India's Energy Overview

February 2025

VASUDHA FOUNDATION
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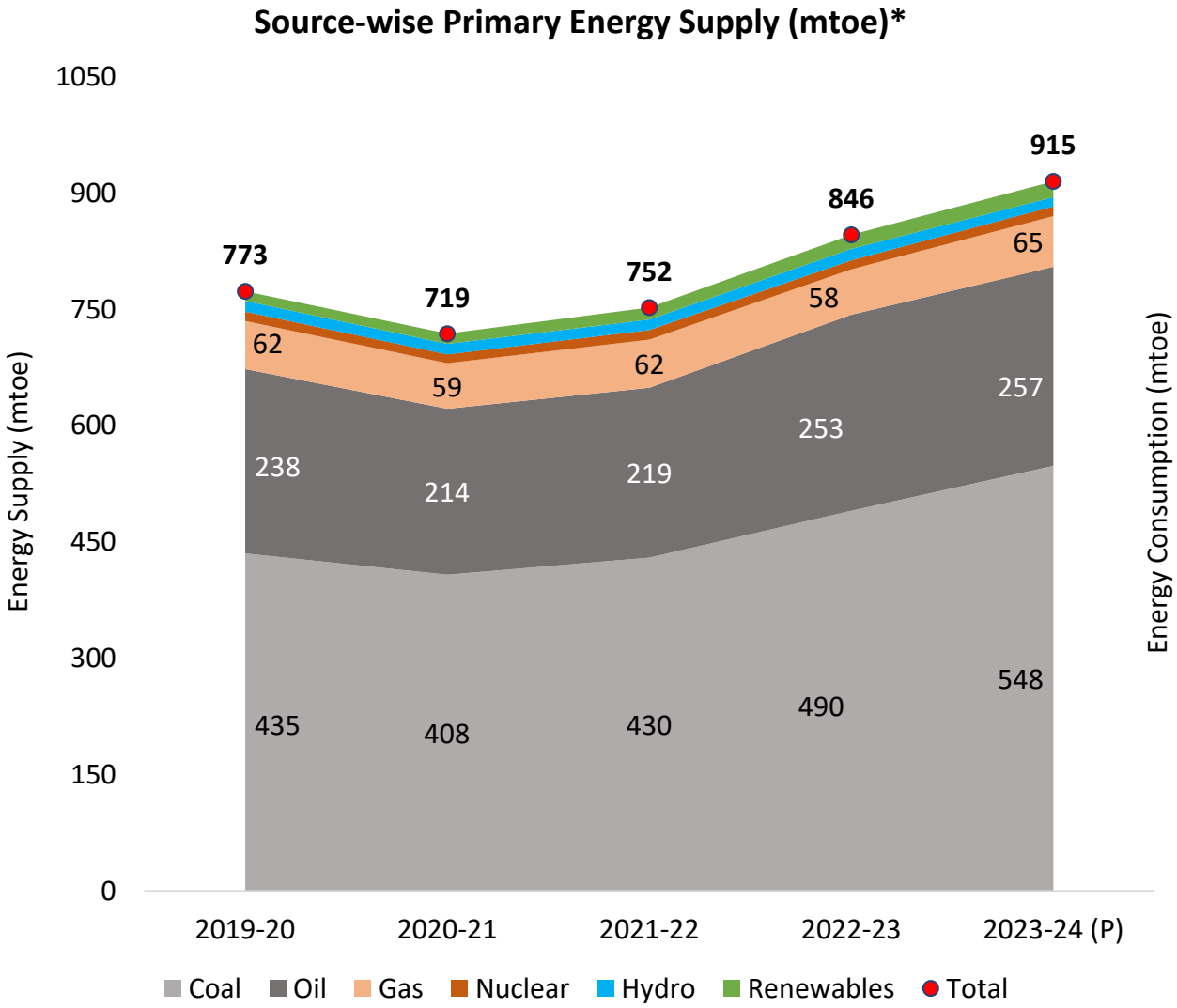
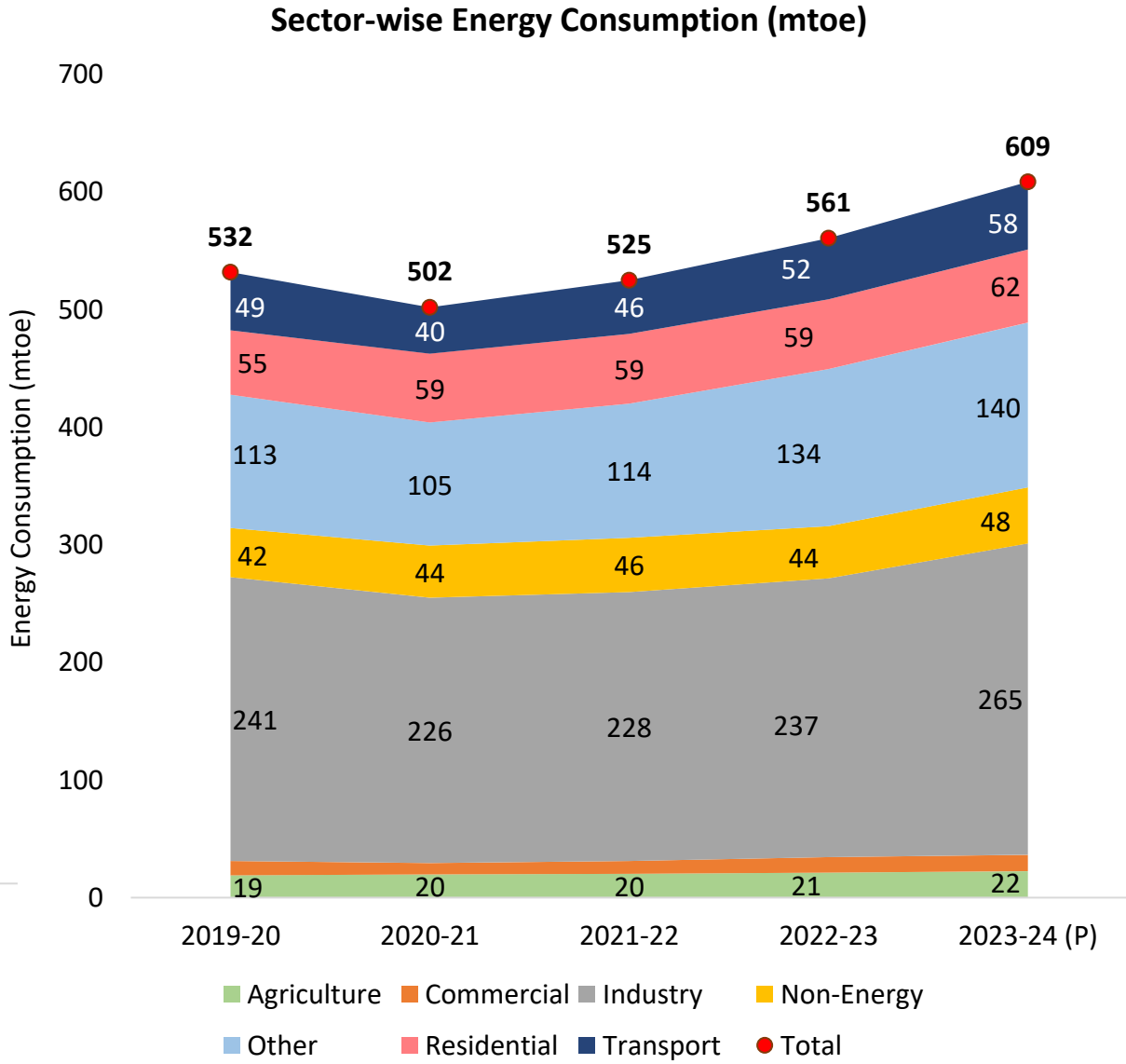
Contents

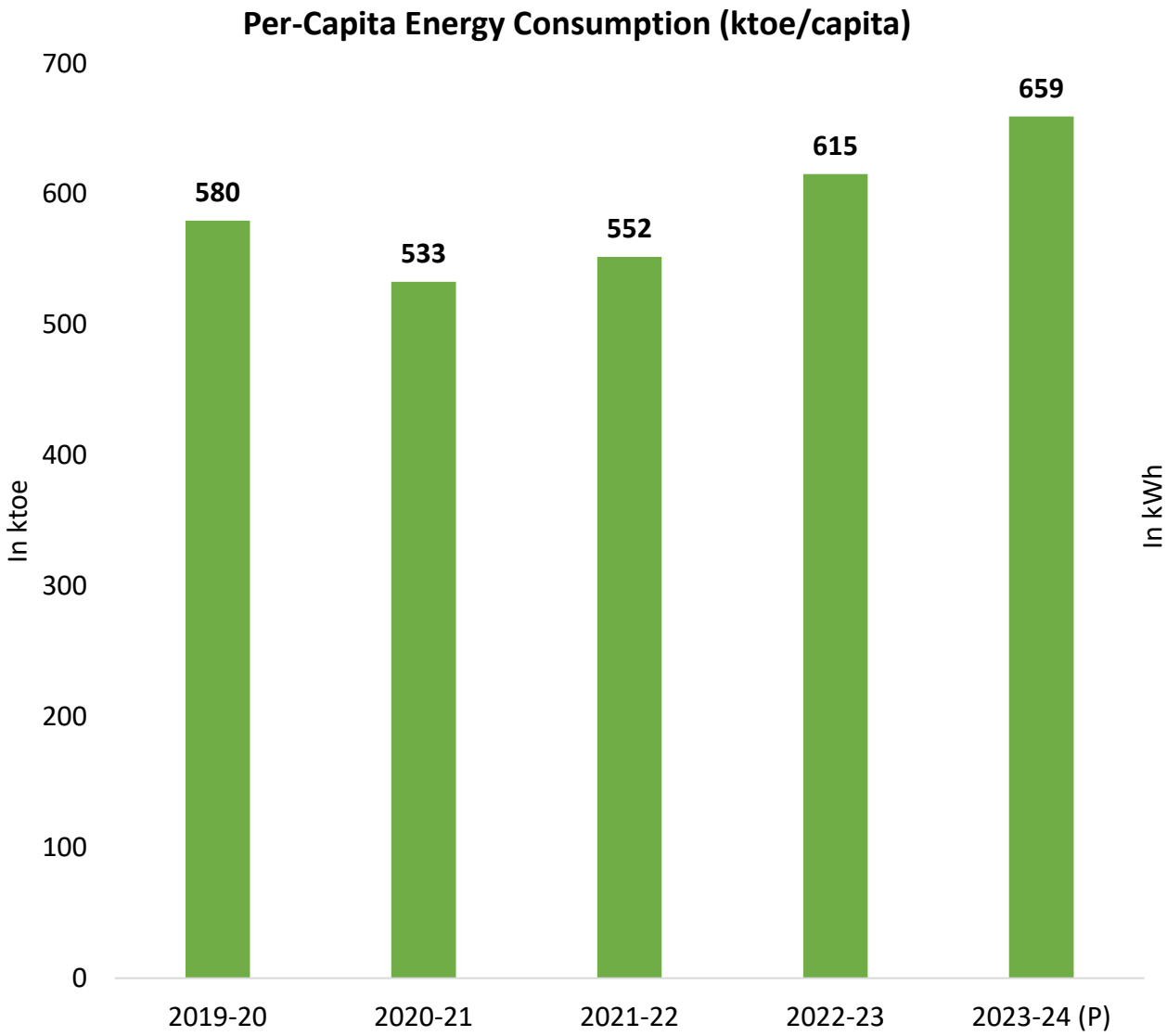
Primary* and Final Energy Mix in India

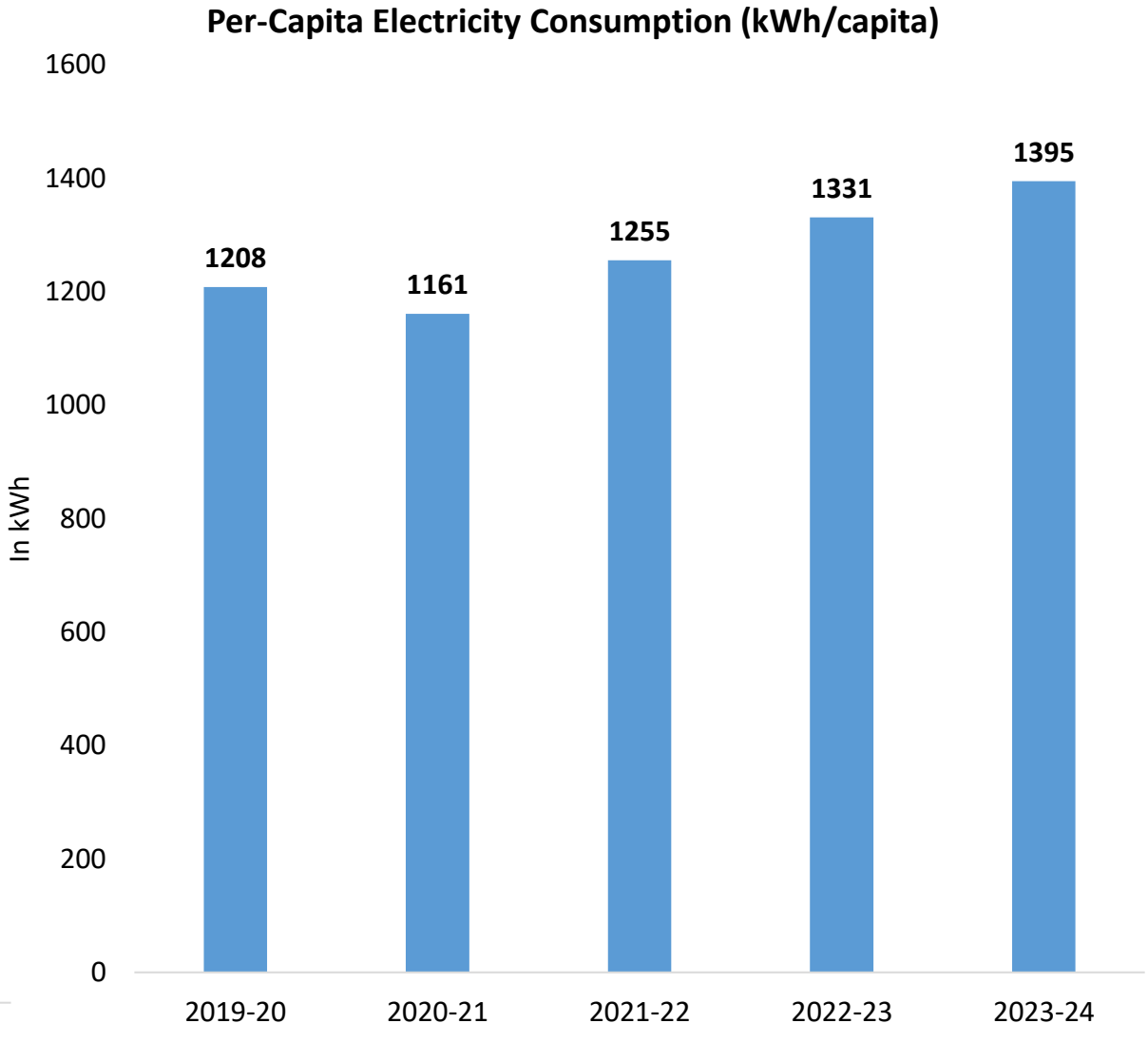




*Excluding biofuels, waste, and other non-commercial source of energy

Per-Capita Energy and Electricity Consumption

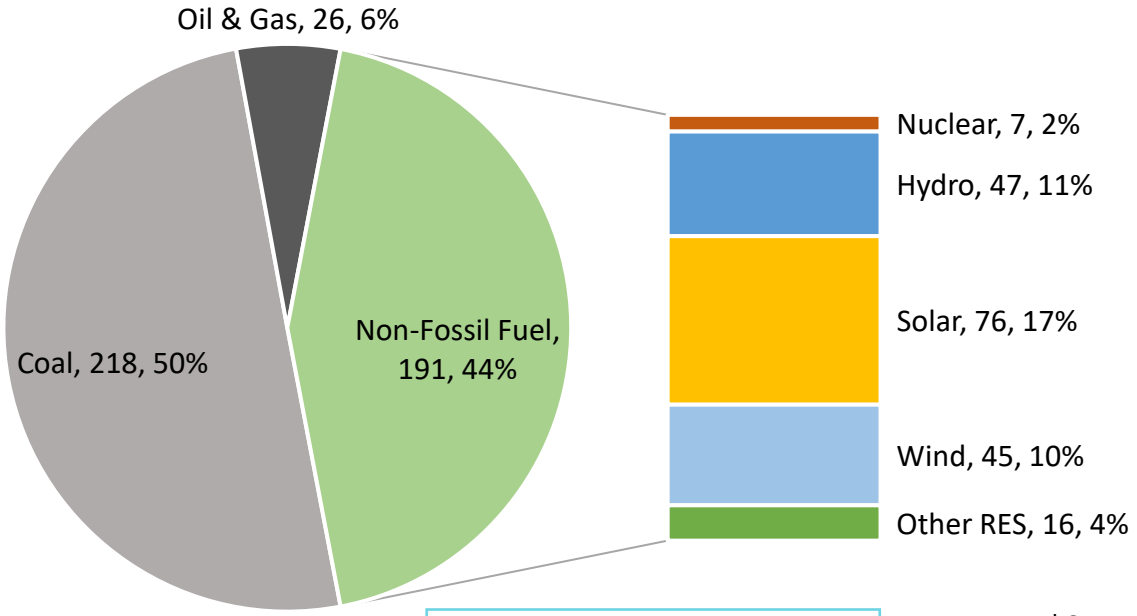




Note: Per Capita energy consumption is calculated on energy supply basis.

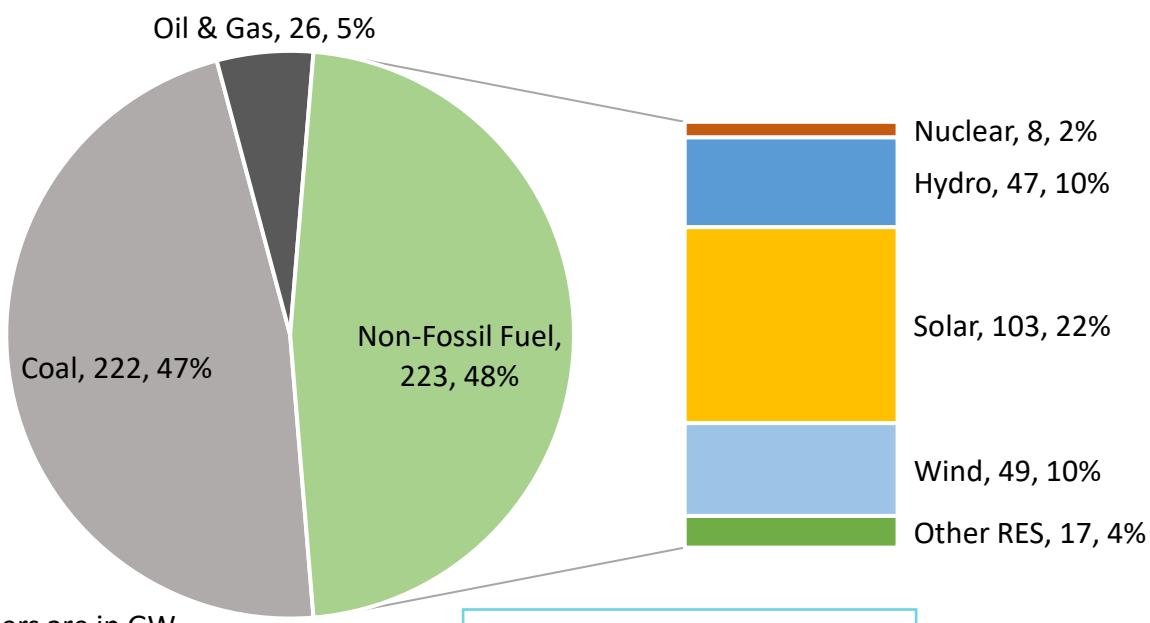
India’s Electricity Capacity Mix (Utility-scale)

February 2024



Total Capacity: 434 GW

February 2025



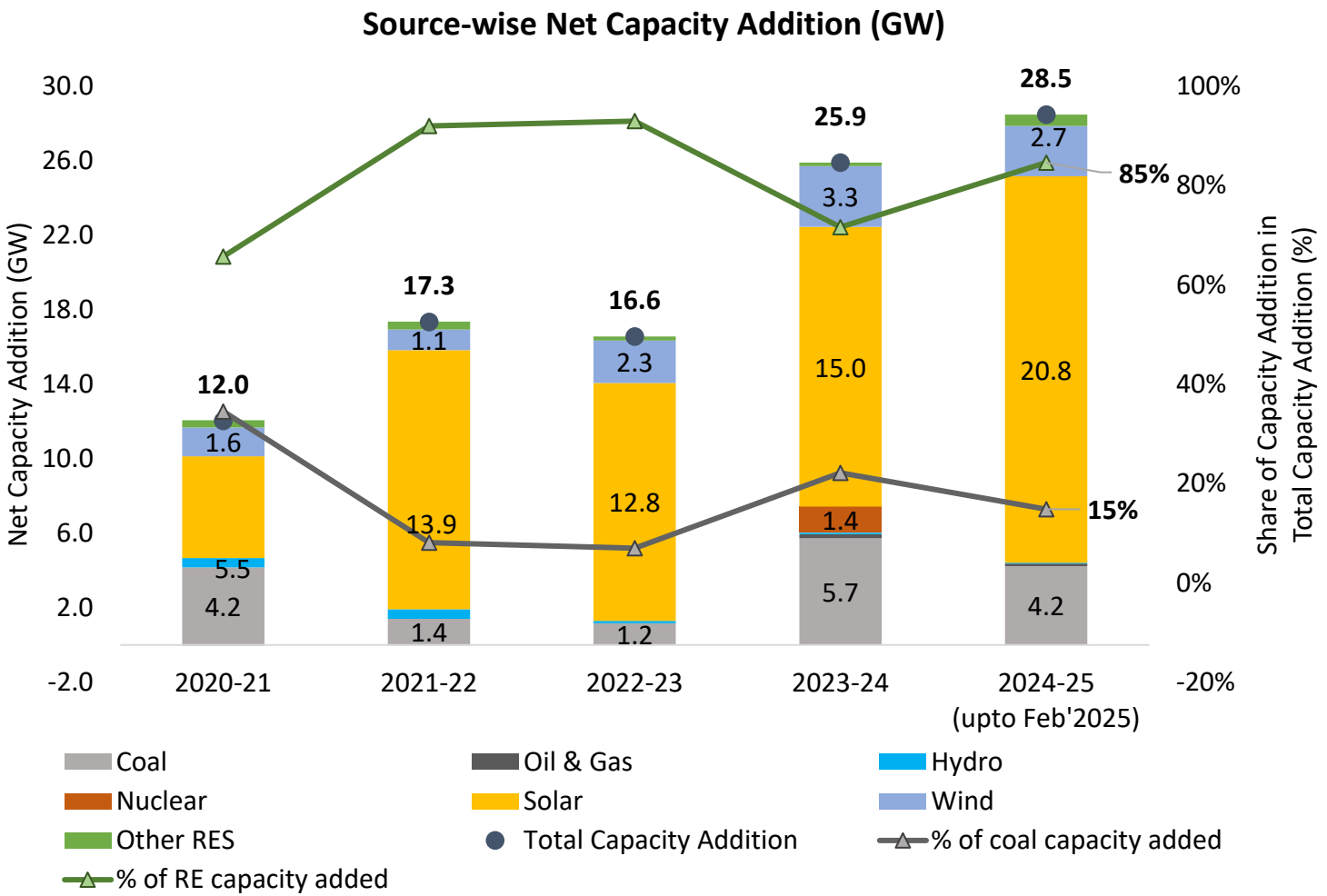
Total Capacity: 470 GW

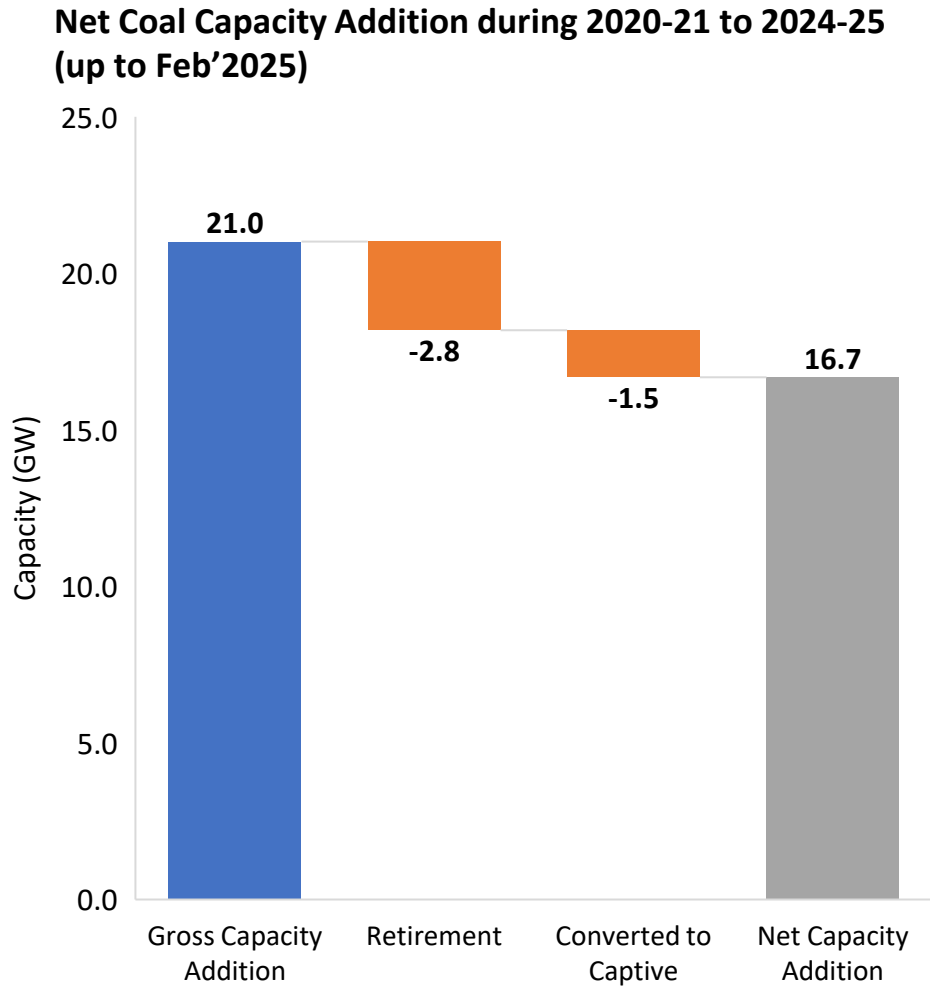
*Capacity Numbers are in GW

- India’s electricity generating capacity is 470 GW as on Feb’2025 [coal 222 GW (47%), solar 103 GW (22%), wind 49 GW (10%), and hydro 47 (10%)].
- As on Feb’2025, the share of non-fossil-based electricity capacity is 48% against the set target of 50% non-fossil capacity by 2030.
- As on Feb’2025, India’s renewable energy capacity (including large hydro) stood at 215 GW out of 470 GW.

Source: CEA

India’s Electricity Capacity Addition in last 5 years





- A total of 82.0 GW of generation capacity has been added in RE (Hydro, solar, wind, and other RES) over the past 5 years (2020-21 to 2024-25), whereas the net coal capacity addition during the same period was 16.7 GW, mostly in the central sector.

Source: CEA & MNRE

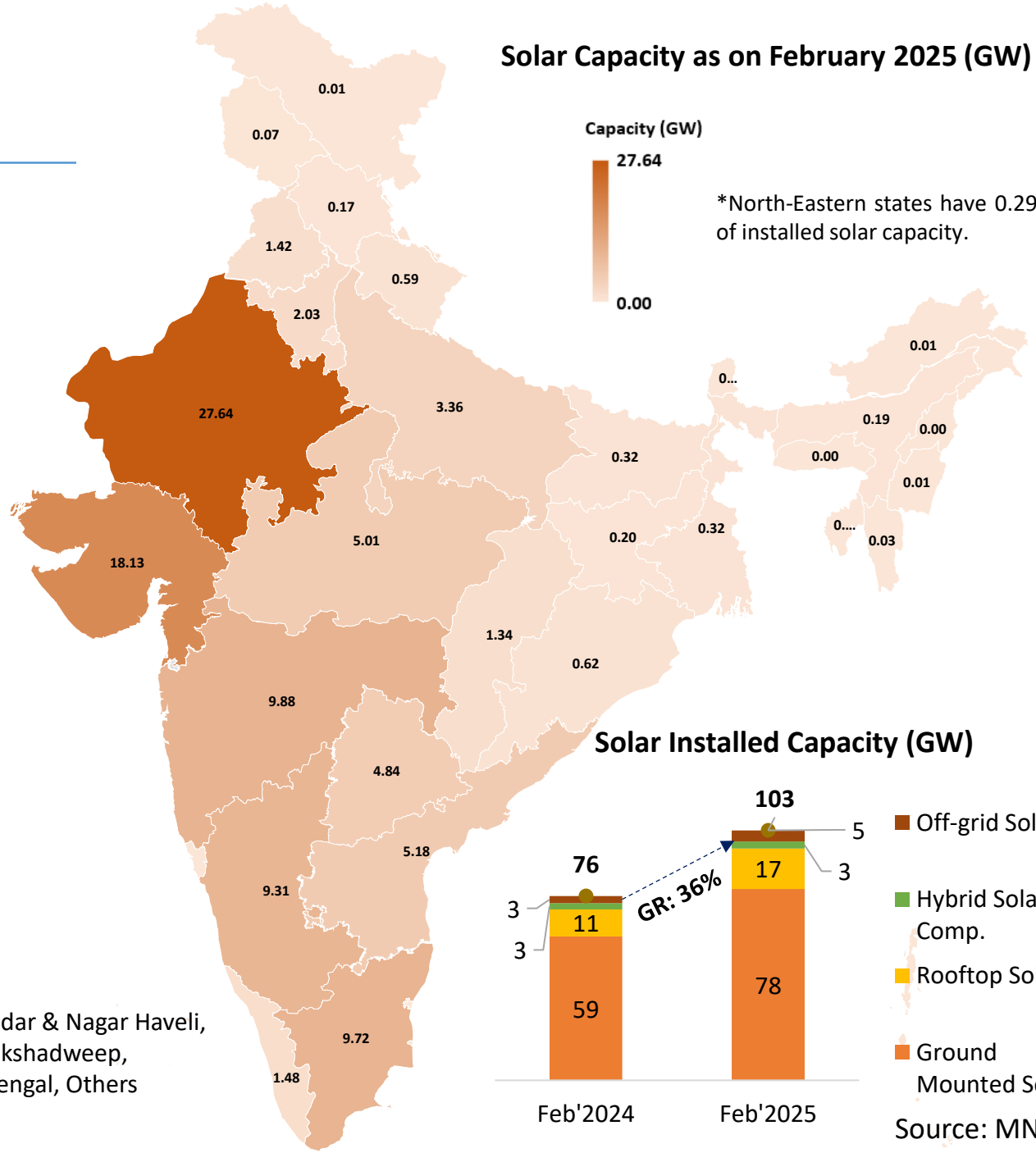
State-wise Solar Capacity

as on February 2025

State-wise installed capacity of Solar Power (GW)					
States	**Ground Mounted**	**Rooftop**	**Solar Component in Hybrid**	**Off Grid**	**Total Solar Power**
Rajasthan	**23.35**	1.50	**1.98**	0.81	**27.64**
Gujarat	12.20	**5.04**	0.79	0.10	18.13
Maharashtra	5.48	3.14	0.00	**1.26**	9.88
Tamil Nadu	8.75	0.90	0.00	0.07	9.72
Karnataka	8.50	0.70	0.08	0.04	9.31
Andhra Pradesh	4.80	0.29	0.00	0.09	5.18
Madhya Pradesh	4.40	0.51	0.00	0.10	5.01
Telangana	4.36	0.47	0.00	0.01	4.84
Uttar Pradesh	2.71	0.32	0.00	0.32	3.36
Haryana	0.27	0.81	0.00	0.95	2.03
Kerala	0.32	1.13	0.00	0.02	1.48
Punjab	0.89	0.45	0.00	0.08	1.42
Chhattisgarh	0.84	0.11	0.00	0.39	1.34
Odisha	0.51	0.07	0.00	0.04	0.62
Others	1.09	1.21	0.00	0.31	2.60
All India	**78.47**	**16.66**	**2.85**	**4.59**	**102.57**

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 February 2025 (GW)



Solar Installed Capacity (GW)

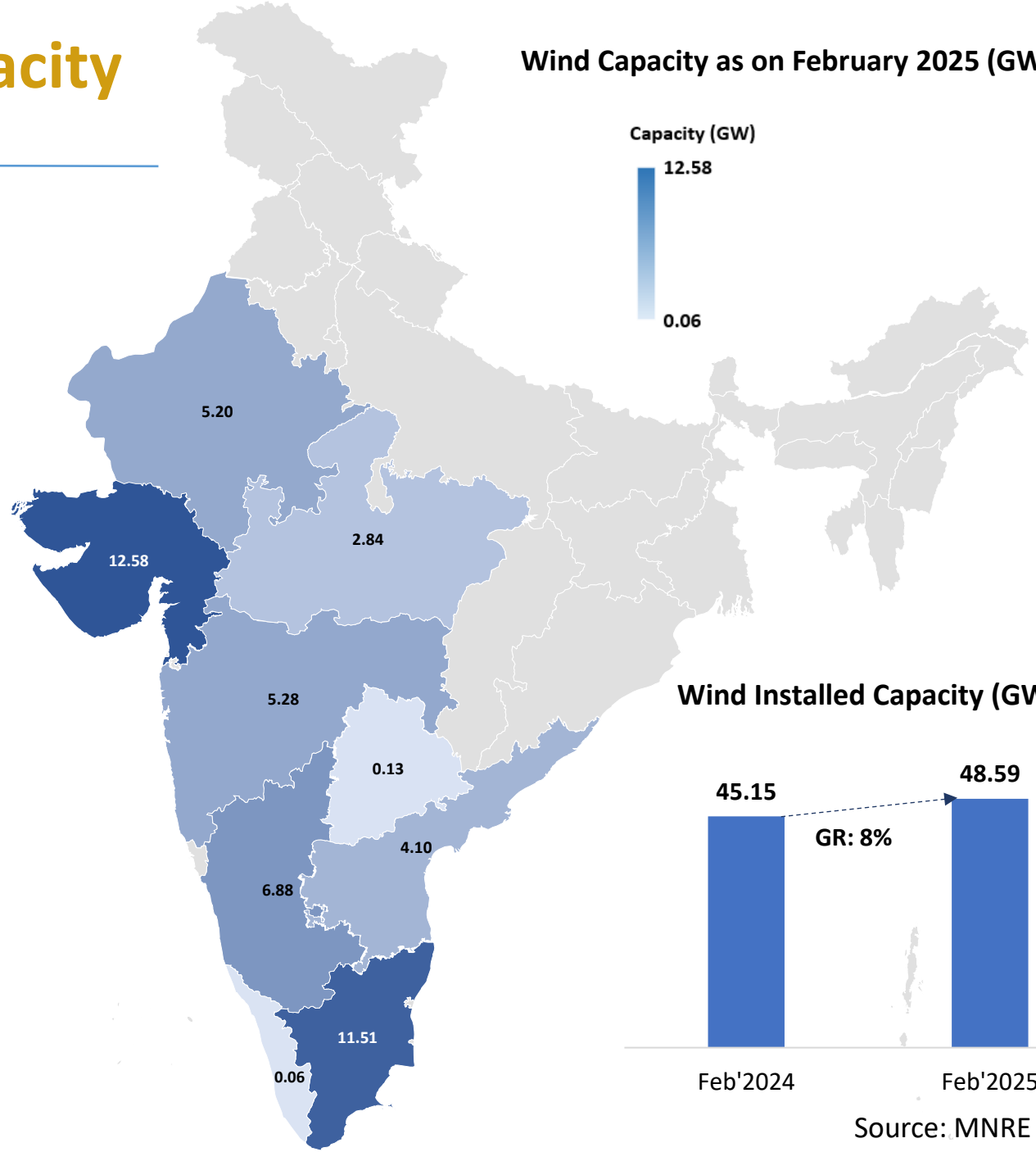
Source: MNRE

State-wise Wind Onshore Capacity

as on February 2025

State-wise installed capacity of Wind (Onshore) Power	
States	**Installed Capacity (GW)**
Gujarat	12.58
Tamil Nadu	11.51
Karnataka	6.88
Maharashtra	5.28
Rajasthan	5.20
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
India Total	**48.59**

Wind Capacity as on February 2025 (GW)

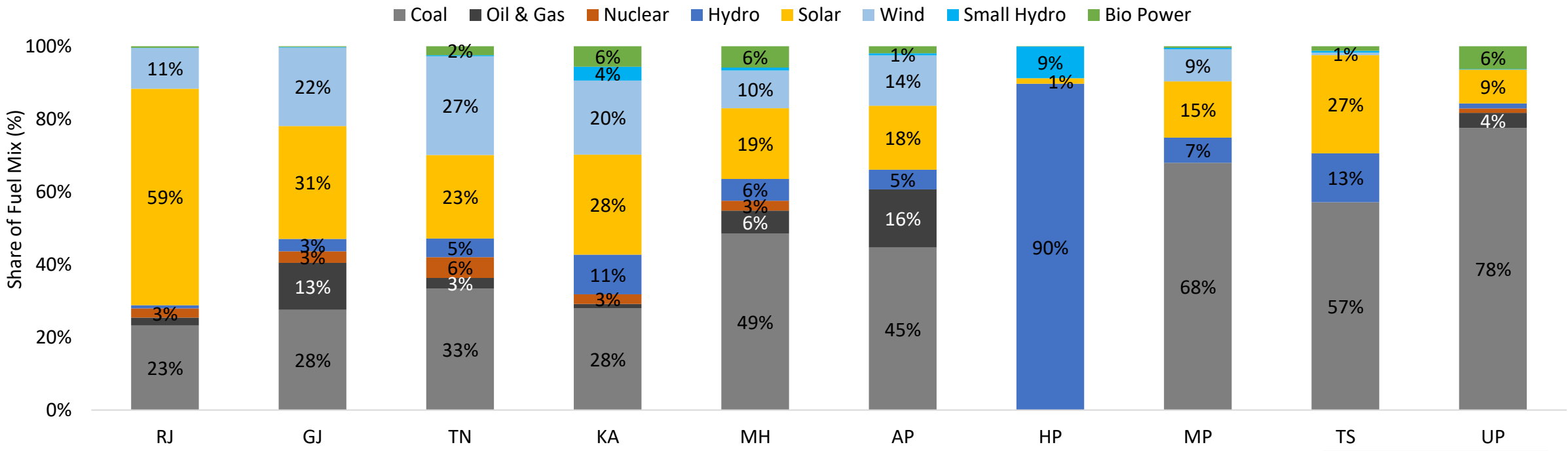


Wind Installed Capacity (GW)

Source: MNRE

Top 10 High RE States and Their Capacity Mix

as on February 2025



Numbers are in GW

Parameters	RJ	GJ	TN	KA	MH	AP	HP	MP	TS	UP
Total Installed Capacity	46.45	58.41	42.42	33.83	50.86	29.53	11.46	32.37	17.93	36.15
Total RE Capacity	33.47	32.92	24.59	23.07	21.58	11.62	11.46	10.37	7.69	6.18
RE Share	72%	56%	58%	68%	42%	39%	100%	32%	43%	17%

NOTE: TS- Telangana

Source: CEA & MNRE

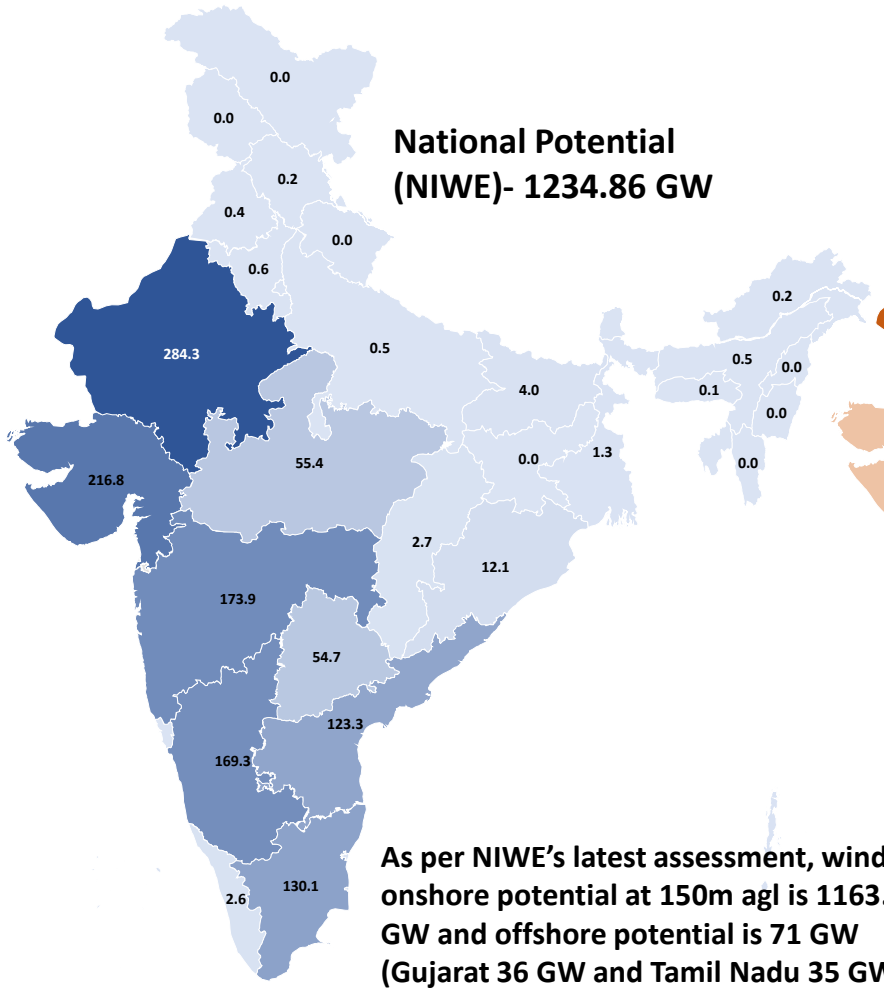
RE Potential and Installed Capacity (1/2)

RE potential in the state

Wind Onshore (at 150m agl) and Offshore Potential

State Potential (GW)

0.0 — 284.3



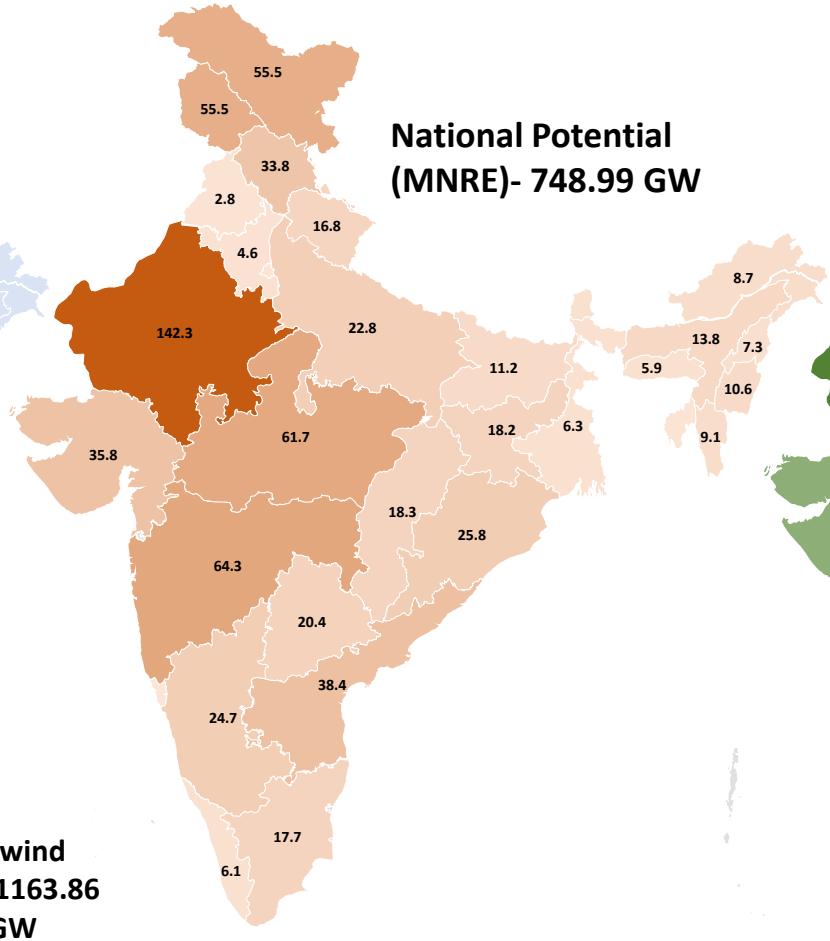
National Potential (NIWE)- 1234.86 GW

As per NIWE's latest assessment, wind onshore potential at 150m agl is 1163.86 GW and offshore potential is 71 GW (Gujarat 36 GW and Tamil Nadu 35 GW).

Solar Potential

State Potential (GW)

0.9 — 142.3



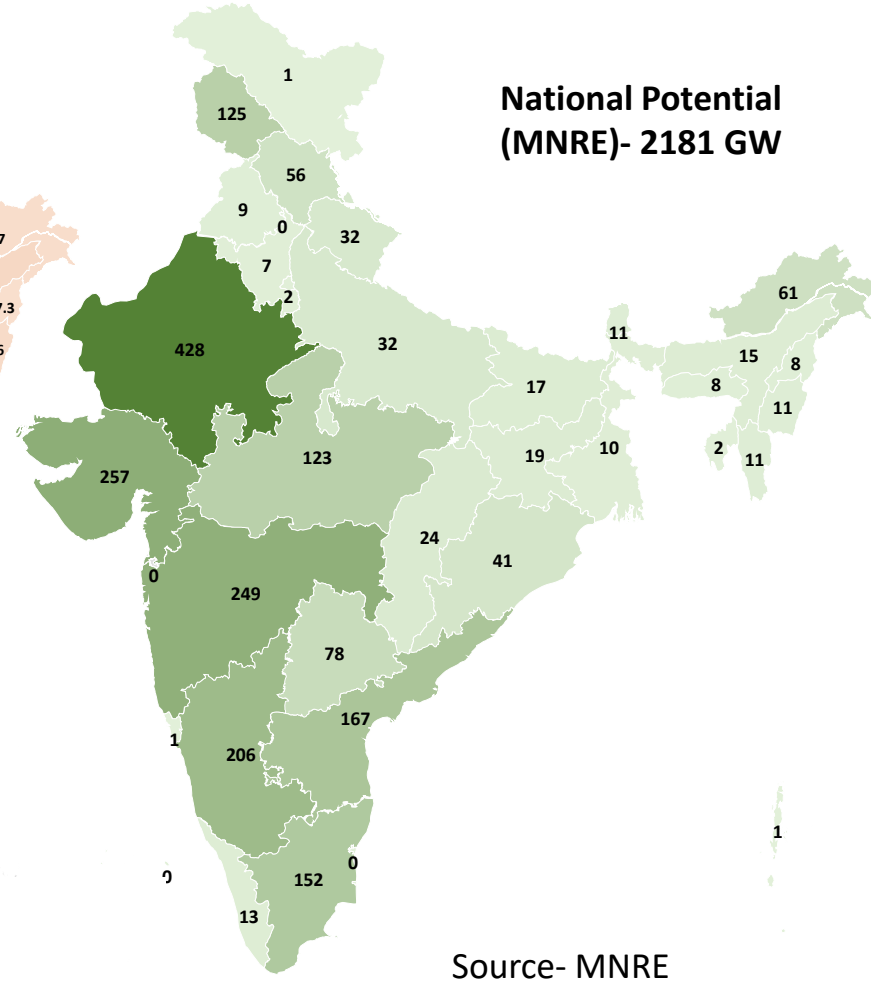
National Potential (MNRE)- 748.99 GW

Market potential for SPV rooftop is 124 GW.

Renewable Energy Potential (all sources incl. large Hydro)

Potential (GW)

0 — 428



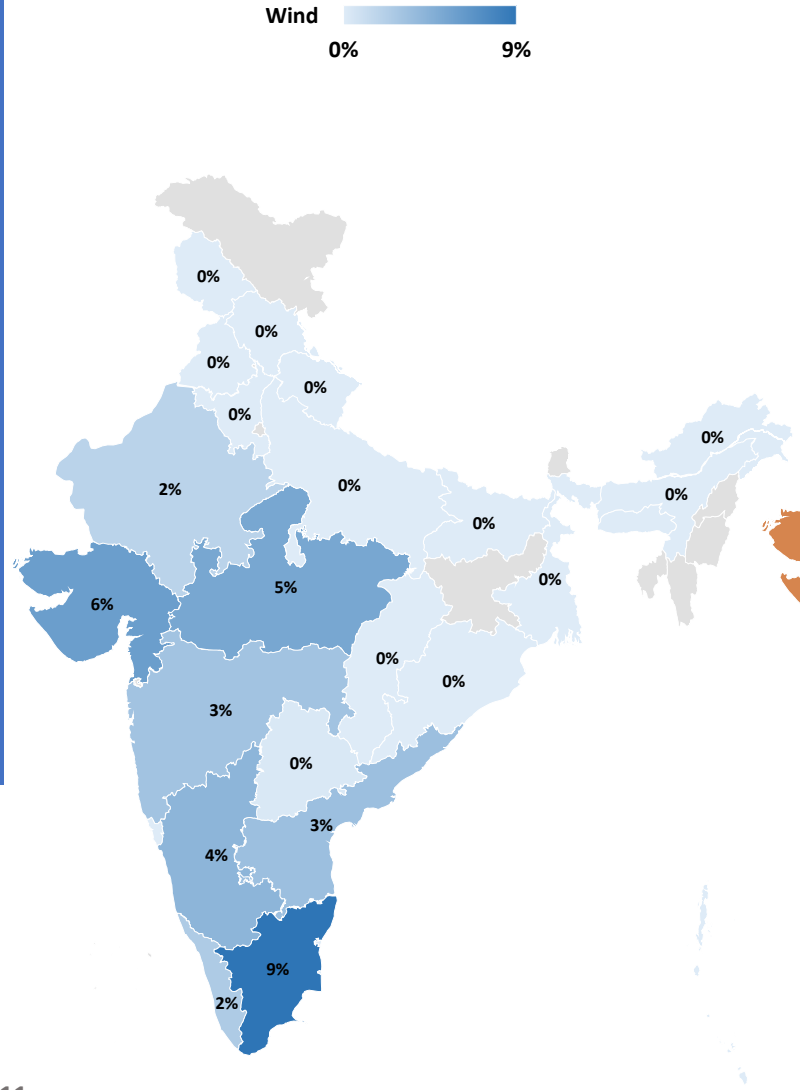
National Potential (MNRE)- 2181 GW

Source- MNRE

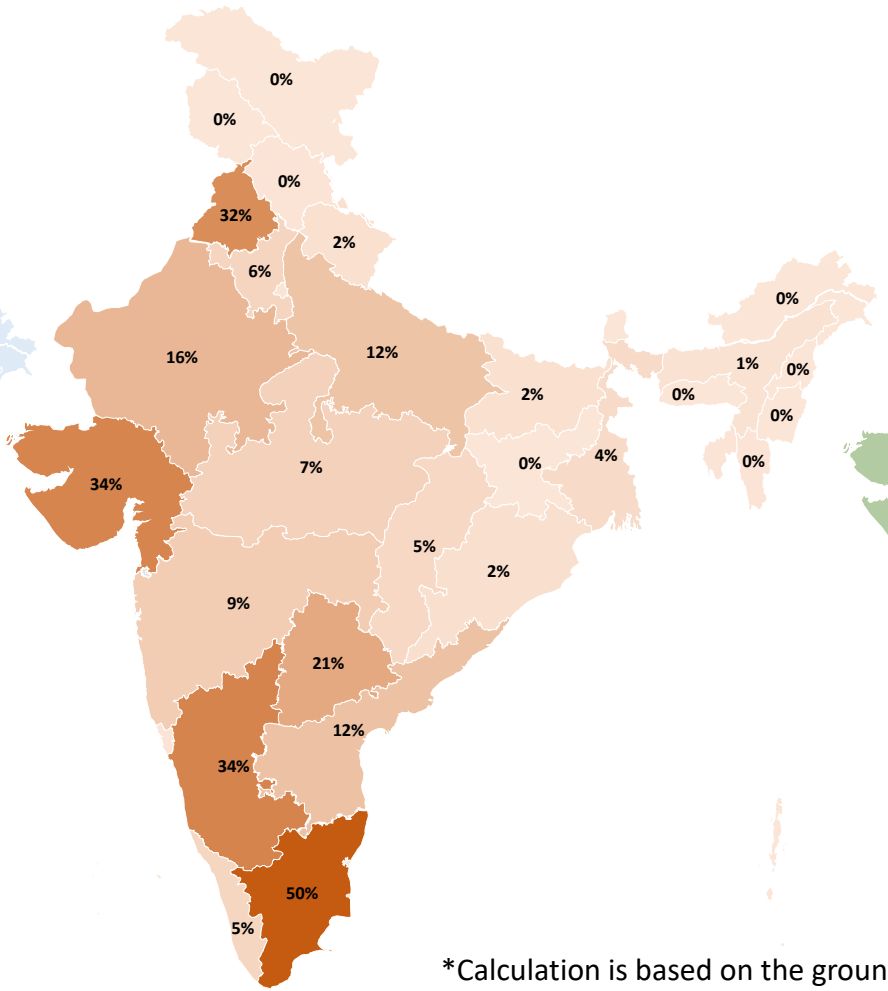
Renewable Energy (RE) Potential and Installed Capacity (2/2)

RE Installed capacity as a Percentage of the total resource potential in the state as on February 2025

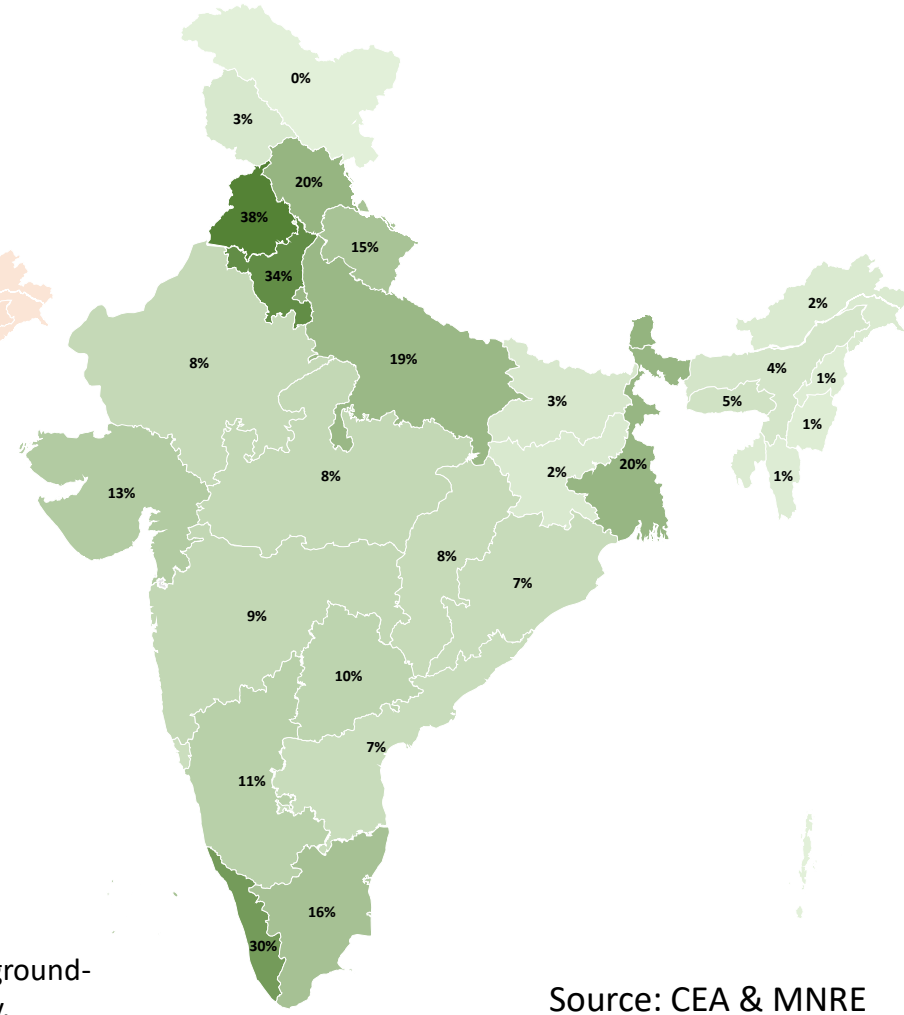
Wind Capacity



Solar Capacity*



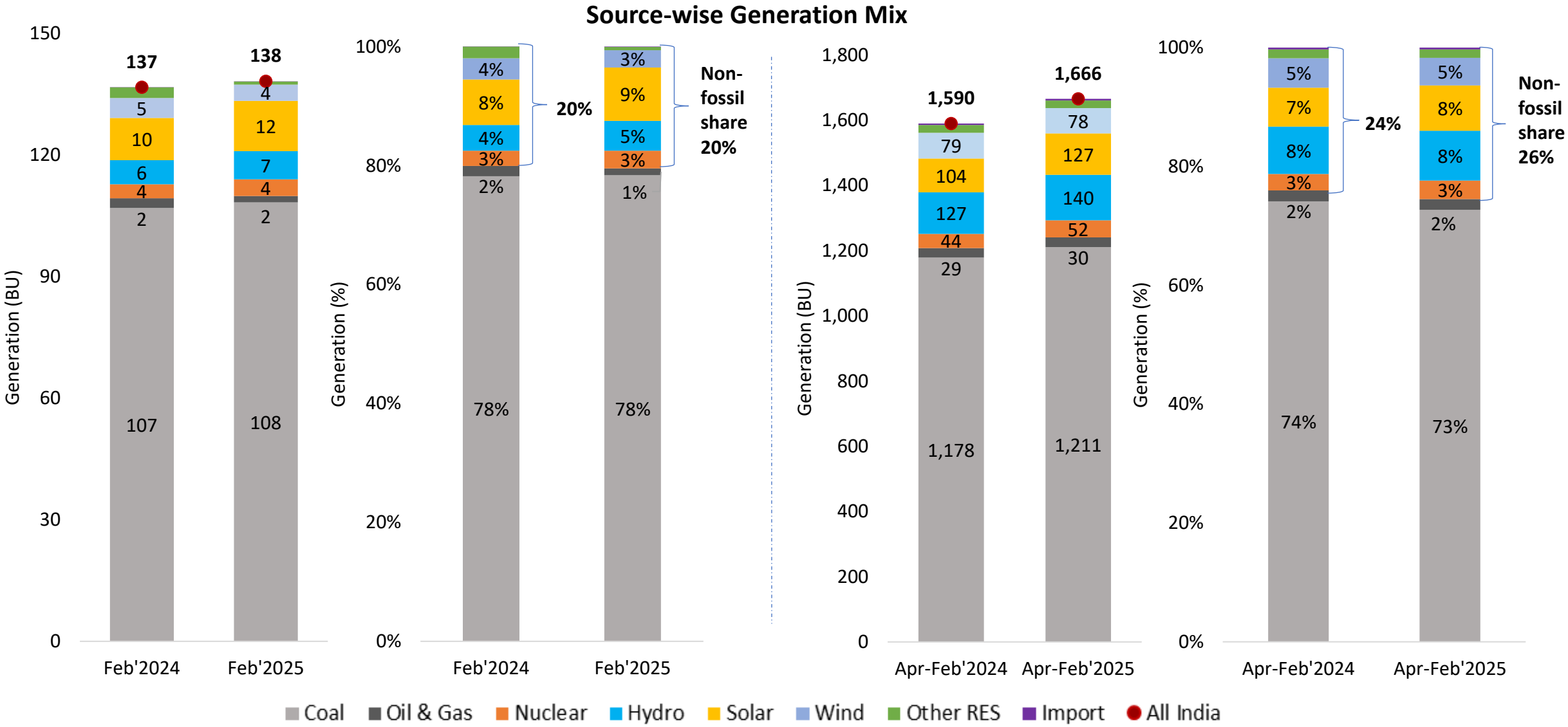
RE Capacity (all sources including large hydro)



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

Source: CEA & MNRE

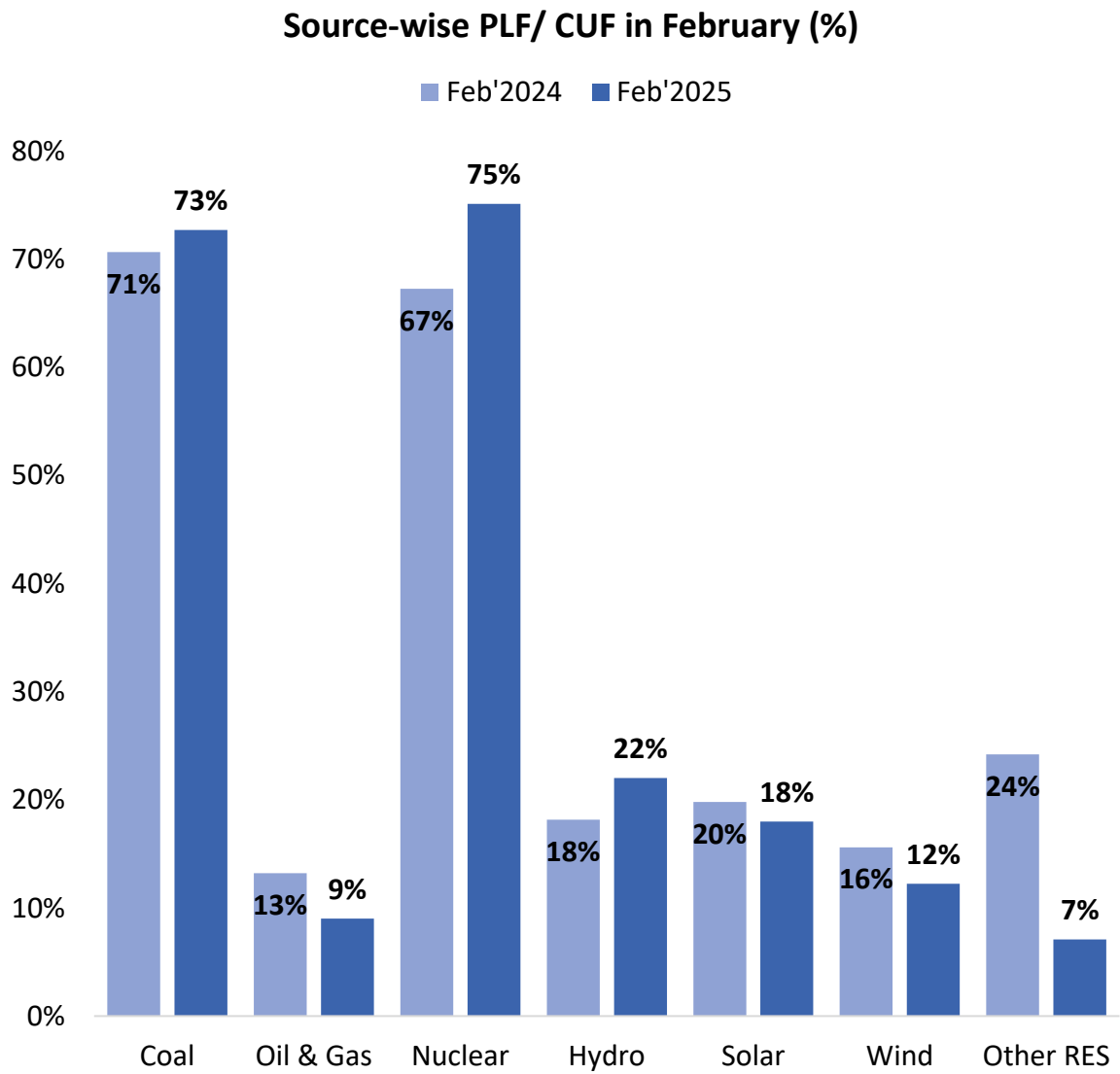
India’s Electricity Generation Mix

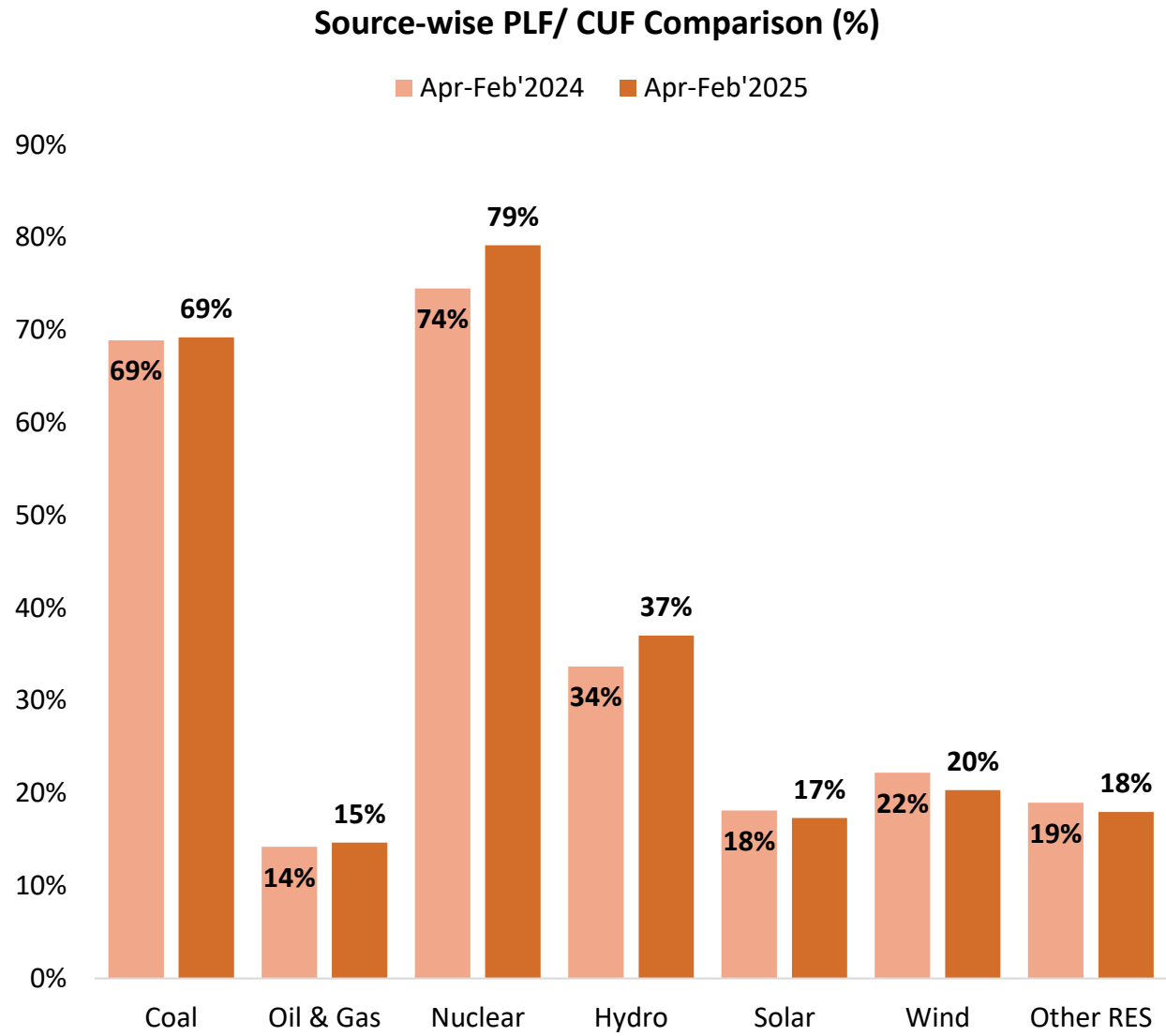


NOTE: The generation data for February’2025 is provisional.

Source: CEA

Source-wise PLF/CUF

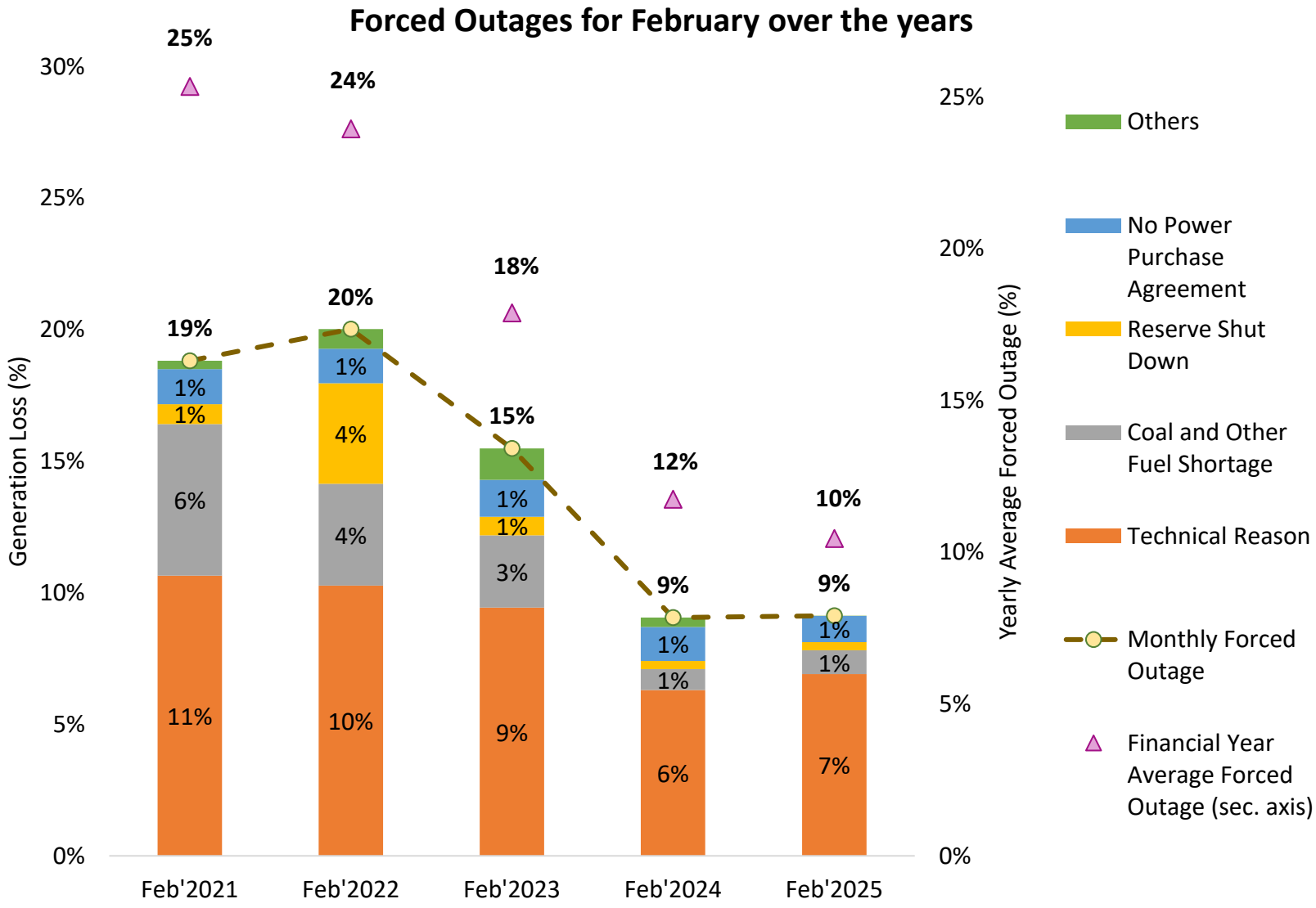




NOTE: The PLF/CUF data is based on provisional generation for February'2025.

Source: CEA & MNRE

Thermal Generation Loss and Reasons for Forced Outages

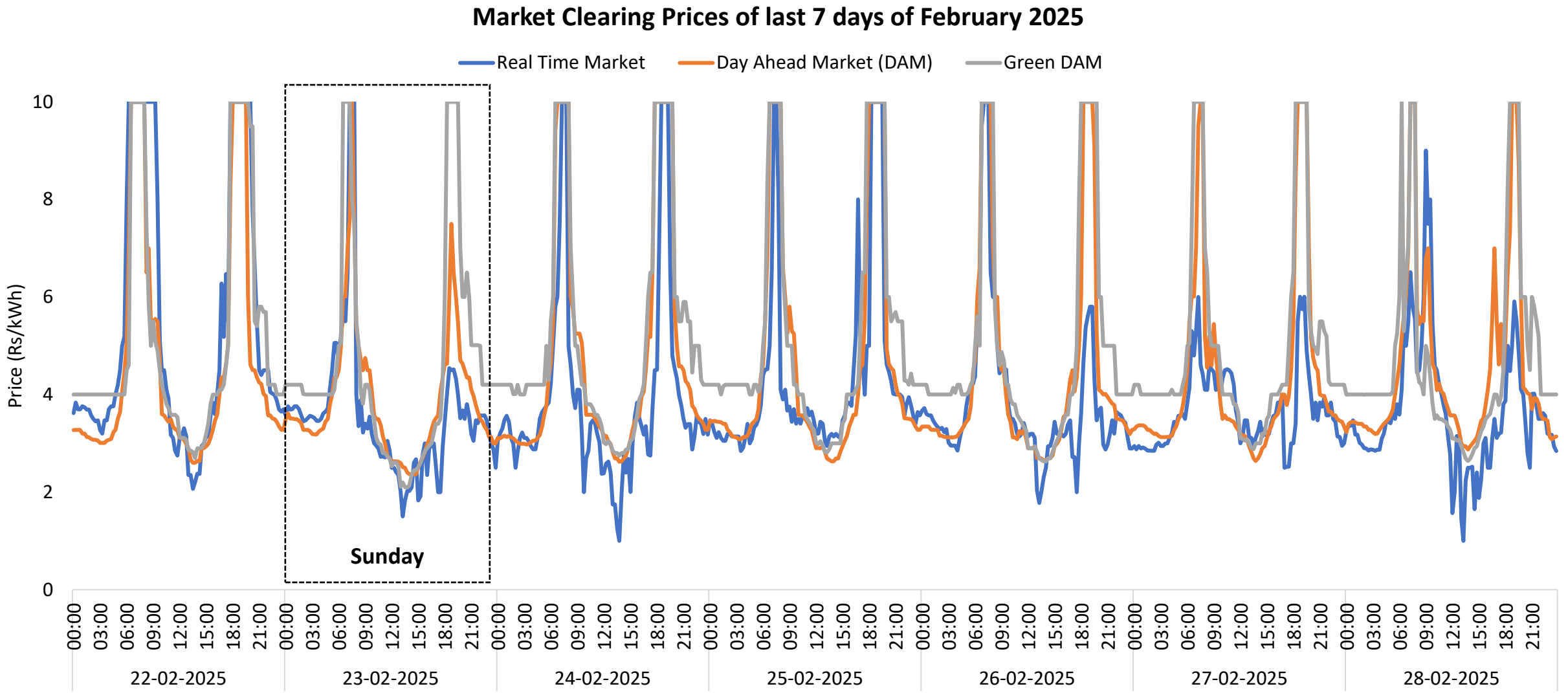


Year/ Month		Average Forced Outage Share
Yearly	FY 2022-23	18%
	FY 2023-24	12%
	FY 2024-25 (up to Feb'2025)	10%
Monthly	Feb'2023	15%
	Feb'2024	9%
	Feb'2025	9%

Thermal includes only Coal and Lignite Plants.

Source: ICED

Indian Electricity Exchange (IEX) Market Snapshot

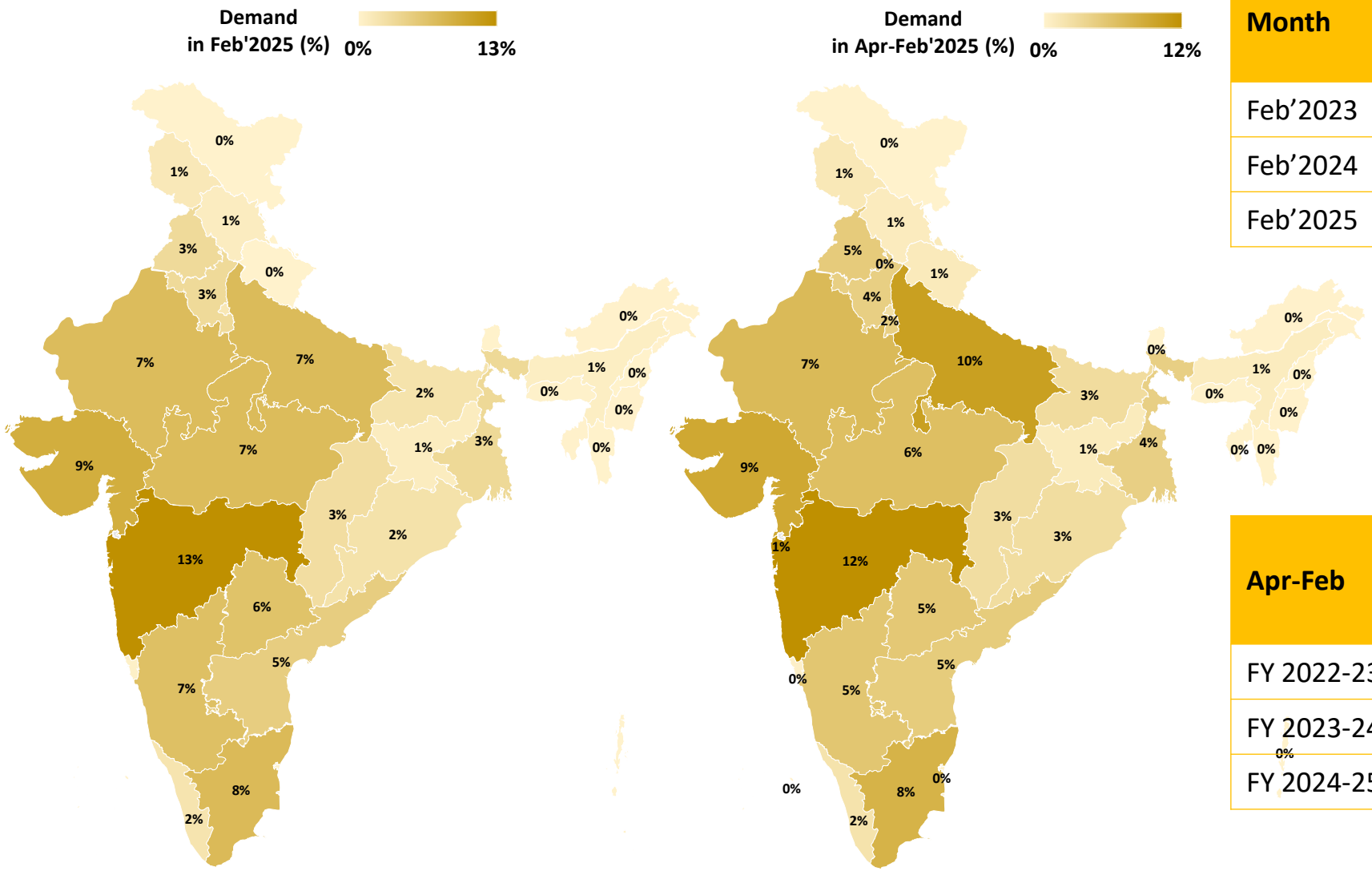


In April 2023, CERC revised the price ceiling from ₹12/kWh to ₹10/kWh in the power exchange market.

Source: IEX

National and State level Electricity Demand

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



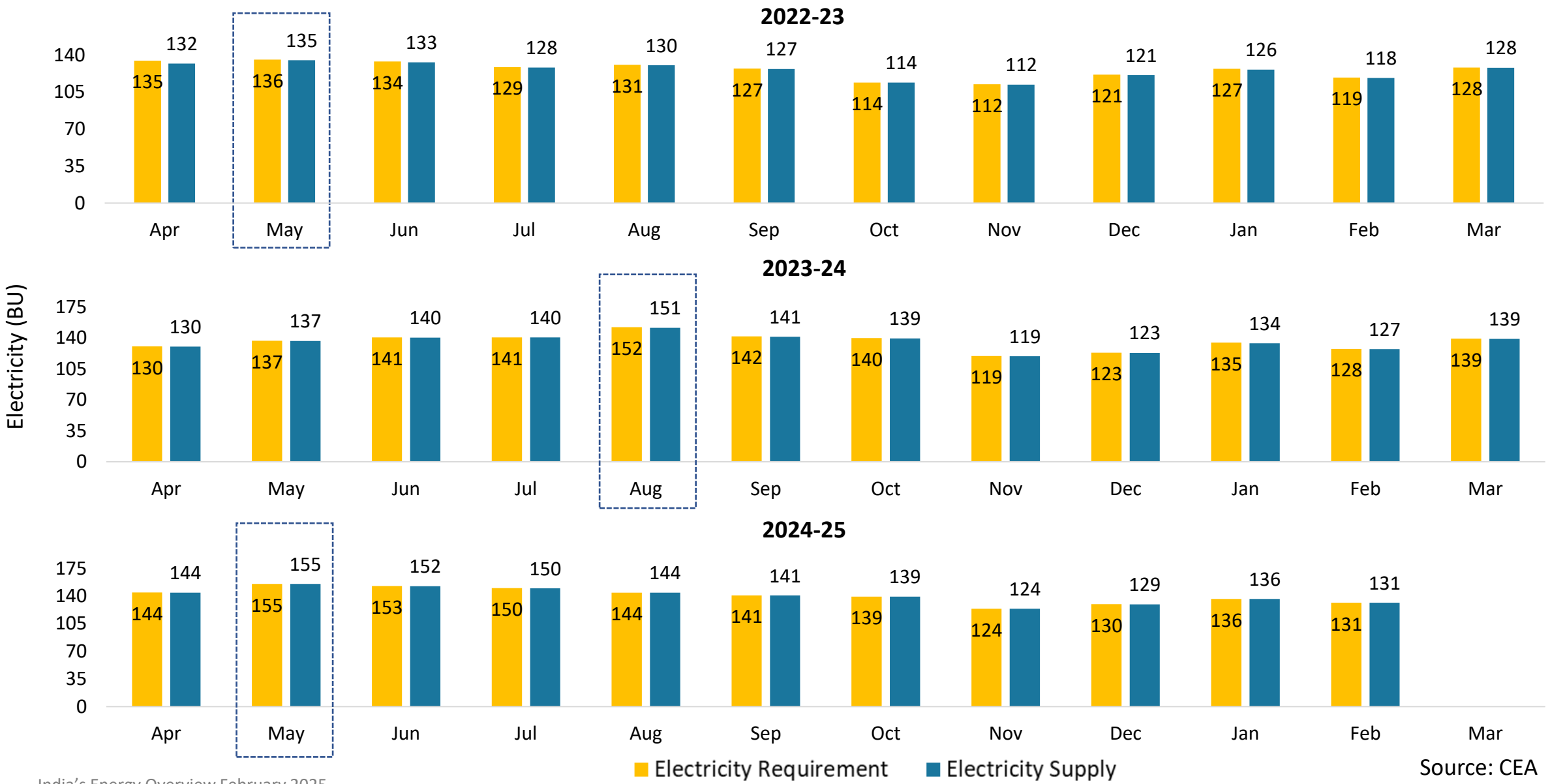
Month	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
Feb'2023	119	118	0.5
Feb'2024	128	127	0.3
Feb'2025	131	131	0.0

Apr-Feb	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
FY 2022-23	1,385	1,378	7
FY 2023-24	1,487	1,483	4
FY 2024-25	1,548	1,546	2

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

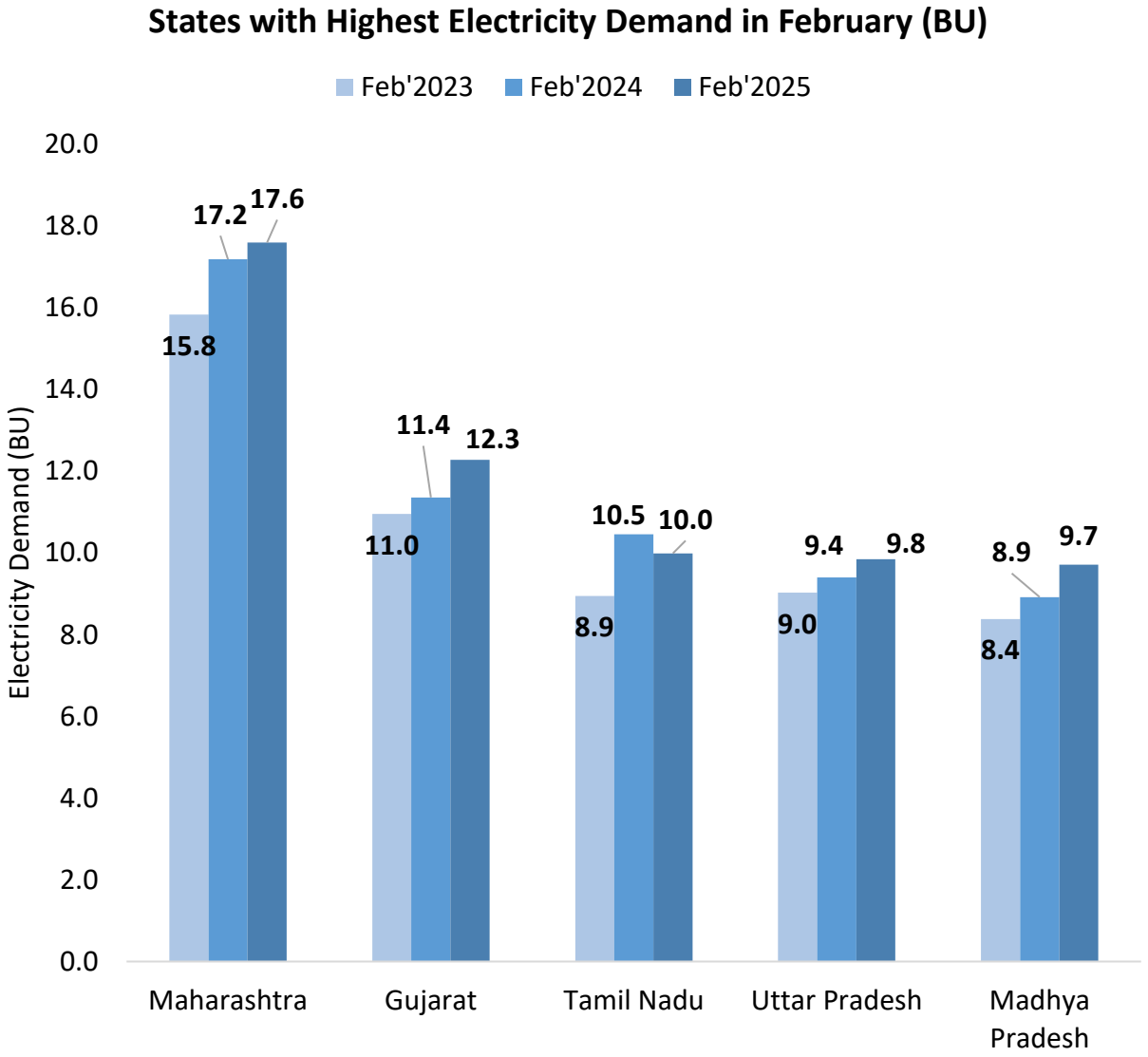
Source: CEA

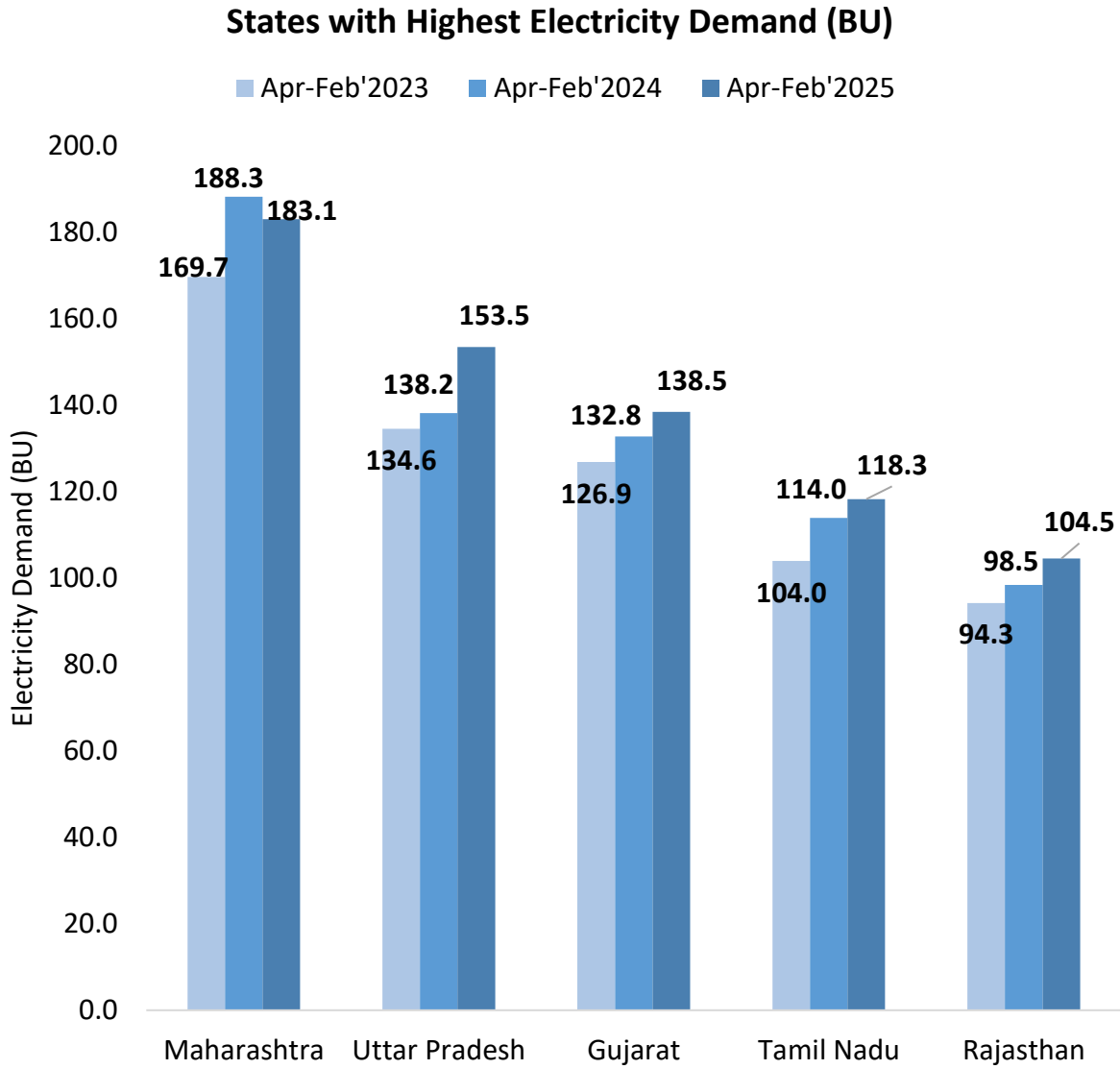
India’s Monthly Electricity Requirement and Supply



Source: CEA

Monthly Electricity Demand of the top 5 states

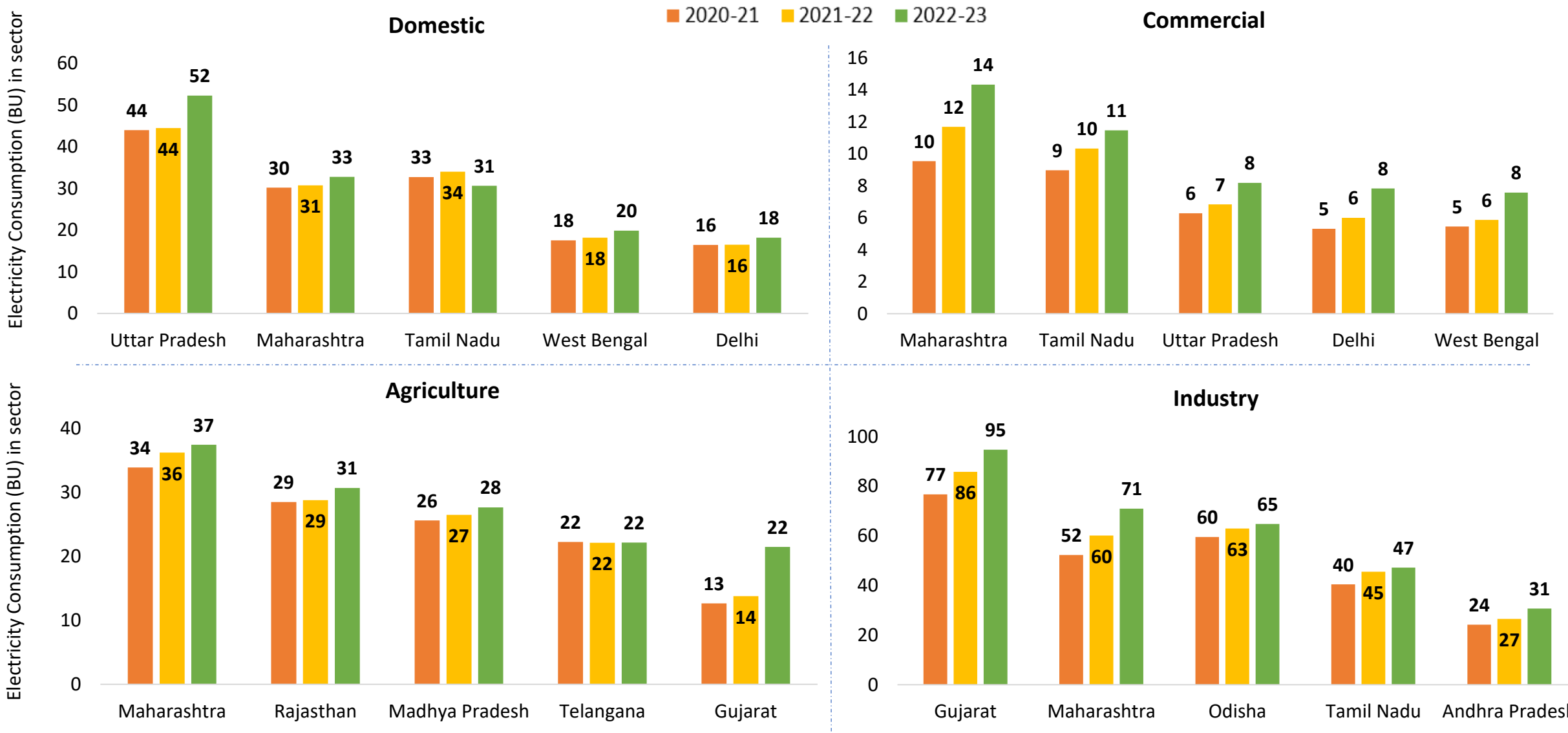




Note: The electricity demand data for February'25 is Provisional.

Source: CEA

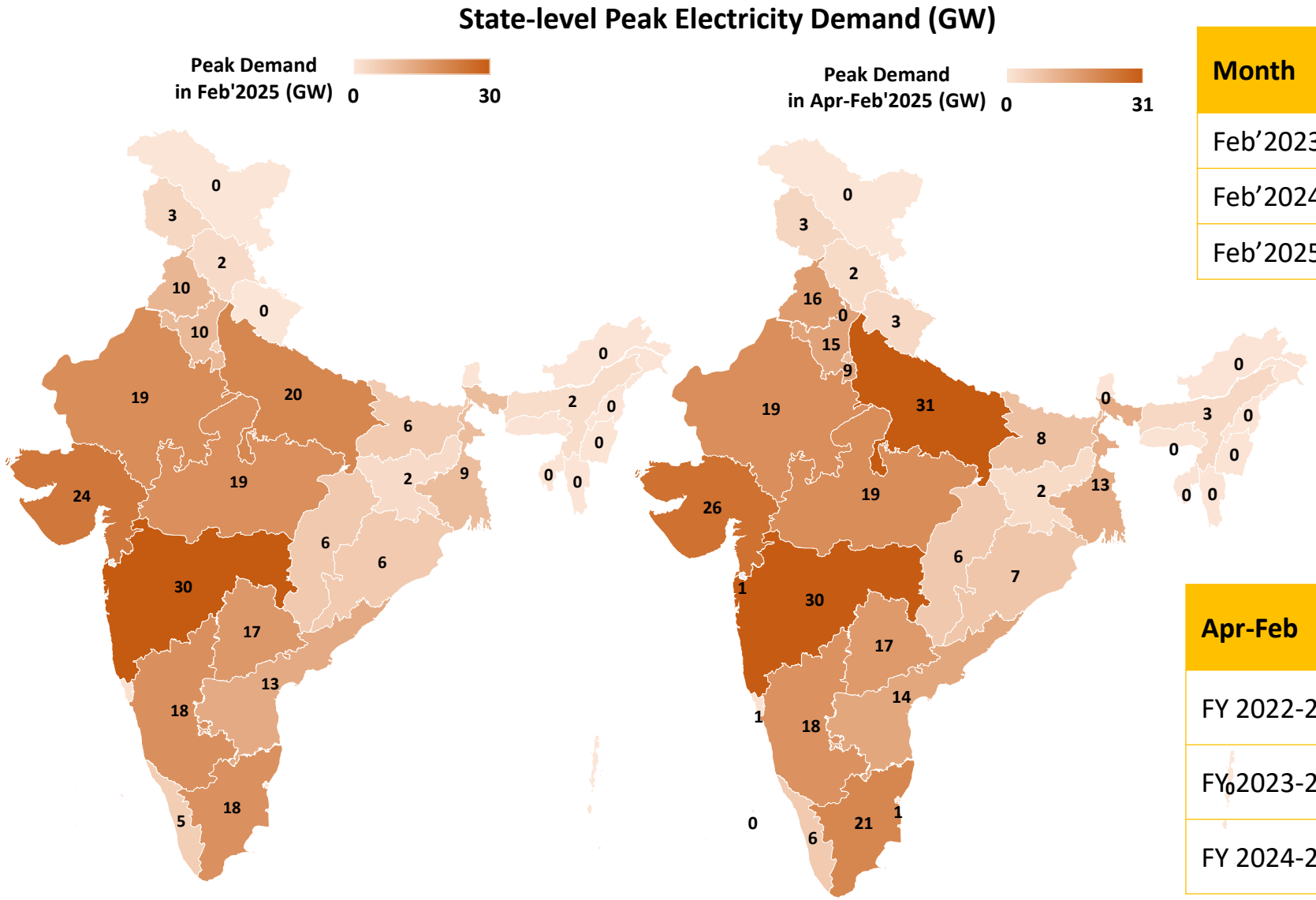
Electricity Consumer-category wise top 5 States



NOTE: Top 5 States under consumer-categories are selected on the basis of 2022-23

Source: CEA

National and State level Peak Electricity Demand



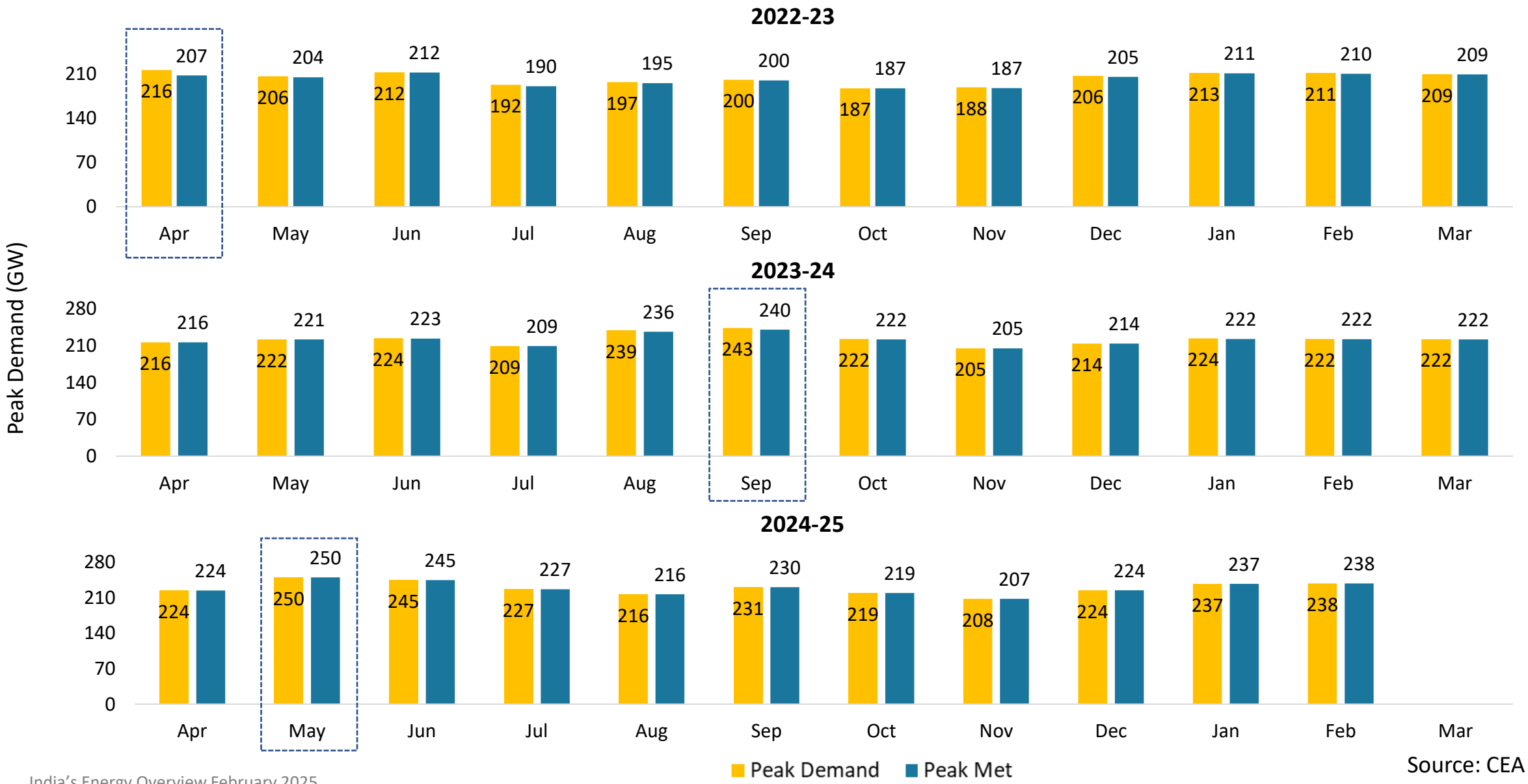
Month	Peak Demand (GW)	Peak Supply (GW)	Gap(GW) (+/-)
Feb'2023	211	210	1.4
Feb'2024	222	222	0.2
Feb'2025	238	238	0.0

Apr-Feb	Peak Demand (GW)	Peak Supply (GW)	Gap (GW) (+/-)
FY 2022-23	216	207	8.7
FY 2023-24	243	240	3.3
FY 2024-25	250	250	0.0

Note: The peak electricity demand data for February'25 is Provisional.

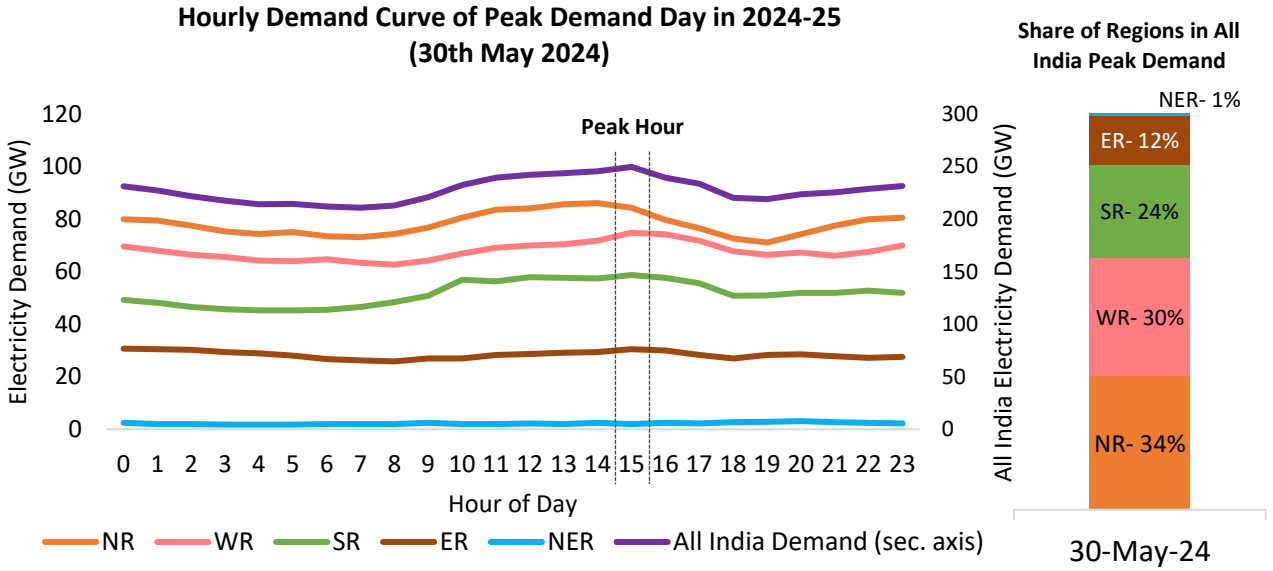
Source: CEA

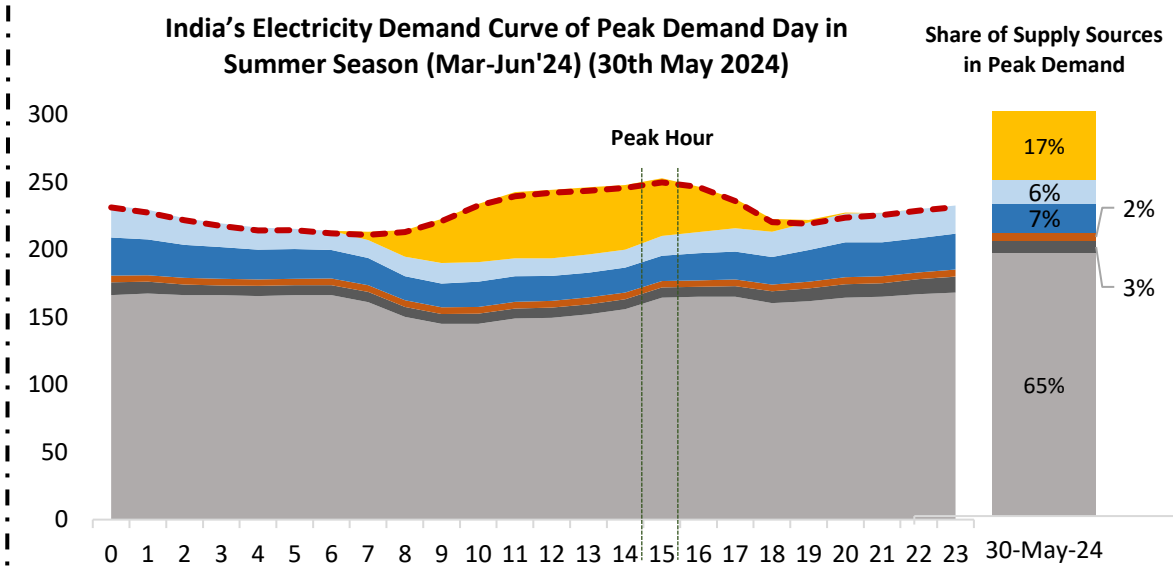
India’s Monthly Peak Electricity Demand and Supply

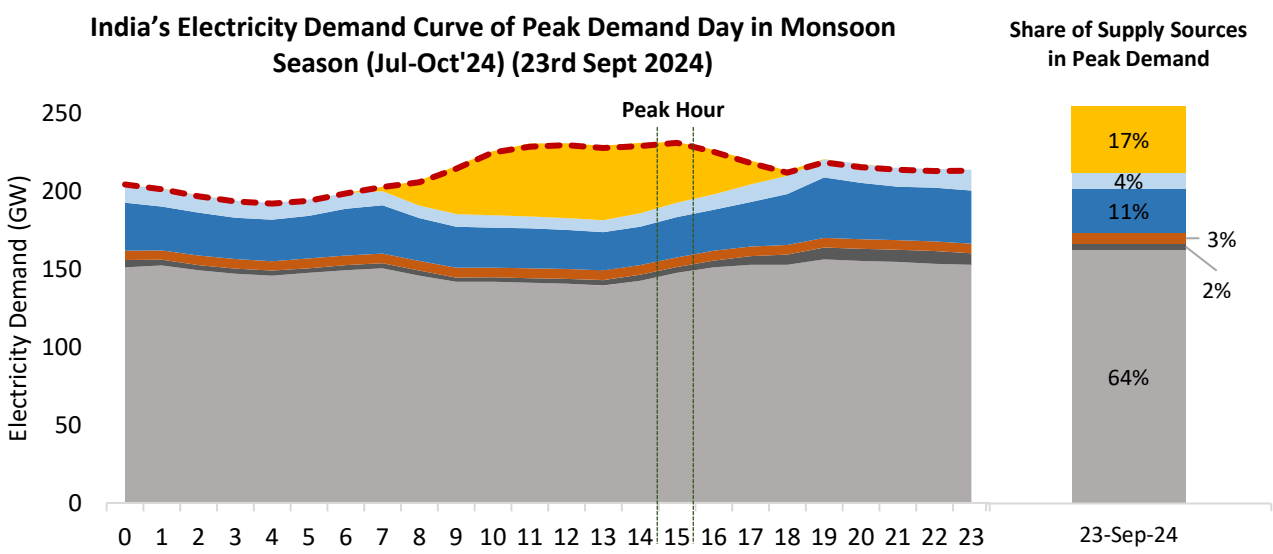


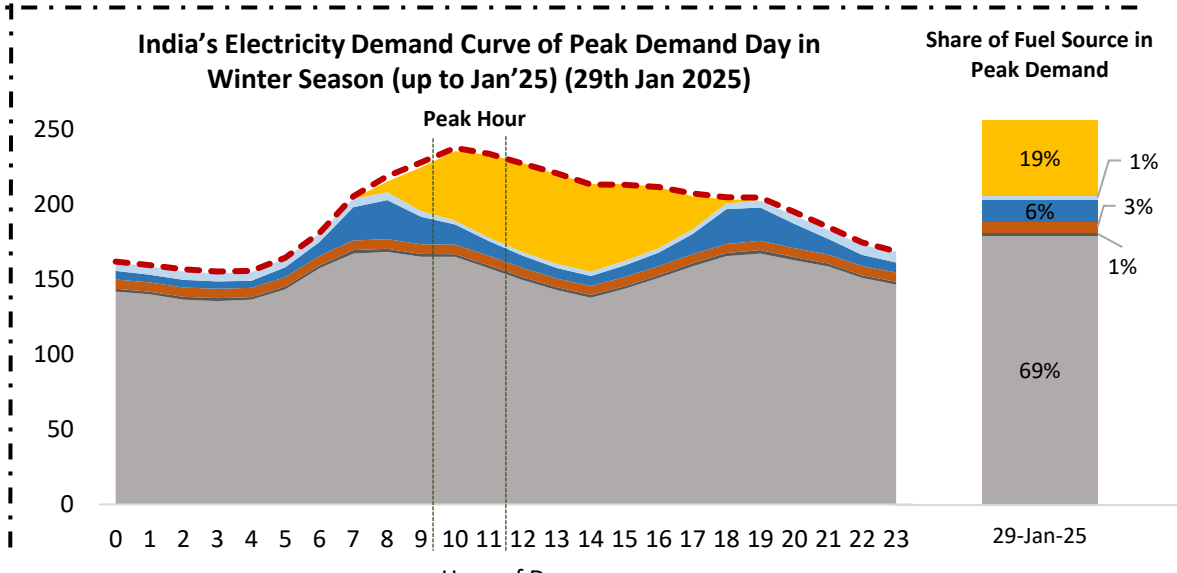
Source: CEA

All India, Regional, and Seasonal Electricity Demand Curve of Peak Demand Day



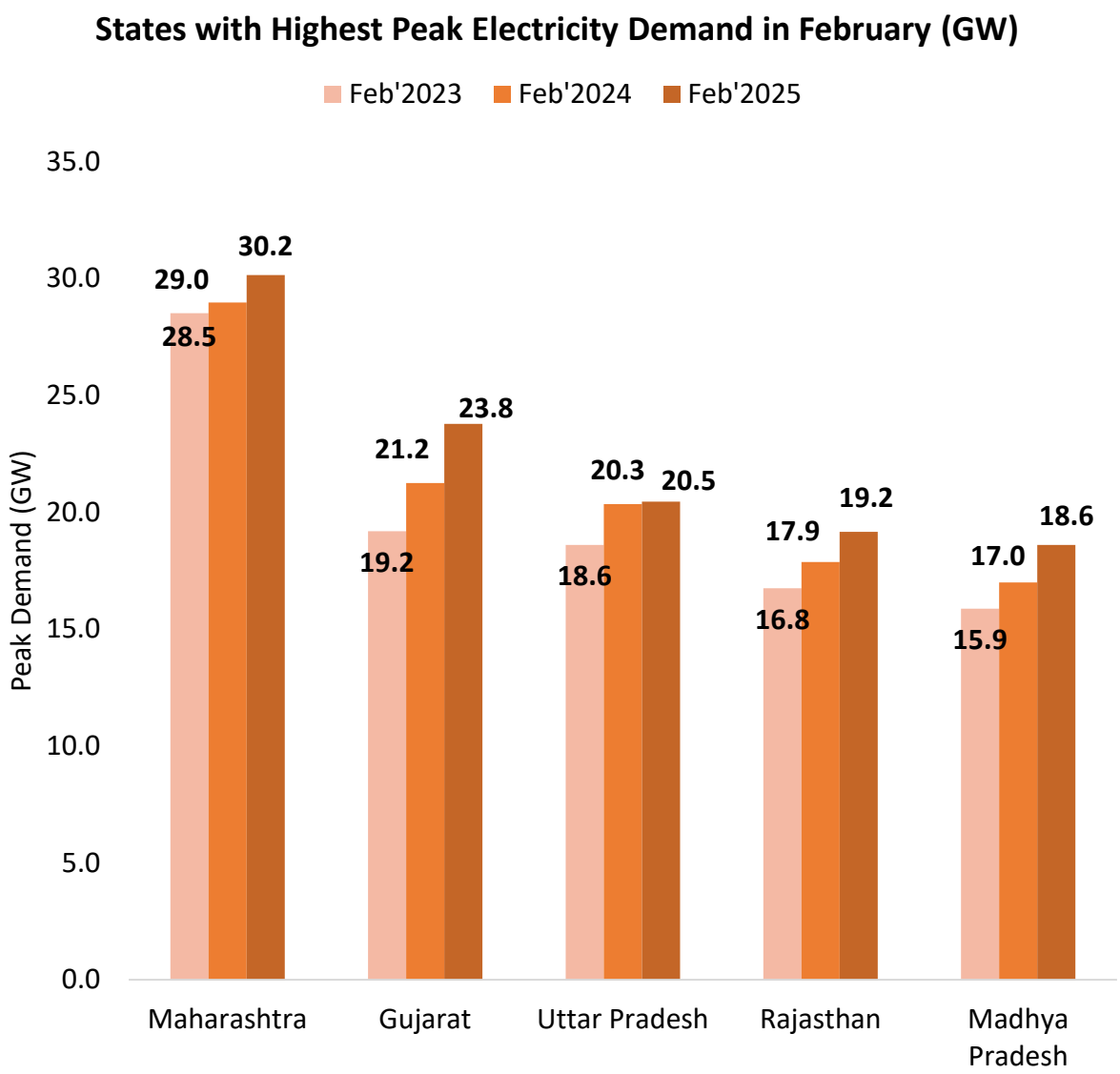


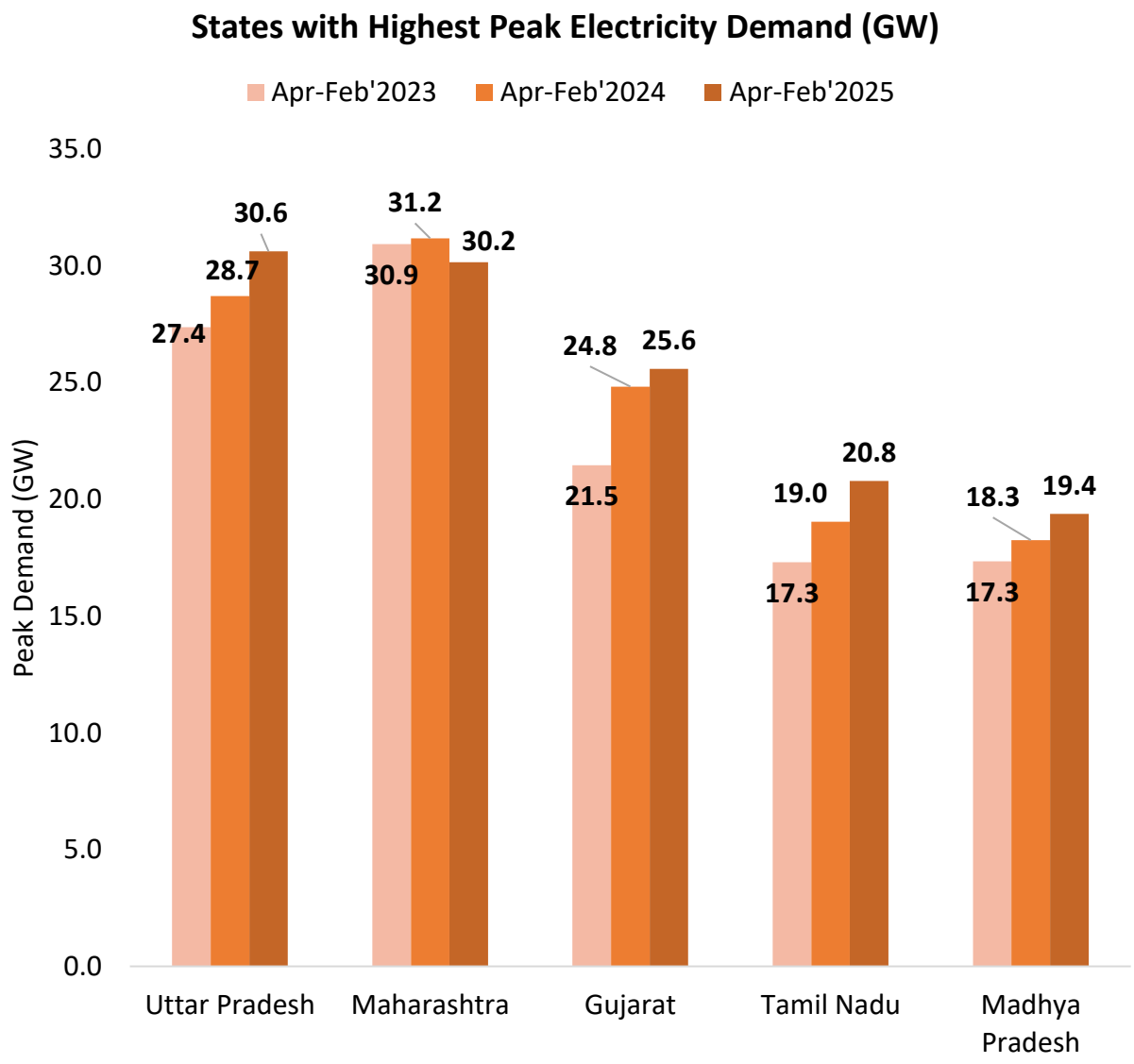




Source: POSOCO

Monthly Peak Electricity Demand of the top 5 states

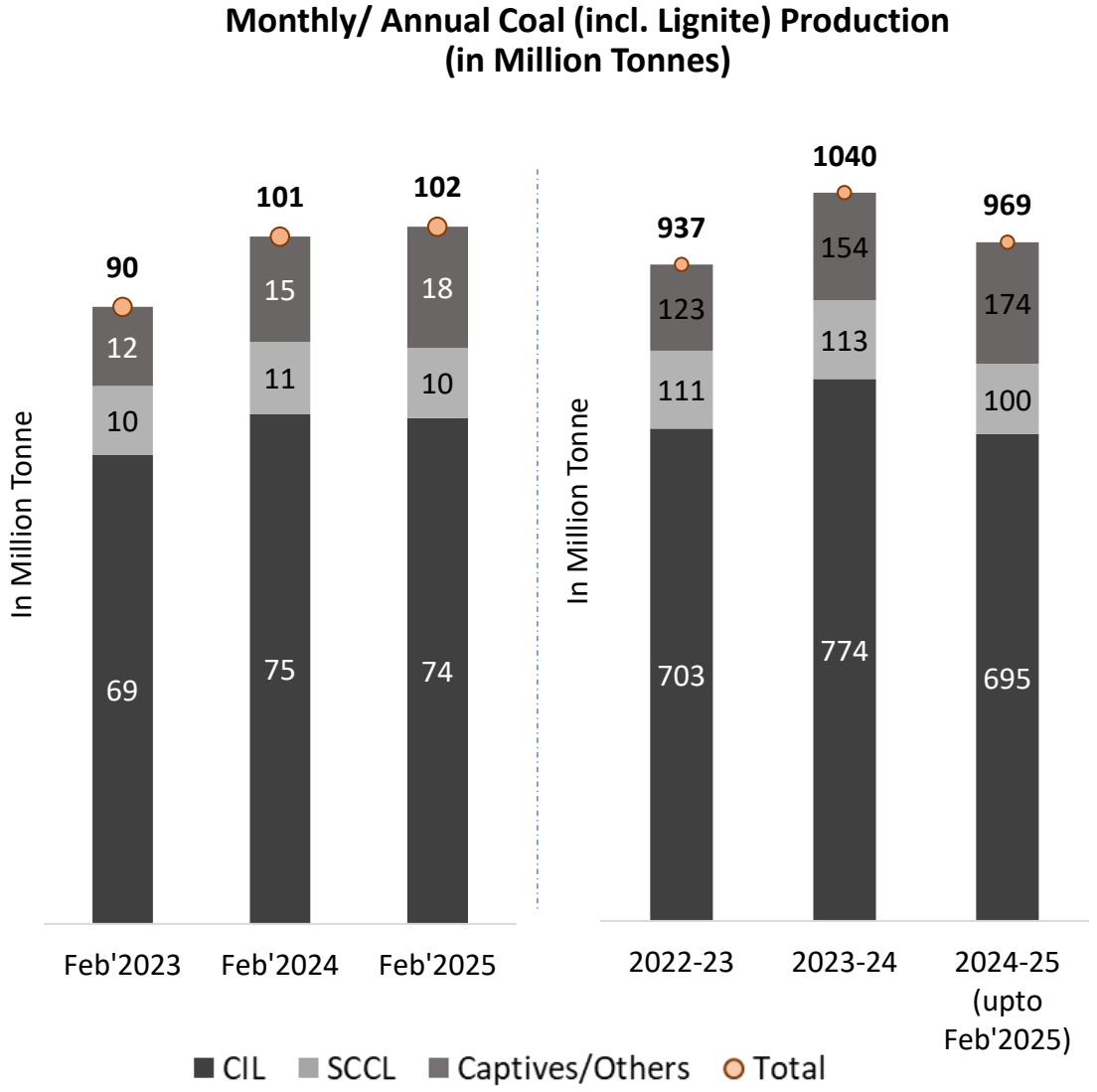


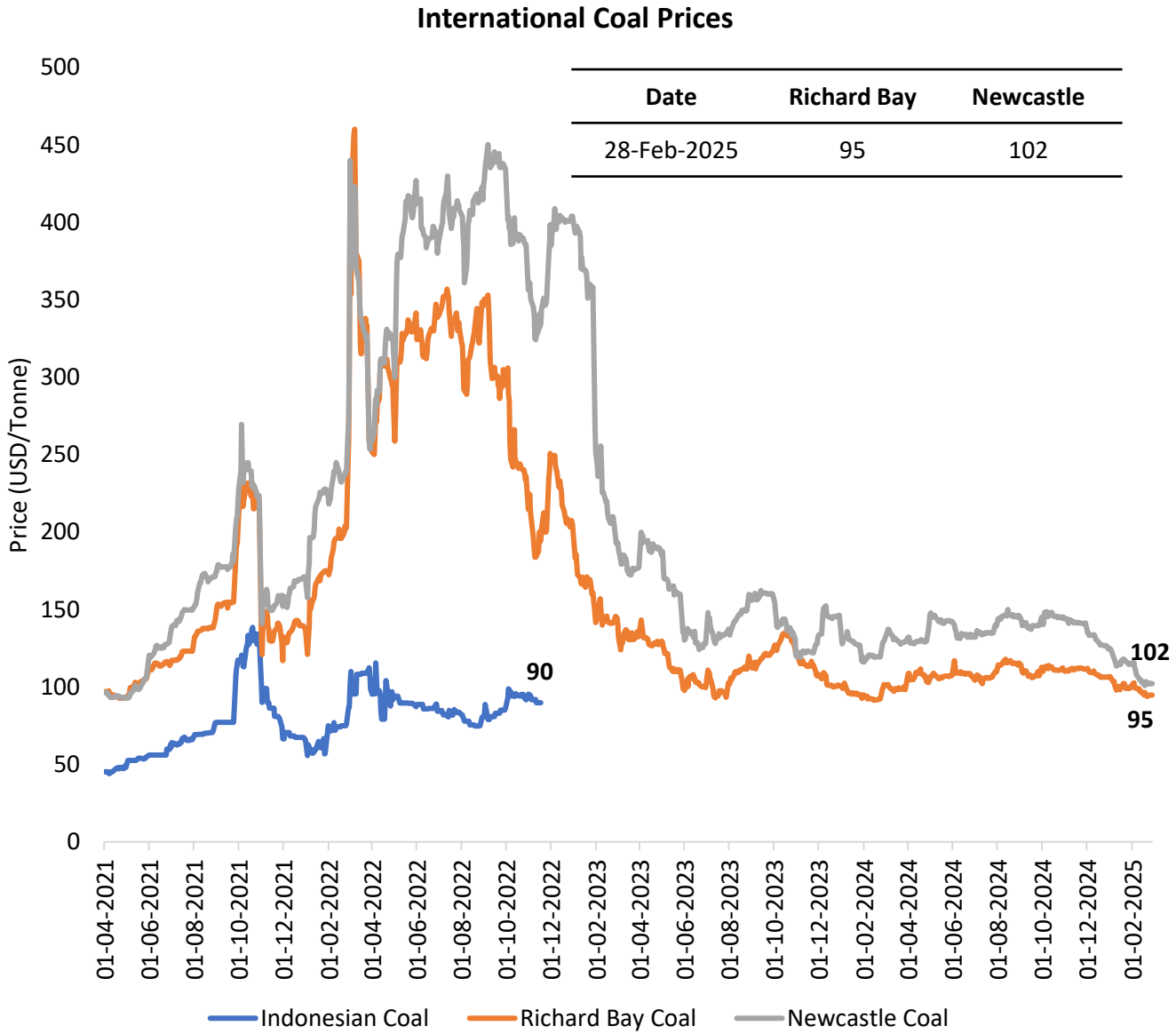


Note: The peak electricity demand data for Febuary'25 is Provisional.

Source: CEA

Monthly Coal Statistics

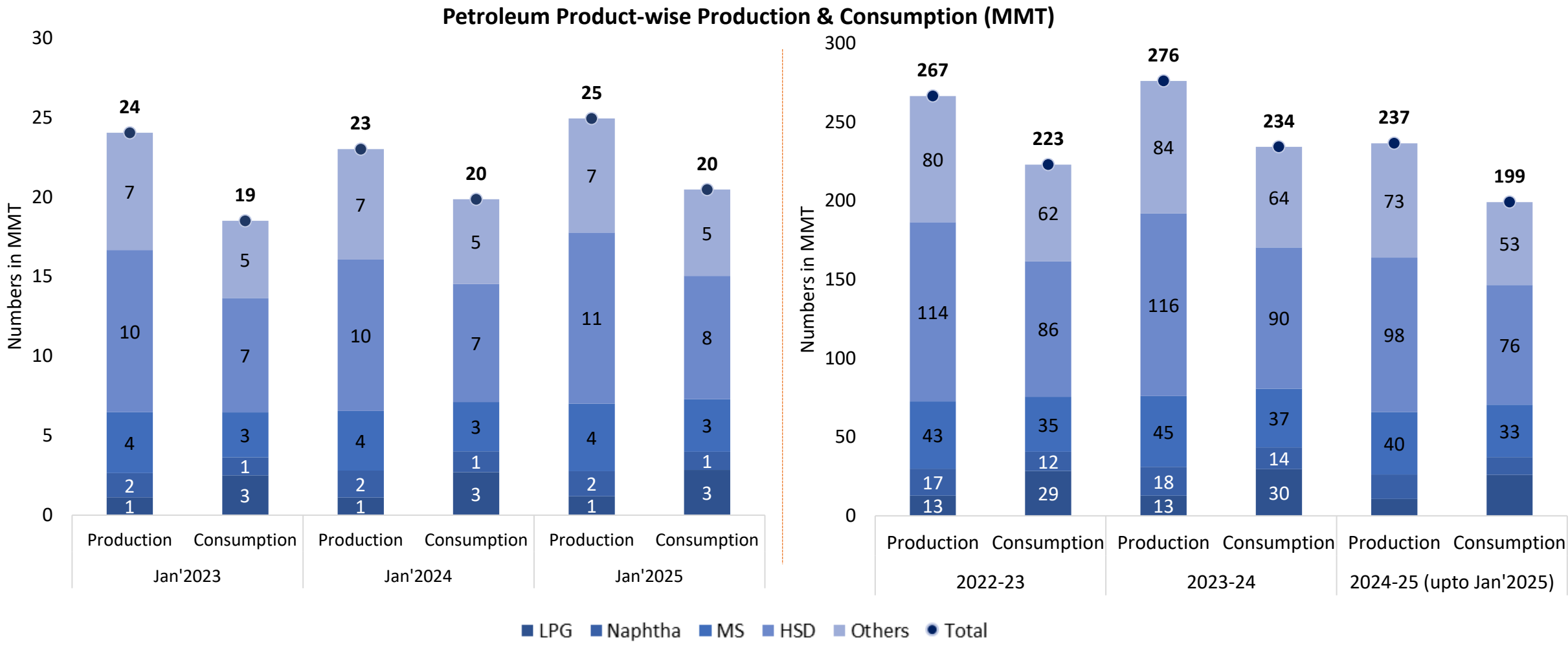




Date	Richard Bay	Newcastle
28-Feb-2025	95	102

Source: Ministry of Coal

Petroleum Products Market Scenario (1/3)



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

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

NOTE: The data is available latest up to January'2025

Source: PPAC

Petroleum Products Market Scenario (2/3)

Import/Export of Crude Oil and Petroleum Products ('000 Tonnes)							
Petroleum Products	Import/ Export	Monthly			Yearly		
		Jan'23	Jan'24	Jan'25	2022-23	2023-24	2024-25 (upto Jan'2025)
Crude Oil	Import	20229	21515	20846	232700	234262	200479
	Export	0	0	0	0	0	0
	Net Import	**20229**	**21515**	**20846**	**232700**	**234262**	**200479**
LPG	Import	1709	1645	1820	18335	18514	17466
	Export	48	45	49	540	525	452
	Net Import	**1661**	**1600**	**1771**	**17796**	**17989**	**17014**
Diesel	Import	5	3	4	322	42	36
	Export	1991	2024	2789	28494	28204	22874
	Net Import	**-1986**	**-2021**	**-2785**	**-28172**	**-28162**	**-22838**
Petrol	Import	0	0	0	1069	717	235
	Export	1165	975	1362	13127	13472	12375
	Net Import	**-1165**	**-975**	**-1362**	**-12058**	**-12755**	**-12141**
Others	Import	2069	2181	2540	24871	29419	25345
	Export	1297	1799	1272	18854	20391	17622
	Net Import	**771**	**382**	**1268**	**6017**	**9029**	**7723**

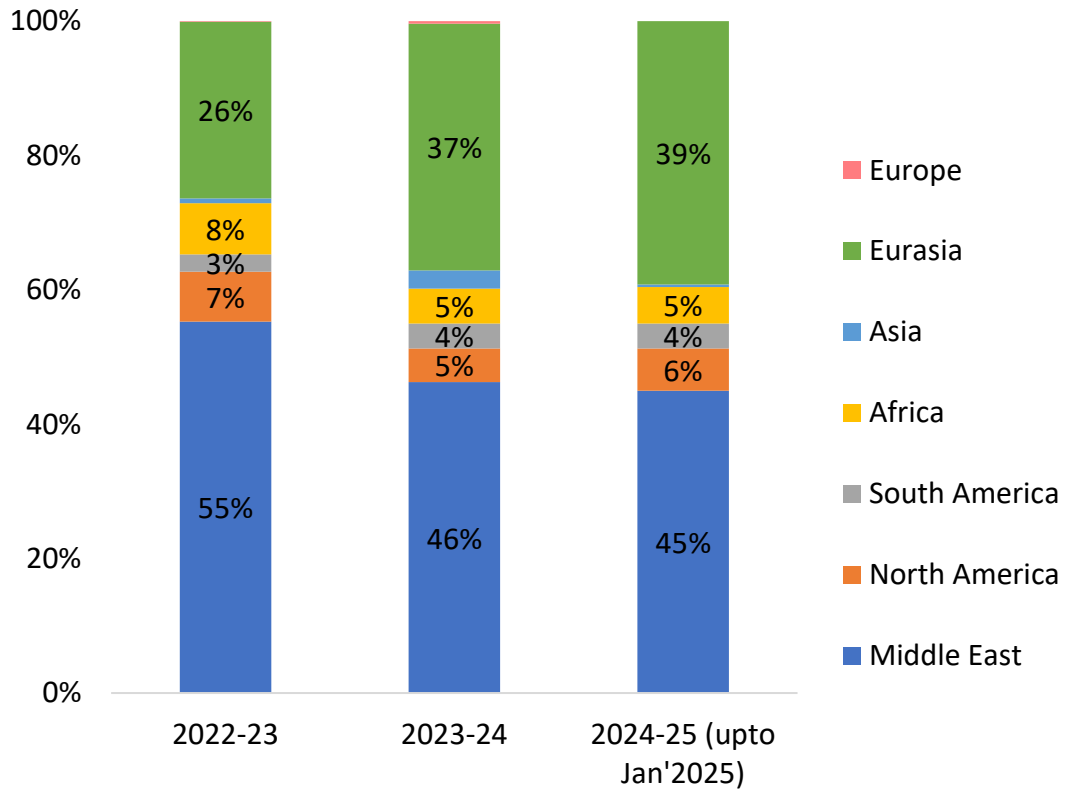
*Others include ATF, Naphtha, SKO, LDO, Lubes, FO, LSHS, Bitumen, pet coke, and others.

NOTE: The data is available latest up to January'2025

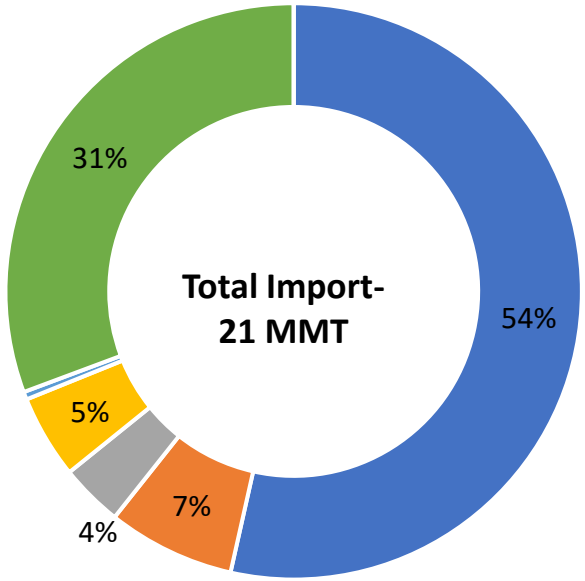
Source: PPAC

Petroleum Products Market Scenario (3/3)

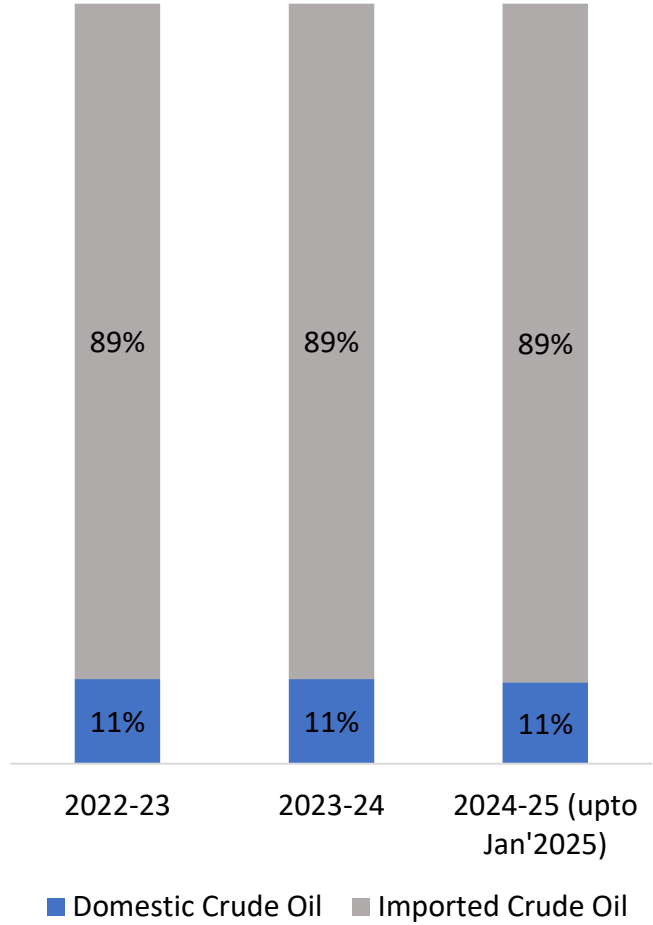
Region-wise Share in Import of Crude Oil (%)



Regional share of Imported Crude oil in January 2025 (P)



Domestic and Imported Crude Oil share in India (%)



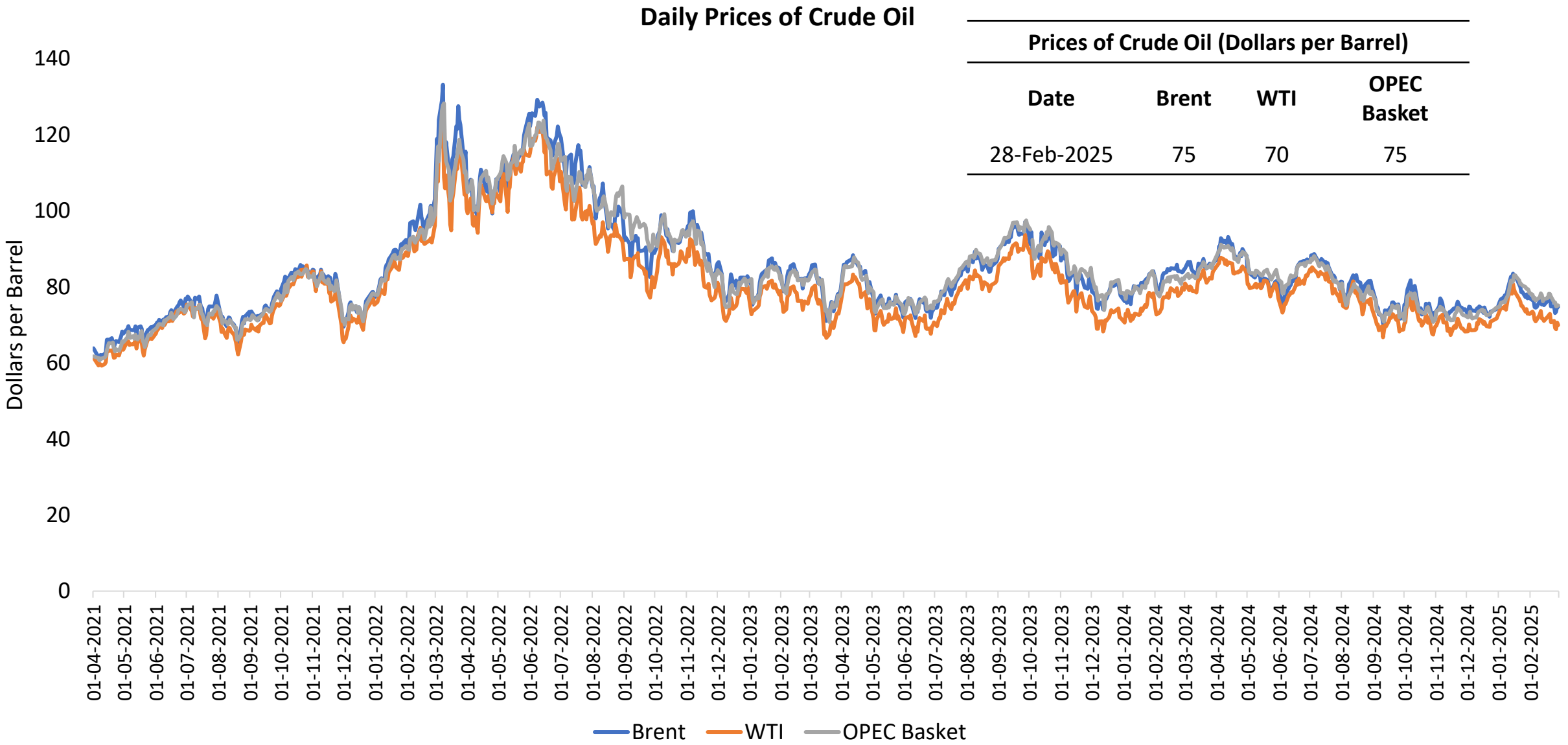
Total Import of Crude Oil (MMT)

Total Import	2022-23	2023-24	2024-25 (up to Jan'2025)
Crude Oil	**233**	**234**	**200**

NOTE: The data is available latest up to December'2024 P- Provisional

Source: MoPNG and PPAC

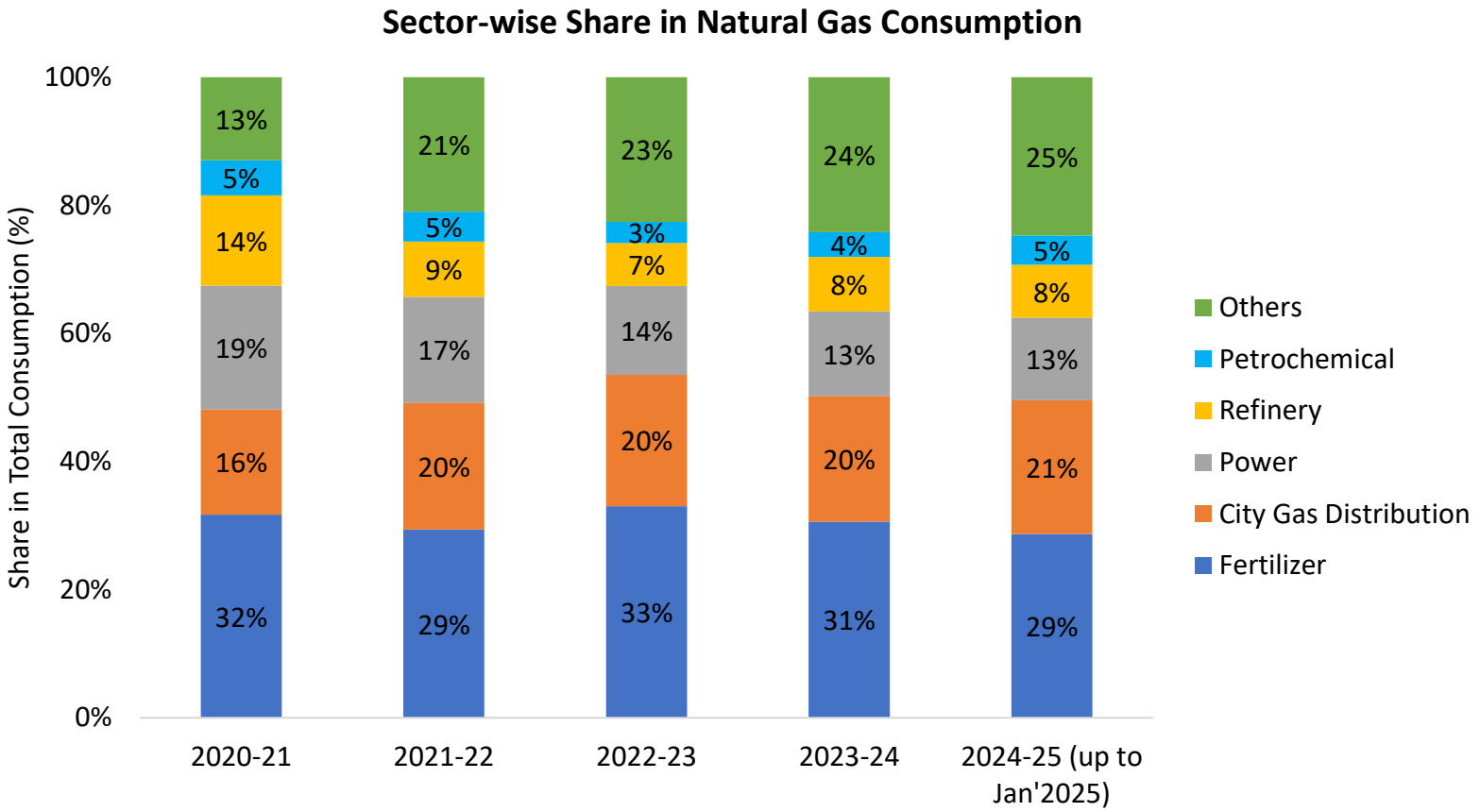
Daily Prices of Crude Oil

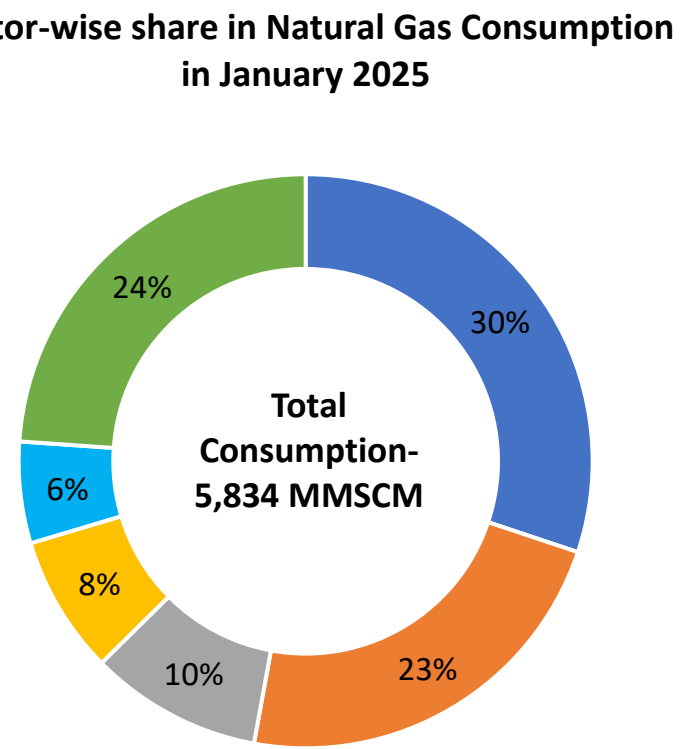


Prices of Crude Oil (Dollars per Barrel)

Date	Brent	WTI	OPEC Basket
28-Feb-2025	75	70	75

Gas Market Scenario (1/2)





Total Consumption of Natural Gas (NG) (MMSCM)					
Total Consumption	2020-21	2021-22	2022-23	2023-24	2024-25 (up to Jan'2025)
Natural Gas	**56,116**	**61,491**	**58,702**	**68,759**	**60,156**

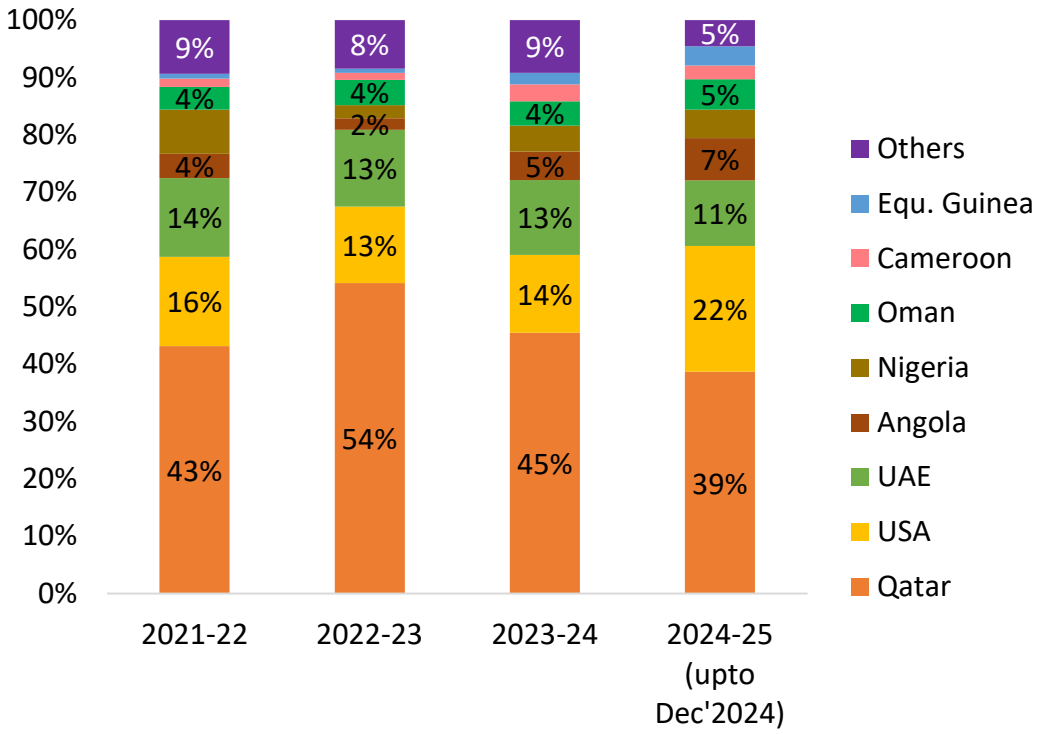
Others include- Internal Combustion of Pipeline System, Industrial, Sponge iron/steel, LPG shrinkage, Manufacturing, Agriculture (tea plantation), Others

NOTE: The data is available latest up to January'2025

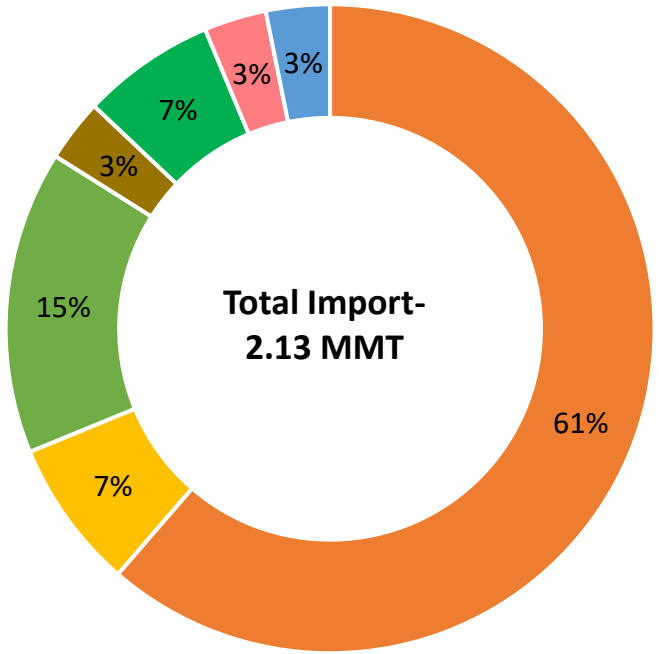
Source: PPAC

Gas Market Scenario (2/2)

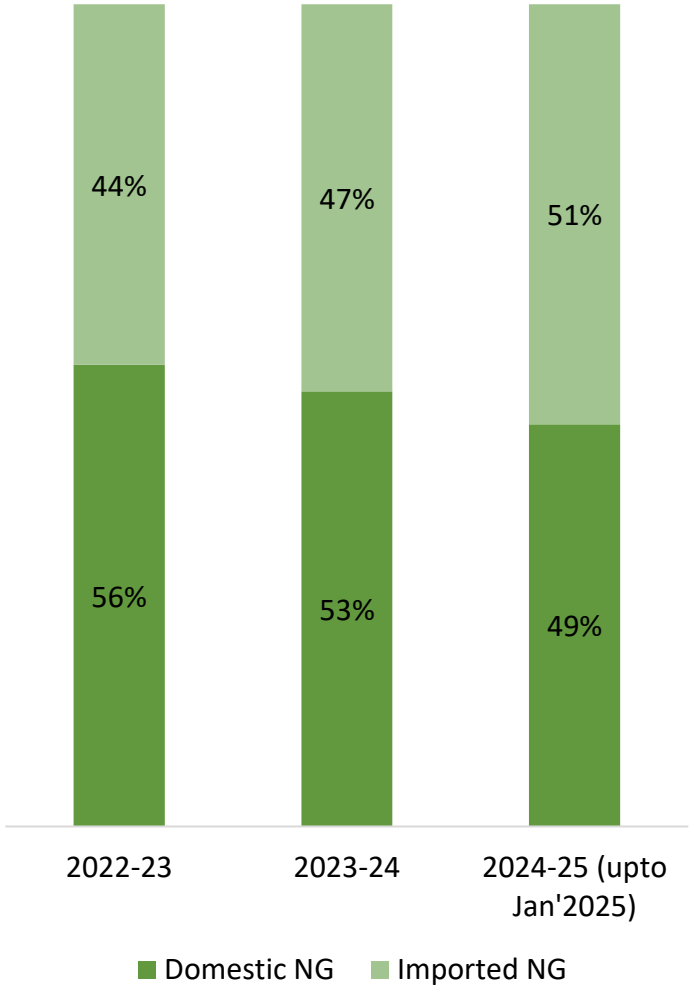
Region-wise Share in Import of LNG (%)



Country Share of Imported LNG in December'2024



Domestic and Imported Natural Gas share in India (%)



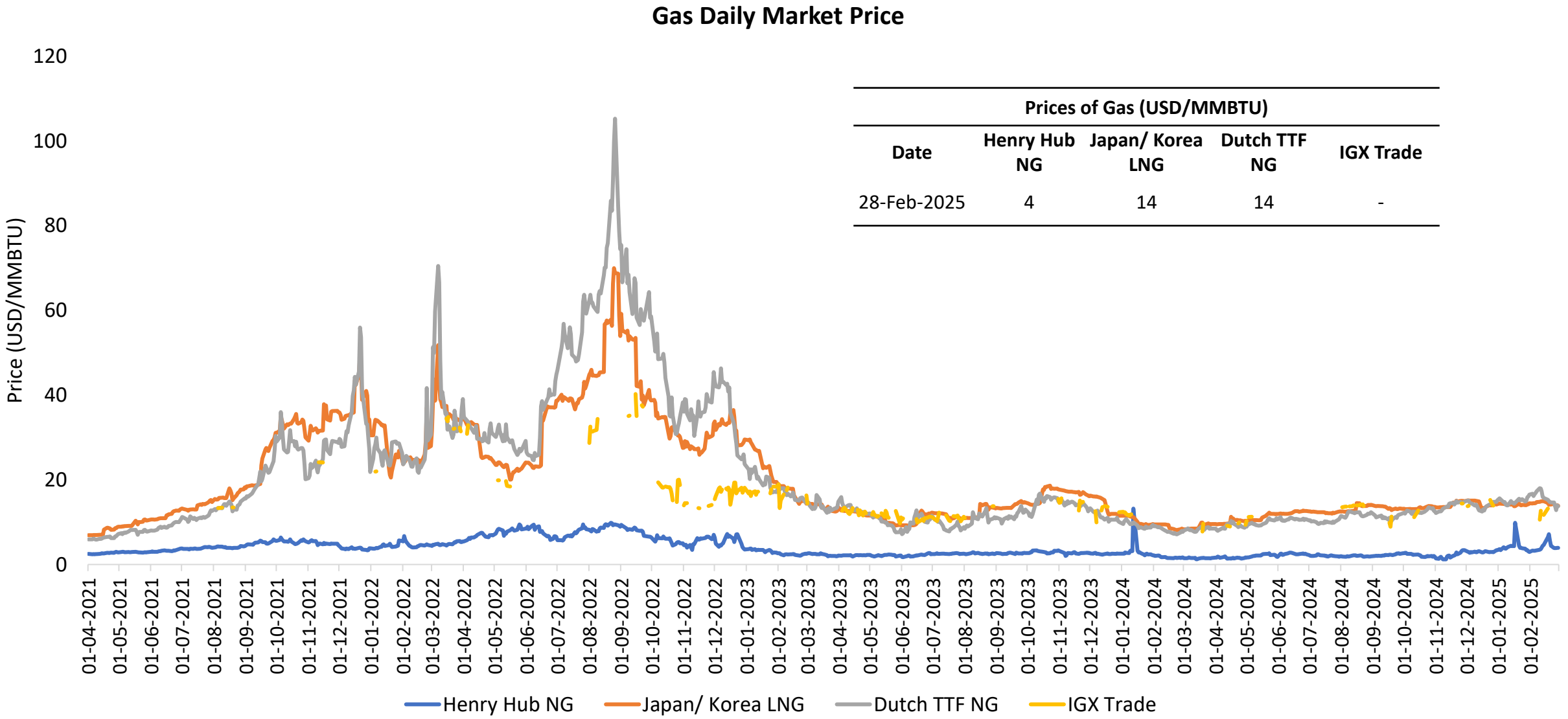
Others include- Trinidad, Cameroon, Egypt, France, Algeria, Belgium, Indonesia, Turkey, Russia, Spain, Malaysia, Brunei, Netherlands, Norway, and others.

Total Import of Liquified Natural Gas (LNG) (MMT)			
Total Import	2022-23	2023-24	2024-25 (up to Jan'2025)
LNG	**19.85**	**24.00**	**23.59**

NOTE: The data is based on the latest available information.

Source: MoCI and PPAC

Daily Prices of Gas

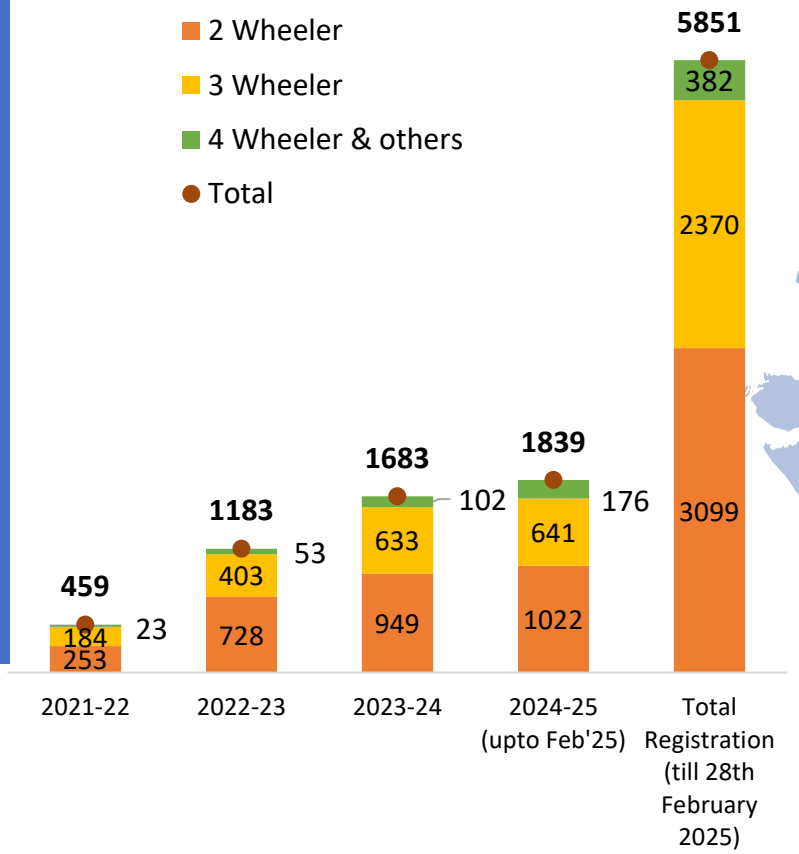


Prices of Gas (USD/MMBTU)				
Date	Henry Hub NG	Japan/ Korea LNG	Dutch TTF NG	IGX Trade
28-Feb-2025	4	14	14	-

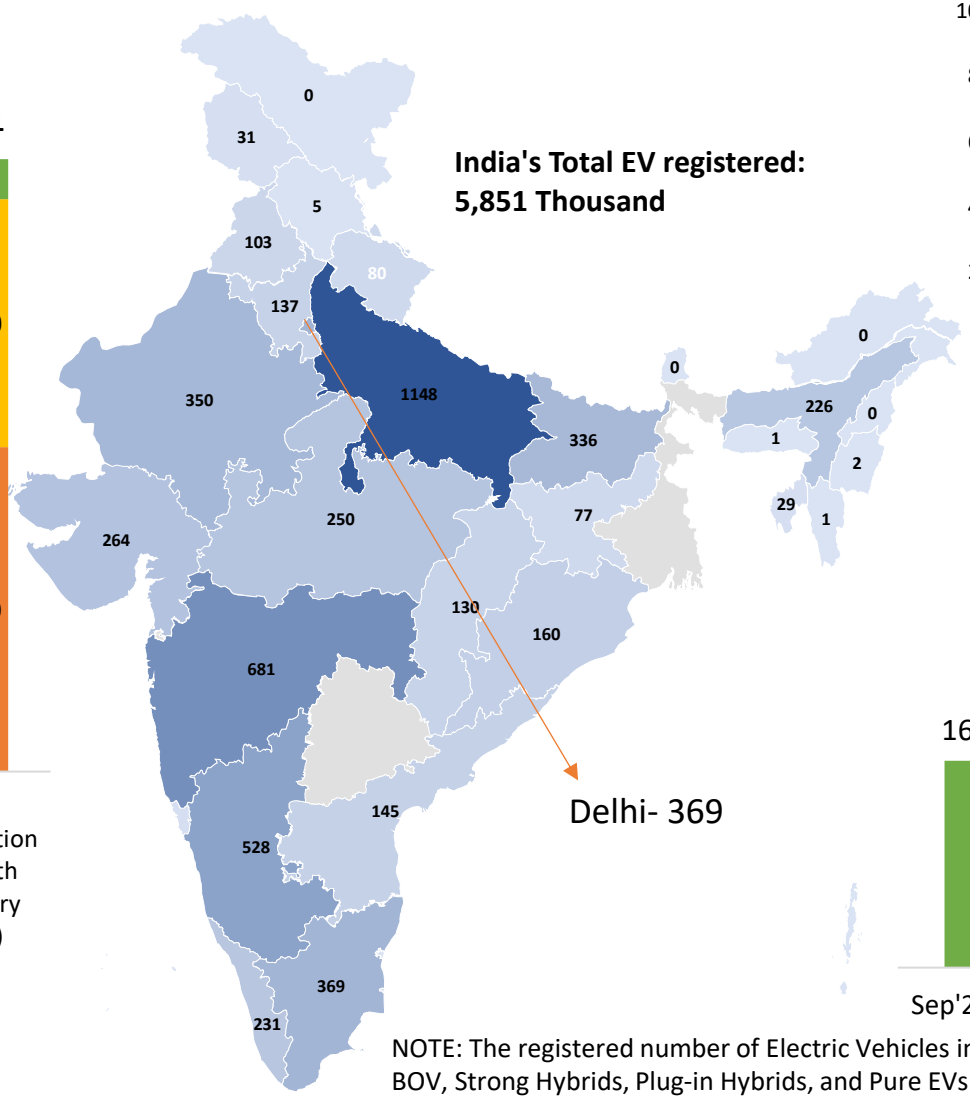
MMBTU- Million Metric British Thermal Unit

Status of Electric Mobility in India

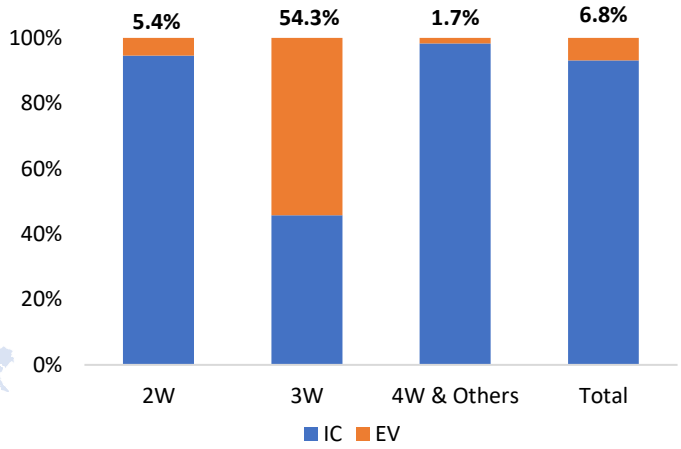
National EV registration (Number in Thousands)



Cumulative State-wise EV registration as on 28th February 2025 (in Thousands)

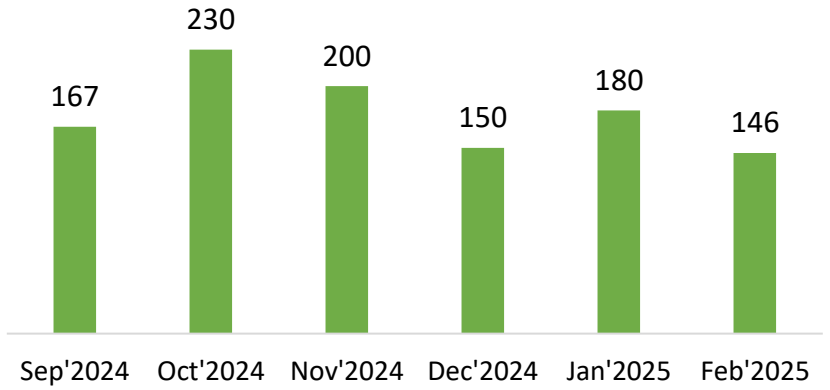


EV and ICE sale composition in 2023-24



Under 3-wheeler (54.3%) EV registration, 45.6% is L3 and 8.7% is L5 vehicles.

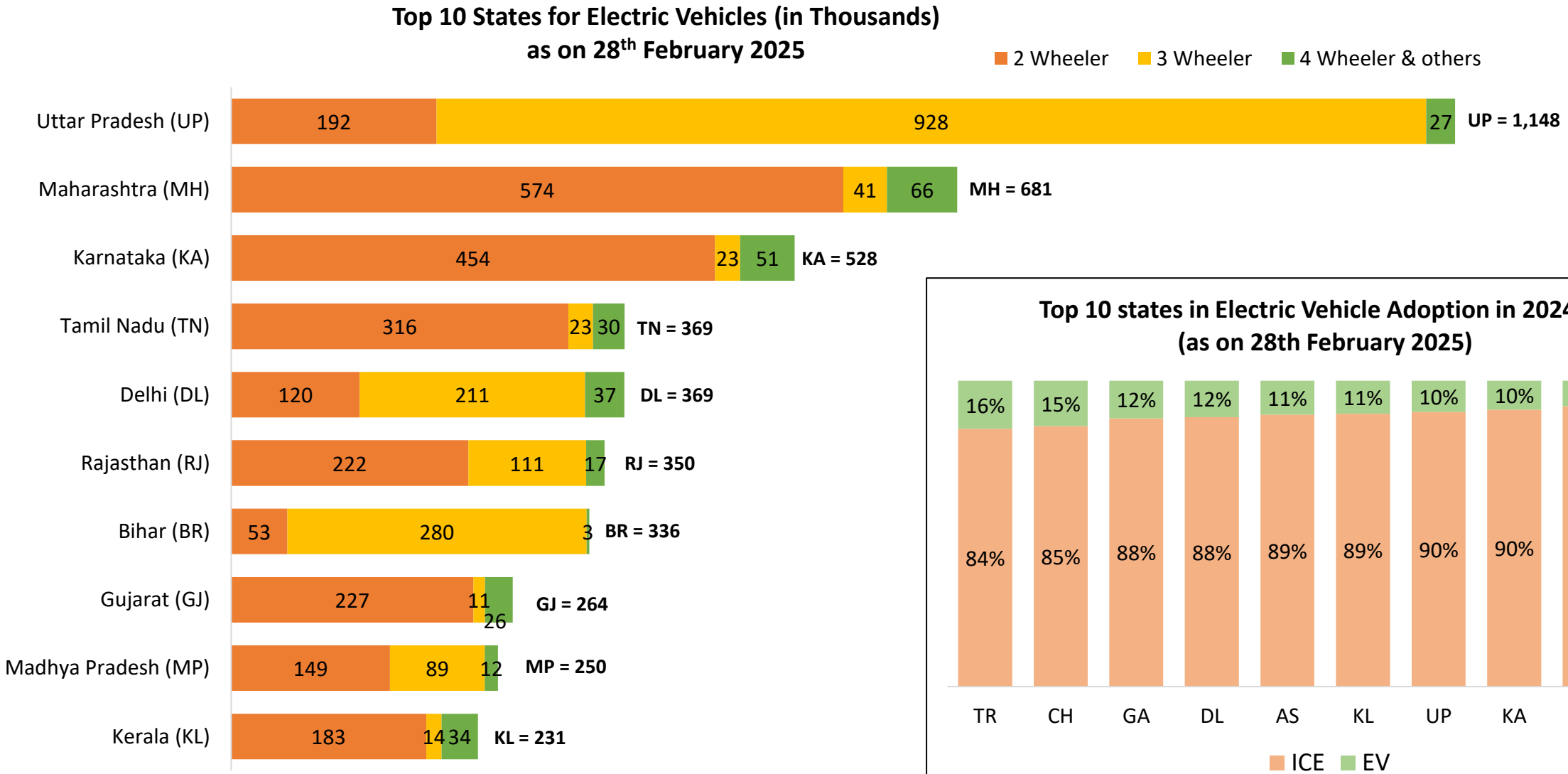
Provisional Monthly EV registered (in Thousands)



NOTE: The registered number of Electric Vehicles includes Electric BOV, Strong Hybrids, Plug-in Hybrids, and Pure EVs.

Source: VAHAN Dashboard

Status of Electric Mobility in India



NOTE: CH- Chandigarh, GA- Goa, AS- Assam, TR- Tripura

Source: VAHAN Dashboard

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.

PM-Surya Ghar: Muft Bijli Yojana relaesed with a total outlay of Rs. 75,021 crore for installing rooftop solar (RTS) for one crore households. The scheme provides a CFA of Rs 30,000 for a 1 kW RTS system, Rs 60,000 for a 2kW RTS system, and Rs 78,000 for a 3kW RTS system.

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 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 National Repowering & Life Extension Policy for Wind Power Projects- 2023, 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.

India's first 20 MW/40MWh BESS project is going to go live at the 33/11 kV Kilokari sub-station belonging to BRPL, Delhi.

Under the aegis of MNRE, SECI has successfully commissioned India's largest BESS plant, featuring a 40 MW/120 MWh BESS alongside a solar PV plant with a installed capacity of 152 MWh, located in Rajnandgaon, Chhattisgarh.

Green Hydrogen (H_2)

National Green Hydrogen Mission (NGHM) 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. NGHM portal to track the recent initiatives and developments.

India's first Green Hydrogen Hub to be build in Andhra Pradesh by NTPC at an estimated cost of ₹1.85 Lakh Crore with a capacity of producing 1500 TPD Green Hydrogen and 7500 TPD Green Hydrogen derivative

MNRE has sanctioned pilot projects on Hydrogen Fuelled Buses and Trucks consisting total of 37 vehicles and 9 hydrogen refueling stations.

MNRE has sanctioned 3 pilot projects in steel sector for use of green Hydrogen in steel production to be commissioned in next 3 years with total financial outlay of ₹347 Crore from GoI.

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.

Key Highlights or Announcements of February 2025

- Government of Assam has released the Assam Integrated Clean Energy Policy- 2025, which will remain effective upto 2029-30, or until superseded by a subsequent policy. The policy aims to achieve a target of capacity addition of 11.70 GW of renewable power projects. The key targets are-

S.No.	Parameters	Capacity Addition (in MW)
1	**Solar**	
1.1	Grid Connected Ground Mounted Solar Power Plant (Without storage / with storage / hybrid)	3000
1.2	Grid Connected Floating Solar Power Plant (Without storage / with storage / hybrid)	300
2	**Rooftop Solar Power Plant (SRTPVS)**	
2.1	SRTPVS at Residential Sector	600
2.2	SRTPVS at Government Buildings	300
2.3	SRTPVS at Industrial & Commercial Sector	1000
3	Wind	200
4	Pumped Storage Power (PSP)	2000
5	Small Hydro	100
6	Biomass Power Plant & Waste to Energy	100
7	Battery Energy Storage	1000
8	Solar Manufacturing (Across the value chain Mine/Polysilicon to Module)	3000
9	Off Grid Solar Applications	100
	Total	**11,700**

S.No.	Parameters	Capacity Addition (in MW)
10	Wind Turbine Manufacturing	No pre-set limit
11	Battery Manufacturing	2000 MWh
12	Biofuels	Ethanol – 1,500 KLPD Bio CNG/CBG – 10,000 TPD
13	EV Charging Infrastructure	2000 Nos.
14	Green Hydrogen	2000 kilo Tonnes per Annum

Key Highlights or Announcements of February 2025

- The CEA has issued an Advisory on co-locating Energy Storage Systems with Solar Power Projects to enhance grid stability and cost efficiency. The key recommendations include:
  - All Renewable Energy Implementing Agencies (REIAs) and State utilities to incorporate a minimum of 2-hour co-located Energy Storage Systems (ESS), equivalent to 10% of the installed solar project capacity, in future solar tenders. This measure aims to mitigate intermittency issues and provide critical support during peak demand periods.
  - Distribution licensees may also consider mandating 2-hour storage with rooftop solar plants. This will improve supply reliability for consumers while reducing the burden on distribution networks caused by over-injection during peak solar hours.

- Ministry of Power has issued the Tariff Based Competitive Bidding Guidelines for Procurement of Storage Capacity/Stored Energy From Pumped Storage Plants (PSPs). The primary objective of these guidelines is to promote the development of PSPs while ensuring a transparent, fair, and standardized procurement framework through open competitive bidding with appropriate risk-sharing between various stakeholders.

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