India’s Energy Overview

September 2024

VASUDHA FOUNDATION
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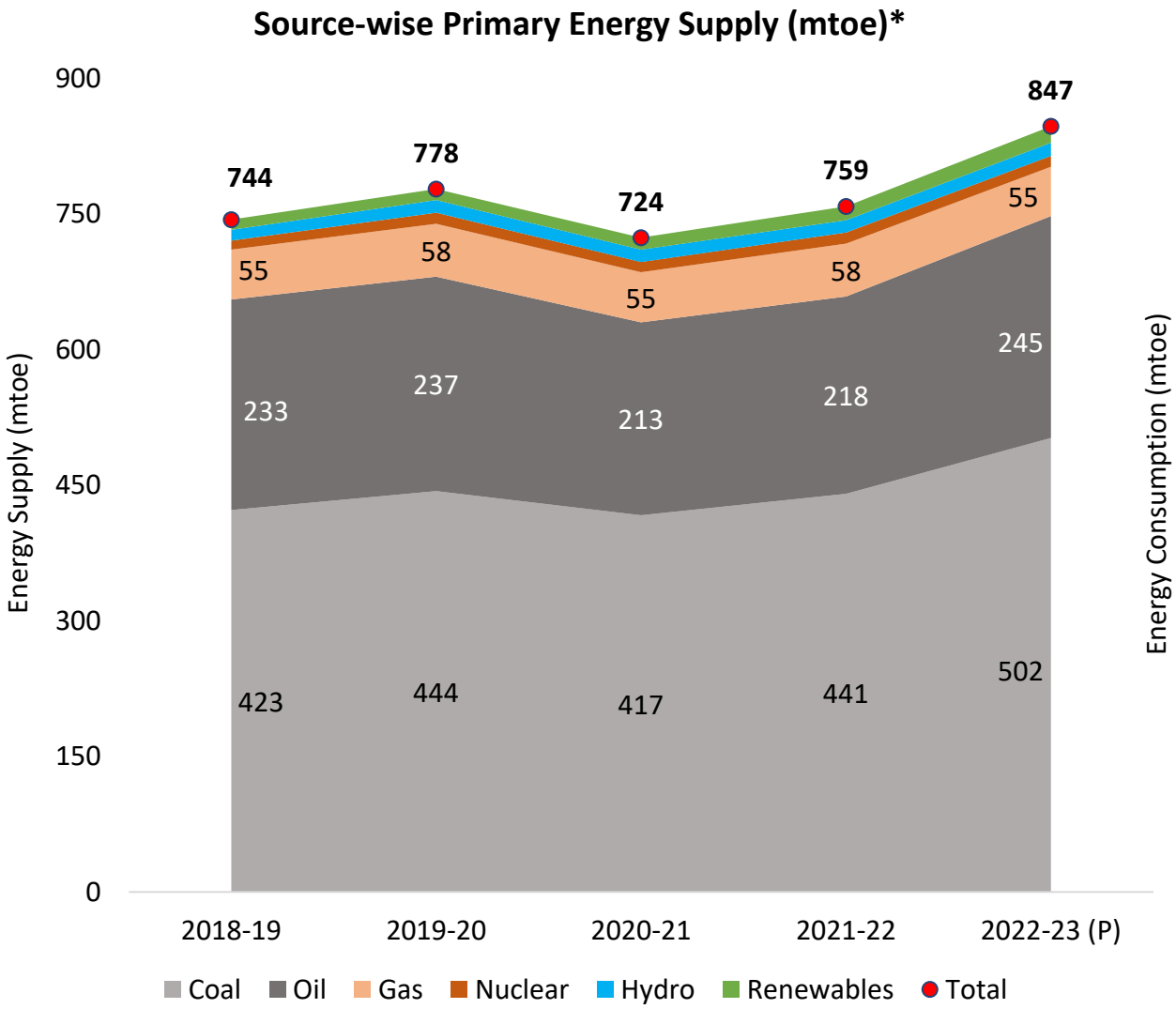
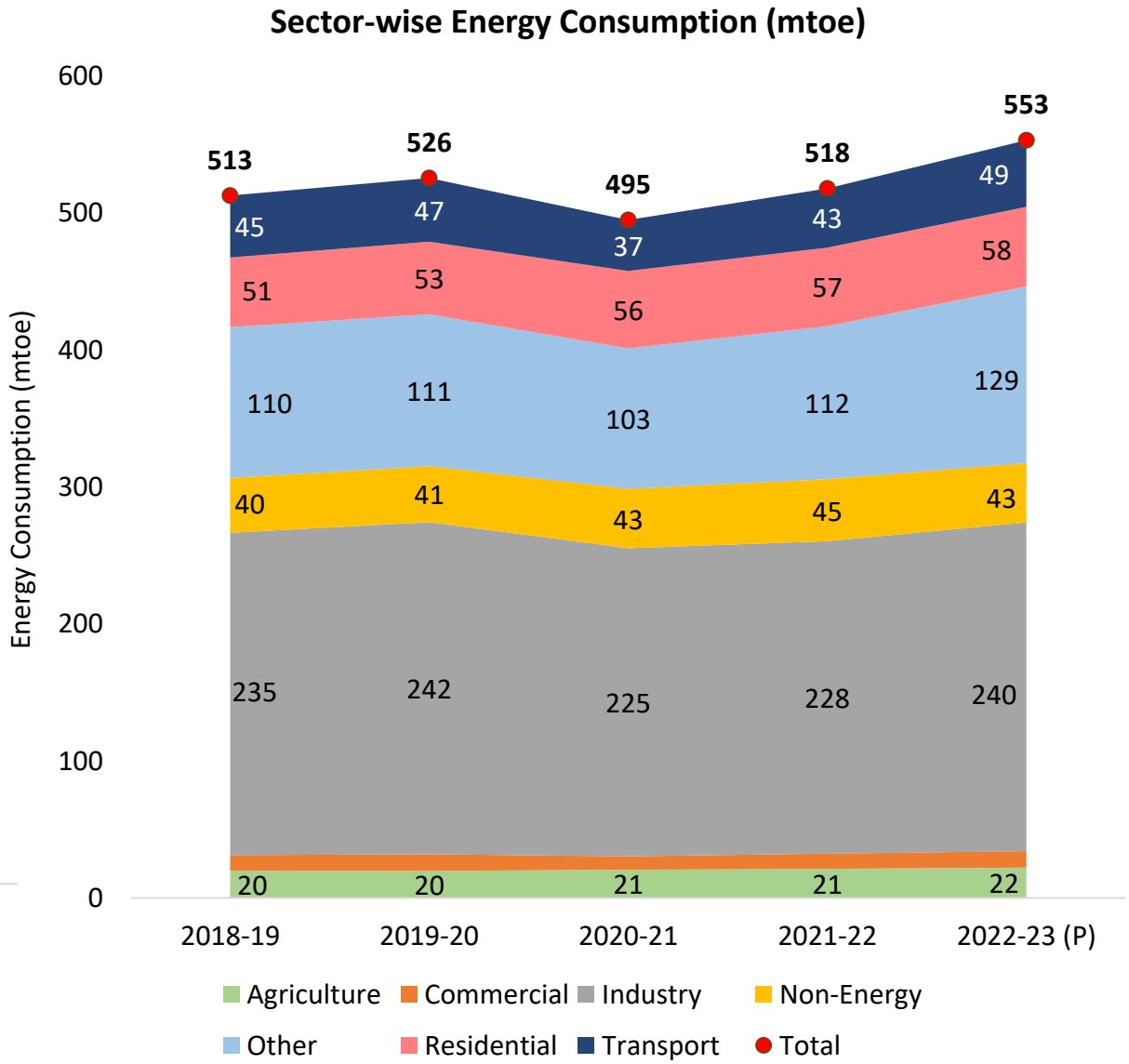
Contents

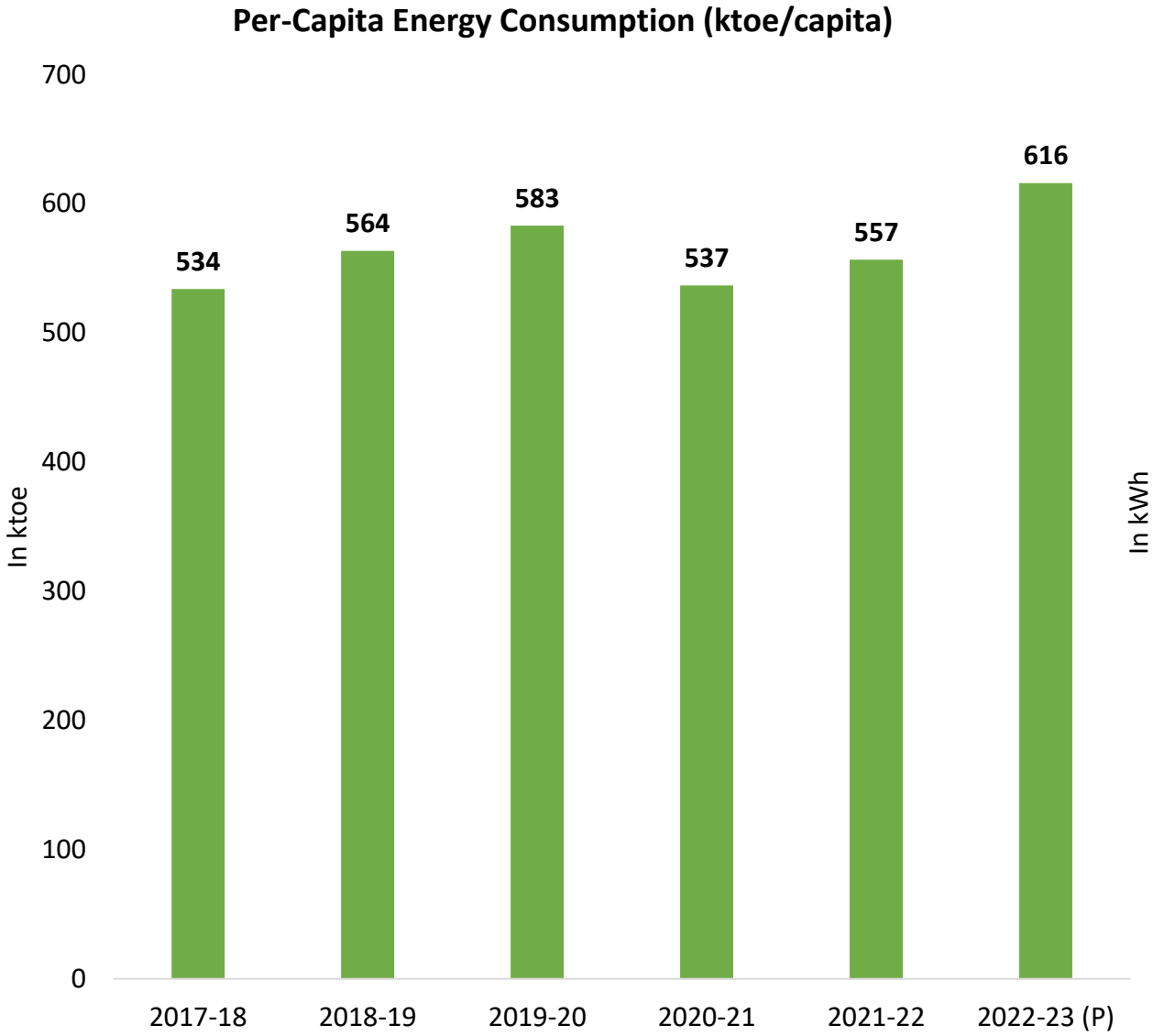
Primary Energy Mix* in India

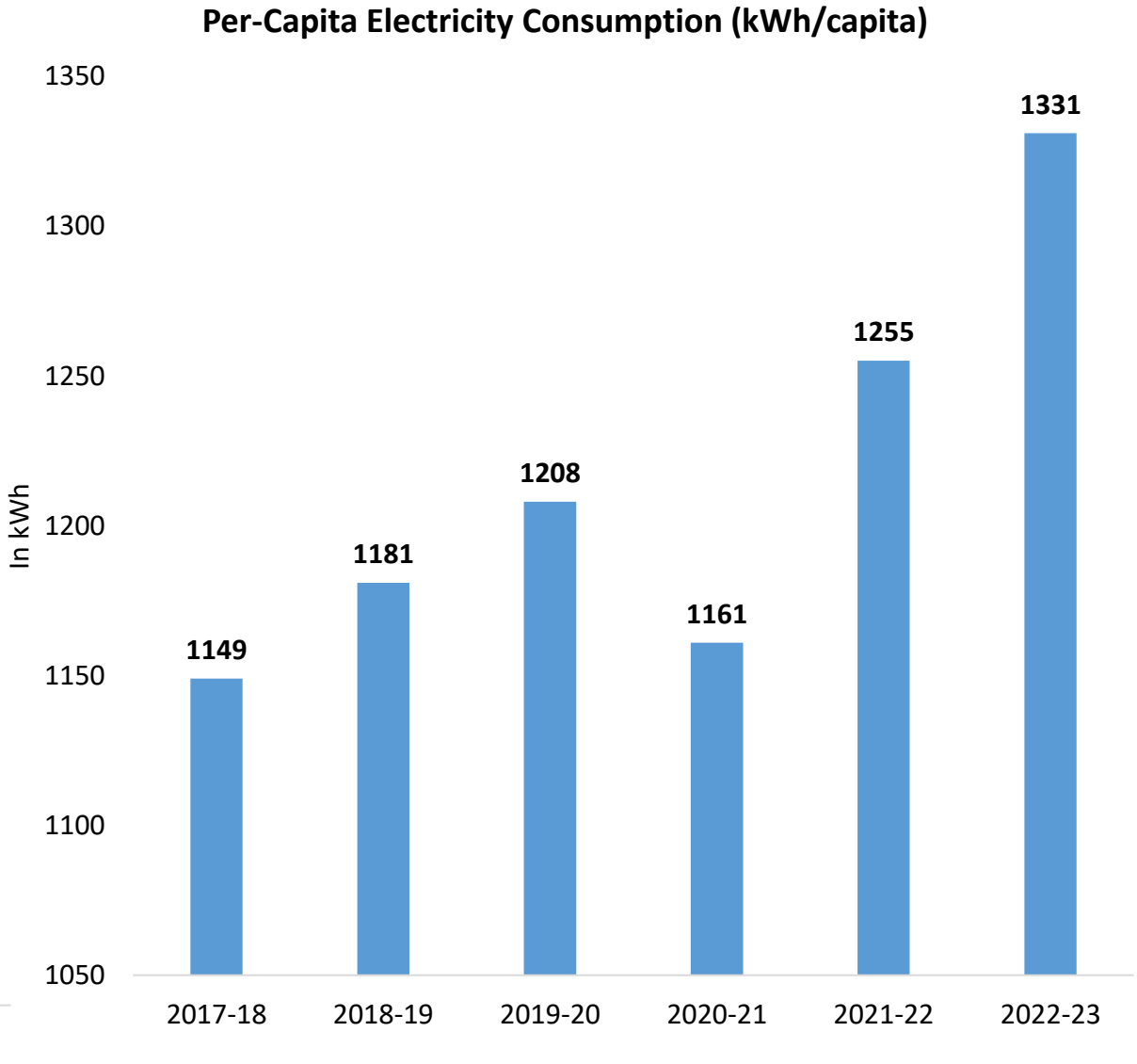




*Excluding biofuels, waste, and other non-commercial source of energy

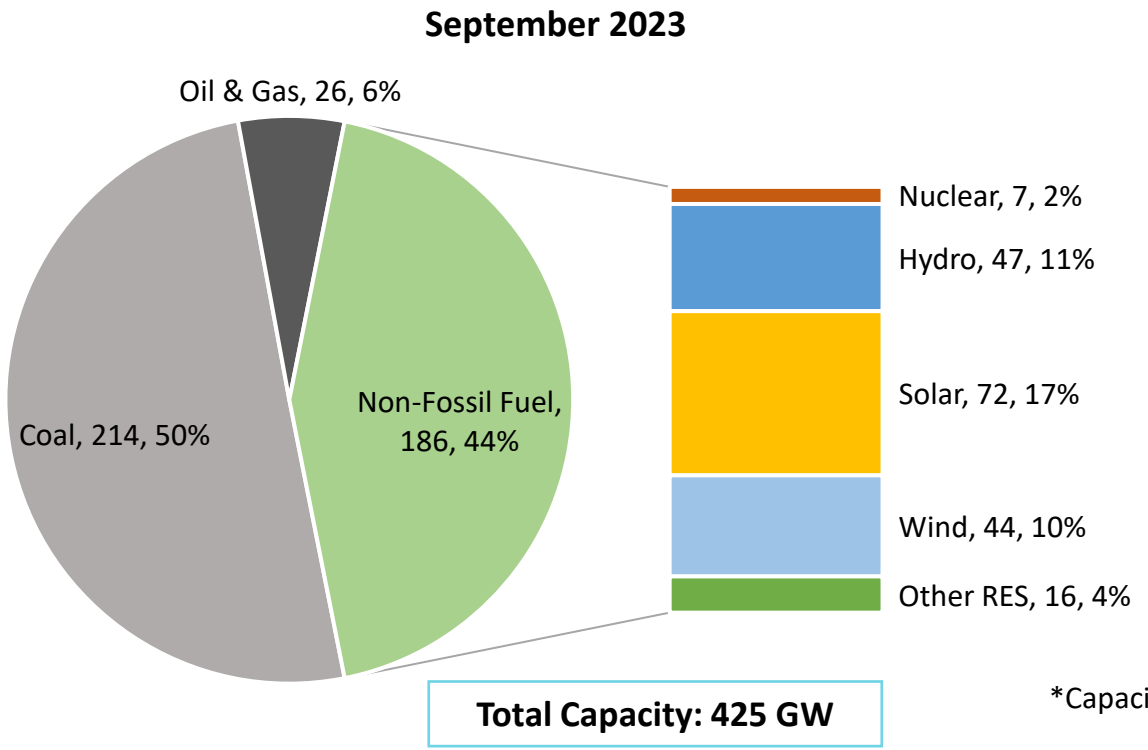
Per-Capita Energy and Electricity Consumption

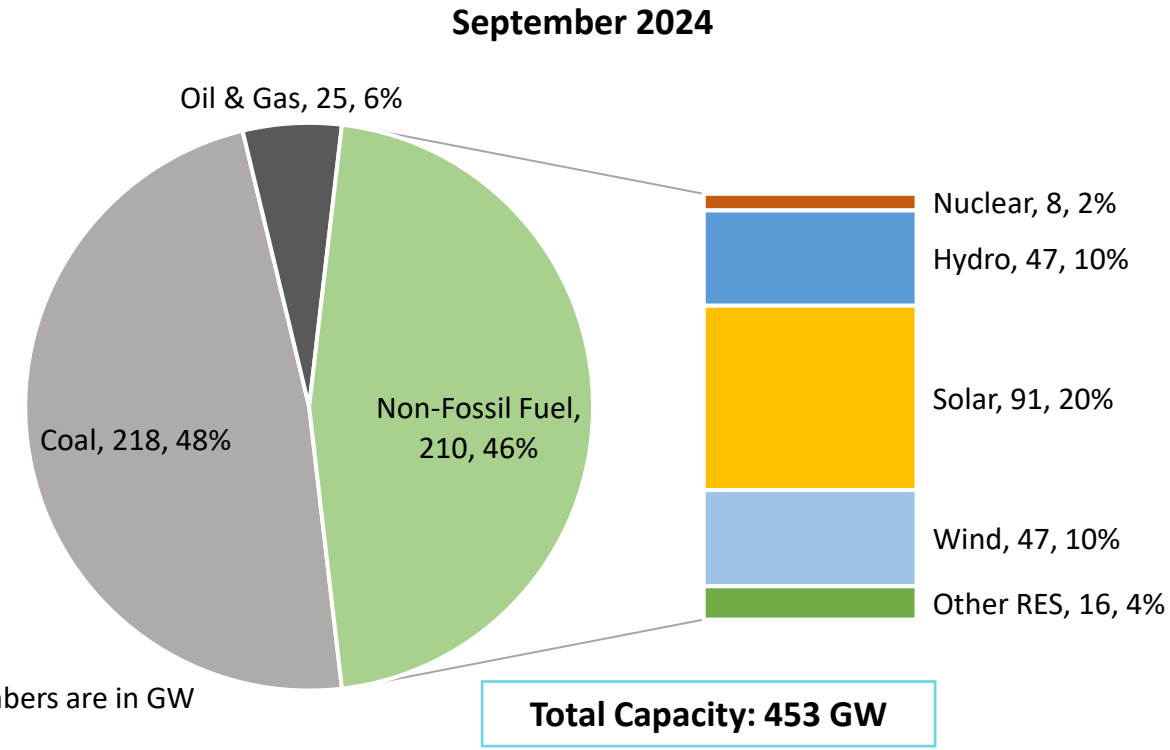




Note: Per Capita energy consumption is calculated on energy supply basis.

India’s Electricity Capacity Mix (Utility-scale)



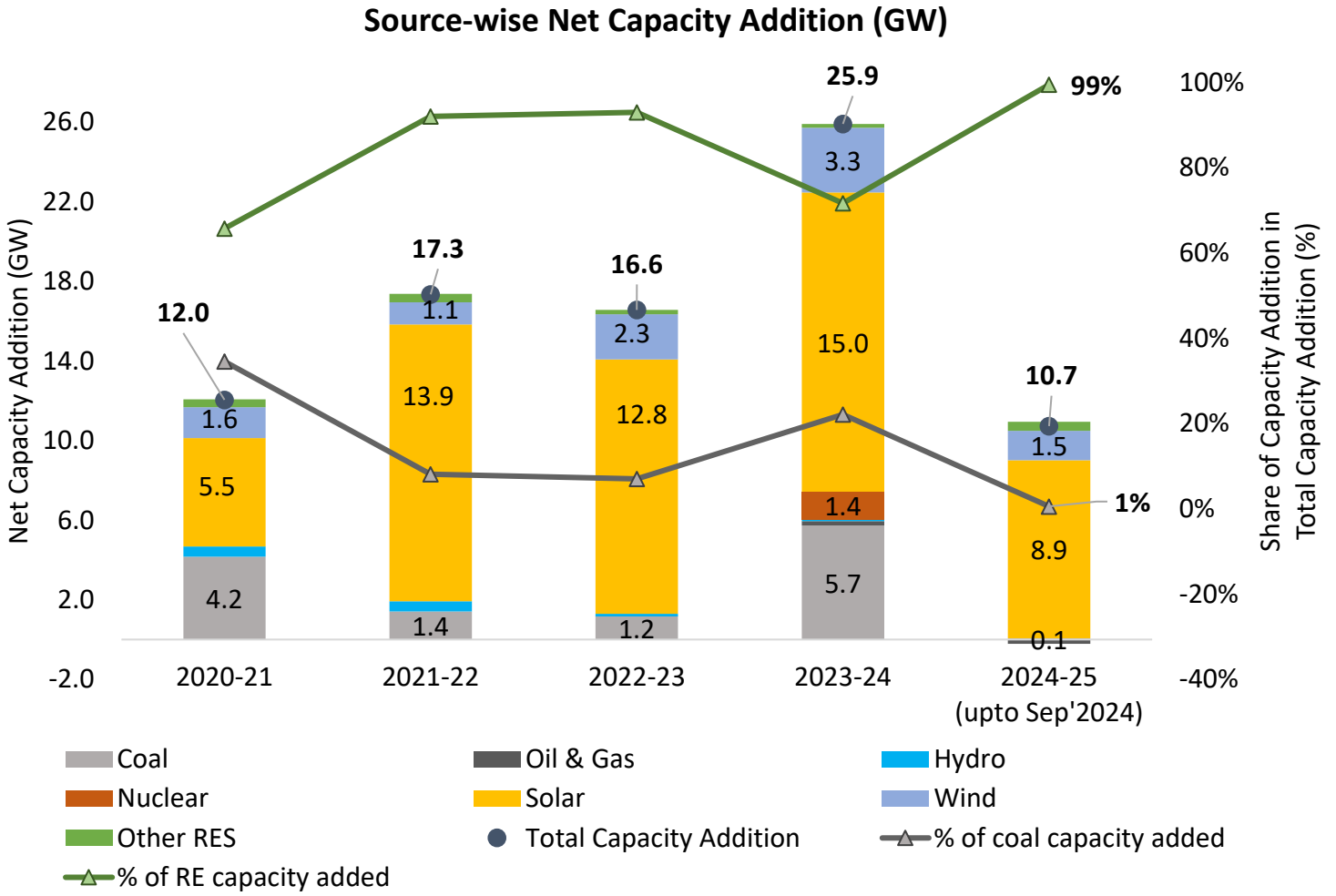


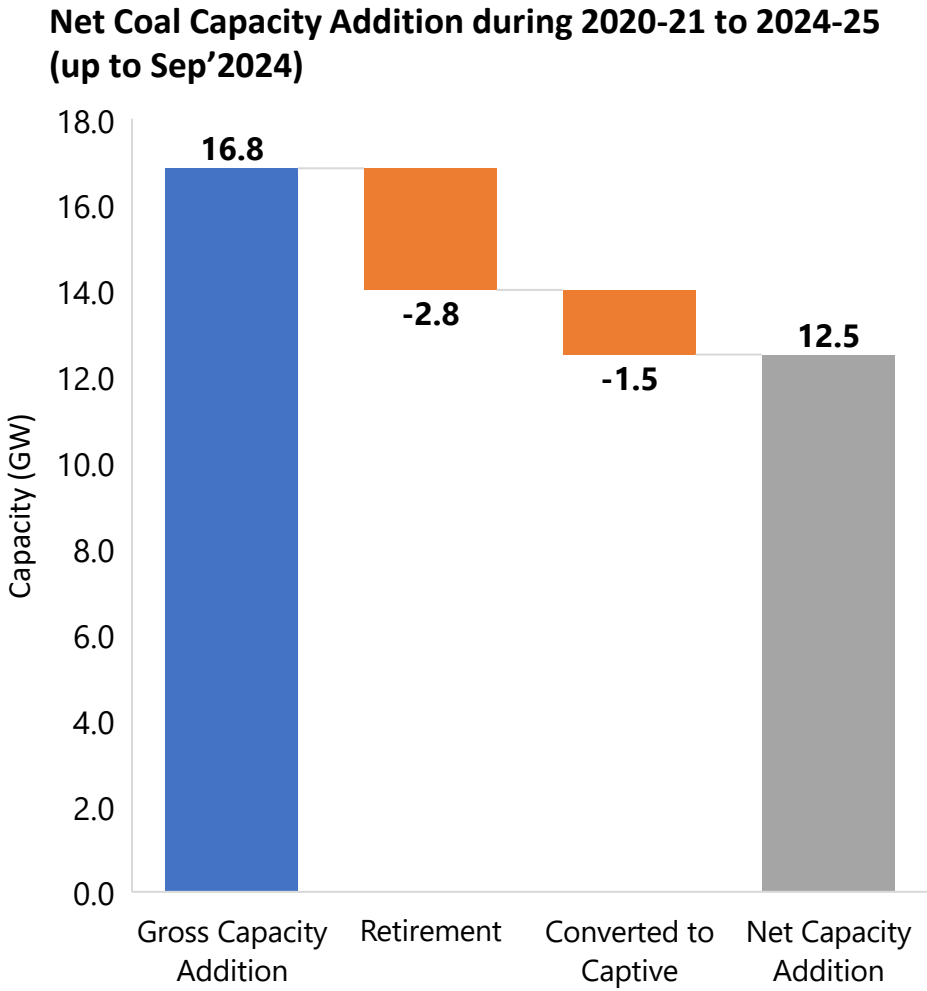
*Capacity Numbers are in GW

- India’s electricity generating capacity is 453 GW as on Sep’2024 [coal 218 GW (48%), solar 91 GW (20%), hydro 47 GW (10%), and wind 47 (10%)].
- As on Sep’2024, the share of non-fossil-based electricity capacity is 46% against the set target of 50% non-fossil capacity by 2030.
- As on Sep’2024, India’s renewable energy capacity (including large hydro) stood at 201 GW out of 453 GW.

Source: CEA

India’s Electricity Capacity Addition in last 5 years





- A total of 68.7 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 12.5 GW, mostly in the central sector.

Source: CEA & MNRE

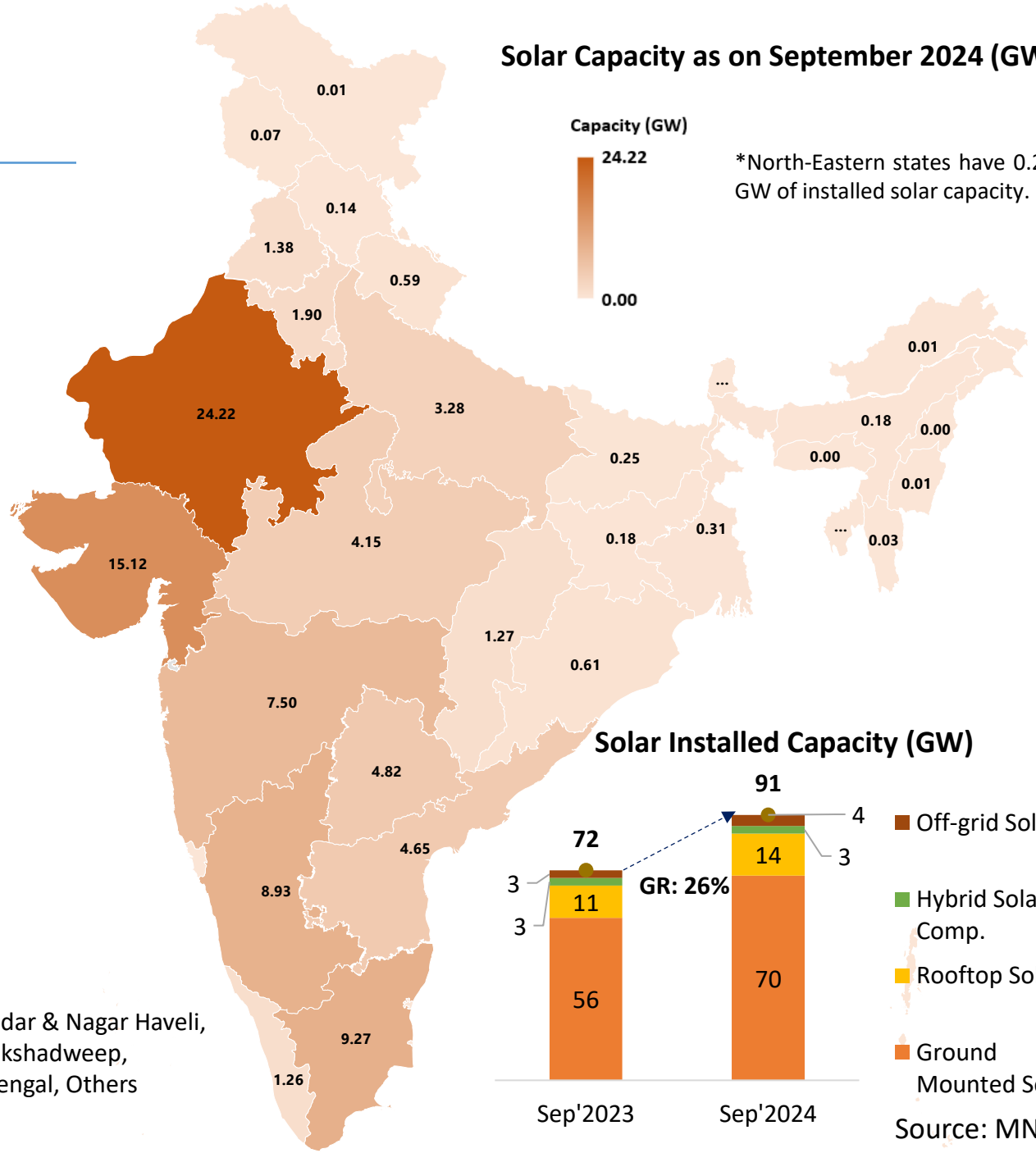
State-wise Solar Capacity

as on September 2024

State-wise installed capacity of Solar Power (GW)					
States	**Ground Mounted**	**Rooftop**	**Solar Component in Hybrid**	**Off Grid**	**Total Solar Power**
Rajasthan	**20.16**	1.28	**1.98**	0.81	**24.22**
Gujarat	10.04	**4.34**	0.65	0.09	15.12
Tamil Nadu	8.41	0.79	0.00	0.07	9.27
Karnataka	8.26	0.63	0.00	0.04	8.93
Maharashtra	4.39	2.57	0.00	0.54	7.50
Telangana	4.36	0.45	0.00	0.01	4.82
Andhra Pradesh	4.33	0.22	0.00	0.09	4.65
Madhya Pradesh	3.63	0.42	0.00	0.10	4.15
Uttar Pradesh	2.70	0.27	0.00	0.32	3.28
Haryana	0.27	0.72	0.00	**0.91**	1.90
Punjab	0.89	0.41	0.00	0.08	1.38
Chhattisgarh	0.78	0.10	0.00	0.39	1.27
Kerala	0.32	0.91	0.00	0.02	1.26
Odisha	0.51	0.06	0.00	0.04	0.61
Others	1.00	1.13	0.00	0.28	2.40
All India	**70.05**	**14.30**	**2.63**	**3.78**	**90.76**

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 September 2024 (GW)



Solar Installed Capacity (GW)

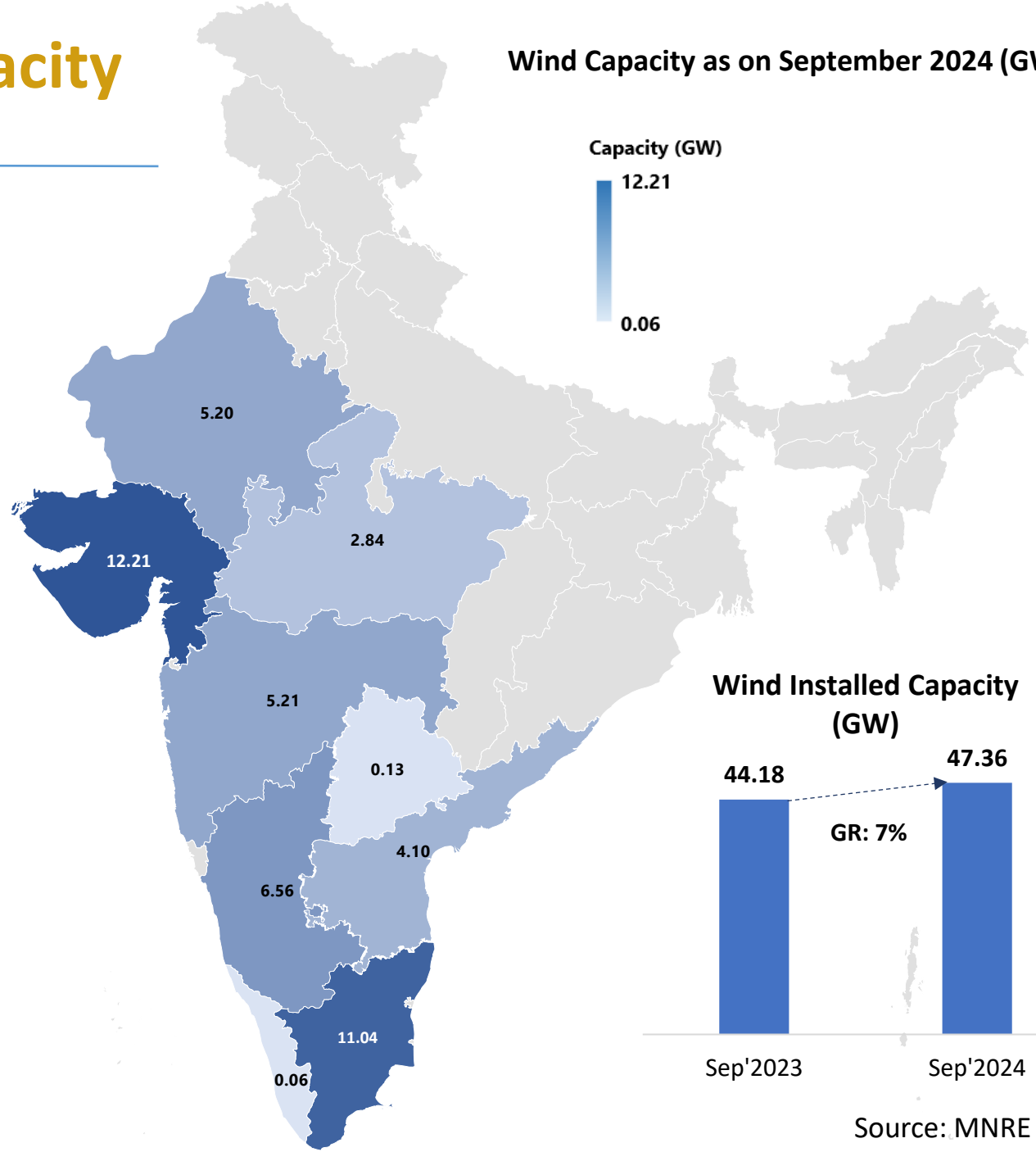
Source: MNRE

State-wise Wind Onshore Capacity

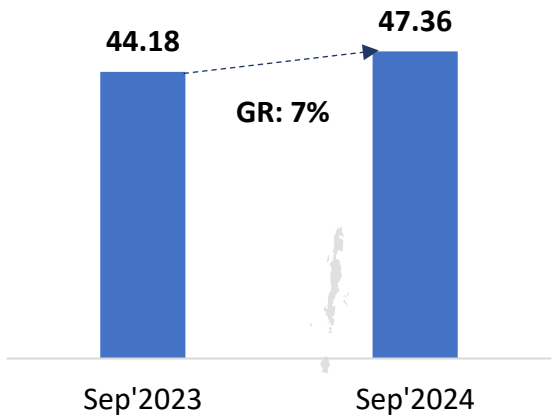
as on September 2024

State-wise installed capacity of Wind (Onshore) Power	
States	**Installed Capacity (GW)**
Gujarat	12.21
Tamil Nadu	11.04
Karnataka	6.56
Maharashtra	5.21
Rajasthan	5.20
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
India Total	**47.36**

Wind Capacity as on September 2024 (GW)



Wind Installed Capacity (GW)



Source: MNRE

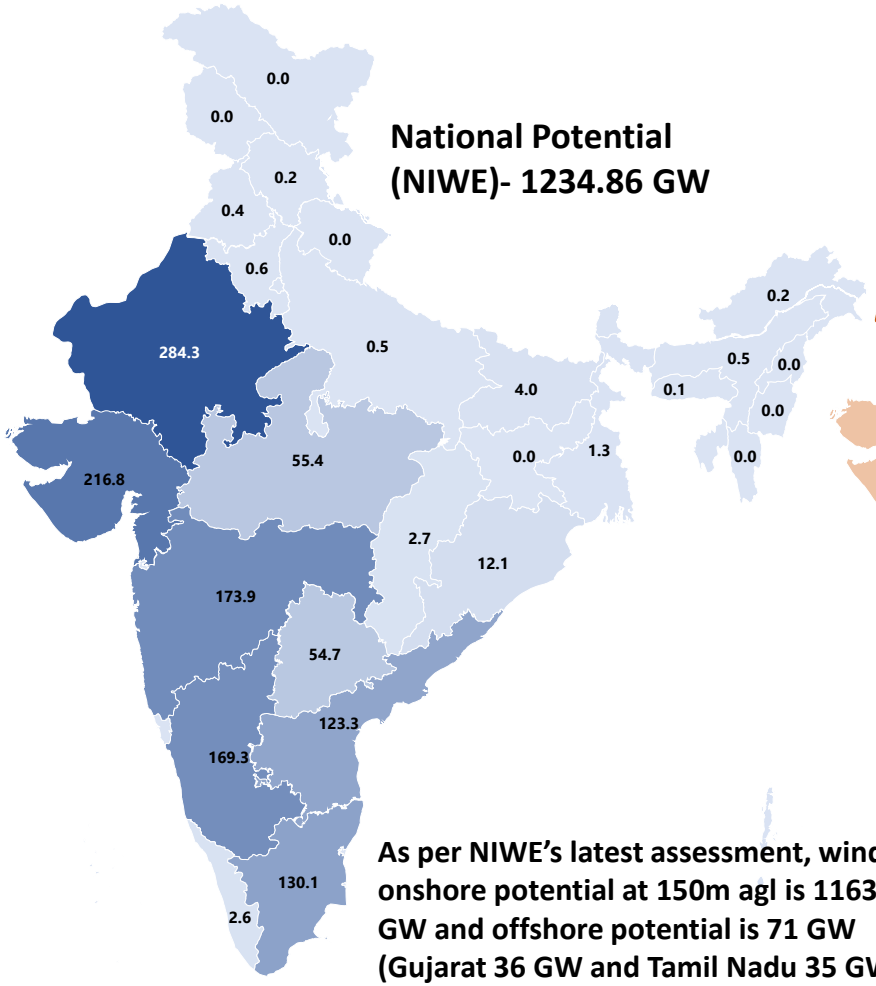
RE Potential and Installed Capacity (1/2)

RE potential in the state

Wind Onshore (at 150m agl) and Offshore Potential

State Potential (GW)

0.0 284.3



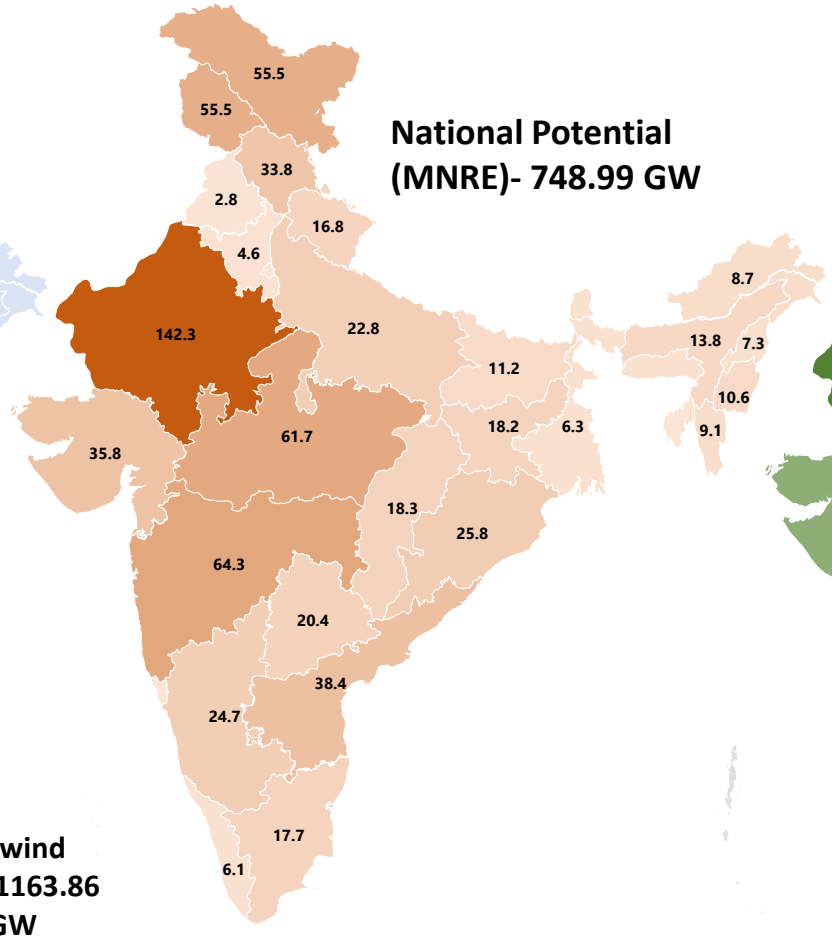
National Potential (NIWE)- 1234.86 GW

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



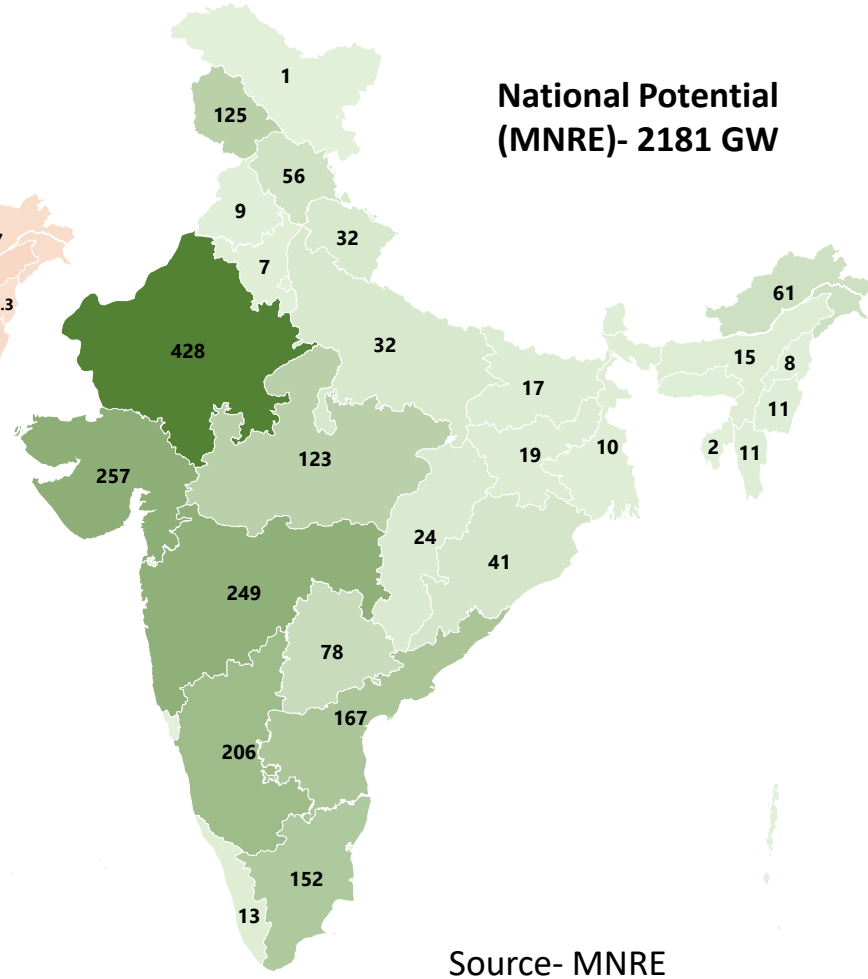
National Potential (MNRE)- 748.99 GW

Market potential for SPV rooftop is 124 GW.

Renewable Energy Potential (all sources incl. large Hydro)

Potential (GW)

0 428



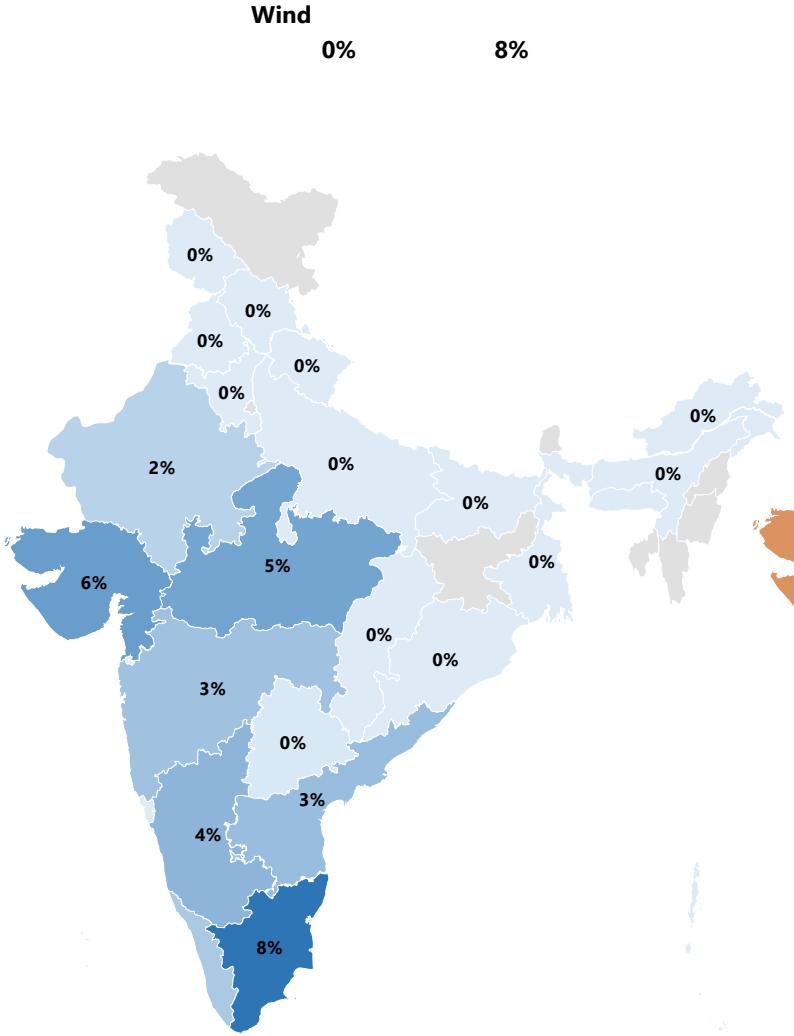
National Potential (MNRE)- 2181 GW

Source- MNRE

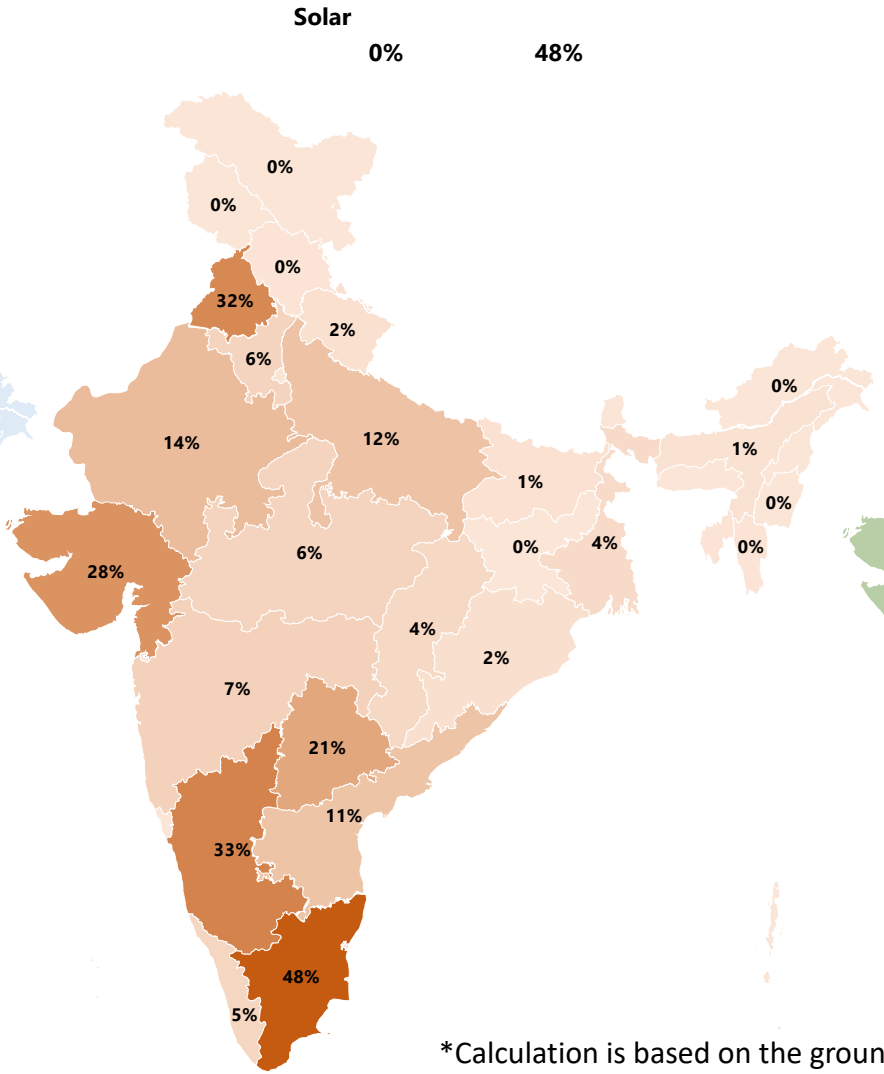
Renewable Energy (RE) Potential and Installed Capacity (2/2)

RE Installed capacity as a Percentage of the total resource potential in the state as on September 2024

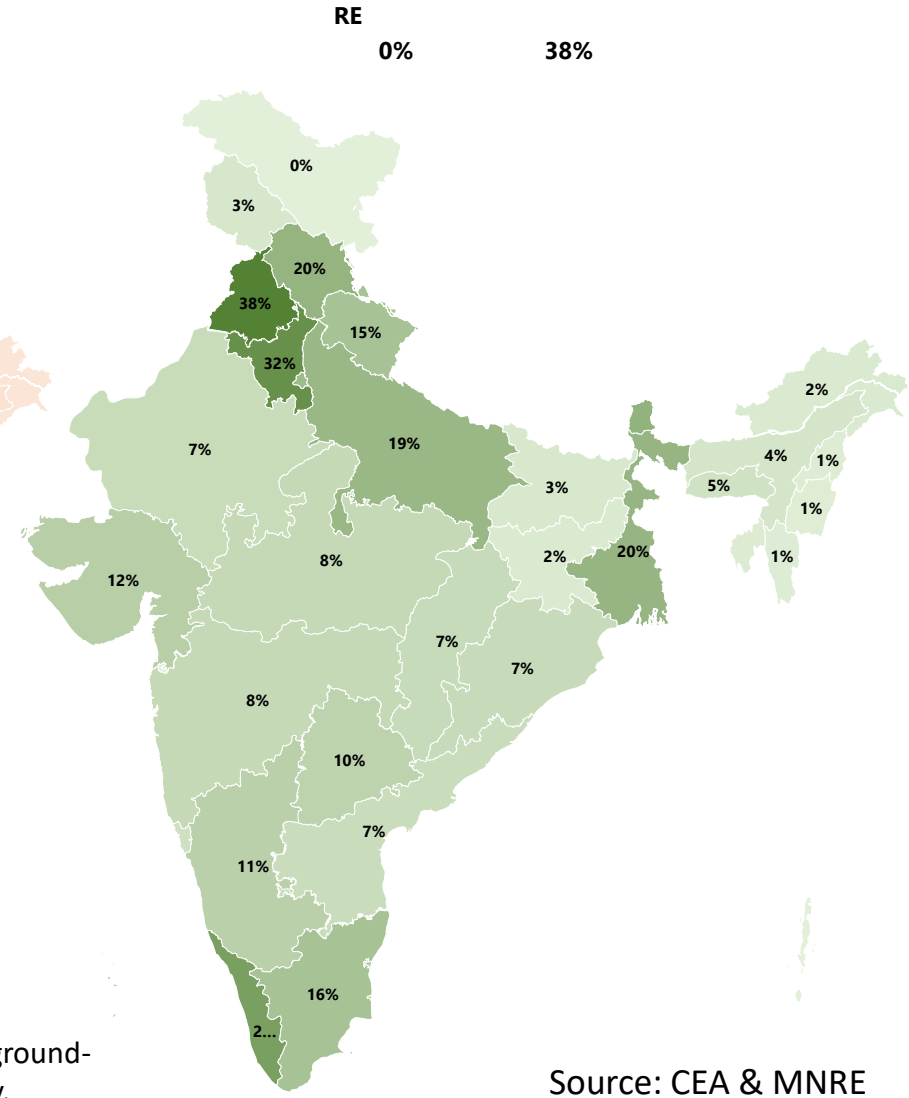
Wind Capacity



Solar Capacity*



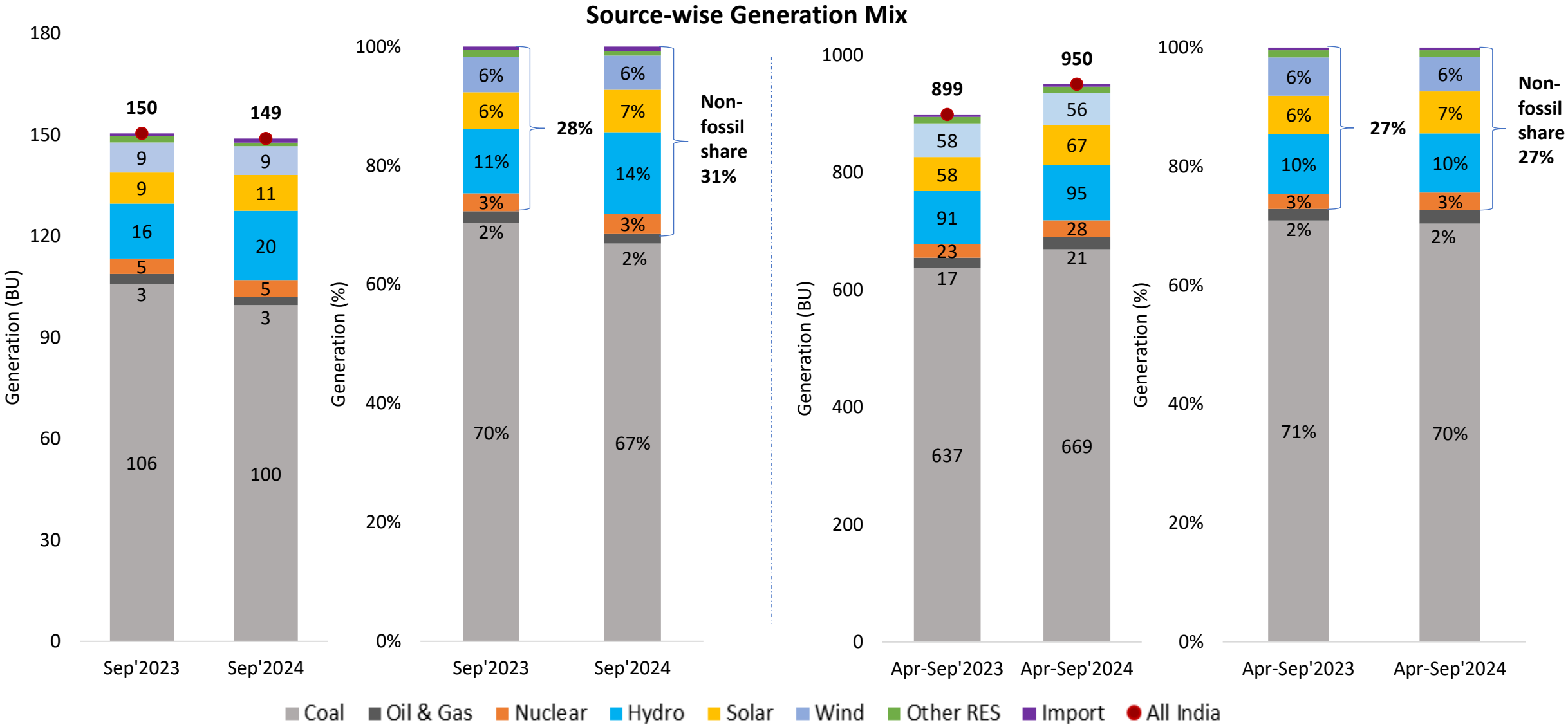
RE Capacity (all sources including large hydro)



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

Source: CEA & MNRE

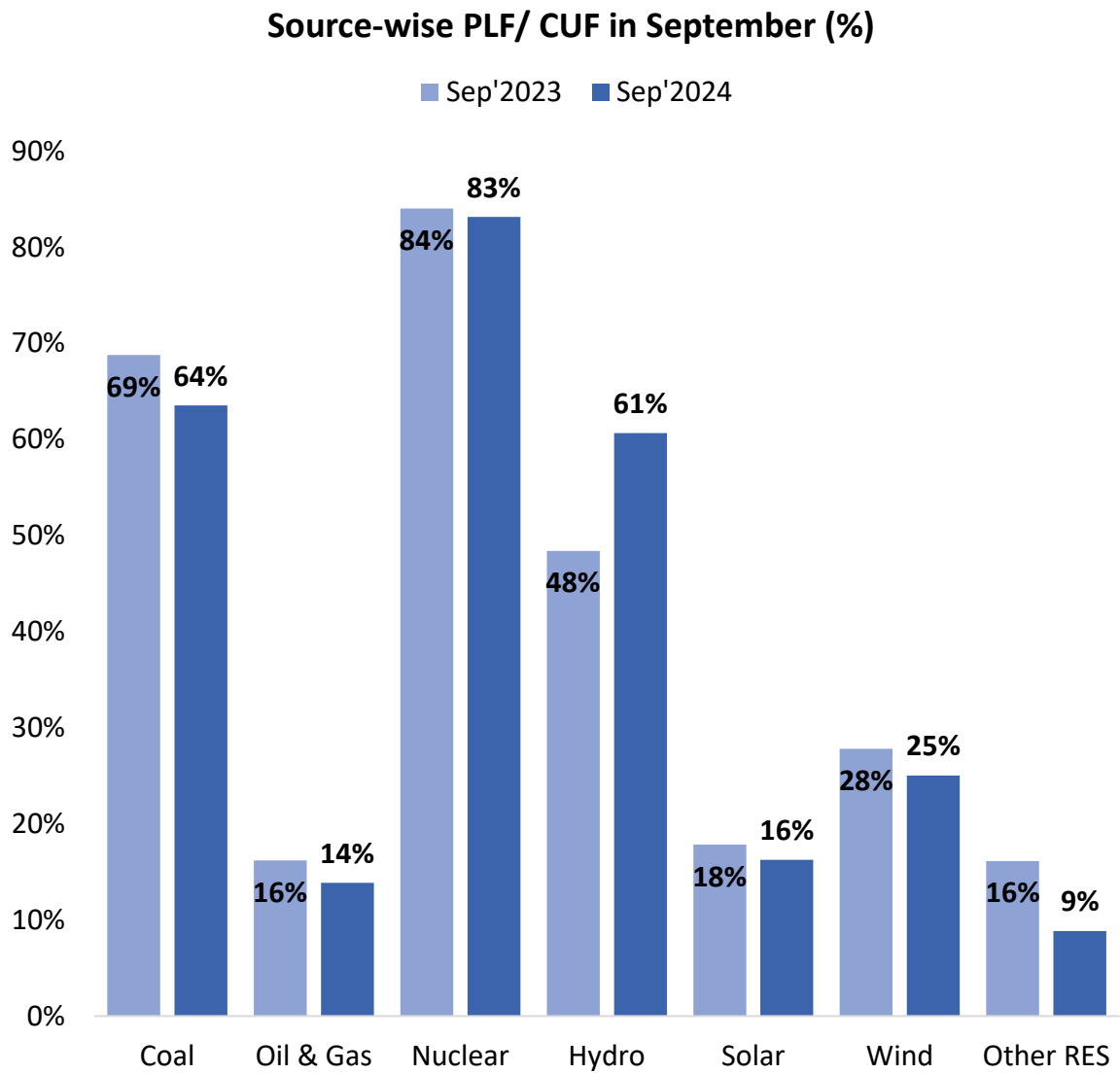
India’s Electricity Generation Mix

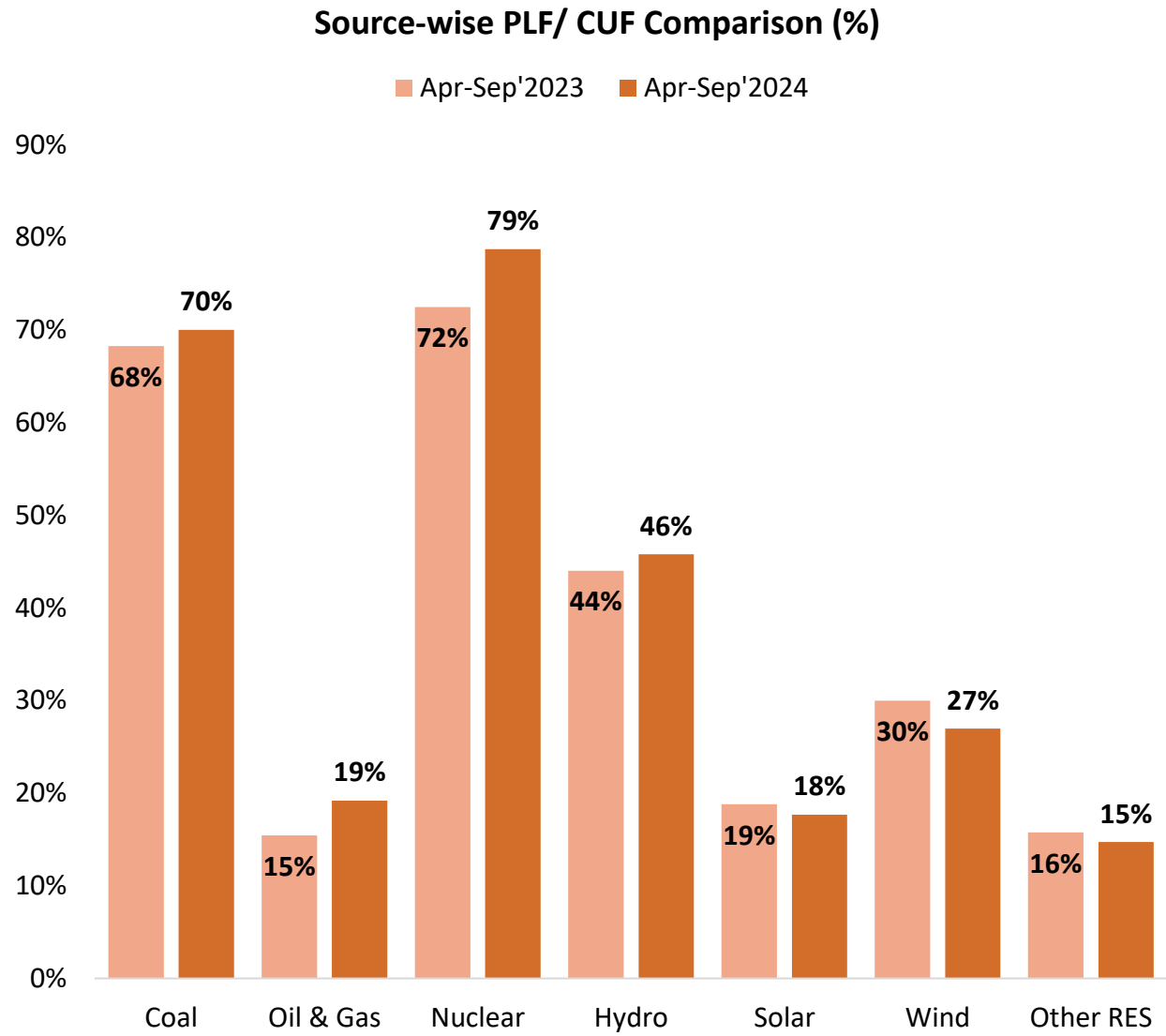


NOTE: The generation data for September’2024 is provisional.

Source: CEA

Source-wise PLF/CUF

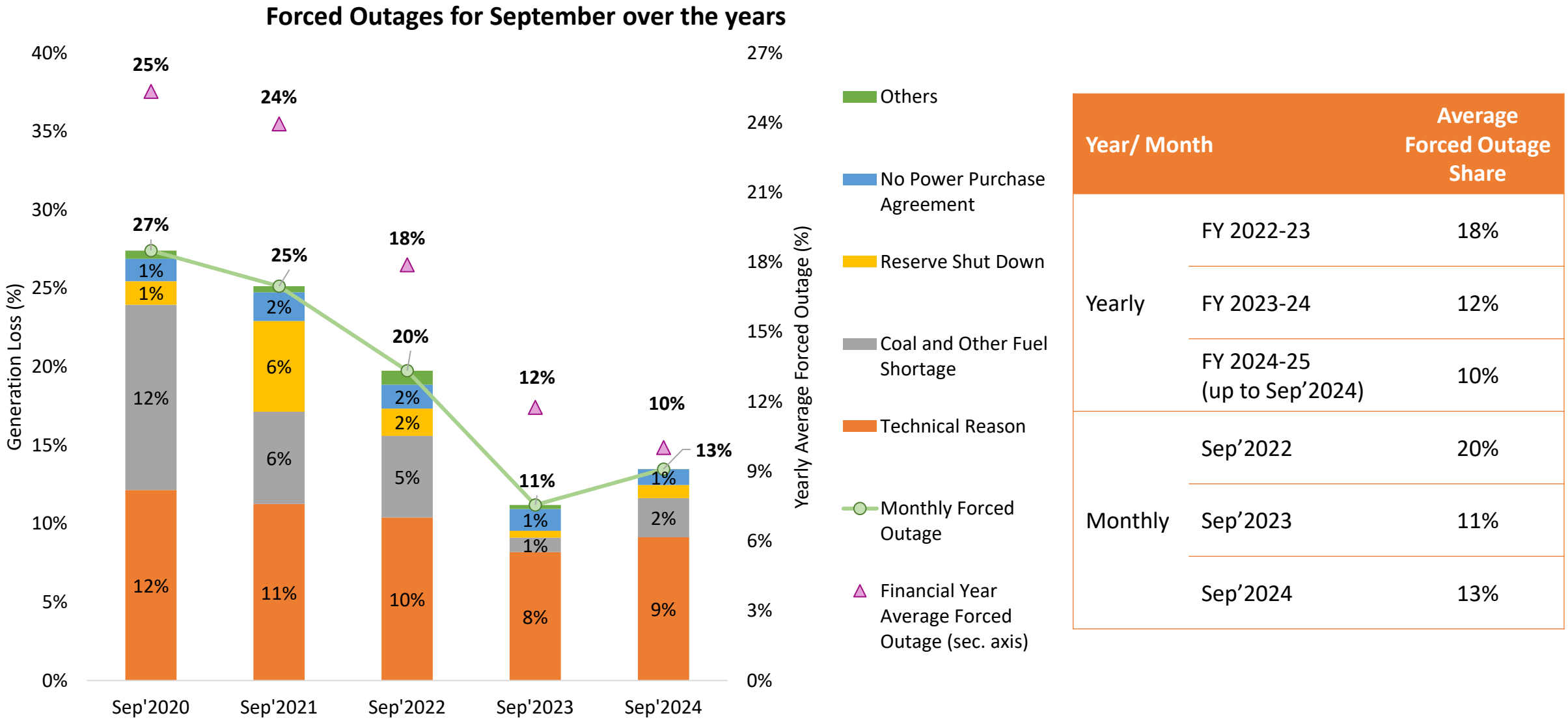




NOTE: The PLF/CUF data is based on provisional generation for September'2024.

Source: CEA & MNRE

Thermal Generation Loss and Reasons for Forced Outages

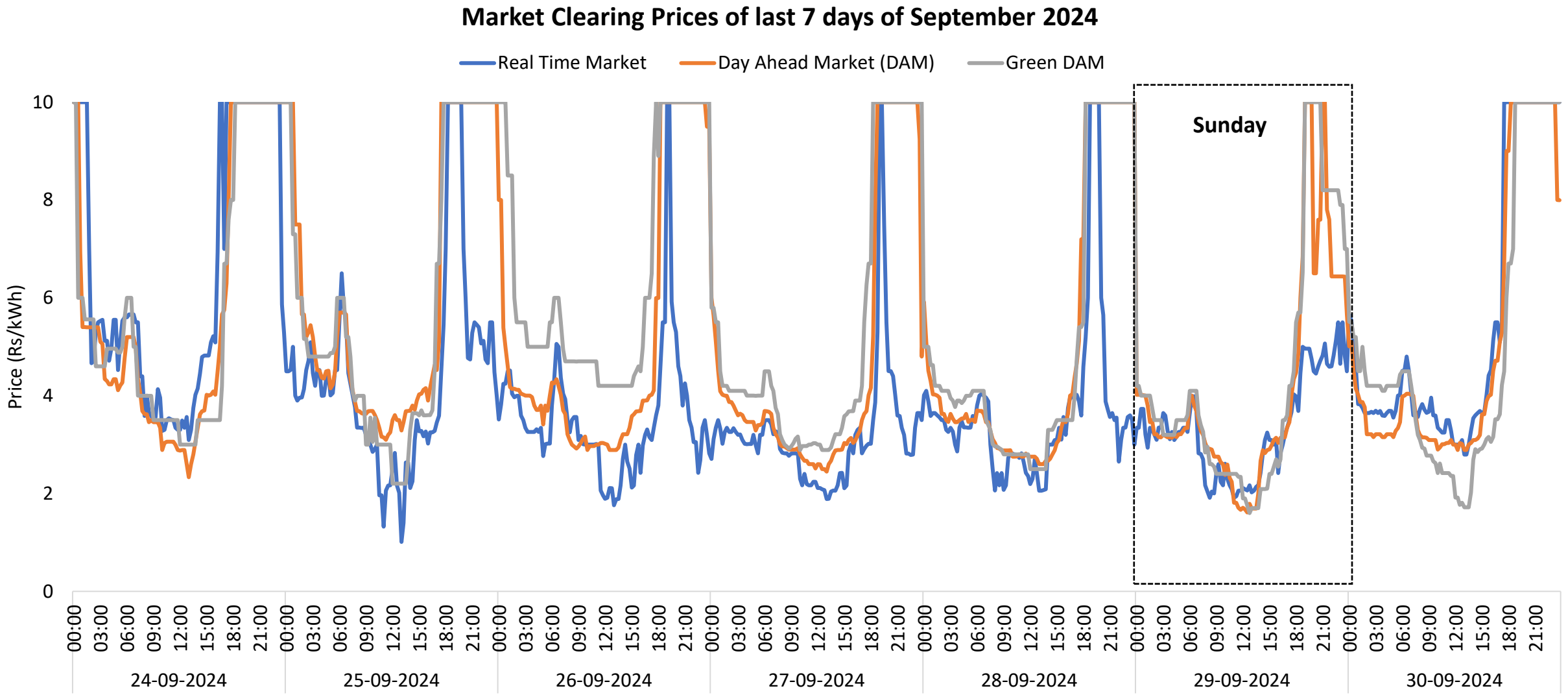


Year/ Month		Average Forced Outage Share
Yearly	FY 2022-23	18%
	FY 2023-24	12%
	FY 2024-25 (up to Sep'2024)	10%
Monthly	Sep'2022	20%
	Sep'2023	11%
	Sep'2024	13%

Thermal includes only Coal and Lignite Plants.

Source: ICED

Indian Electricity Exchange (IEX) Market Snapshot

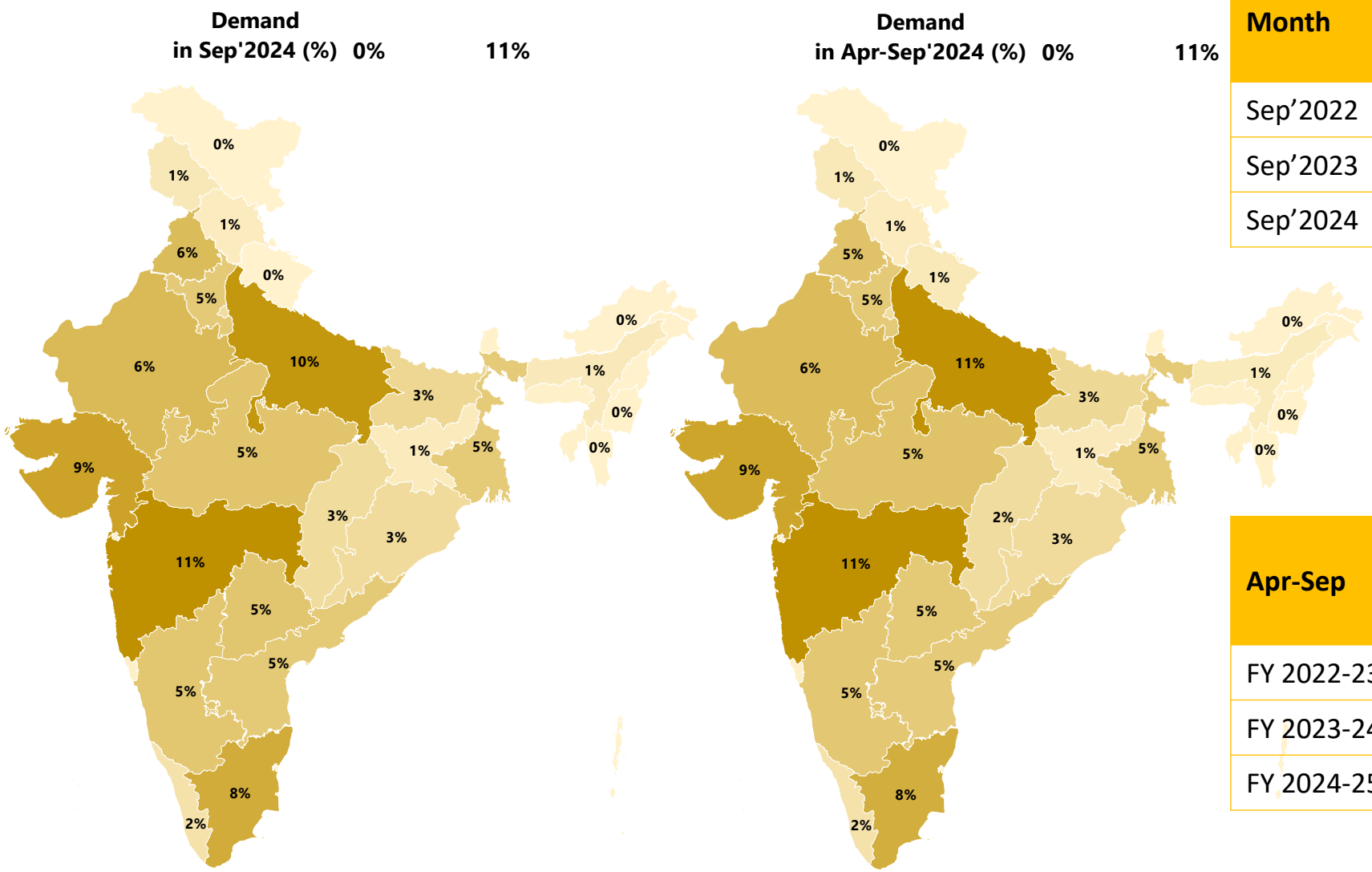


In April 2023, CERC revised the price ceiling from ₹12/kWh to ₹10/kWh in the power exchange market.

Source: IEX

National and State level Electricity Demand

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



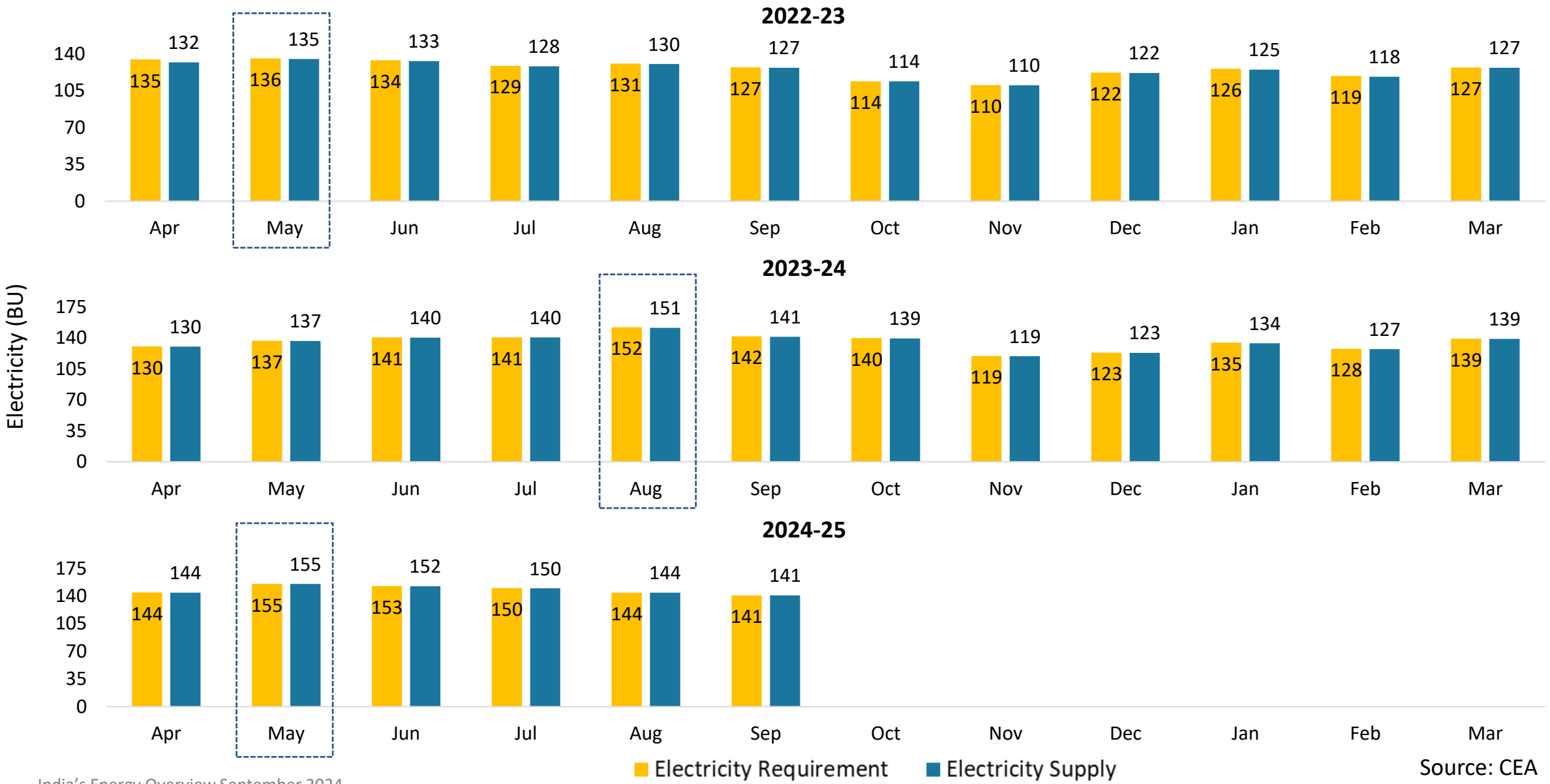
Month	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
Sep'2022	127	127	0.3
Sep'2023	142	141	0.5
Sep'2024	141	141	0.1

Apr-Sep	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
FY 2022-23	791	786	5
FY 2023-24	842	840	2
FY 2024-25	888	886	1

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

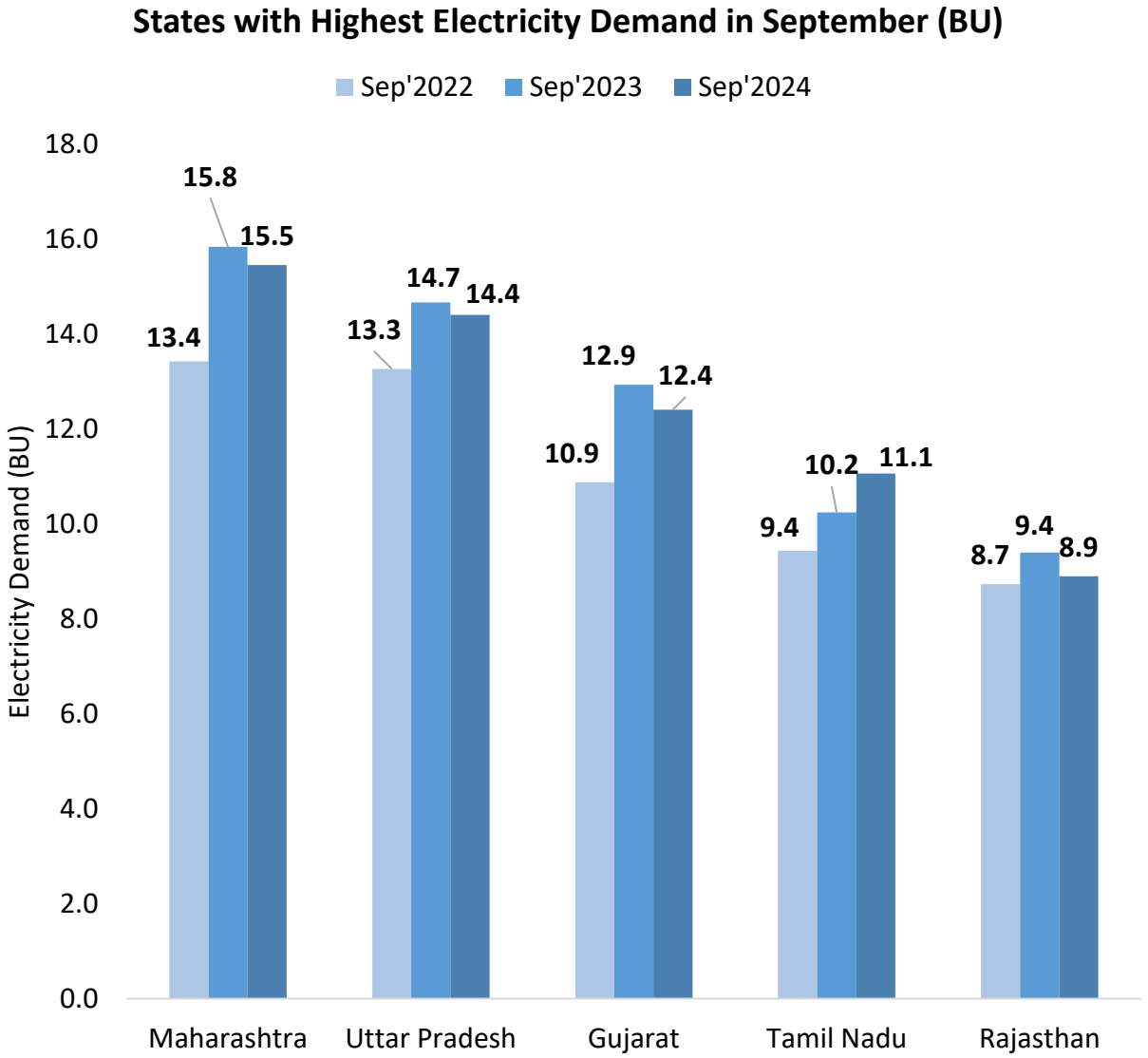
Source: CEA

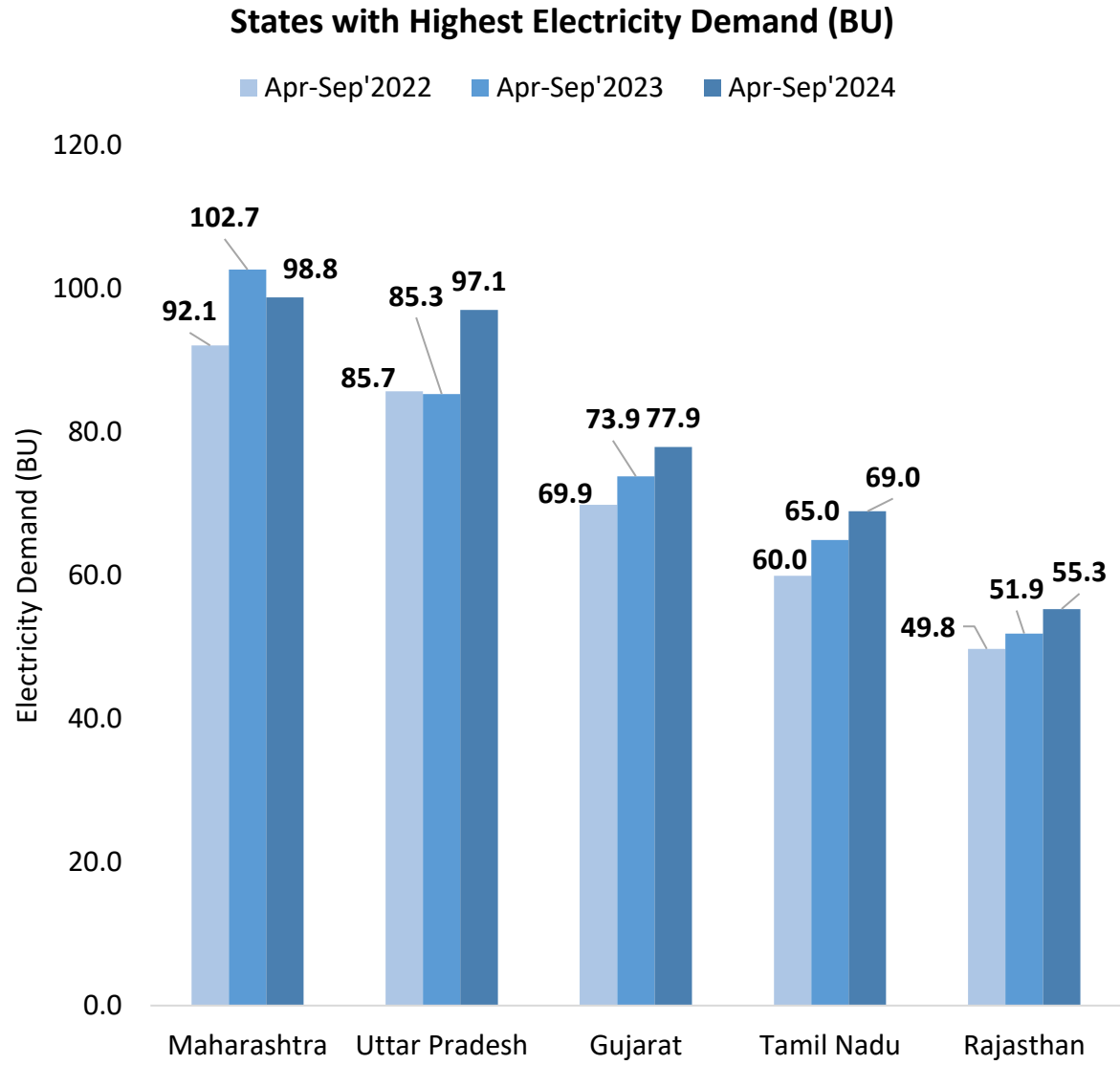
India’s Monthly Electricity Requirement and Supply



Source: CEA

Monthly Electricity Demand of the top 5 states

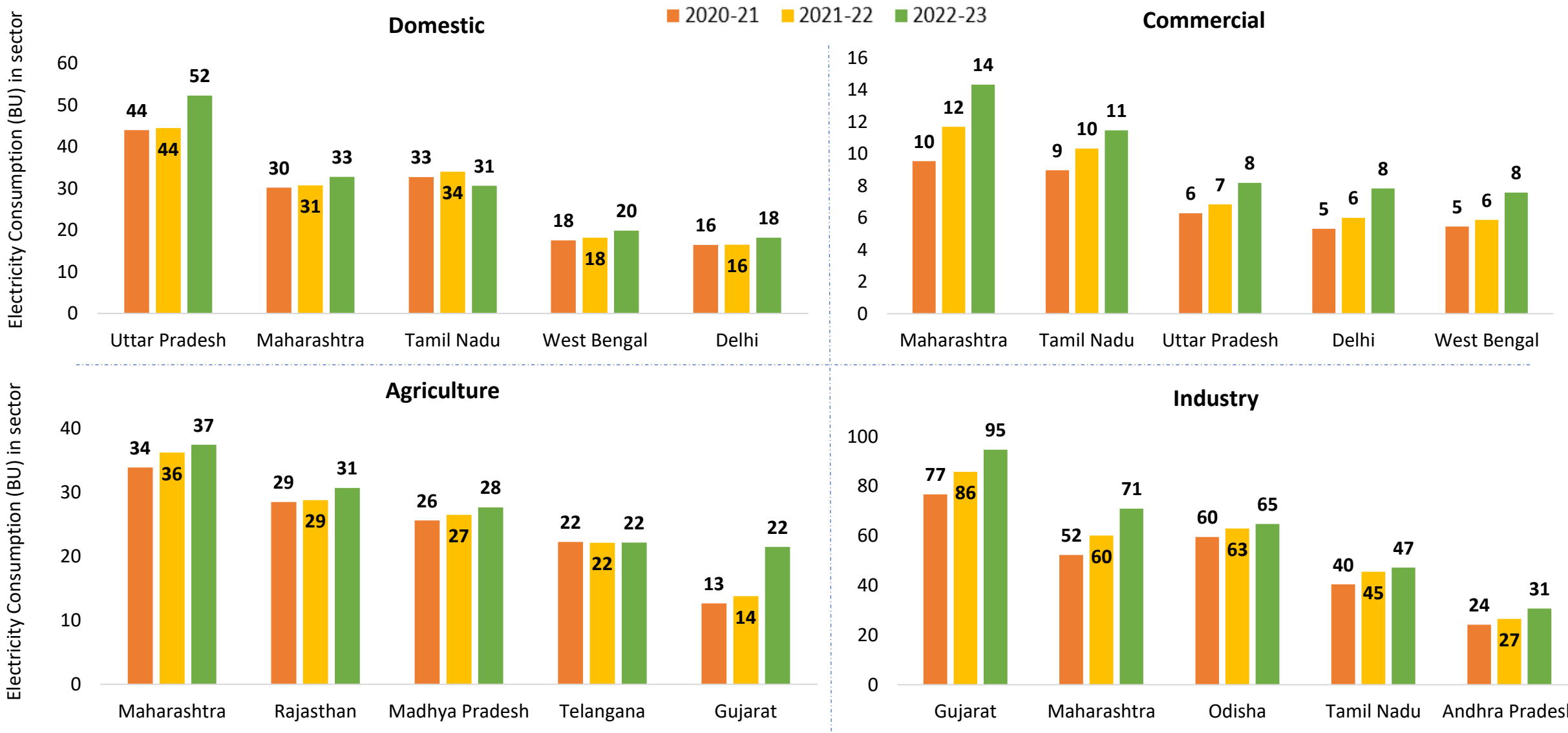




Note: The electricity demand data for September'24 is Provisional.

Source: CEA

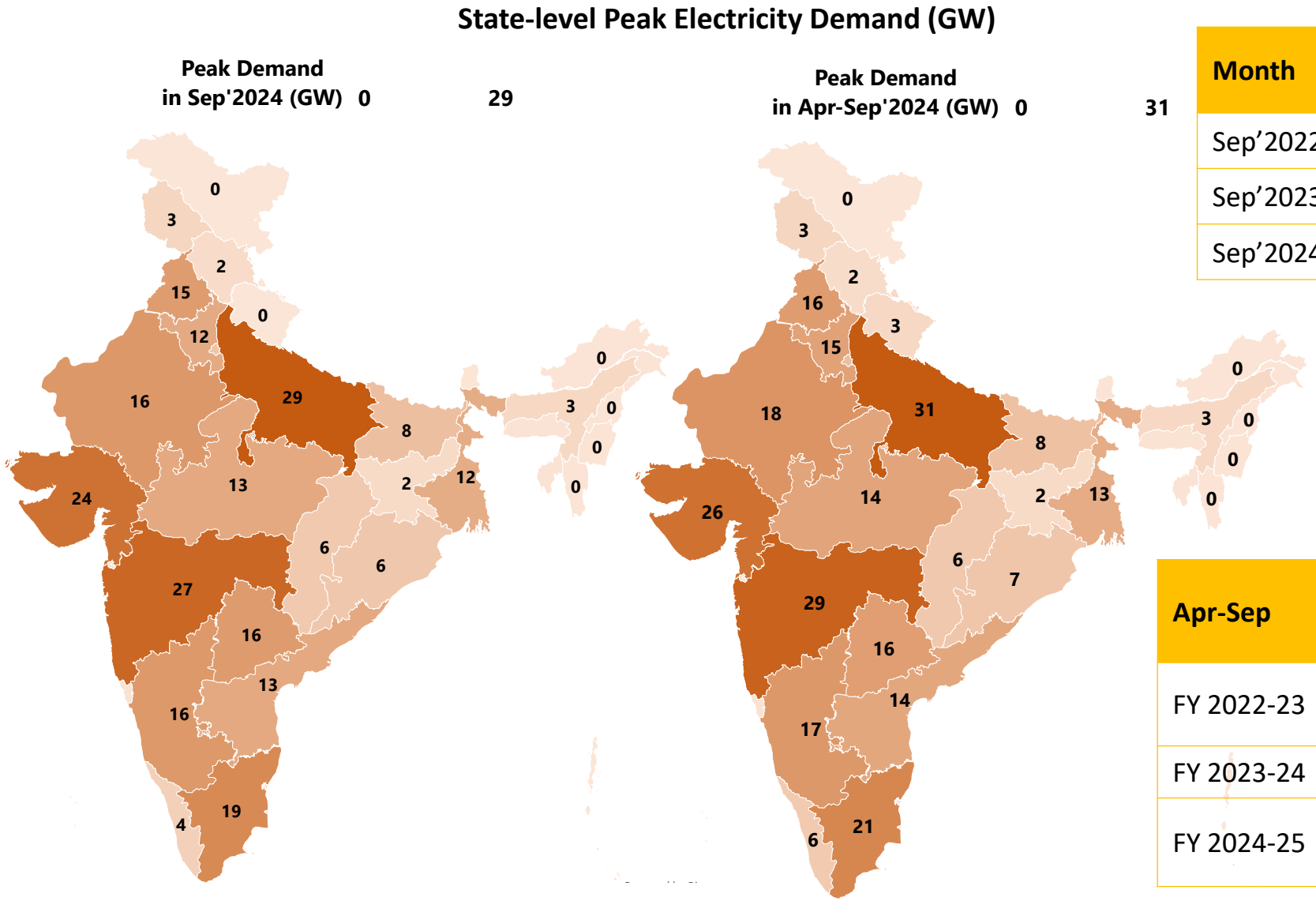
Electricity Consumer-category wise top 5 States



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

Source: CEA

National and State level Peak Electricity Demand



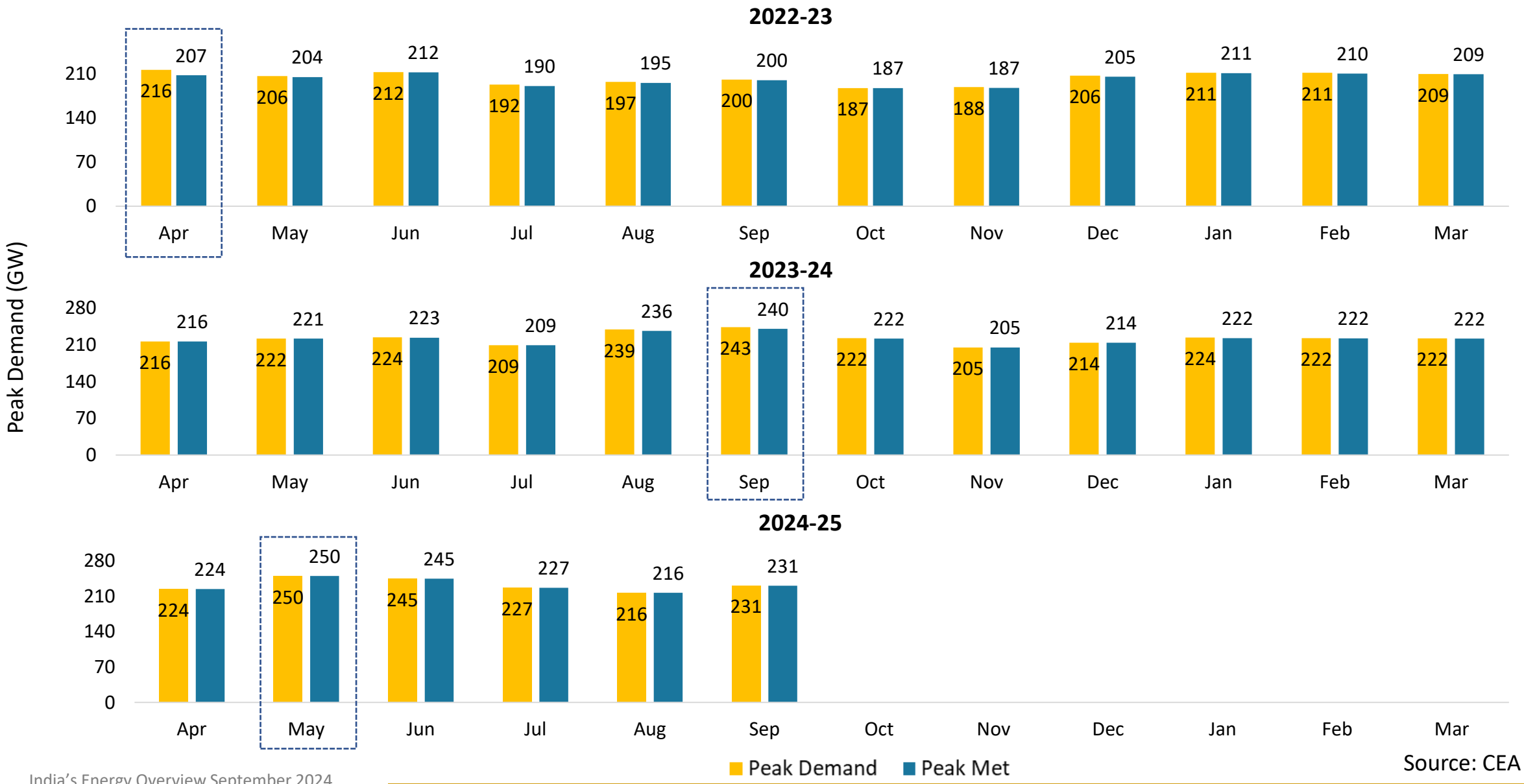
Month	Peak Demand (GW)	Peak Supply (GW)	Gap(GW) (+/-)
Sep'2022	200	200	0.9
Sep'2023	243	240	3.3
Sep'2024	231	231	0.5

Apr-Sep	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 September'24 is Provisional.

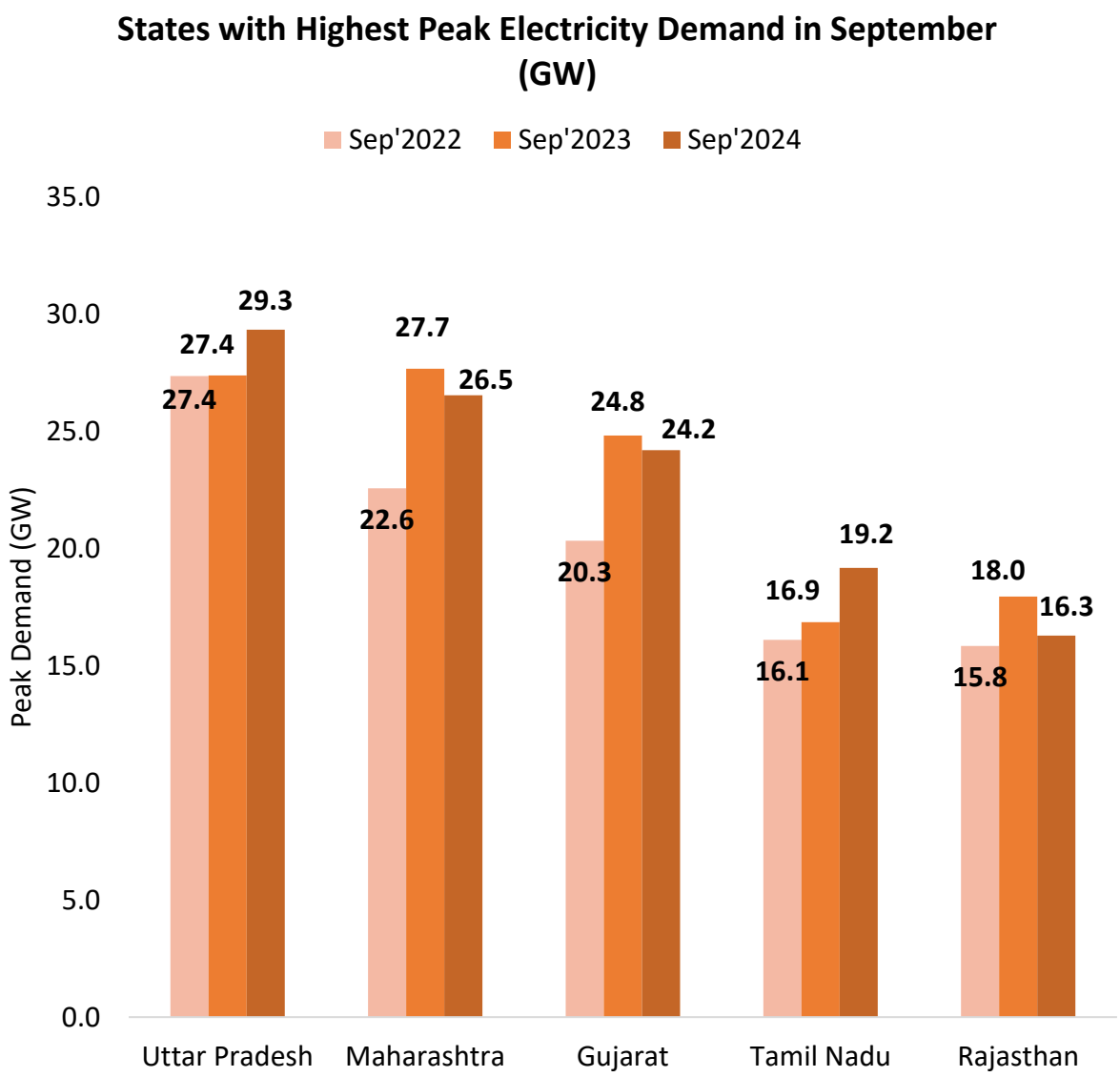
Source: CEA

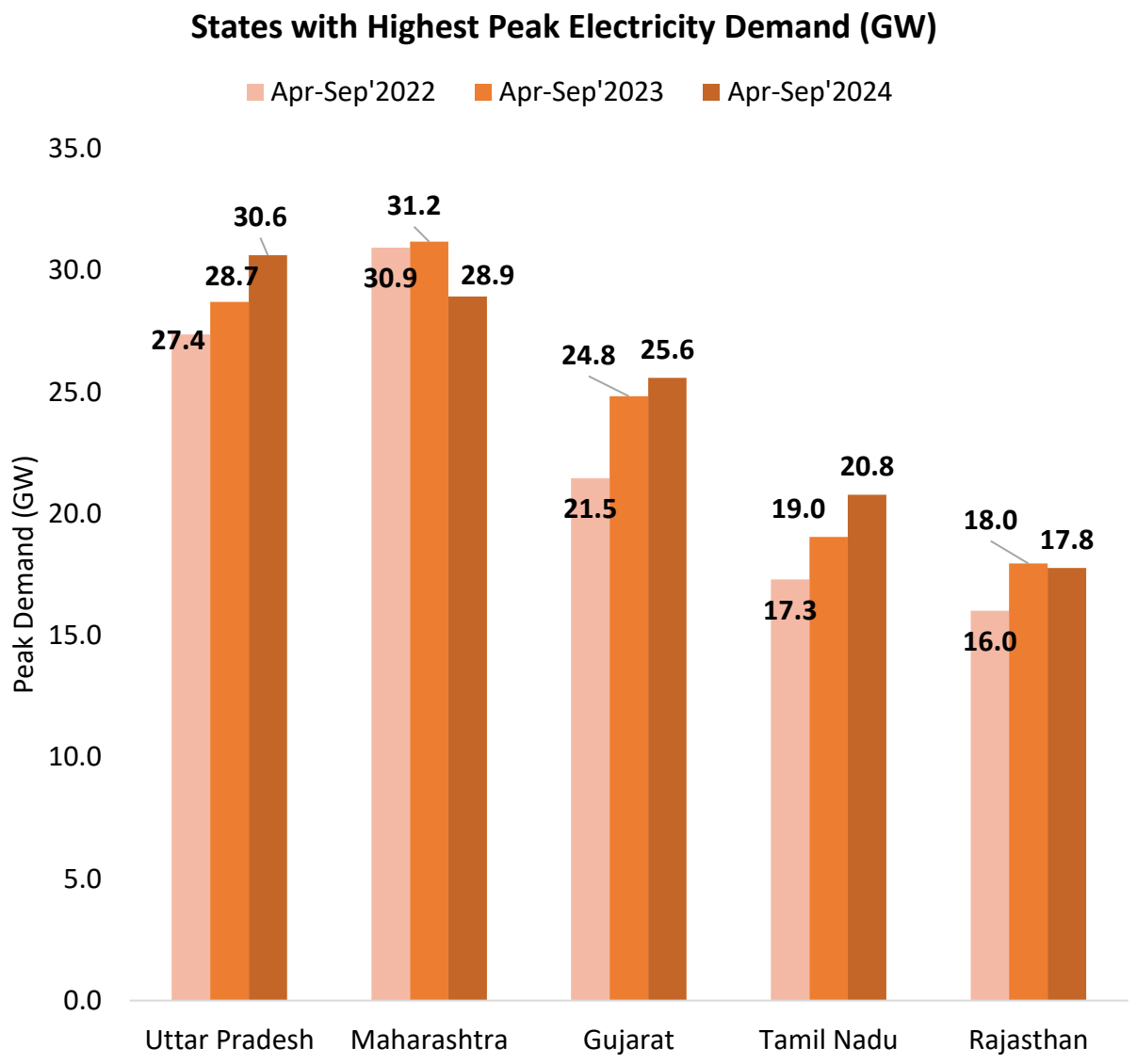
India’s Monthly Peak Electricity Demand and Supply



Source: CEA

Monthly Peak Electricity Demand of the top 5 states

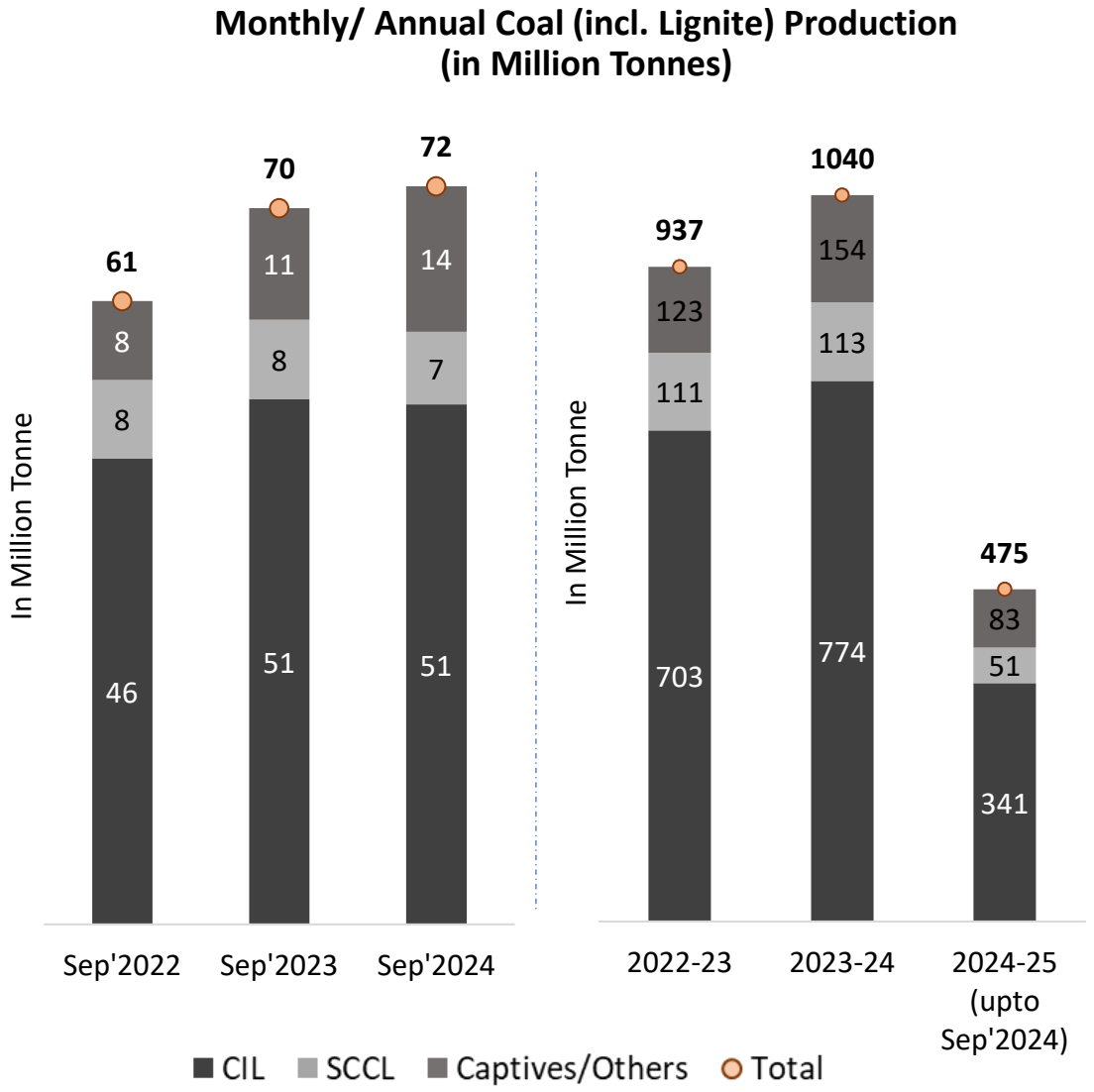


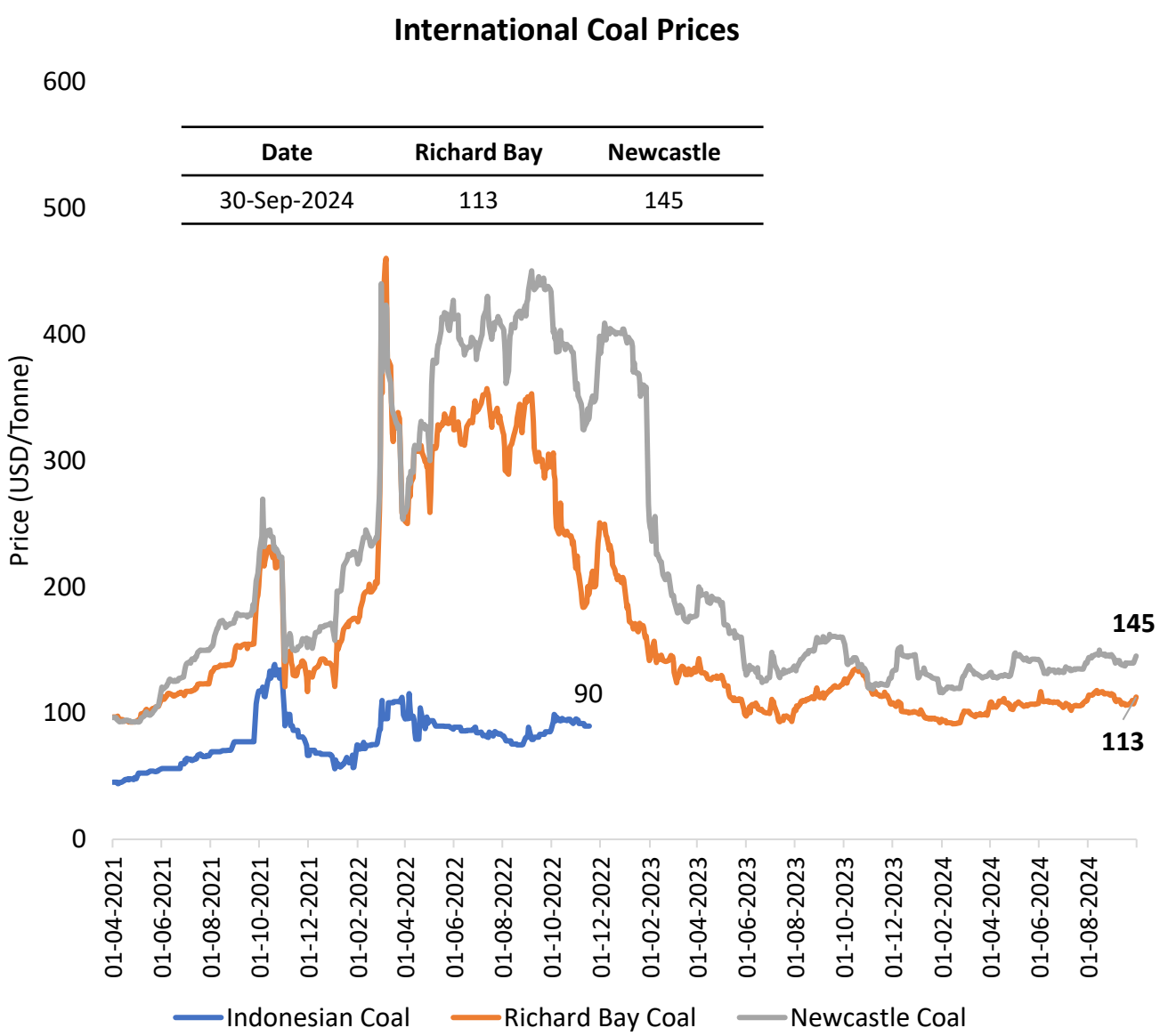


Note: The peak electricity demand data for September'24 is Provisional.

Source: CEA

Monthly Coal Statistics

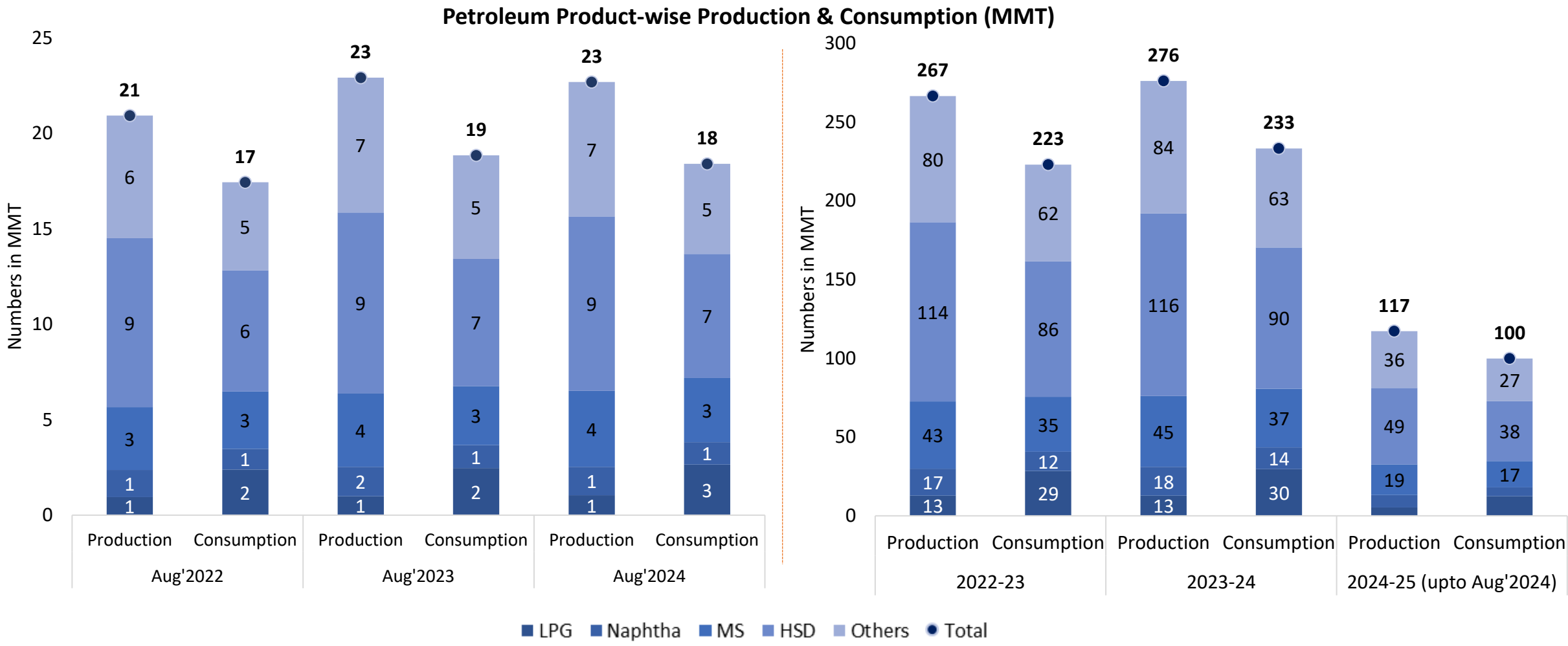




Date	Richard Bay	Newcastle
30-Sep-2024	113	145

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 August'2024

Source: PPAC

Petroleum Products Market Scenario (2/3)

Import/Export of Crude Oil and Petroleum Products ('000 Tonnes)							
Petroleum Products	Import/ Export	Monthly			Yearly		
		Aug'22	Aug'23	Aug'24	2022-23	2023-24	2024-25 (upto Aug'2024)
Crude Oil	Import	17637	18713	19910	232700	233118	101639
	Export	0	0	0	0	0	0
	Net Import	**17637**	**18713**	**19910**	**232700**	**233118**	**101639**
LPG	Import	1574	1569	1763	18335	18475	8160
	Export	40	47	44	540	525	222
	Net Import	**1534**	**1523**	**1719**	**17796**	**17950**	**7937**
Diesel	Import	8	5	4	322	42	19
	Export	2365	2615	2099	28494	28193	10263
	Net Import	**-2357**	**-2610**	**-2095**	**-28172**	**-28150**	**-10244**
Petrol	Import	0	149	0	1069	717	171
	Export	1019	1174	1177	13127	13461	5937
	Net Import	**-1019**	**-1025**	**-1177**	**-12058**	**-12743**	**-5766**
Others	Import	1656	2631	2528	24871	29433	12612
	Export	1818	1990	1706	18854	20258	8728
	Net Import	**-162**	**640**	**821**	**6017**	**9176**	**3884**

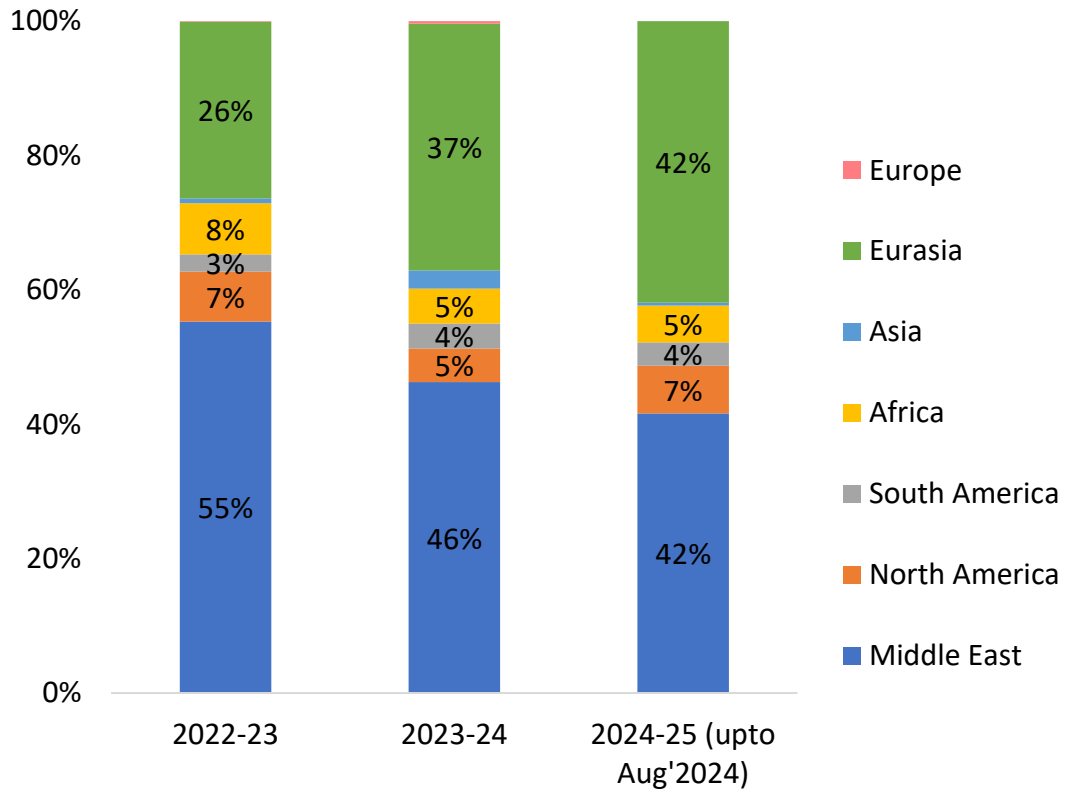
*Others include ATF, Naphtha, SKO, LDO, Lubes, FO, LSHS, Bitumen, pet coke, and others.

NOTE: The data is available latest up to August'2024

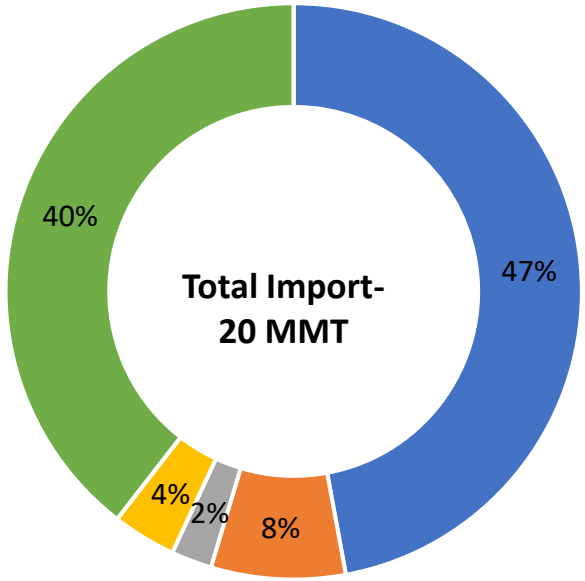
Source: PPAC

Petroleum Products Market Scenario (3/3)

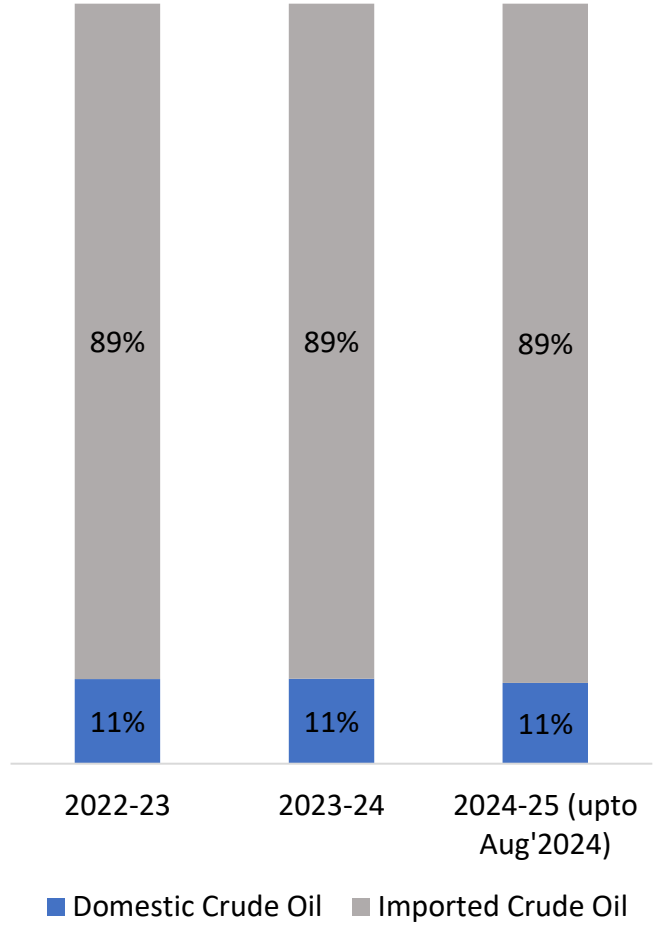
Region-wise Share in Import of Crude Oil (%)



Regional share of Imported Crude oil in August 2024



Domestic and Imported Crude Oil share in India (%)



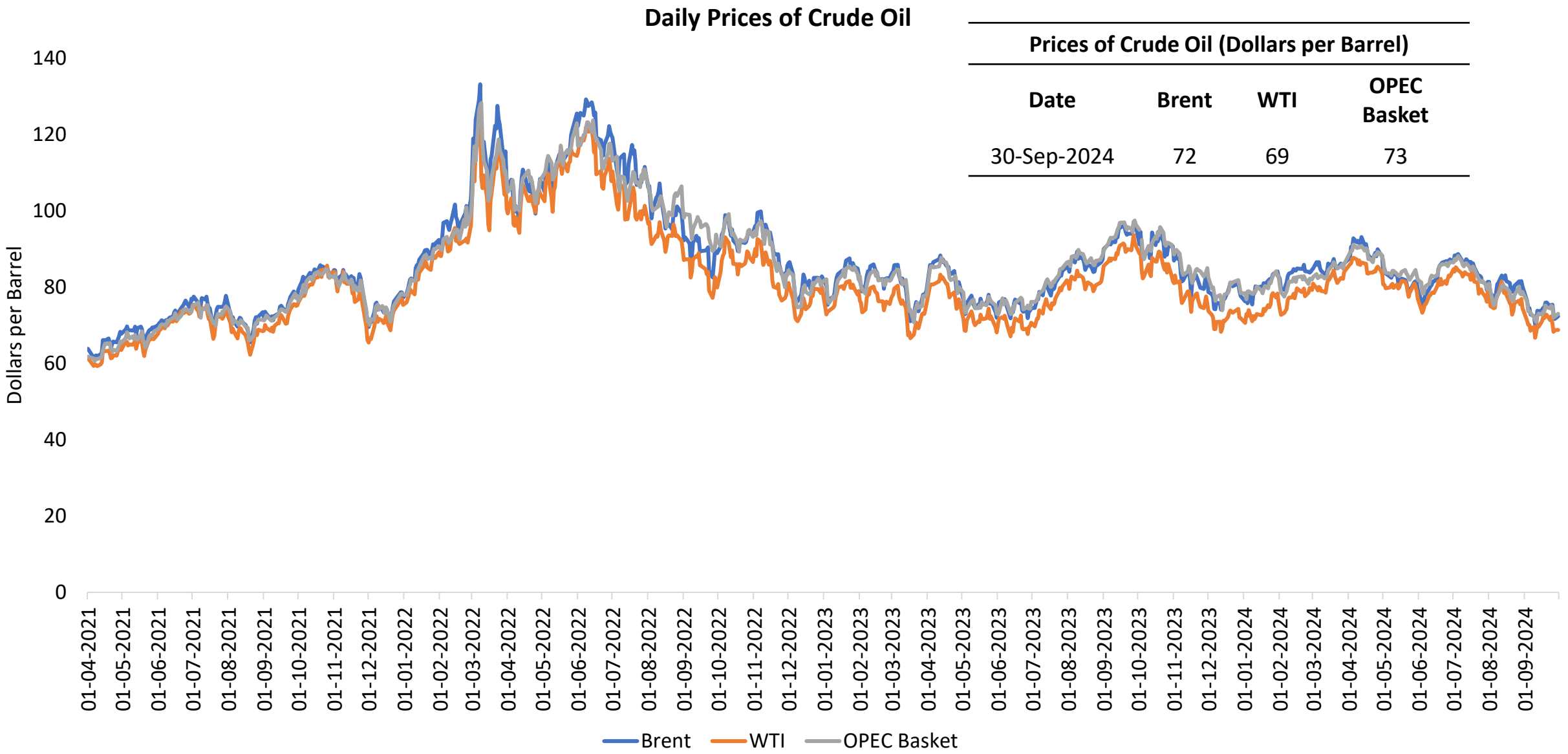
Total Import of Crude Oil (MMT)

Total Import	2022-23	2023-24	2024-25 (up to Aug'2024)
Crude Oil	**233**	**233**	**102**

NOTE: The data is available latest up to August'2024

Source: MoPNG and PPAC

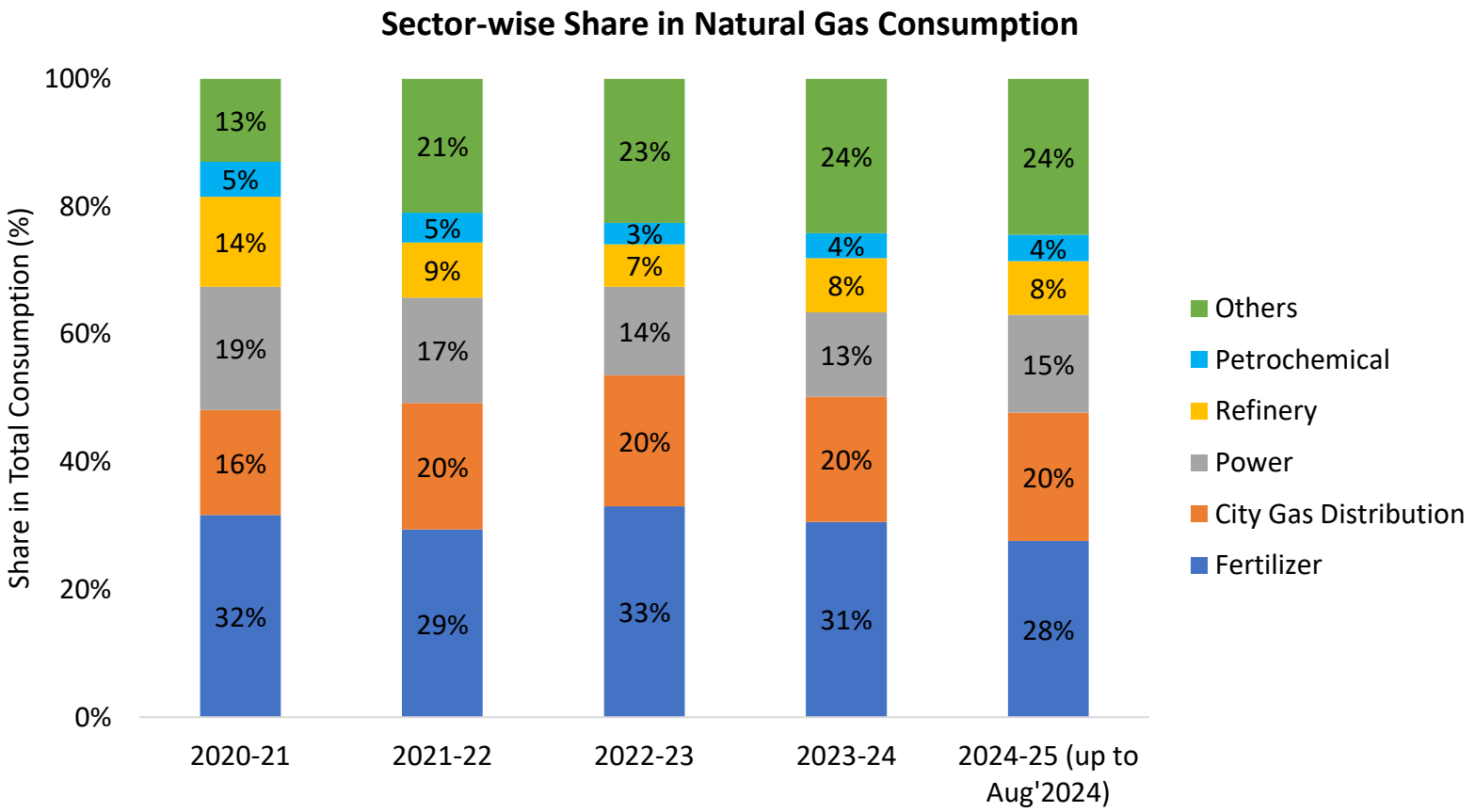
Daily Prices of Crude Oil

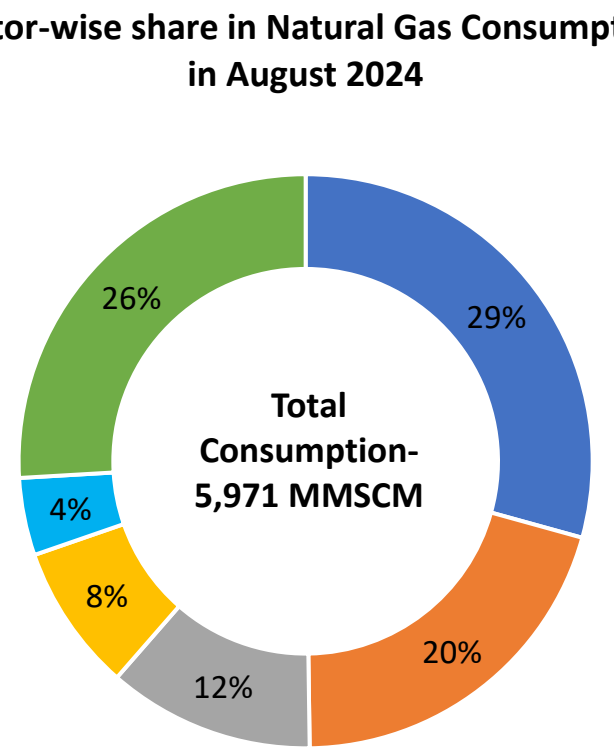


Prices of Crude Oil (Dollars per Barrel)

Date	Brent	WTI	OPEC Basket
30-Sep-2024	72	69	73

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 Aug'2024)
NG	**56,116**	**61,491**	**58,702**	**68,759**	**30,864**

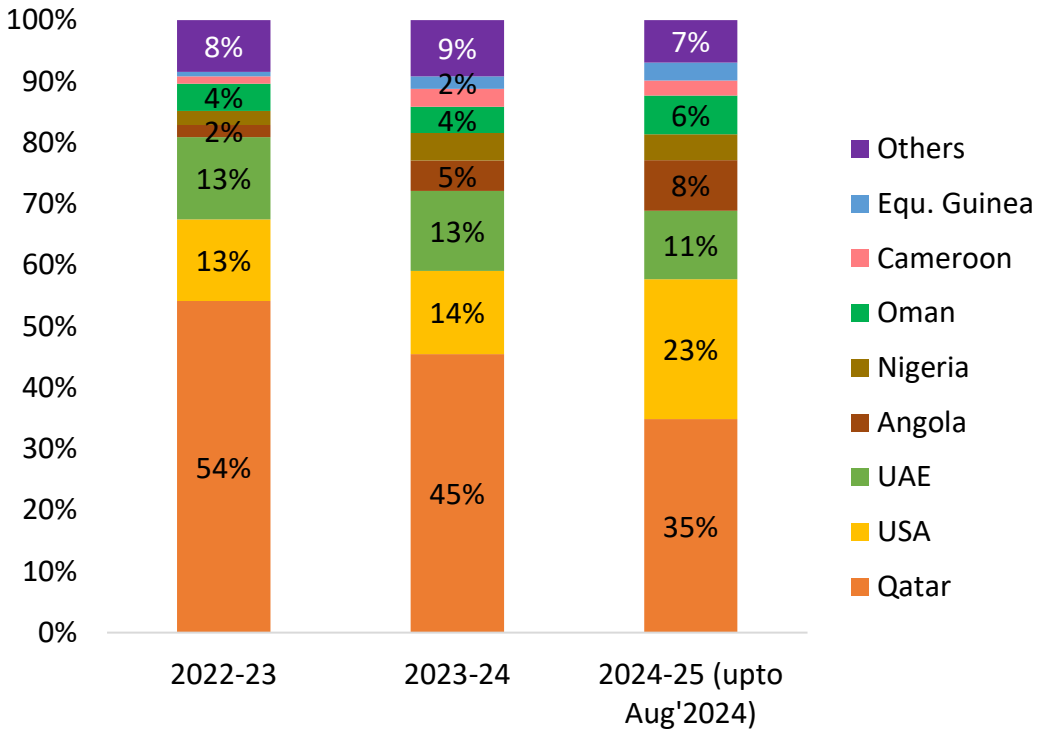
Others include- Internal Combustion of Pipeline System, Industrial, Sponge iron/steel, LPG shrinkage, Manufacturing, Agriculture (tea plantation), Others

NOTE: The data is available latest up to August'2024

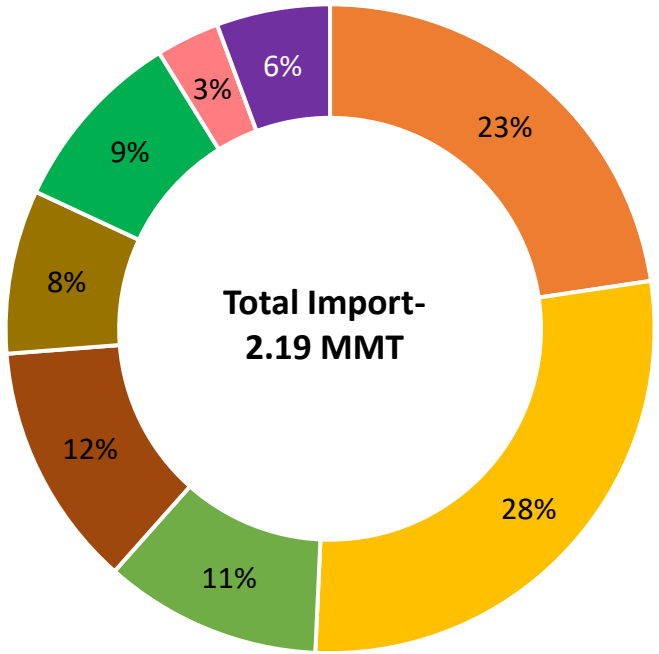
Source: PPAC

Gas Market Scenario (2/2)

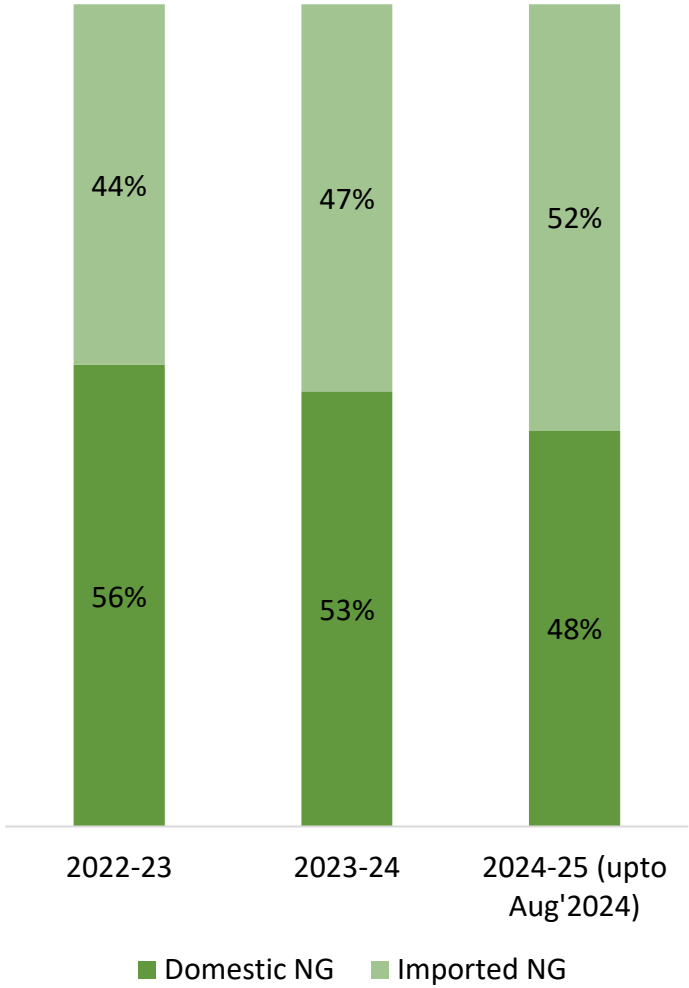
Region-wise Share in Import of LNG (%)



Country Share of Imported LNG in August'2024



Domestic and Imported Natural Gas share in India (%)



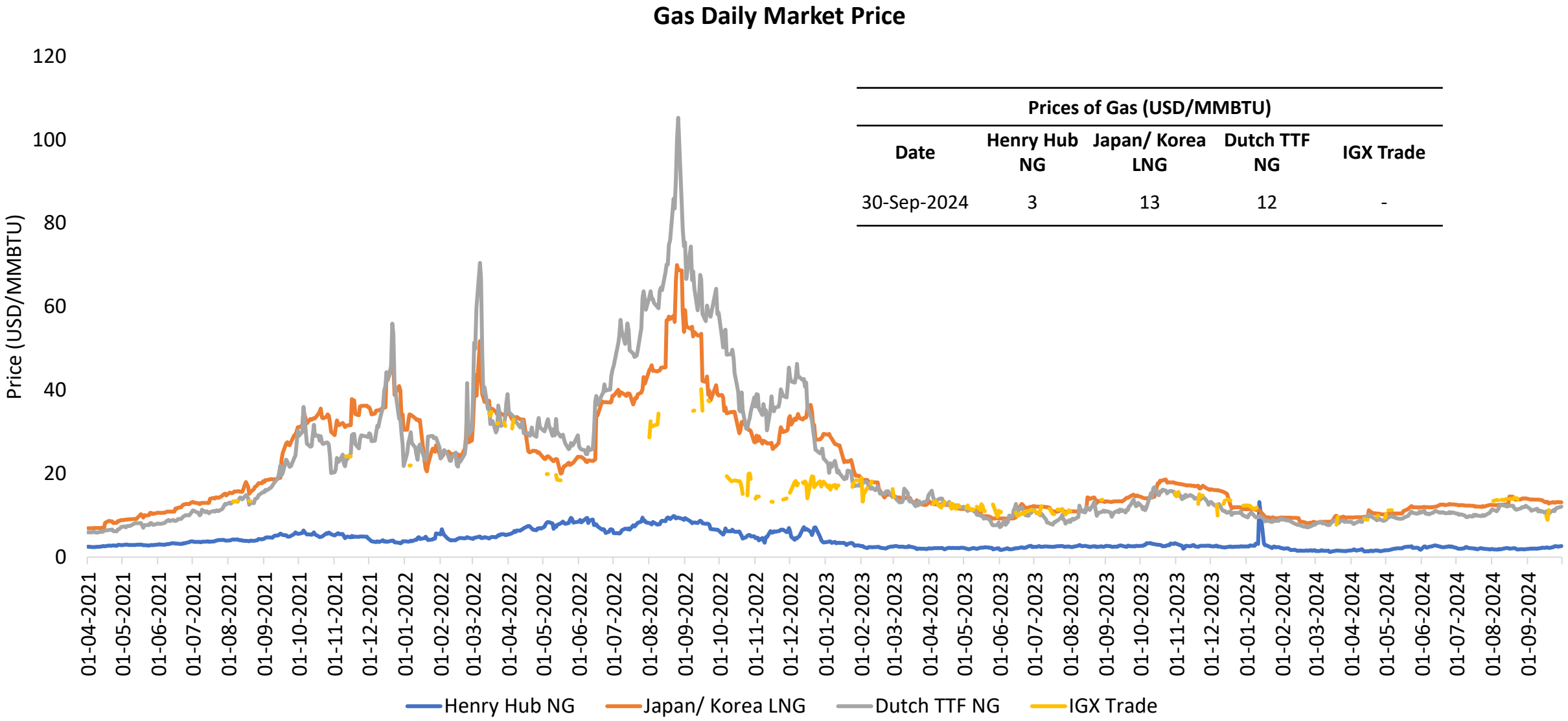
Others include- Trinidad, Cameroon, Egypt, France, Algeria, Belgium, Indonesia, Turkey, Russia, Spain, Malaysia, Brunei, Netherlands, Norway, and others.

Total Import of Liquified Natural Gas (LNG) (MMT)			
Total Import	2022-23	2023-24	2024-25 (up to Aug'2024)
LNG	**19.85**	**24.00**	**12.13**

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

Source: MoCI and PPAC

Daily Prices of Gas

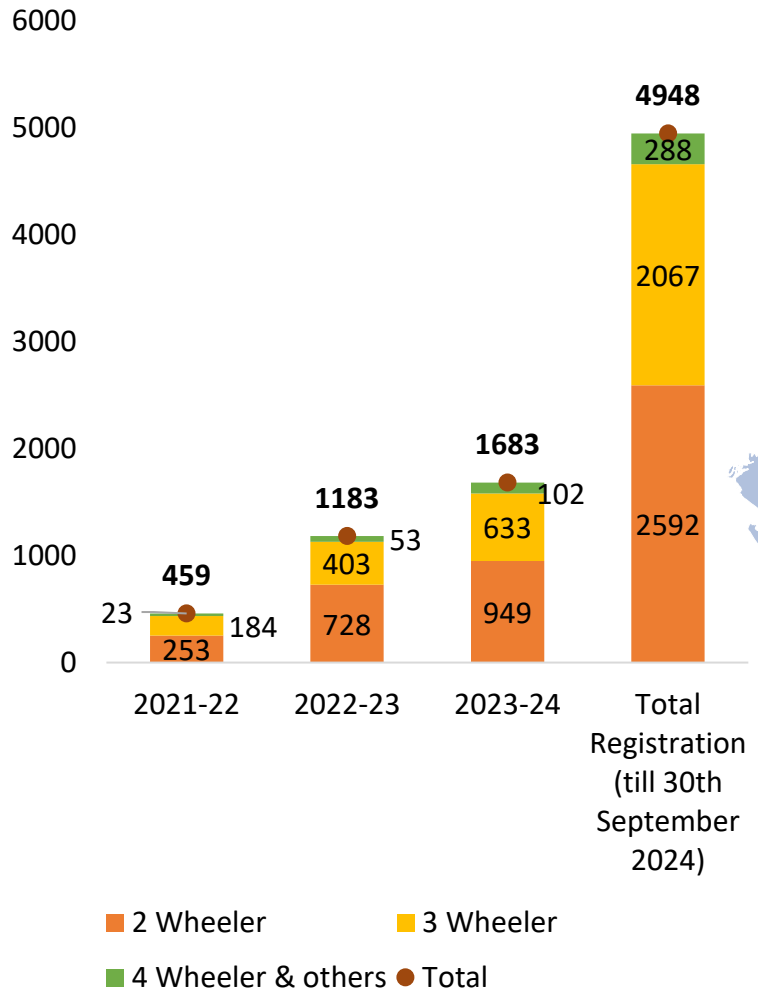


Prices of Gas (USD/MMBTU)				
Date	Henry Hub NG	Japan/ Korea LNG	Dutch TTF NG	IGX Trade
30-Sep-2024	3	13	12	-

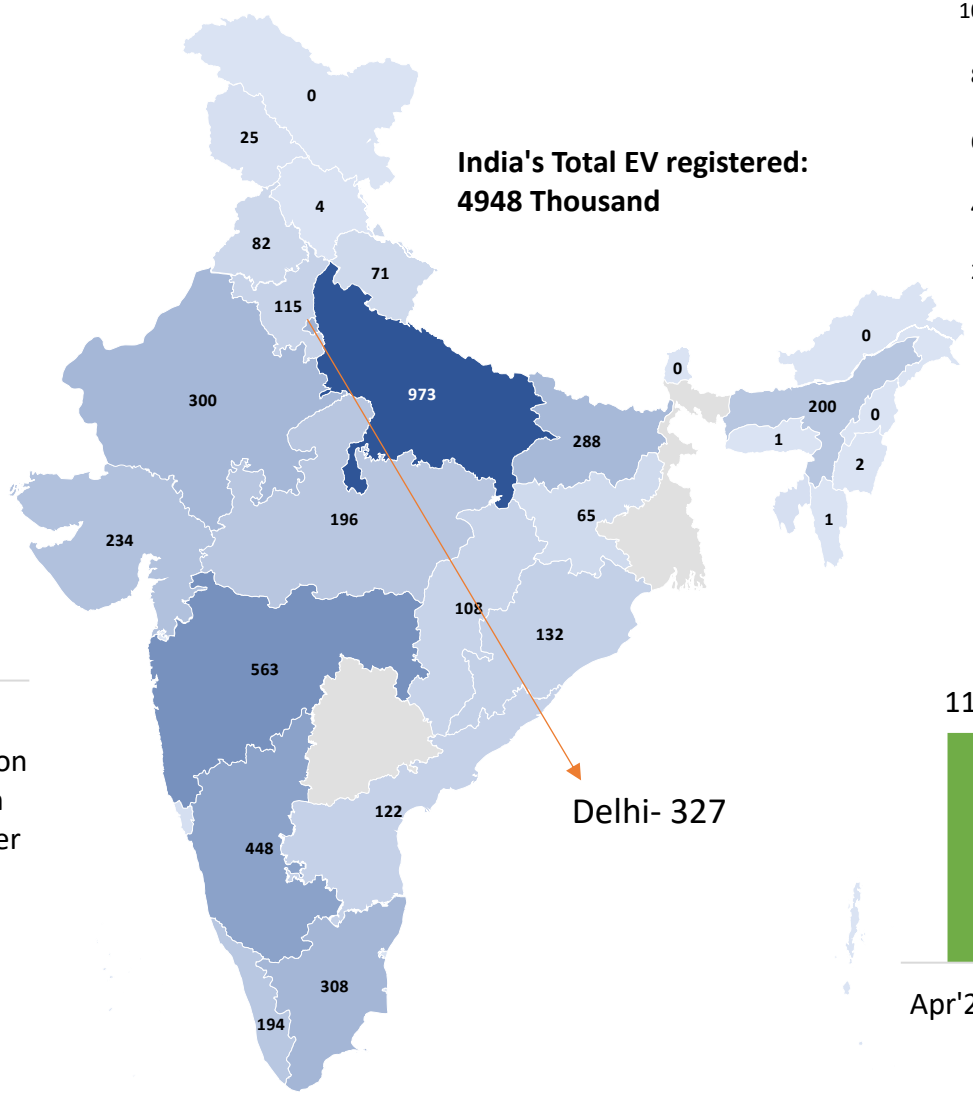
MMBTU- Million Metric British Thermal Unit

Status of Electric Mobility in India

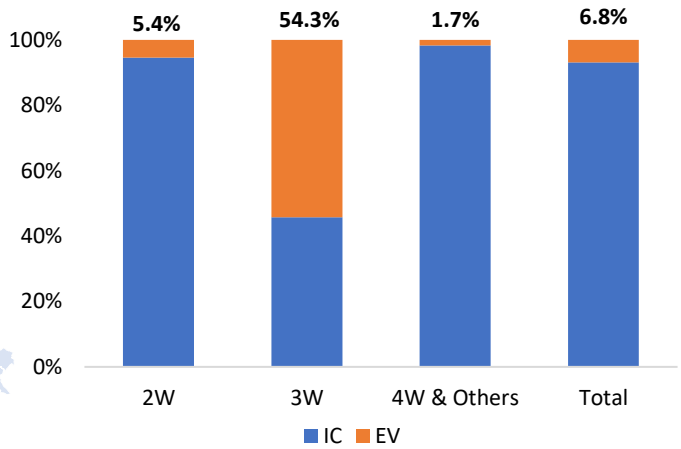
National EV registration (in Thousands)



Cumulative State-wise EV registration as on 30th September 2024 (in Thousands)

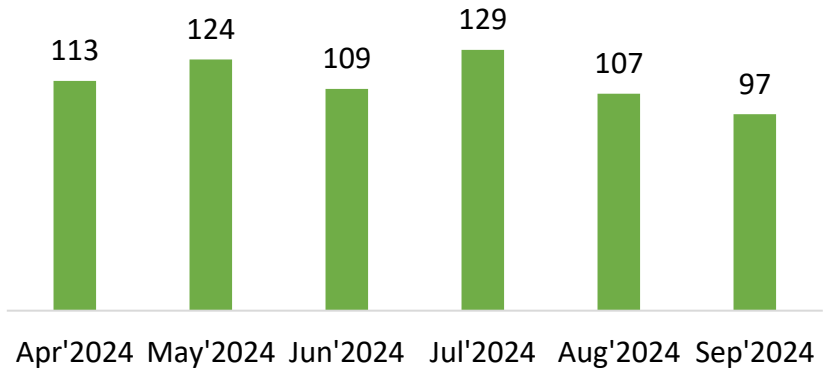


EV and ICE sale composition in 2023-24



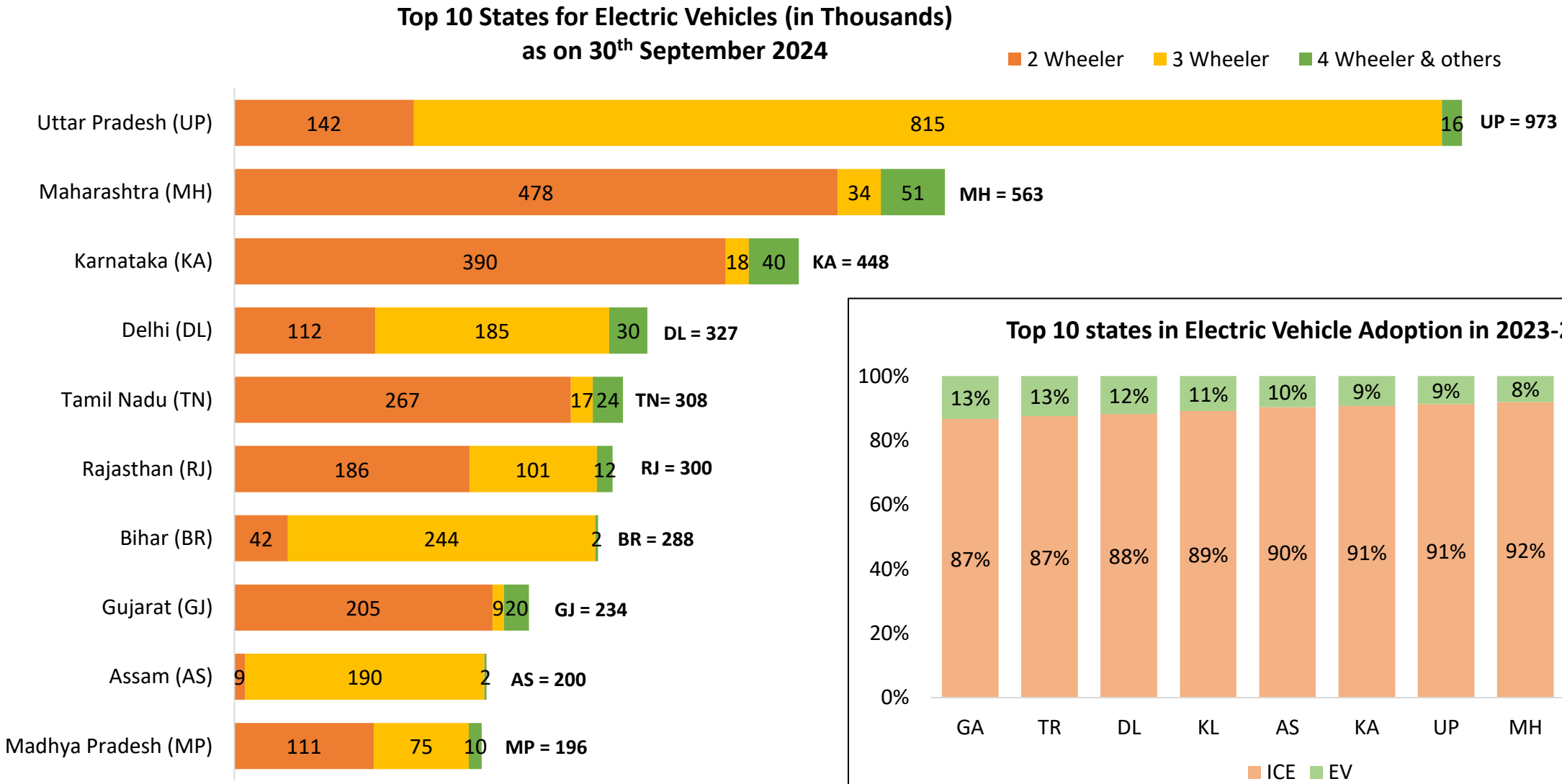
Under 3-wheeler (54.3%) EV registration, 45.6% is L3 and 8.7% is L5 vehicles.

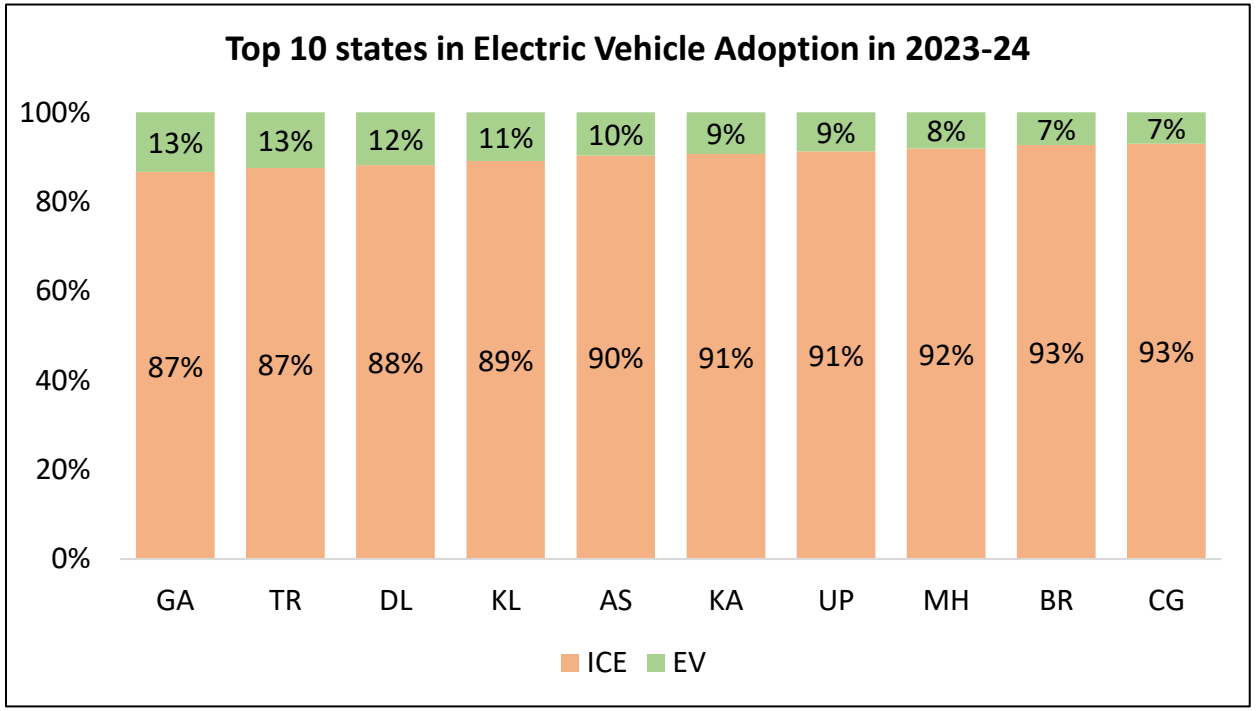
Provisional Monthly EV registered (in Thousands)



Source: VAHAN Dashboard

Status of Electric Mobility in India





NOTE: GA- Goa, TR- Tripura, CG- Chhattisgarh, KL- Kerala

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.

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) 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.

MNRE has released the scheme guidelines for the implementation of pilot projects for the use of Green Hydrogen in the shipping, steel, and transport sectors under the NGHM.

MOP has extended the waiver of ISTS charges from 30th June 2025 to 31st December 2030.

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.

Jindal Stainless Ltd., in collaboration with Hygenco commissioned India's 1st green hydrogen plant in the stainless steel sector at Hisar, Haryana, which aims to reduce CO2 emission by 2,700 metric tonnes per annum.

Key Highlights or Announcements of September 2024

- The Ministry of Heavy Industry launched the PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme on September 29, 2024. The scheme will be implemented from 1st October, 2024 till 31st March, 2026 with an total outlay of ₹10,900 crore.

- The Ministry of Power has released the "Guidelines for Installation and Operation of Electric Vehicle Charging Infrastructure 2024". The main objective of the guidelines are :
  - Standard procedure and timelines for grant of electricity connections for charging
  - Use of open communication protocols to enable interoperability of EV chargers
  - Criteria for optimal selection of locations for siting Public EV charging stations in urban areas and along highways
  - Transparency in charging fee structure: electricity tariff capped at Average Cost of Supply (ACOS) till FY 2028; tariff subsidy charging during solar hours increased from 20% of ACOS to 30%.

- The Ministry of Environment, Forest, and Climate Change has notified the Ecomark Rules, 2024 under the Lifestyle for Environment (LIFE) mission. This initiative aims to boost the demand for environment-friendly products in line with the 'LIFE' principles, promoting lower energy consumption, resource efficiency, and a circular economy. The scheme also focuses on ensuring accurate labeling and preventing misleading claims about products.

- The Government of India has approved the implementation of the Viability Gap Funding (VGF) Scheme for offshore wind energy projects. This scheme aims to commission 1000 MW of offshore wind energy capacity by the financial year 2031-32 with a financial outlay of Rs 6,853 crores.

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