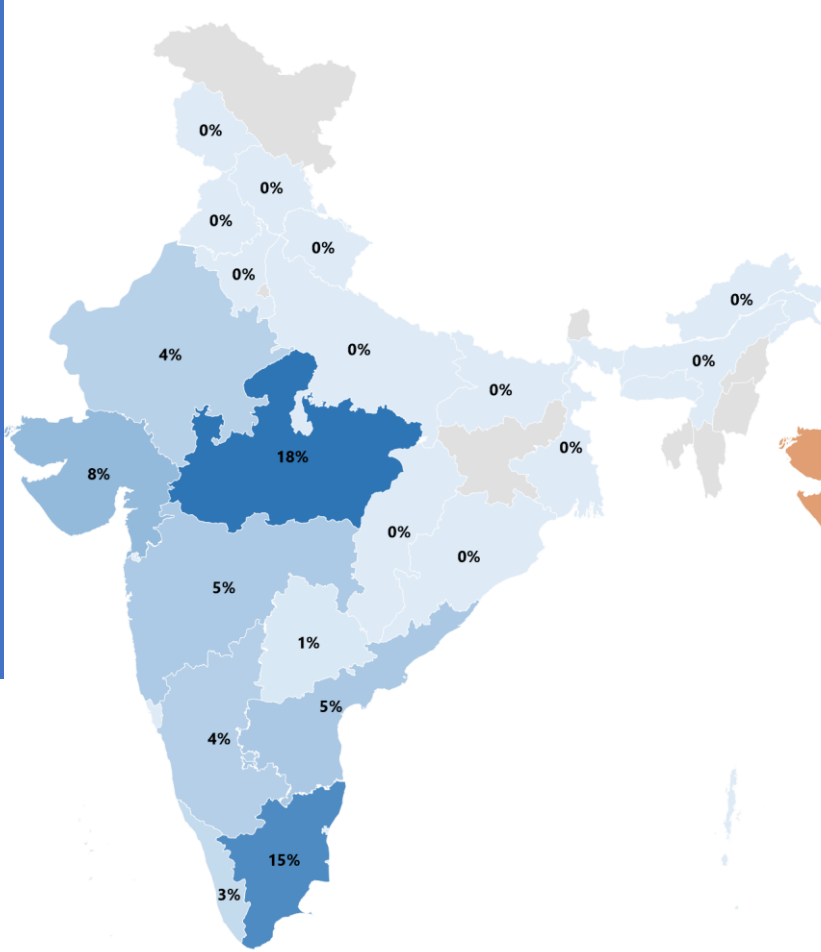
National Potential (MNRE)- 1656 GW

Source- MNRE

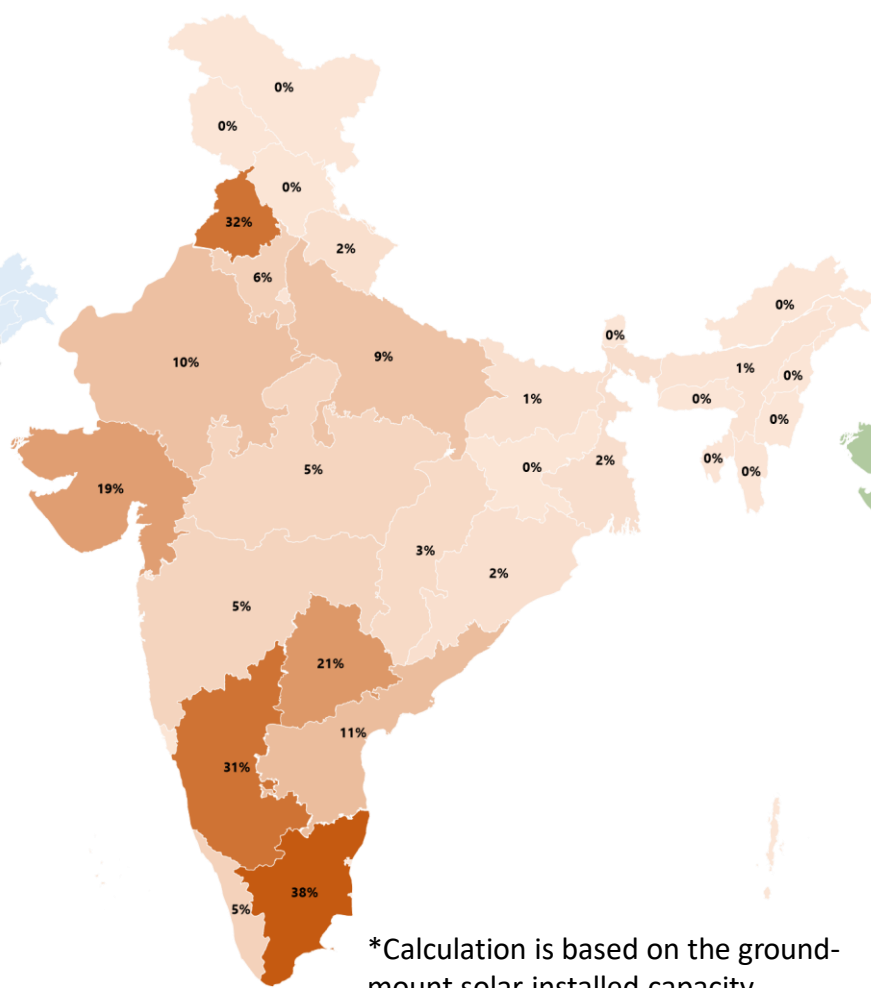
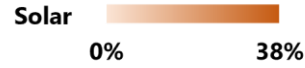
RE Potential and Installed Capacity (2/2)

RE Installed capacity as a Percentage of the total resource potential in the state as on November 2023

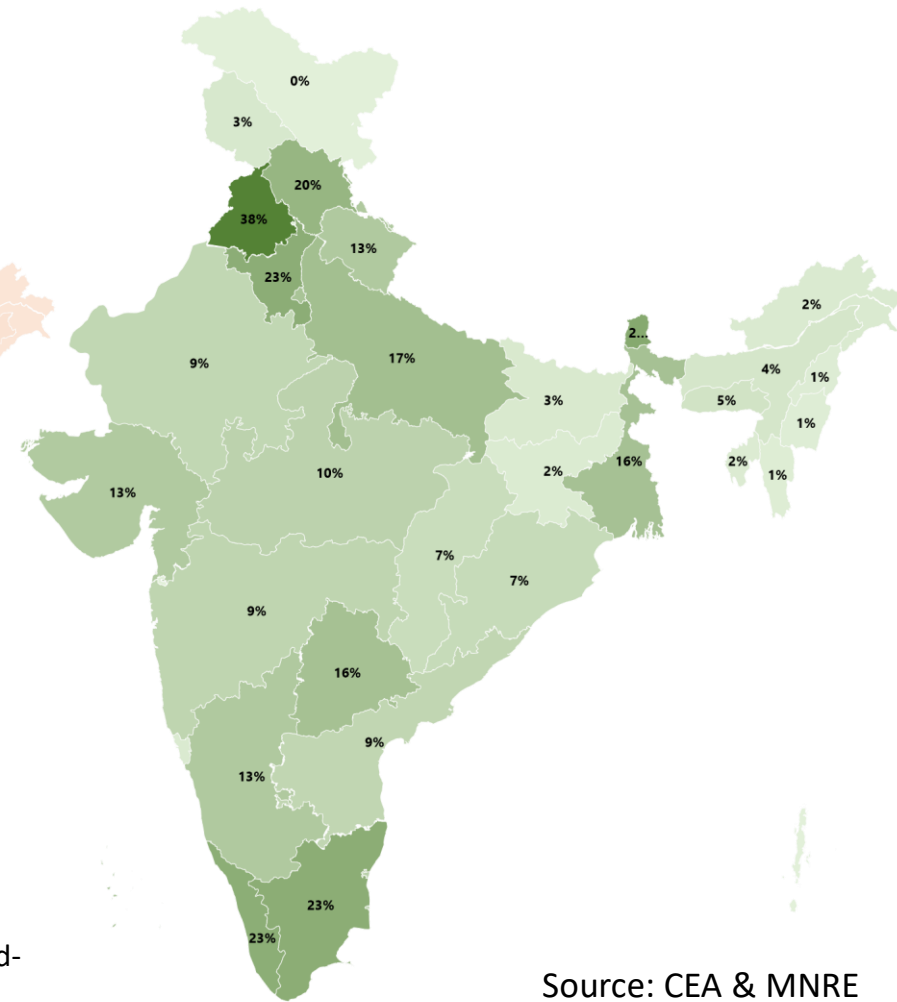
Wind Onshore Capacity



Solar Capacity*



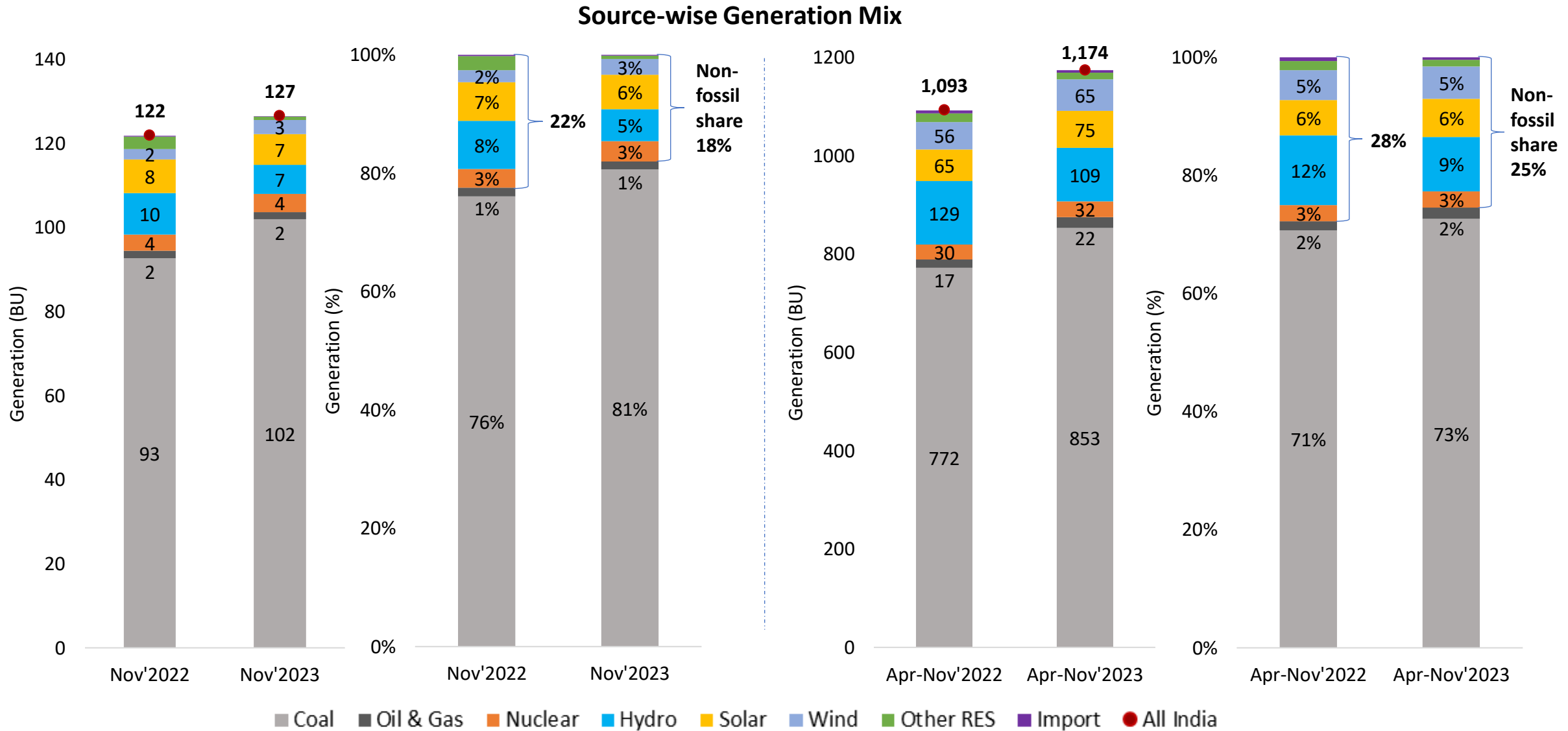
RE Capacity (all sources including large hydro)



*Calculation is based on the ground-mount solar installed capacity.

Source: CEA & MNRE

India's Electricity Generation Mix

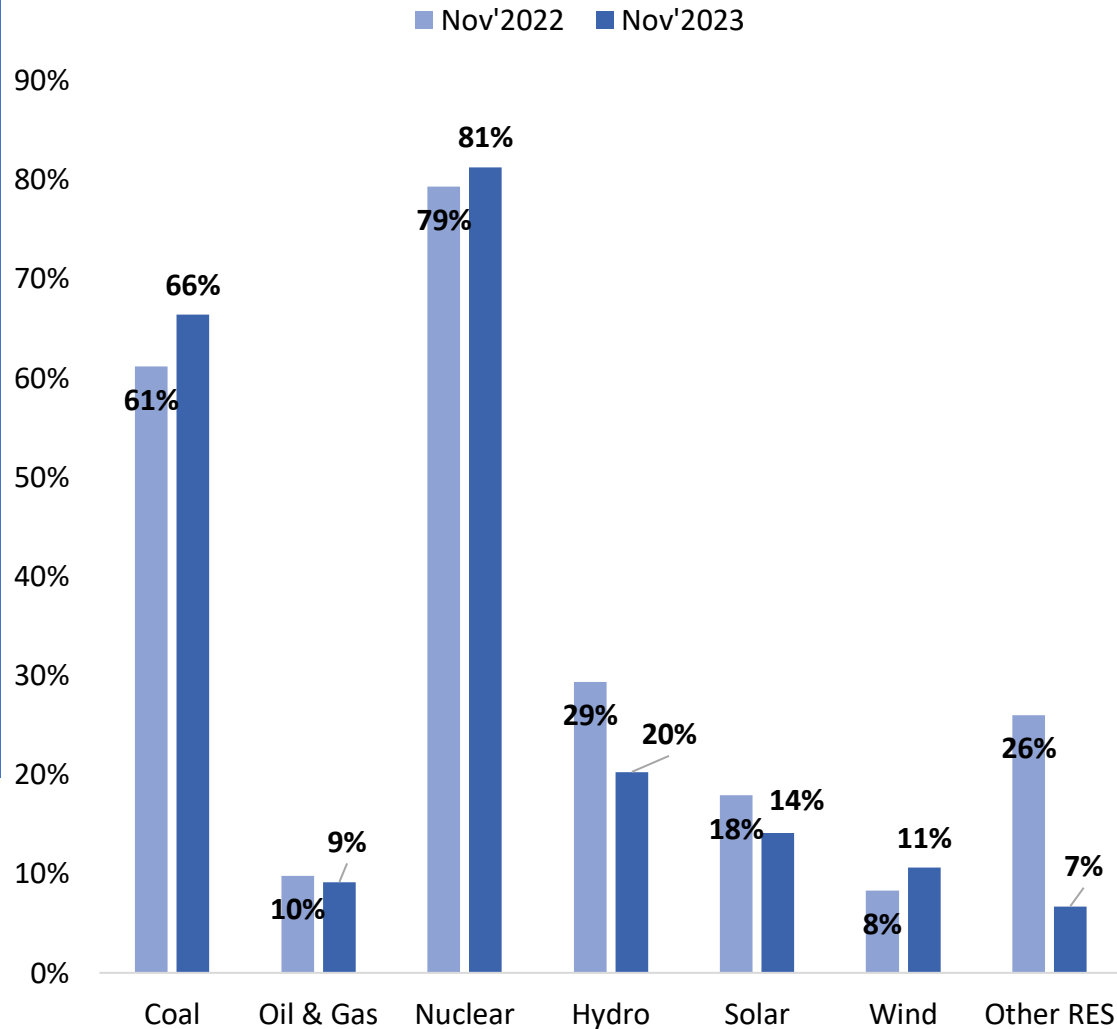


NOTE: The generation data for Nov'2023 is provisional.

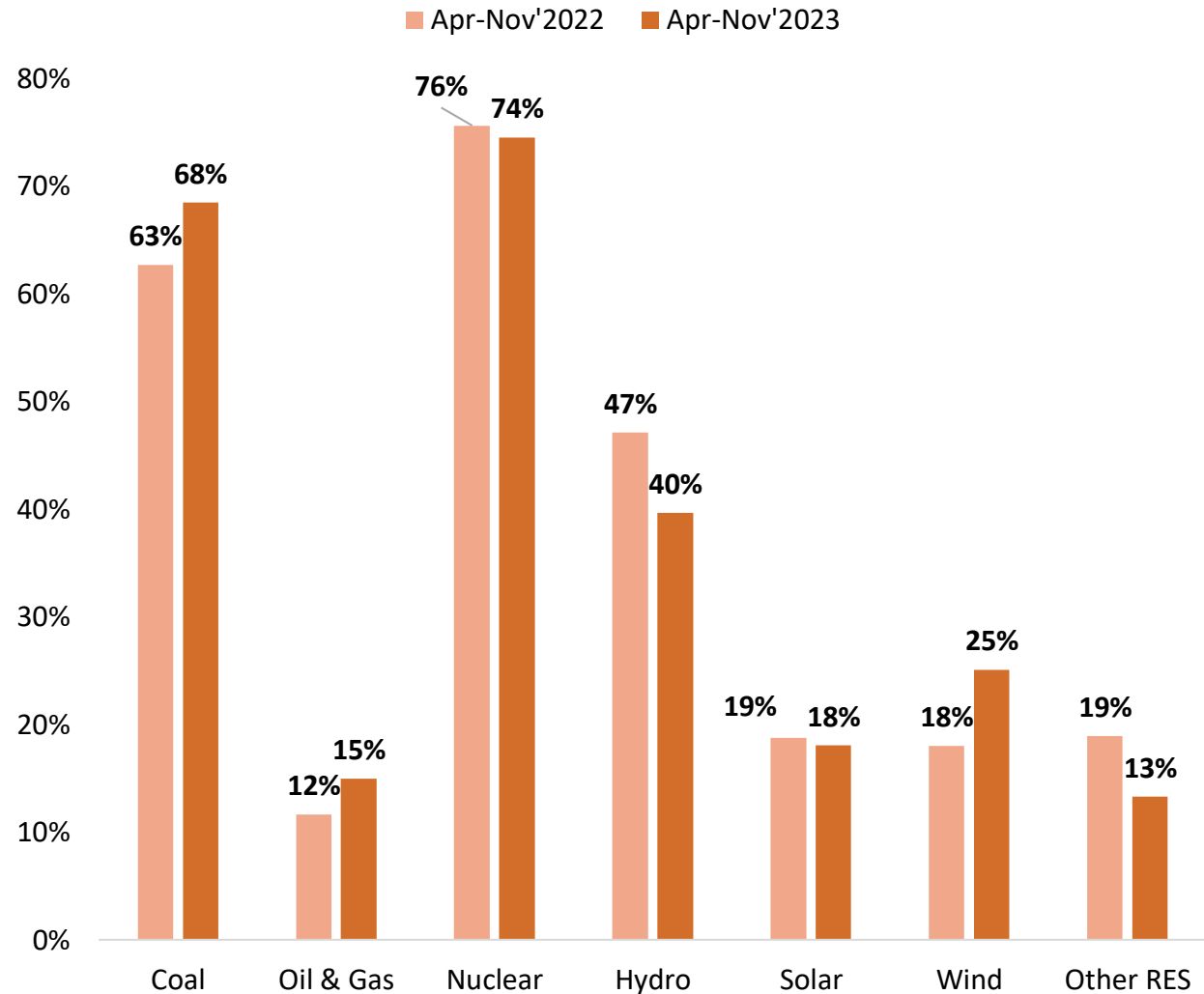
Source: CEA

Source-wise PLF/CUF

Source-wise PLF/ CUF in November (%)

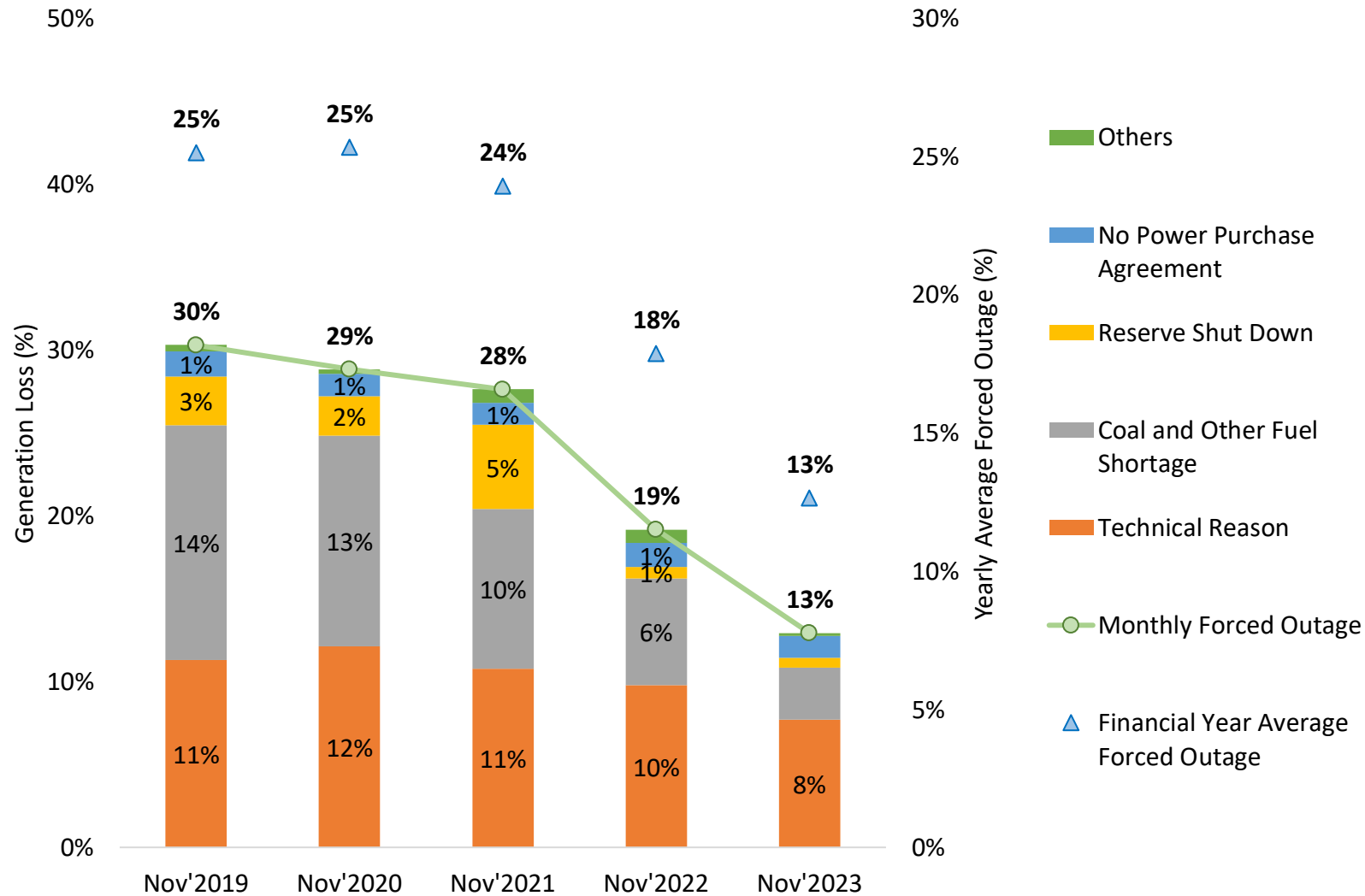


Source-wise PLF/ CUF Comparison (%)



Thermal Generation Loss and Reasons for Forced Outages

Forced Outages for November over the years



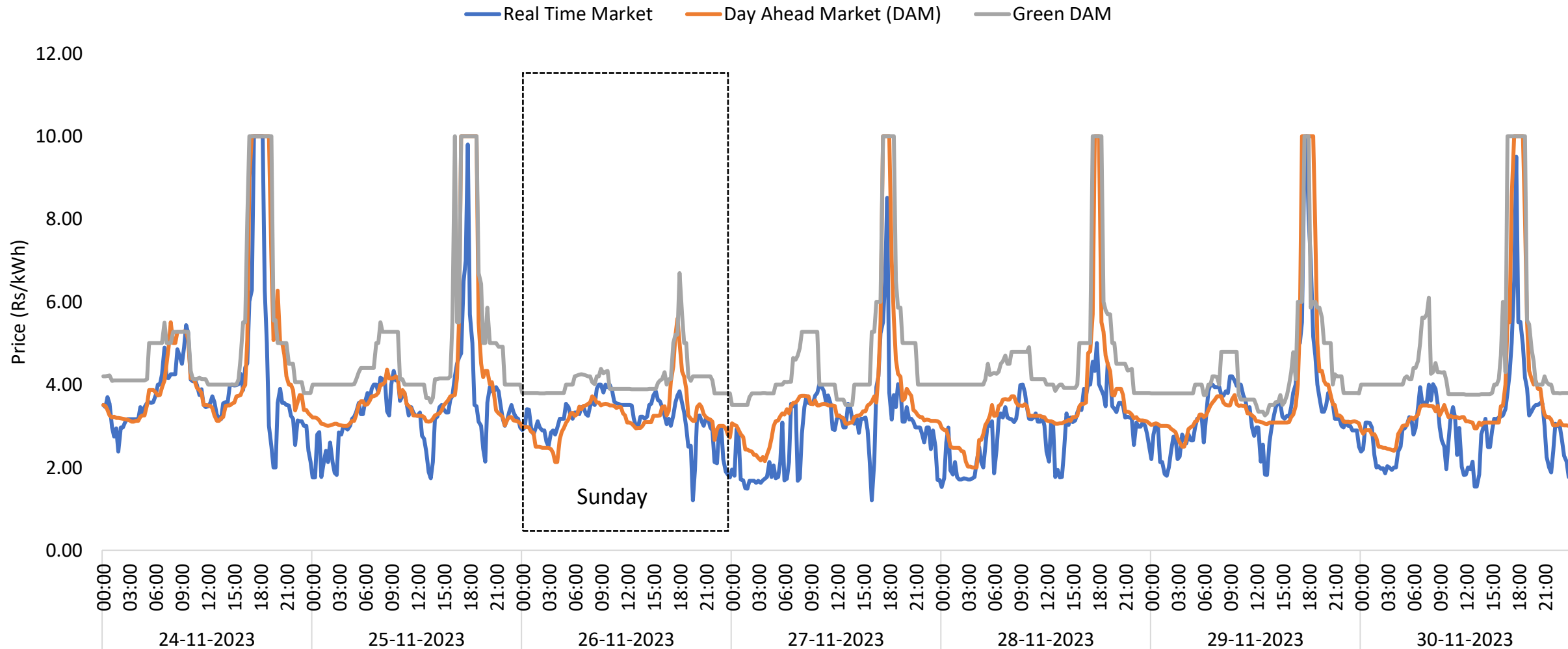
Year/ Month		Average Forced Outage Share
Yearly	FY 2021-22	24%
	FY 2022-23	18%
	FY 2023-24 (up to Nov'2023)	13%
Monthly	Nov'2021	28%
	Nov'2022	19%
	Nov'2023	13%

Thermal includes only Coal and Lignite Plants.

Source: ICED

Indian Electricity Exchange (IEX) Market Snapshot

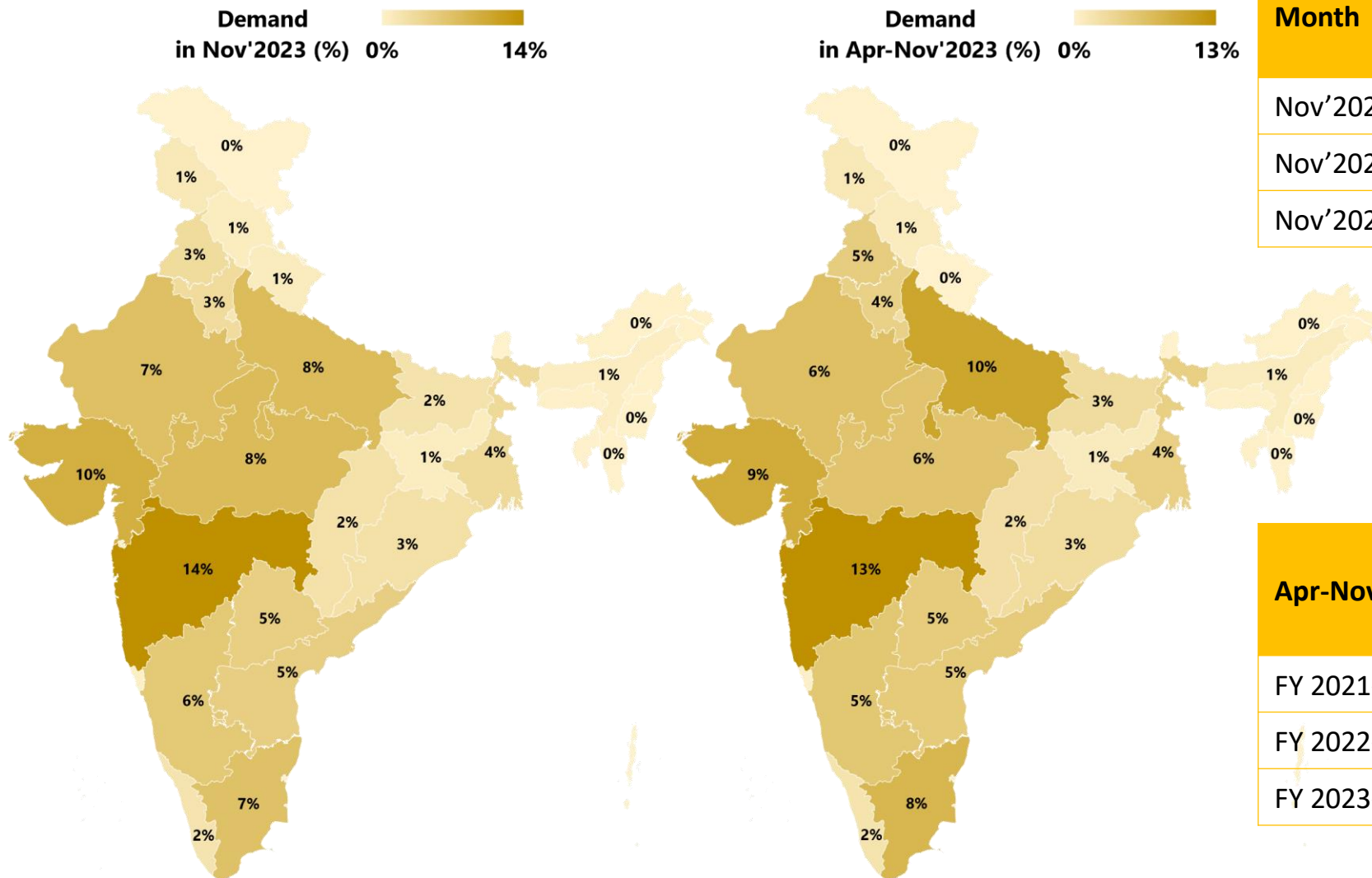
Market Clearing Prices of last 7 days of November 2023



In April 2023, CERC revised the price ceiling from ₹12/kWh to ₹10/kWh in the power exchange market.

National and State level Electricity Demand

State-level Electricity Demand as a percent of National Demand (%)



Month	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
Nov'2021	100	99	0.2
Nov'2022	110	110	0.2
Nov'2023	121	121	0.1

Apr-Nov	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
FY 2021-22	921	917	4
FY 2022-23	1016	1010	6
FY 2023-24	1103	1100	3

NOTE: The demand represented above includes intra state T&D losses.

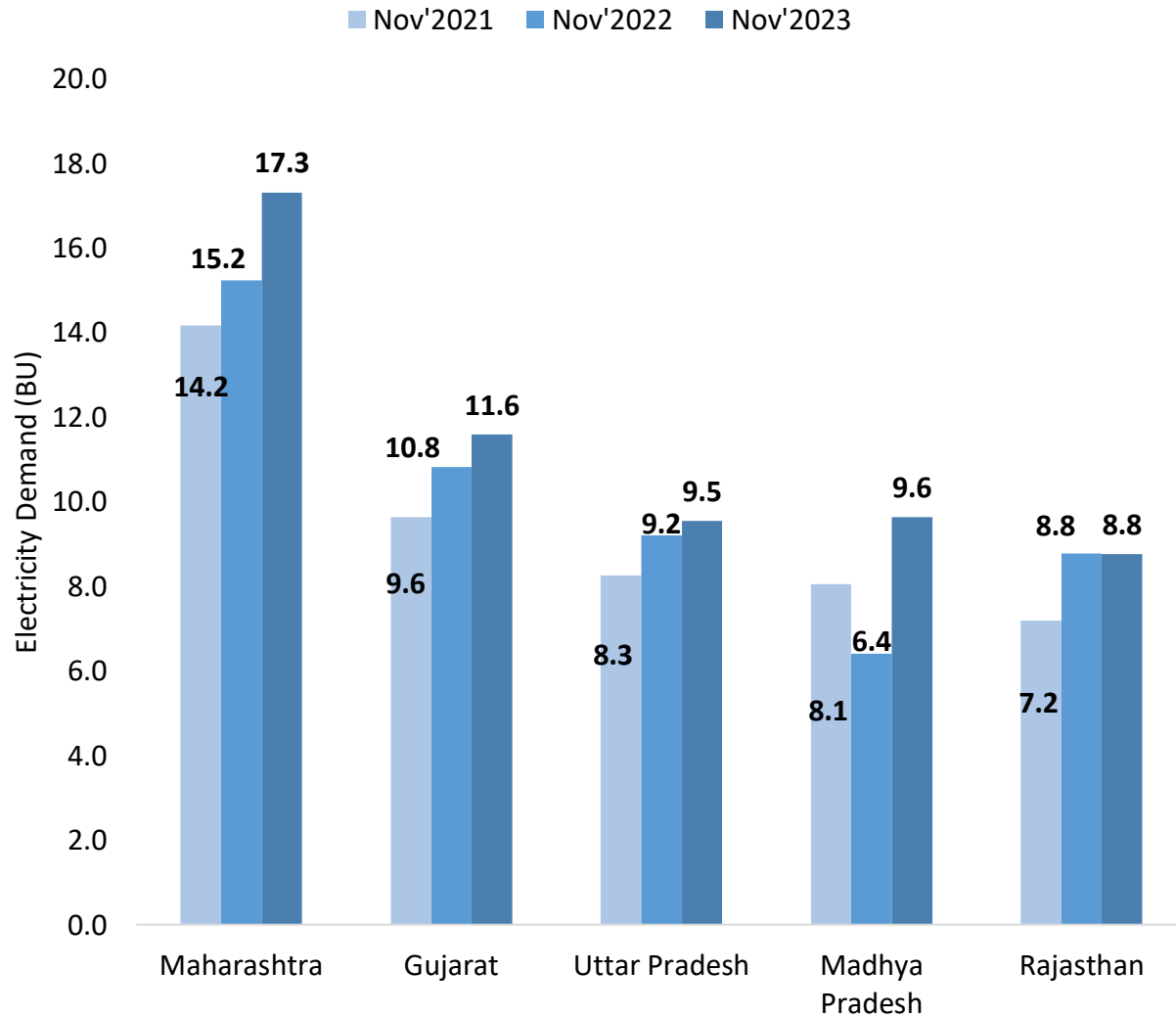
Source: CEA

India's Monthly Electricity Requirement and Supply

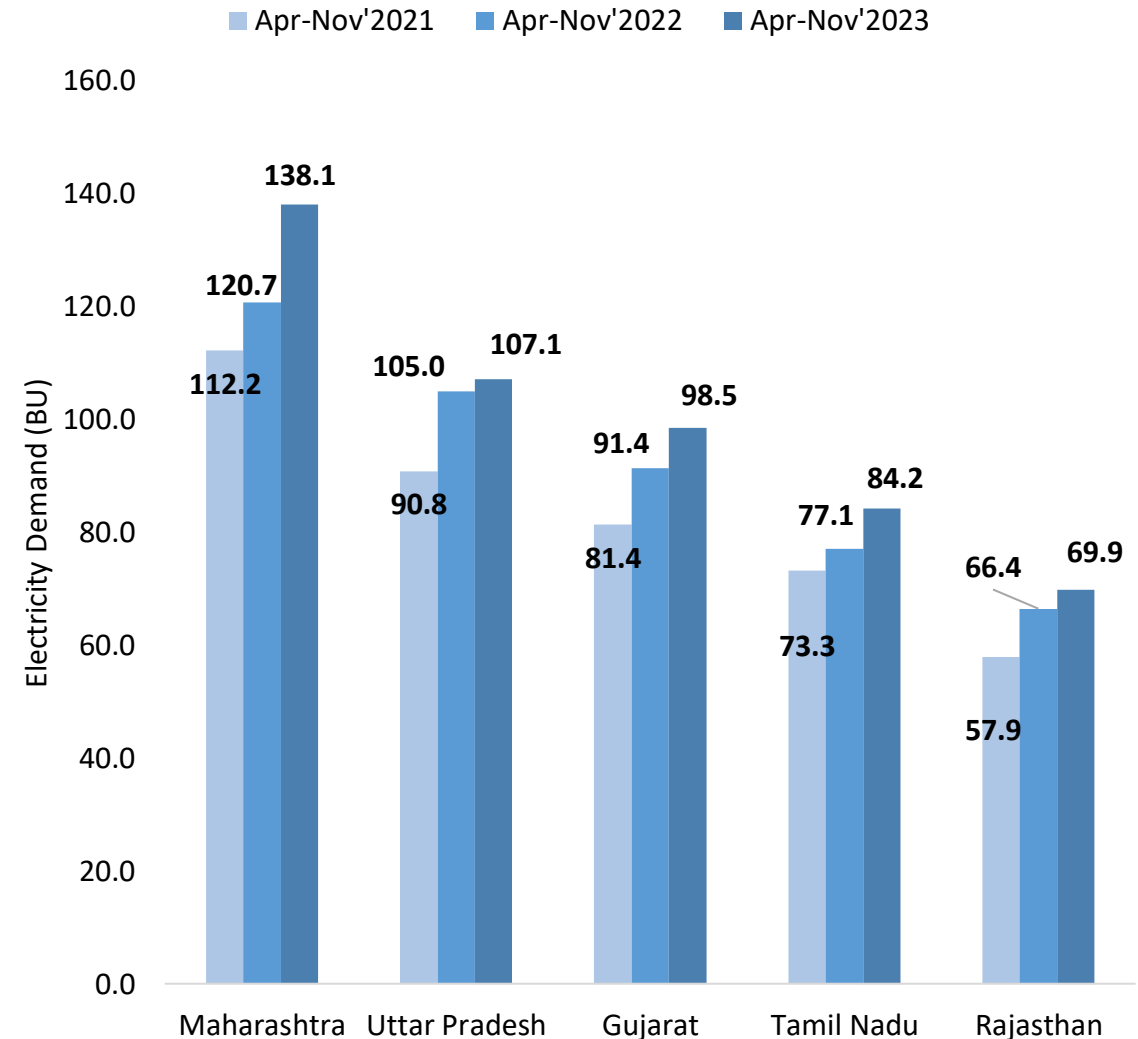


Monthly Electricity Demand of the top 5 states

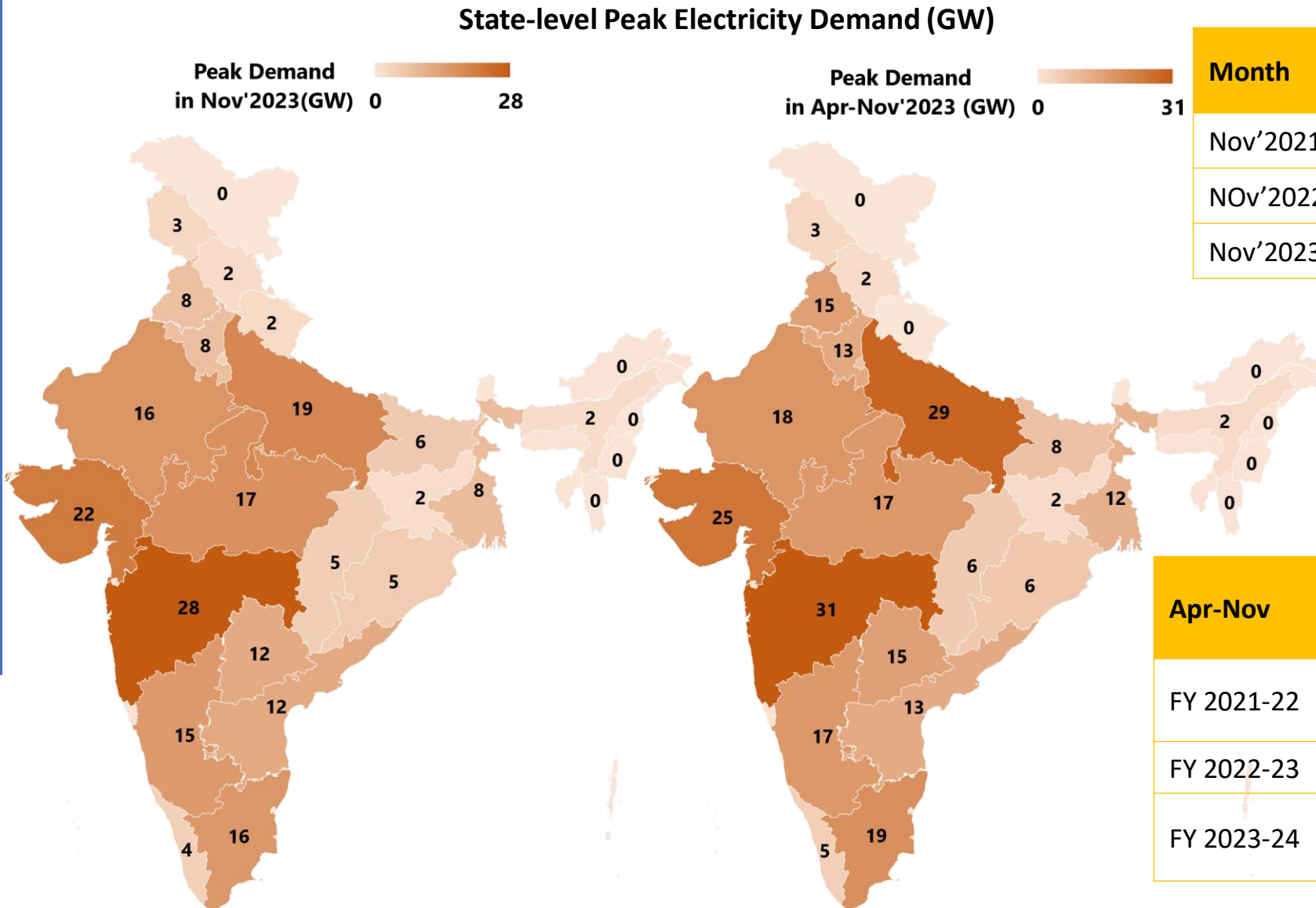
States with Highest Electricity Demand in October (BU)



States with Highest Electricity Demand (BU)



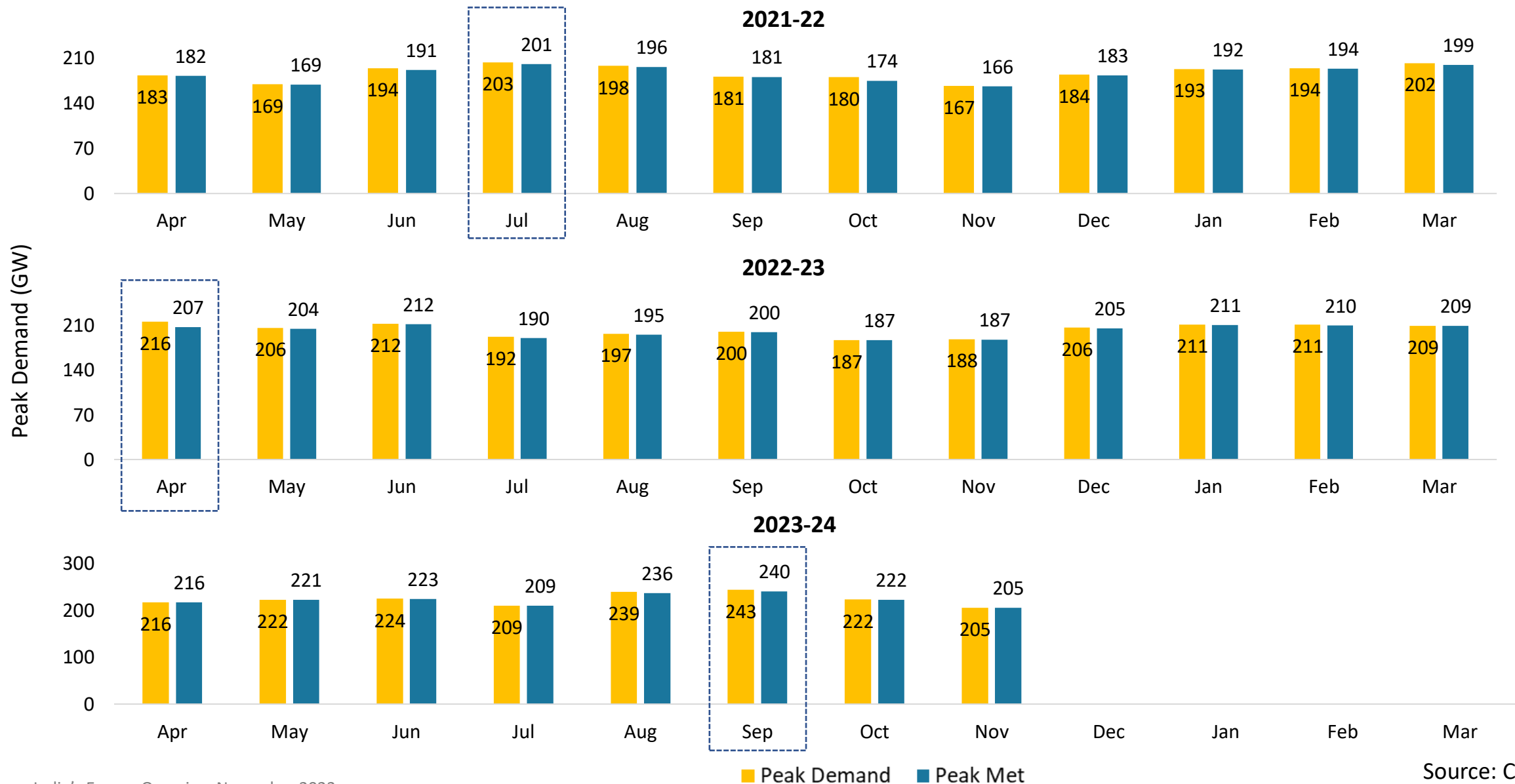
National and State level Peak Electricity Demand



Month	Peak Demand (GW)	Peak Supply (GW)	Gap(BU) (+/-)
Nov'2021	167	166	0.6
NOv'2022	188	187	1.1
Nov'2023	205	205	0.3

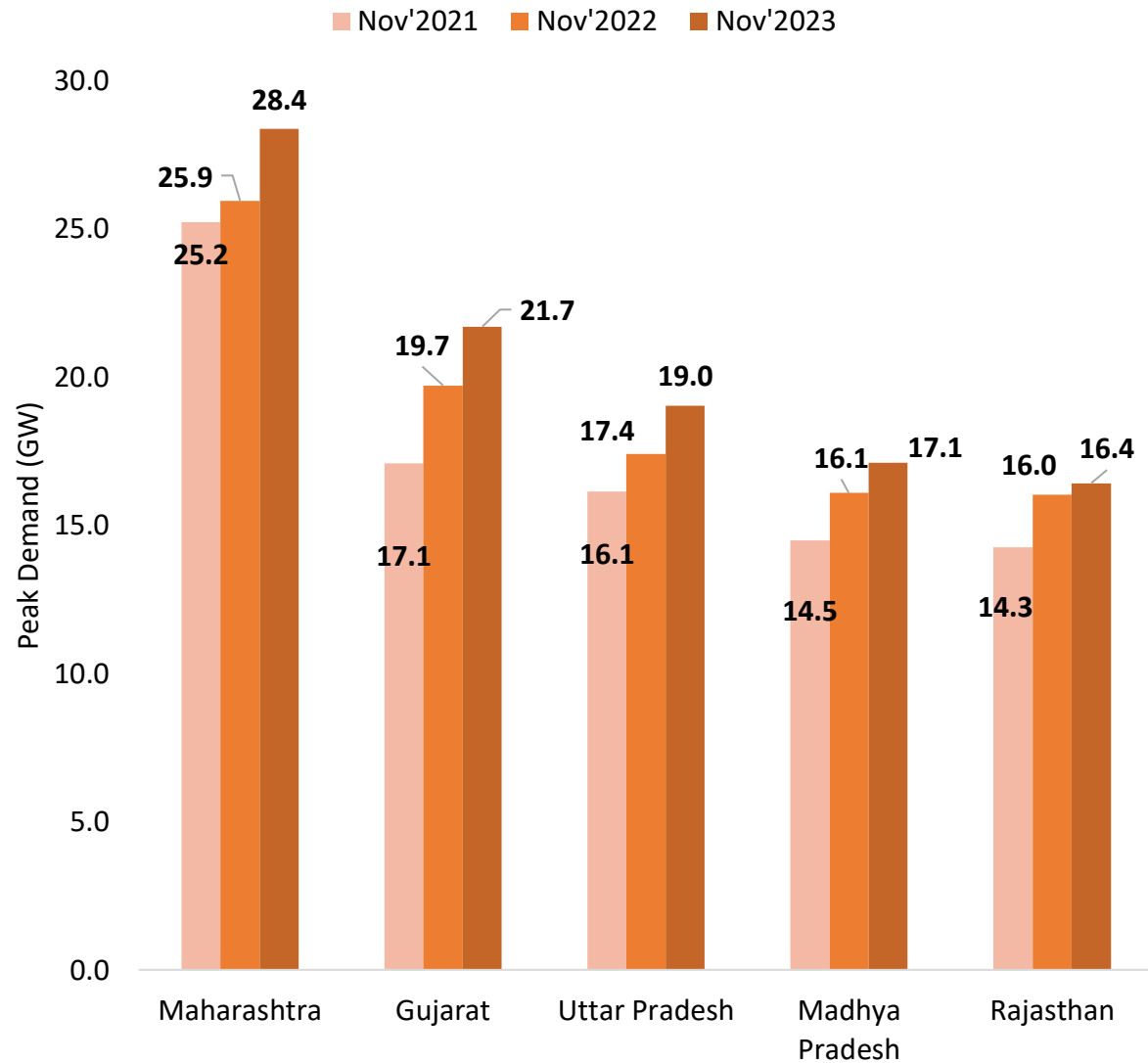
Apr-Nov	Peak Demand (GW)	Peak Supply (GW)	Gap (BU) (+/-)
FY 2021-22	203	201	3
FY 2022-23	216	207	9
FY 2023-24	243	240	3

India's Monthly Peak Electricity Demand and Supply

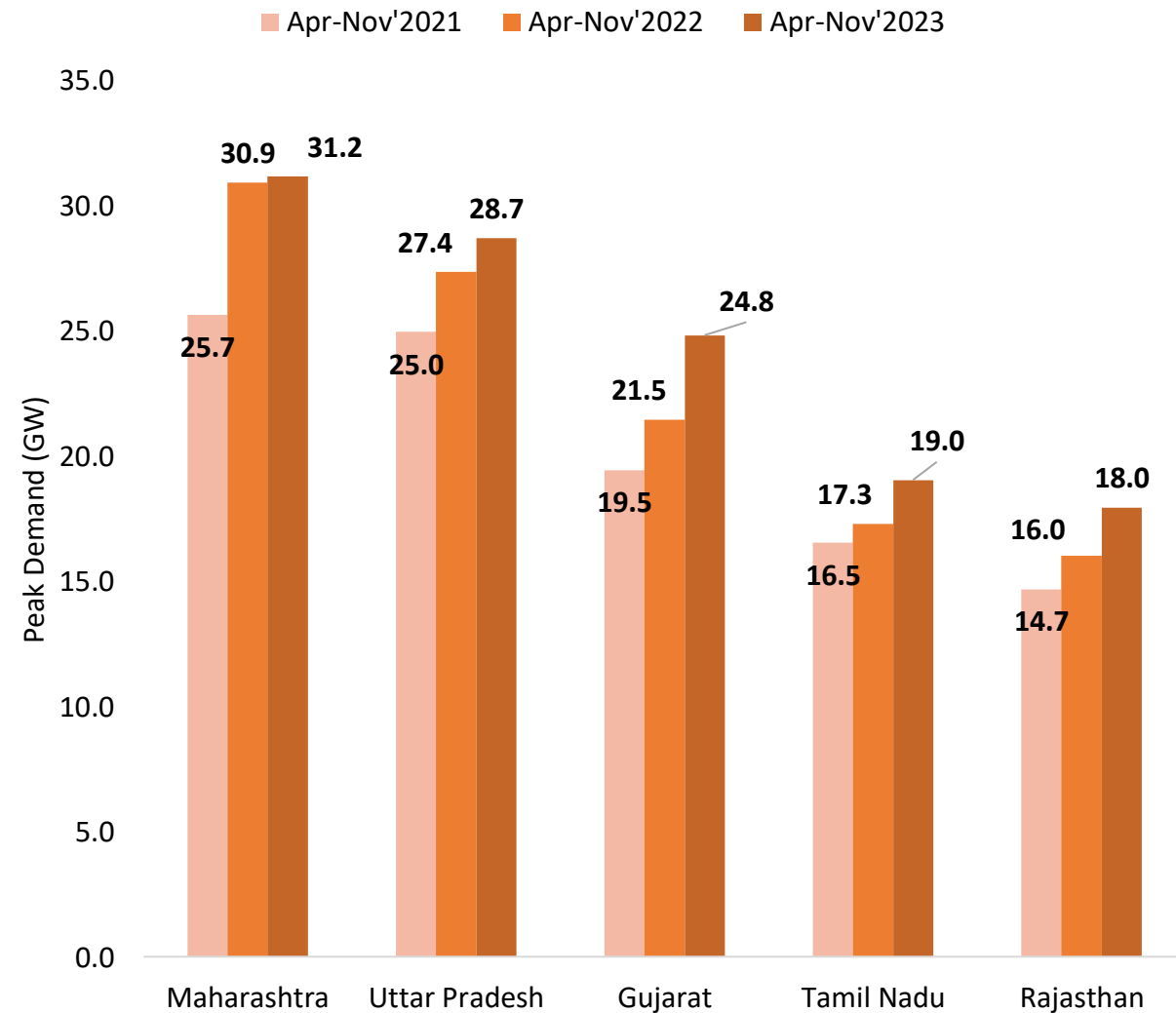


Monthly Peak Electricity Demand of the top 5 states

States with Highest Peak Electricity Demand in October (GW)



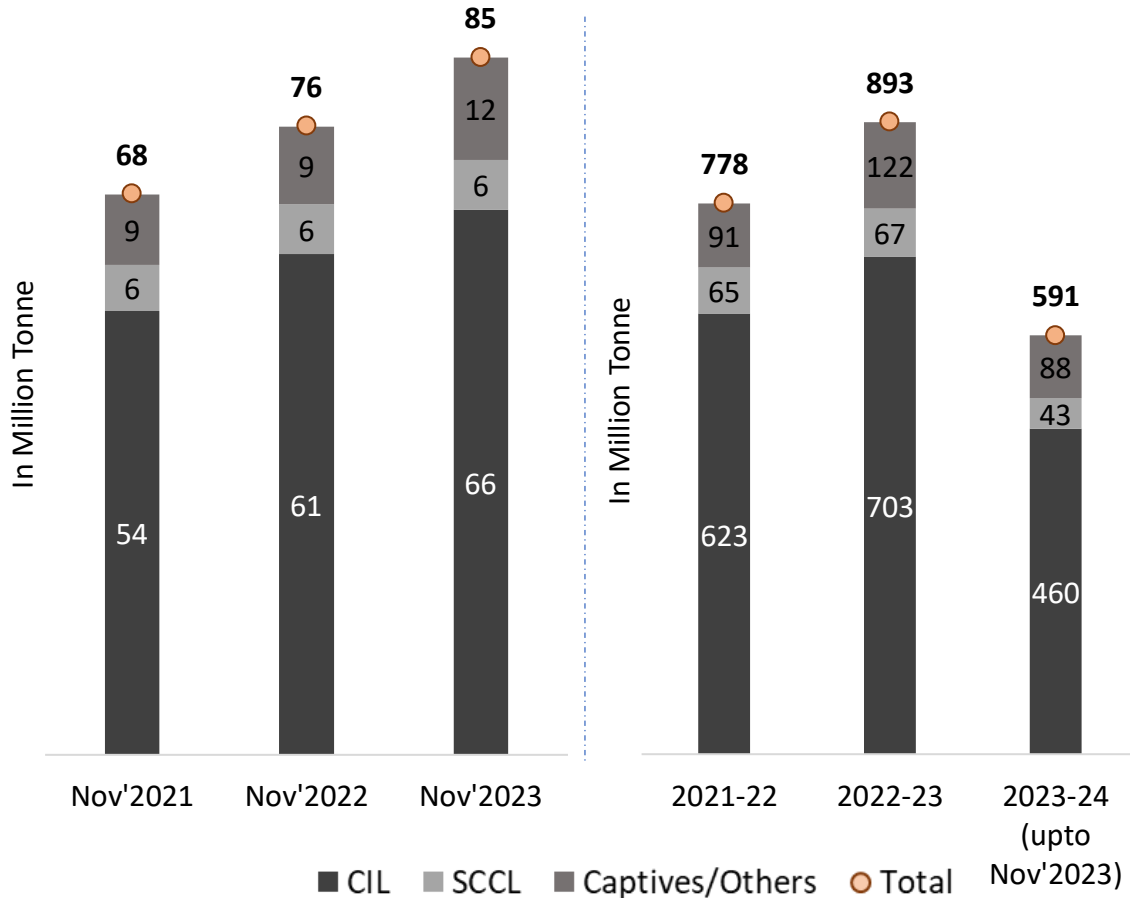
States with Highest Peak Electricity Demand (GW)



Source: CEA

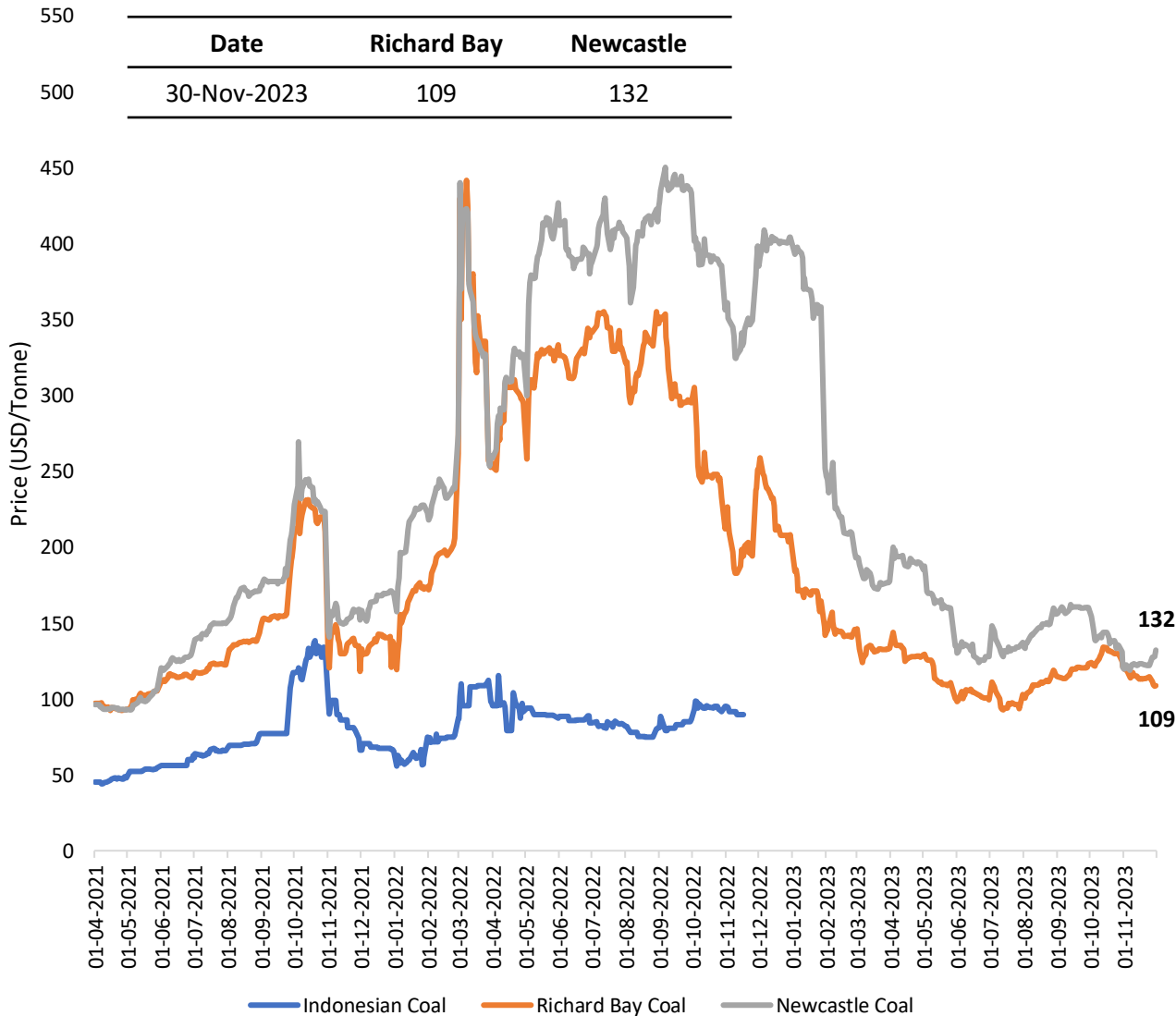
Monthly Coal Statistics

Monthly/ Annual Coal Production (in Million Tonnes)



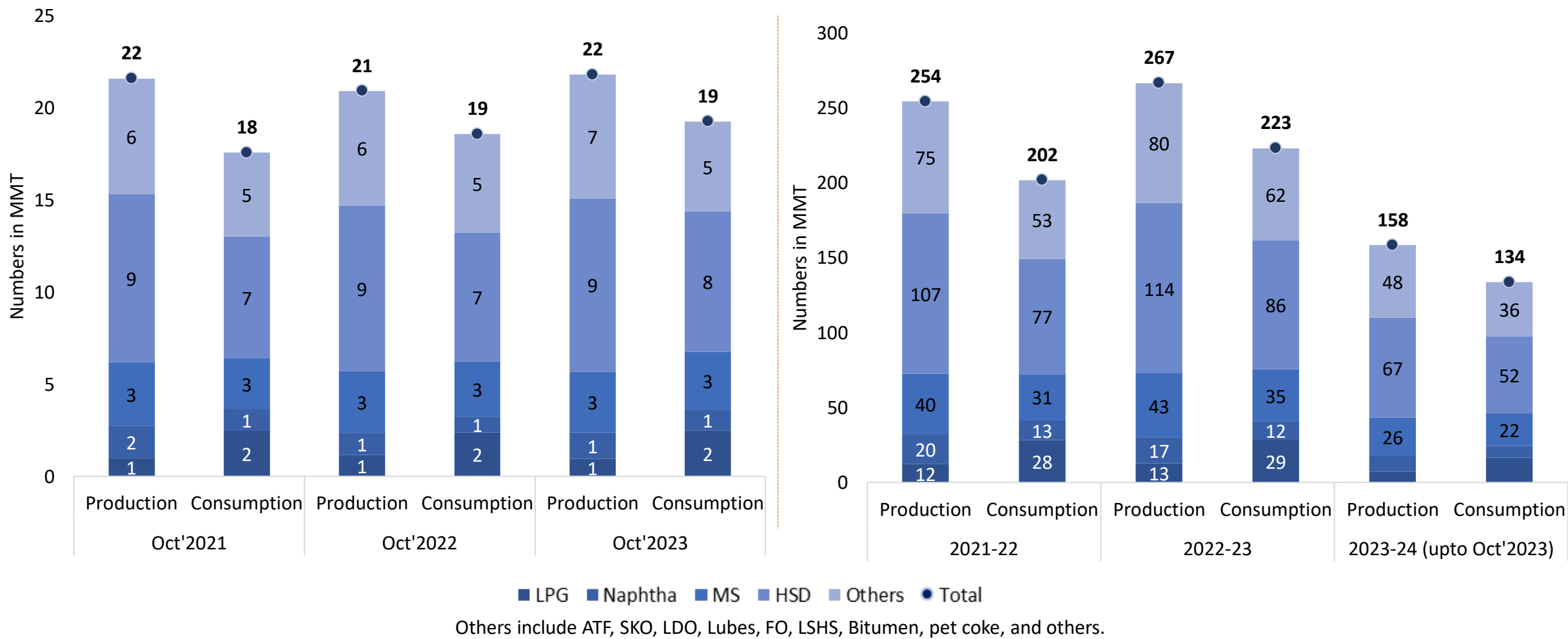
India's coal production increased in Nov'2023 (85 MT) by 11% as compared to Nov'2022.

International Coal Prices



Petroleum Products Market Scenario (1/3)

Petroleum Product-wise Production & Consumption (MMT)



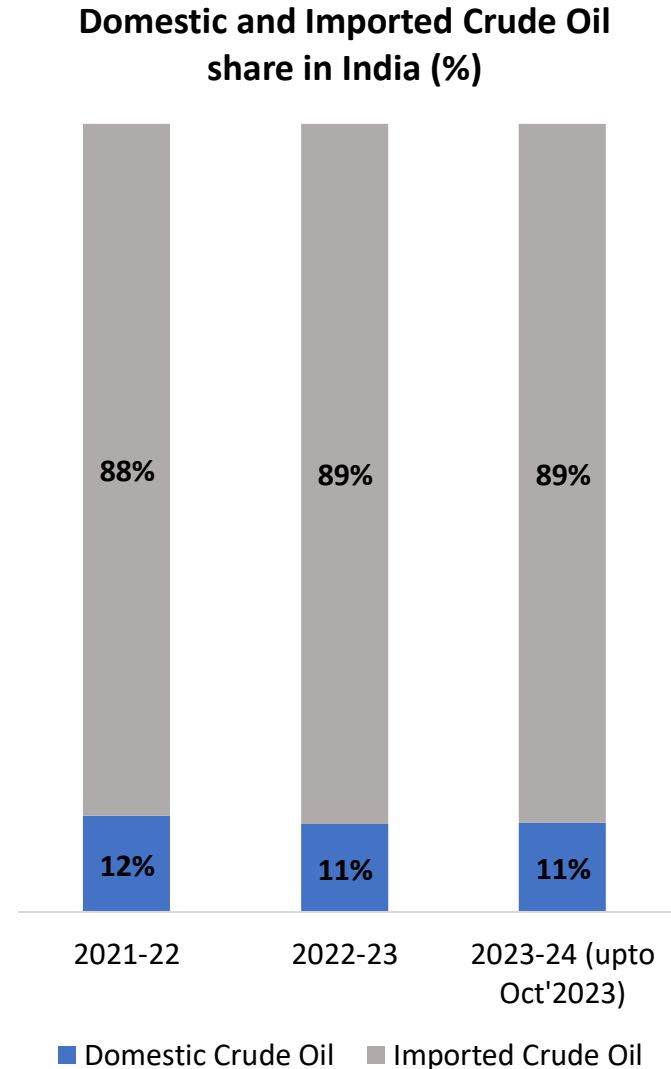
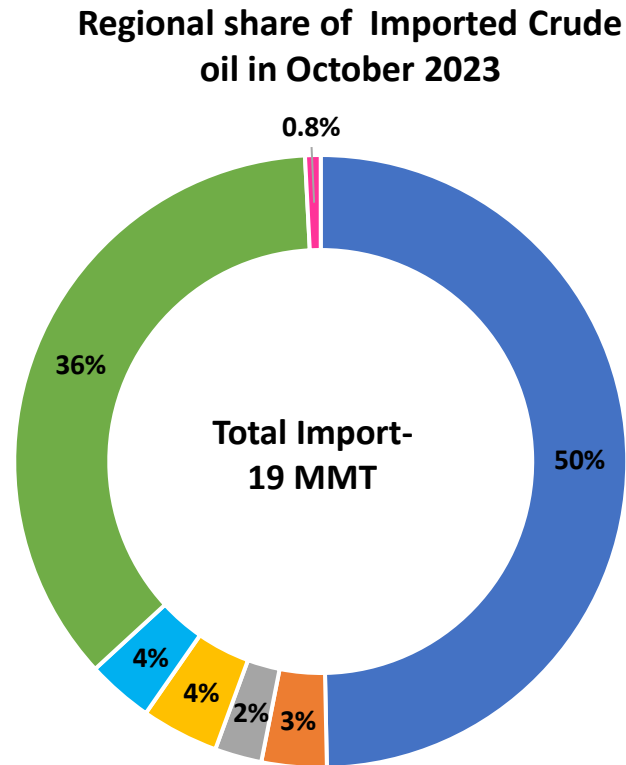
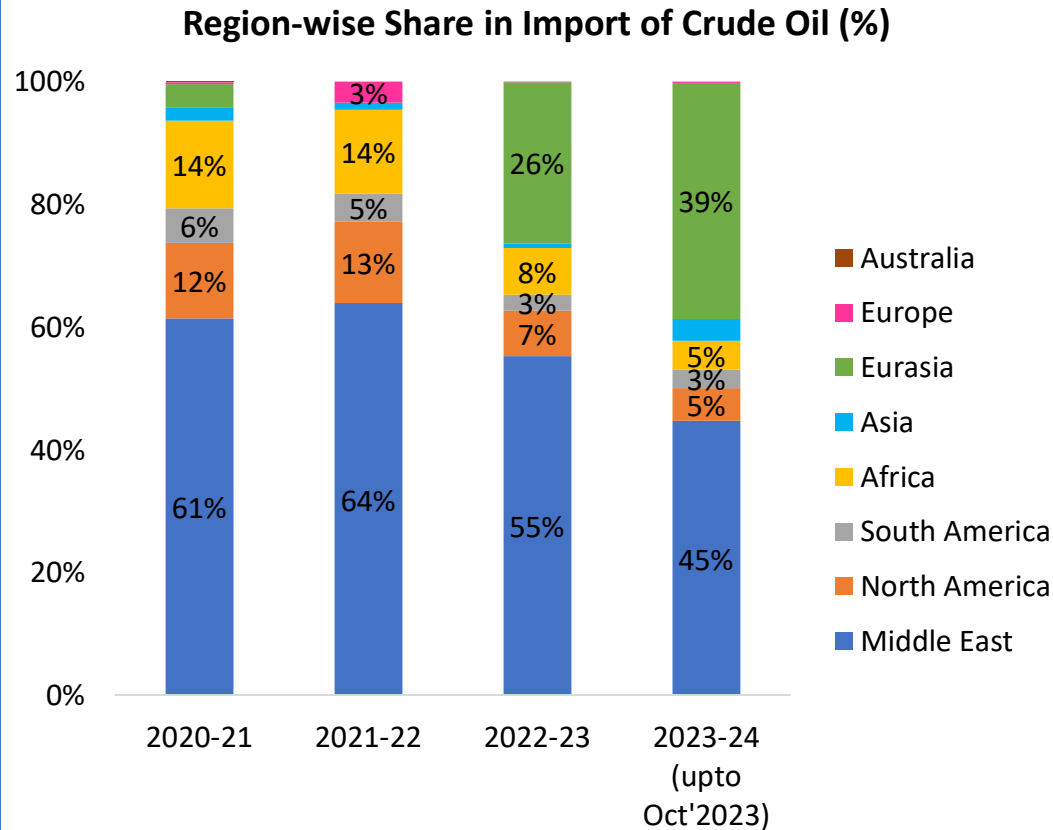
Abbreviations: ATF- Aviation Turbine Fuel, FO- Furnace Oil, HSD- High-Speed Diesel, LDO- Light Diesel Oil, MS- Motor Spirit (Petrol), SKO- Superior Kerosene Oil, LSHS- Low Sulphur Heavy Stock, LPG- Liquefied Petroleum Gas, MMT- Million Metric Tonne

Petroleum Products Market Scenario (2/3)

Import/Export of Crude Oil and Petroleum Products ('000 Tonnes)							
Petroleum Products	Import/ Export	Monthly			Yearly		
		Oct'21	Oct'22	Oct'23	2021-22	2022-23	2023-24 (upto Oct'2023)
Crude Oil	Import	17084	18123	18528	212382	232700	134431
	Export	0	0	0	0	0	0
	Net Import	17084	18123	18528	212382	232700	134431
LPG	Import	1599	1421	1903	17043	18335	10219
	Export	44	43	43	513	540	298
	Net Import	1555	1378	1860	16530	17796	9921
Diesel	Import	2	10	5	43	322	20
	Export	2897	2062	2108	32407	28494	15666
	Net Import	-2894	-2052	-2103	-32364	-28172	-15646
Petrol	Import	412	327	200	671	1069	646
	Export	1005	501	671	13482	13127	7829
	Net Import	-593	-173	-471	-12812	-12058	-7183
Others	Import	1706	1627	2305	21259	24871	16932
	Export	1363	1818	1651	16352	18854	11358
	Net Import	343	-190	654	4907	6017	5574

*Others include ATF, Naphtha, SKO, LDO, Lubes, FO, LSHS, Bitumen, pet coke, and others.

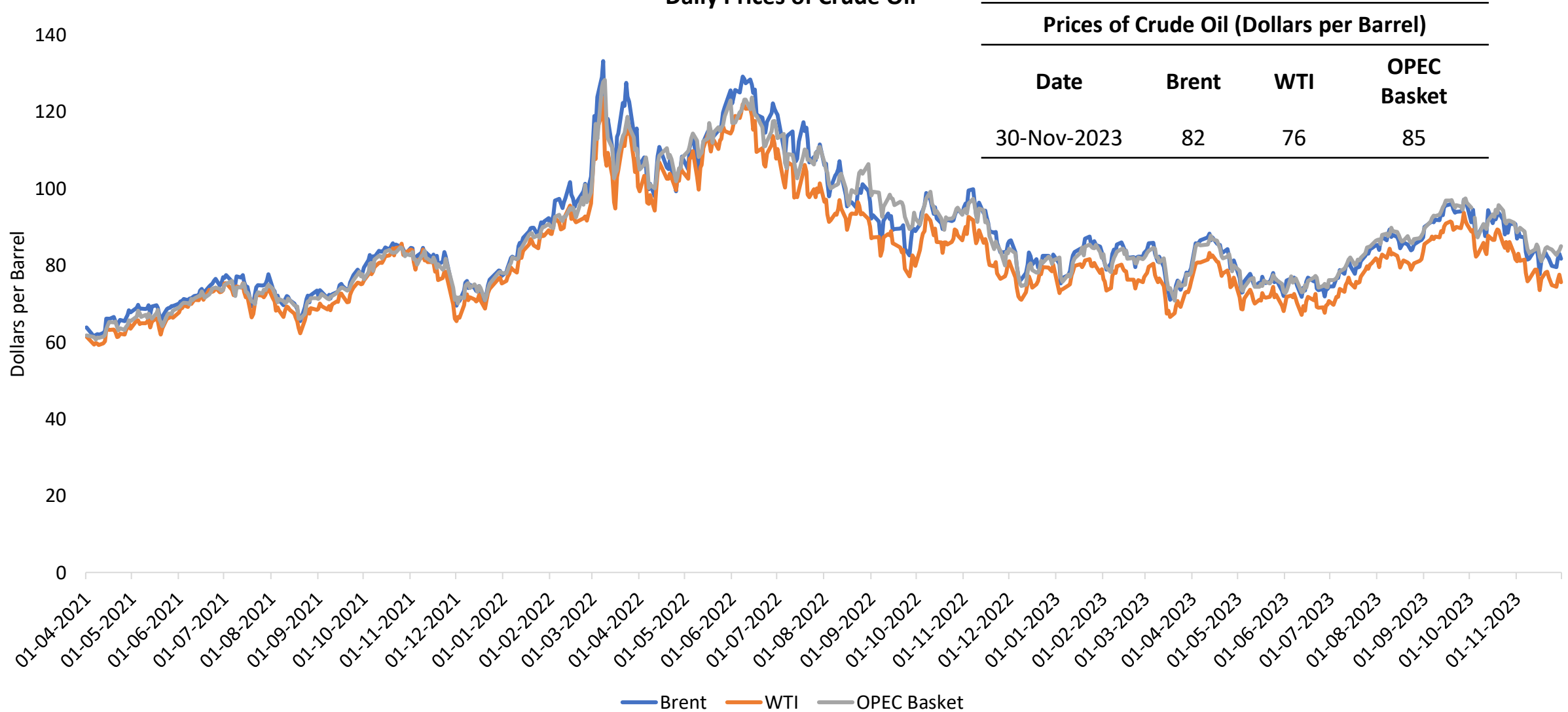
Petroleum Products Market Scenario (3/3)



Total Import of Crude Oil (MMT)			
Total Import	2021-22	2022-23	2023-24 (up to Oct'2023)
Crude Oil	212	233	134

Daily Prices of Crude Oil

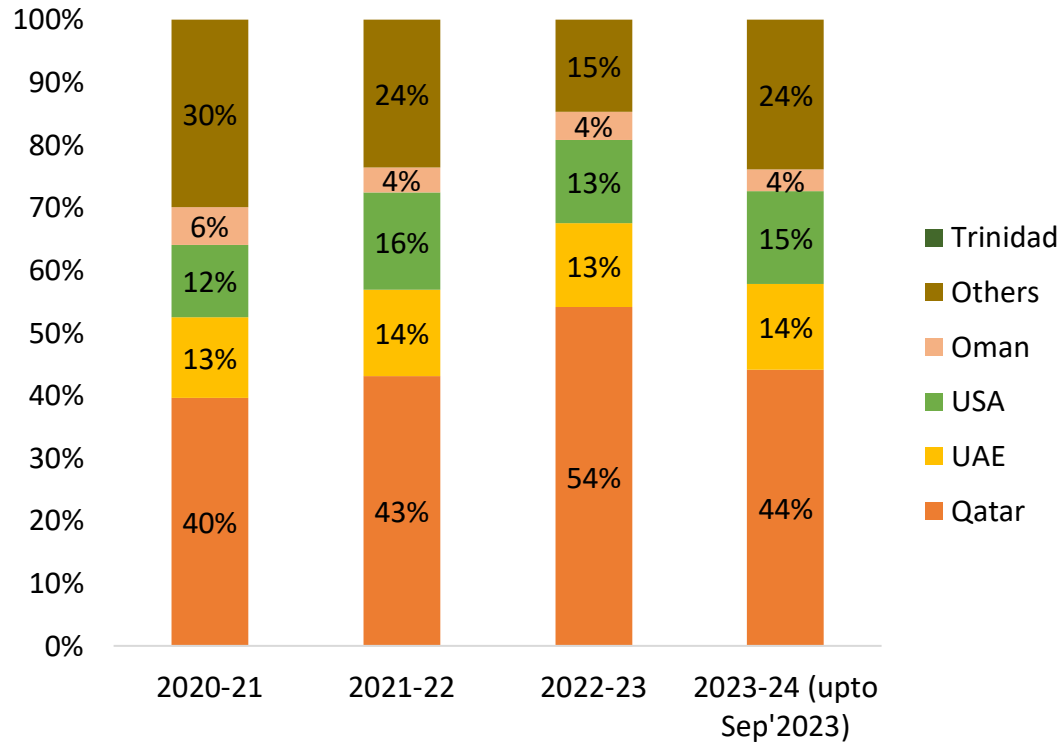
Daily Prices of Crude Oil



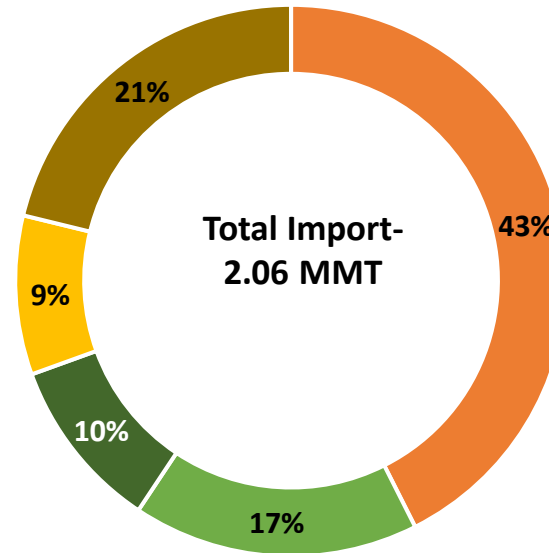
Prices of Crude Oil (Dollars per Barrel)			
Date	Brent	WTI	OPEC Basket
30-Nov-2023	82	76	85

Gas Market Scenario

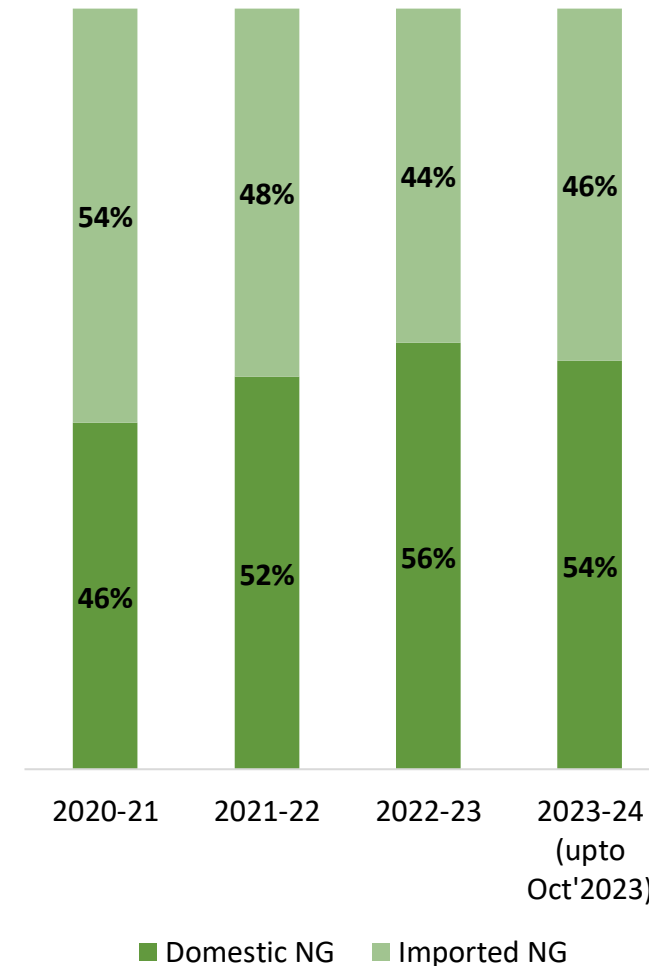
Region-wise Share in Import of LNG (%)



Country Share of Imported LNG in September 2023



Domestic and Imported Natural Gas share in India (%)



Others include- Equatorial Guinea, Trinidad, Cameroon, Egypt, France, Algeria, Belgium, Indonesia, Turkey, Russia, Spain, Malaysia, Brunei, Netherlands, Norway, and others.

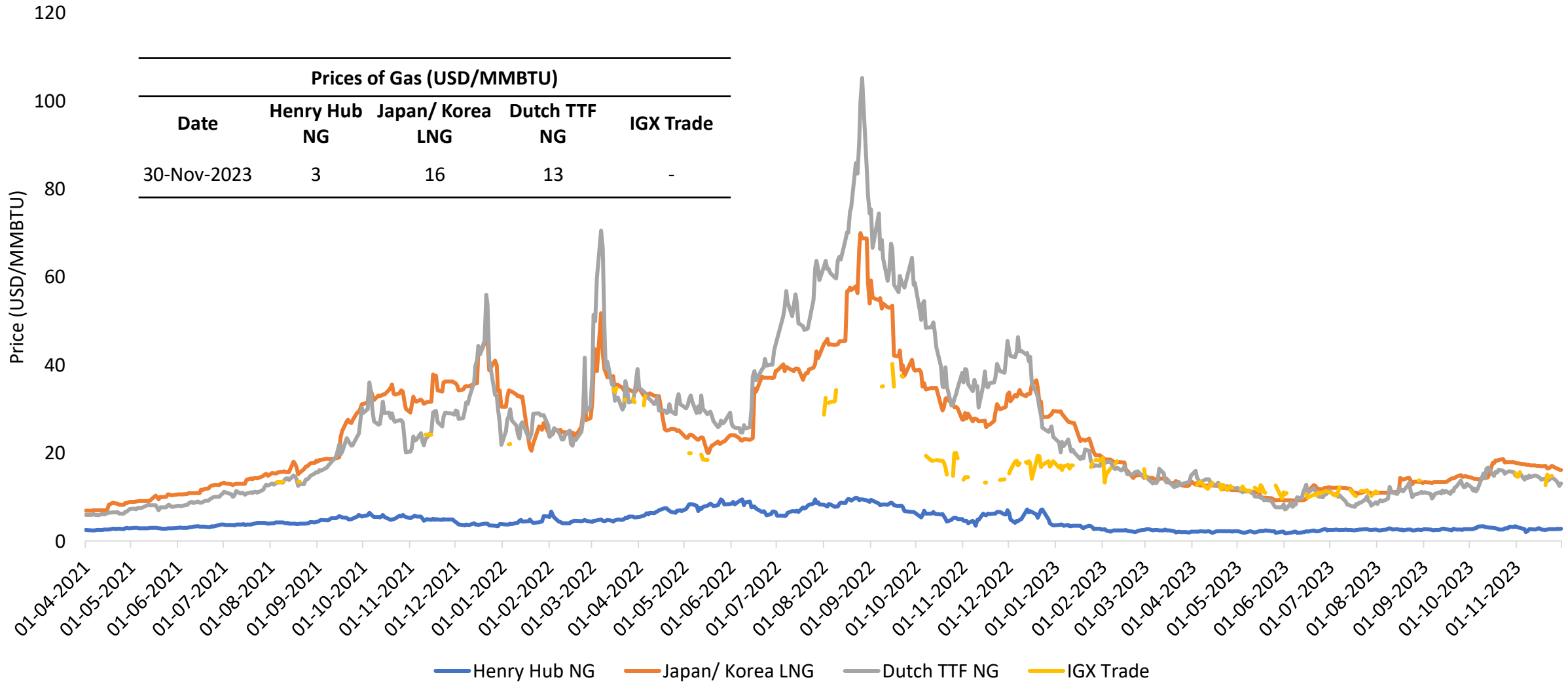
Total Import of Liquefied Natural Gas (LNG) (MMT)			
Total Import	2021-22	2022-23	2023-24 (upto Oct'2023)
LNG	23.42	19.85	13.40

NOTE: The data is latest available

Source: MoCI and PPAC

Daily Prices of Gas

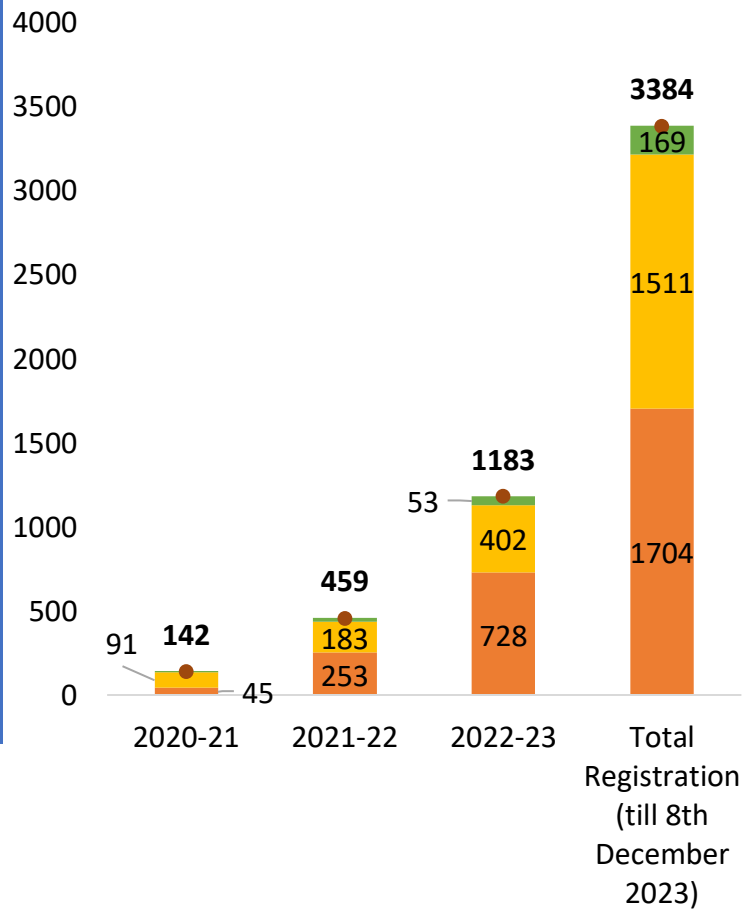
Gas Daily Market Price



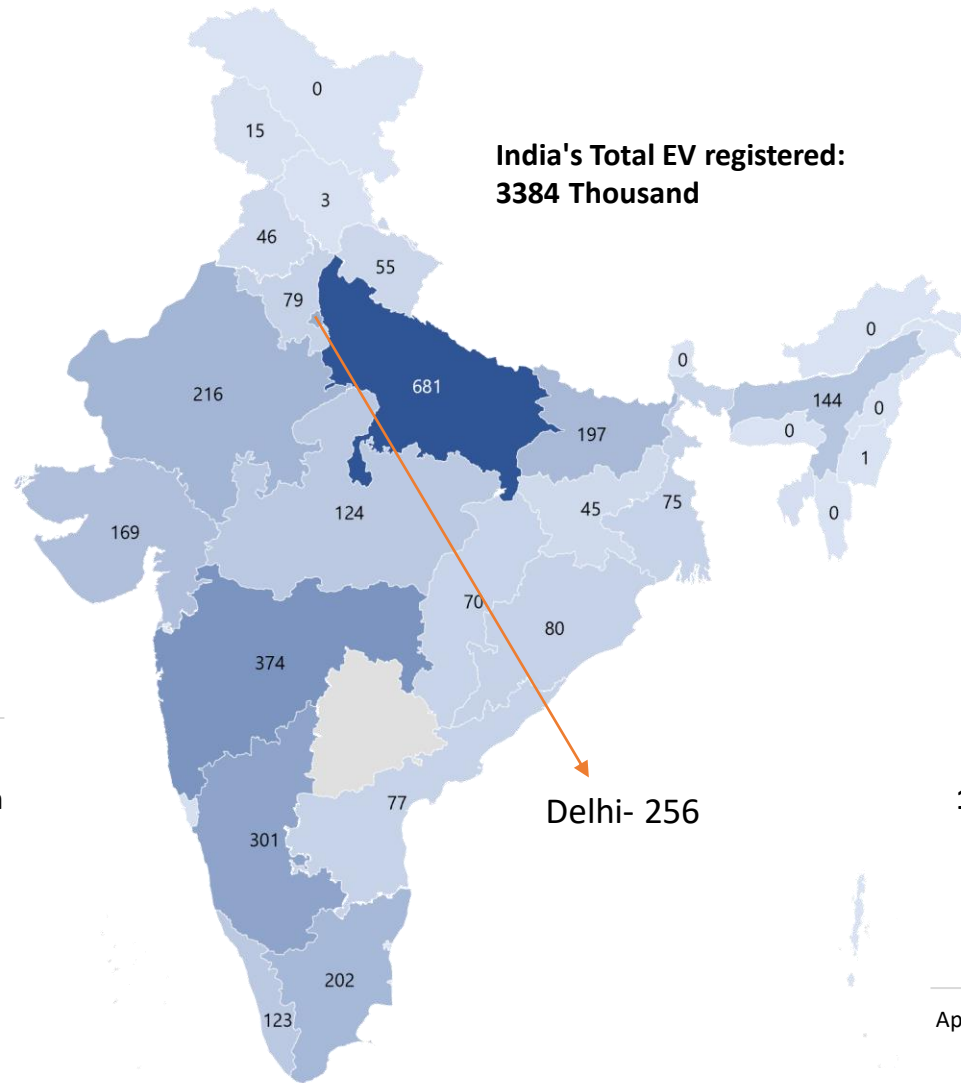
Prices of Gas (USD/MMBTU)				
Date	Henry Hub NG	Japan/ Korea LNG	Dutch TTF NG	IGX Trade
30-Nov-2023	3	16	13	-

Status of Electric Mobility in India

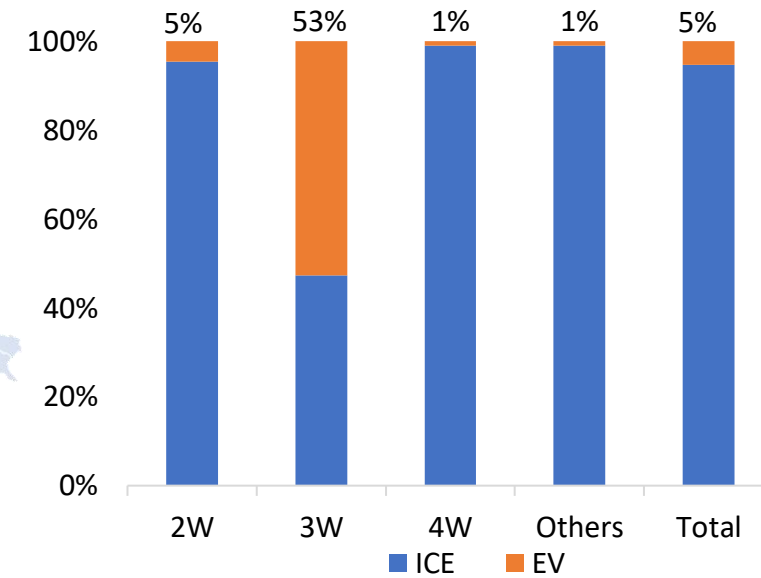
National EV registration (in Thousands)



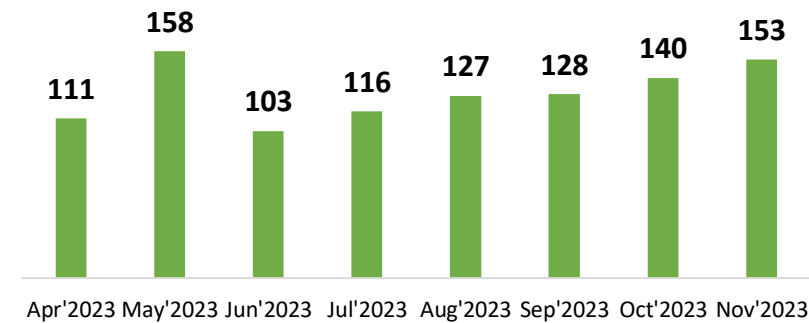
Cumulative State-wise EV registration as on 8th December 2023 (in Thousands)



EV and ICE sale composition in 2022-23



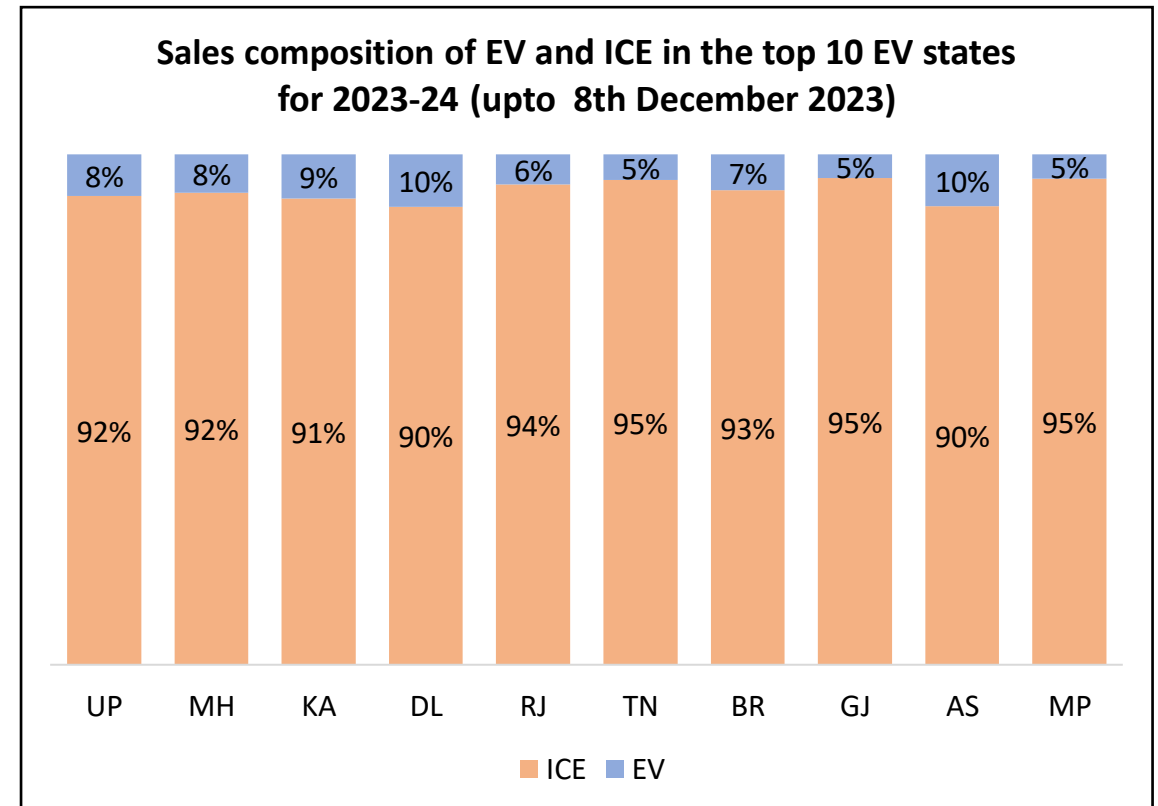
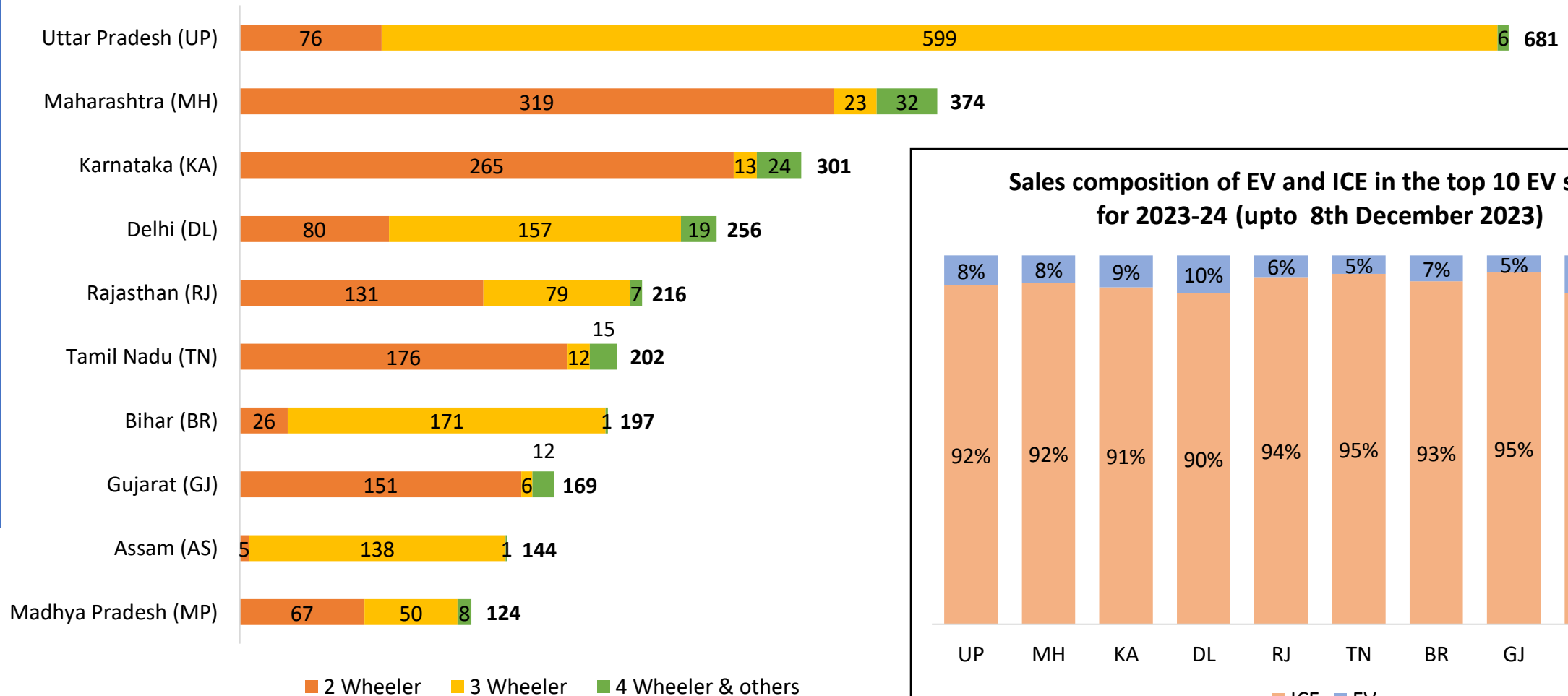
Provisional Monthly EV registered (in Thousands)



Source: VAHAN Dashboard

Status of Electric Mobility in India

**Top 10 States for Electric Vehicles (in Thousands)
as on 8th December 2023**



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.

[Approved List of Models and Manufacturers](#) abeyance till 31 March 2024. MNRE has reduced the application fee by 80% and the inspection fee by 70%.

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 ISTS charges are waived for 25 years for the [onshore projects](#) being commissioned before 30th June 2025 and for [off-shore projects](#) on or before 31st December 2032.

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.

The GoI has decided to invite bids for 50 GW of RE annually, which includes up to [10 GW of wind](#) capacity.

Energy Storage

Ministry of Power has released the [guidelines for the development of PSP](#) with the target of 26.7 GW of PSP and 47.2 GW of BESS to integrate with RE capacity till 2032.

[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 extended the [waiver of ISTS charges](#) from 30th June 2025 to 31st December 2030.

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

Indian Railways to run [35 Hydrogen trains under "Hydrogen for Heritage"](#) at an estimated cost of ₹ 80 crores per train and ground infrastructure of ₹ 70 crores per route on various heritage/hill routes.

The pilot projects are-

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

Key Highlights or Announcements of November 2023

- The Ministry of Heavy Industries has released the revised [Phased manufacturing program \(PMP\)](#) to promote the domestic manufacturing of EV chargers, its assemblies/ sub-assemblies, and parts/sub-parts thereby increasing the domestic value addition. The main highlights are:
 - The policy outlines the comprehensive list of charger components alongside their respective timelines.
 - EV charger manufacturers must achieve a minimum of 50% domestic value addition by 1st December 2024 to be eligible under the FAME II scheme.
- The Bureau of Energy Efficiency (BEE) unveils the [draft Detailed Procedure for Compliance Mechanism under the Carbon Credit Trading Scheme \(CCTS\)](#), focusing on a national carbon market. The key highlights are:
 - The GHG emission intensity reduction trajectory will be developed based on NDC commitments, available technology, and associated cost of their implementation.
 - The trajectory period will be of three years, with annual targets assigned to be met by the Obligated Entity during each compliance cycle.
 - A transparent, independent, and credible monitoring and reporting arrangement (monitoring plan) for GHG emissions and production.
 - Rigorous assessment of technologies and costs.
 - A detailed framework for issuance, trading, and banking of carbon credits.
- On 2nd November 2023, Energy Efficiency Services Limited (EESL), a joint venture of Public Sector Undertakings under the Ministry of Power, inaugurated the [National Efficient Cooking Programme \(NECP\) and Energy Efficient Fans Programme \(EEFP\)](#). These programs are designed to transform cooking methodologies in India, underscoring the critical significance and immediate need for energy-efficient fans. Within the framework of these initiatives, EESL will distribute 1 crore advanced BLDC fans and 20 lakh energy-efficient induction cookstoves across the nation.
- The Ministry of Power has [benchmarked the non-torrefied biomass pellets for 1 year in the Northern Region \(excluding NCR\) at Rs 2.27/1000 kcal](#) excluding GST and transportation costs at the pellet manufacturing plant site. The notification also specifies that pellets shall have a moisture content below 14% and GCV between 2800-4000 kcal/kg.



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