

India's Energy Overview

July 2023

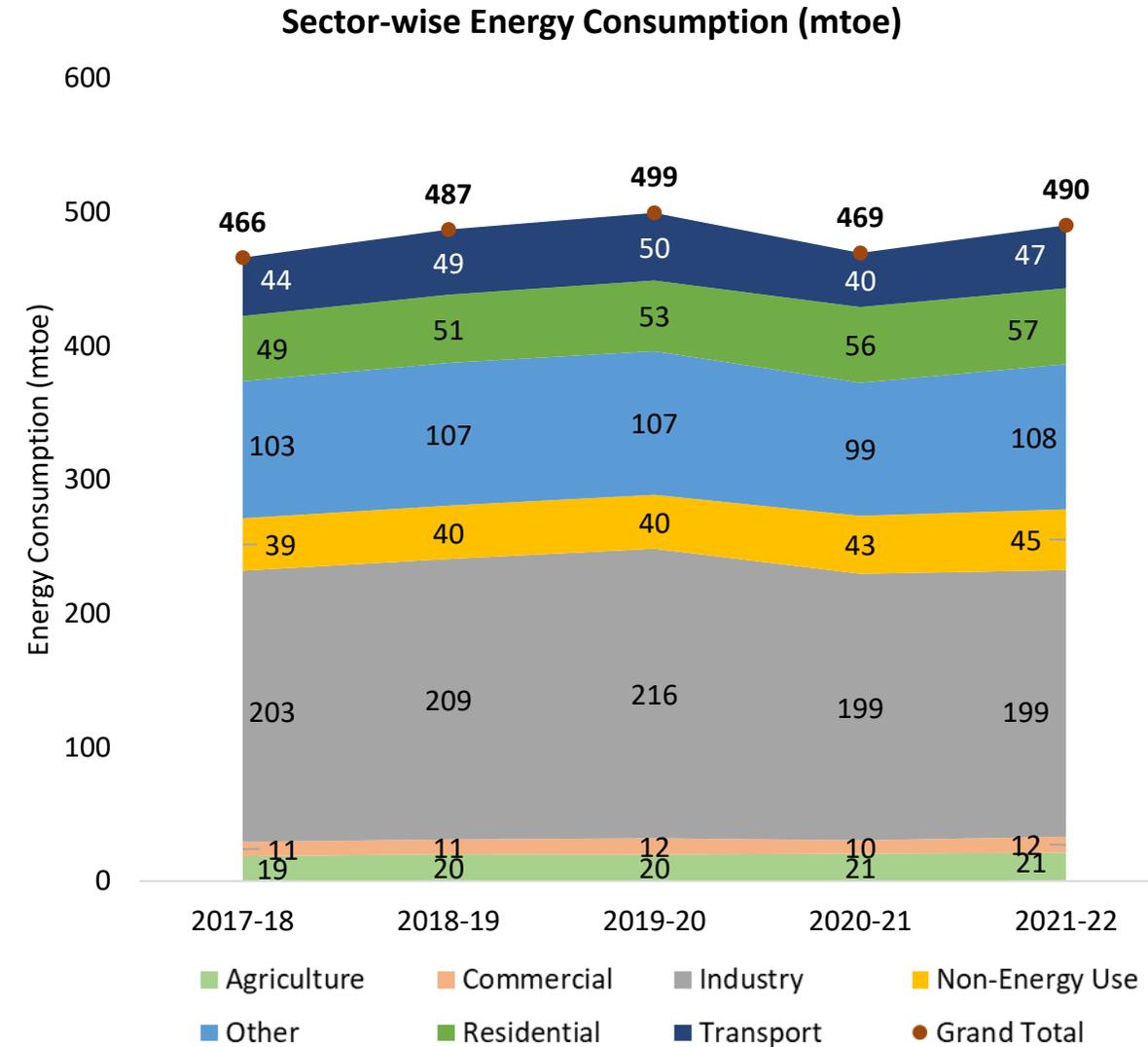
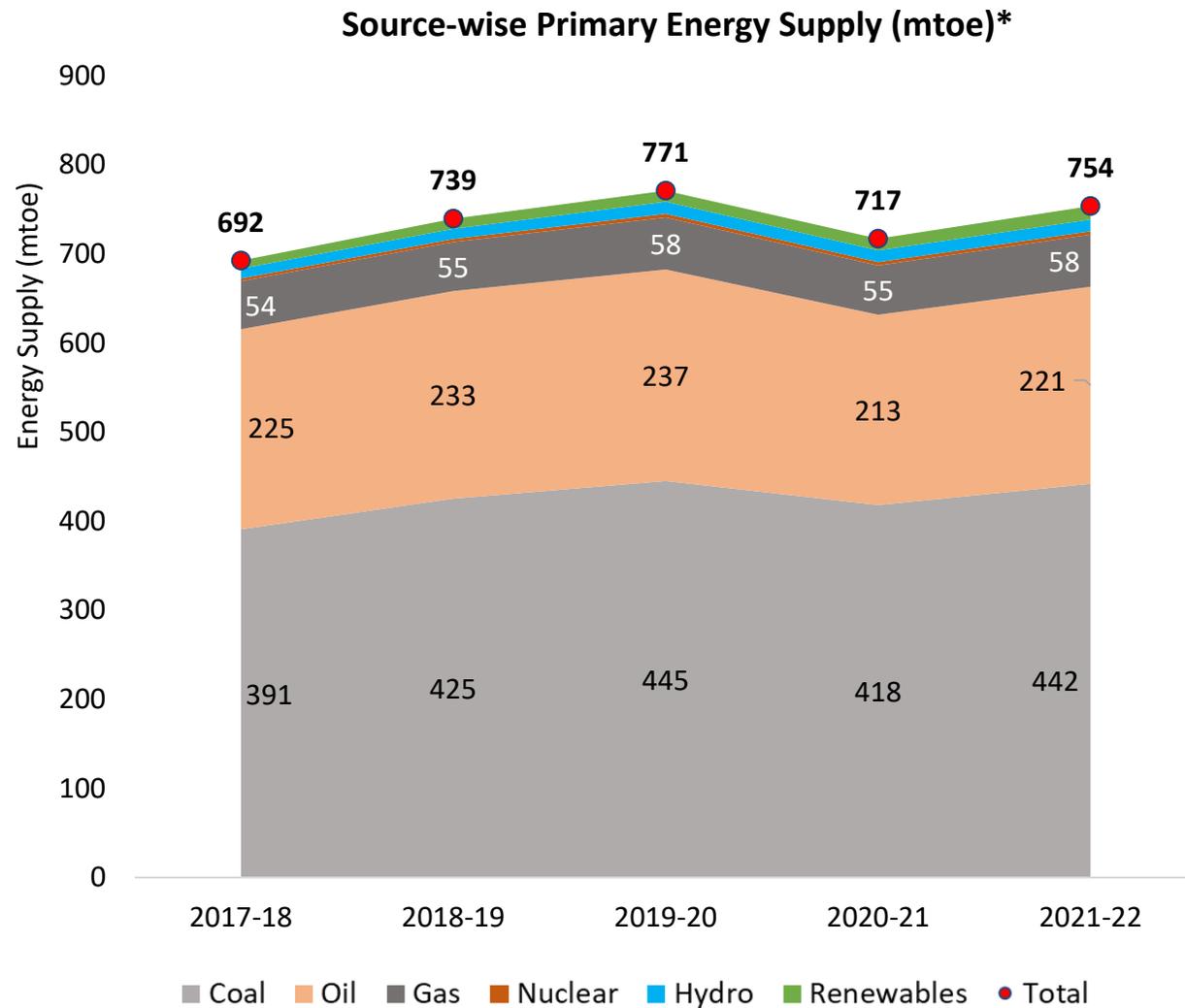


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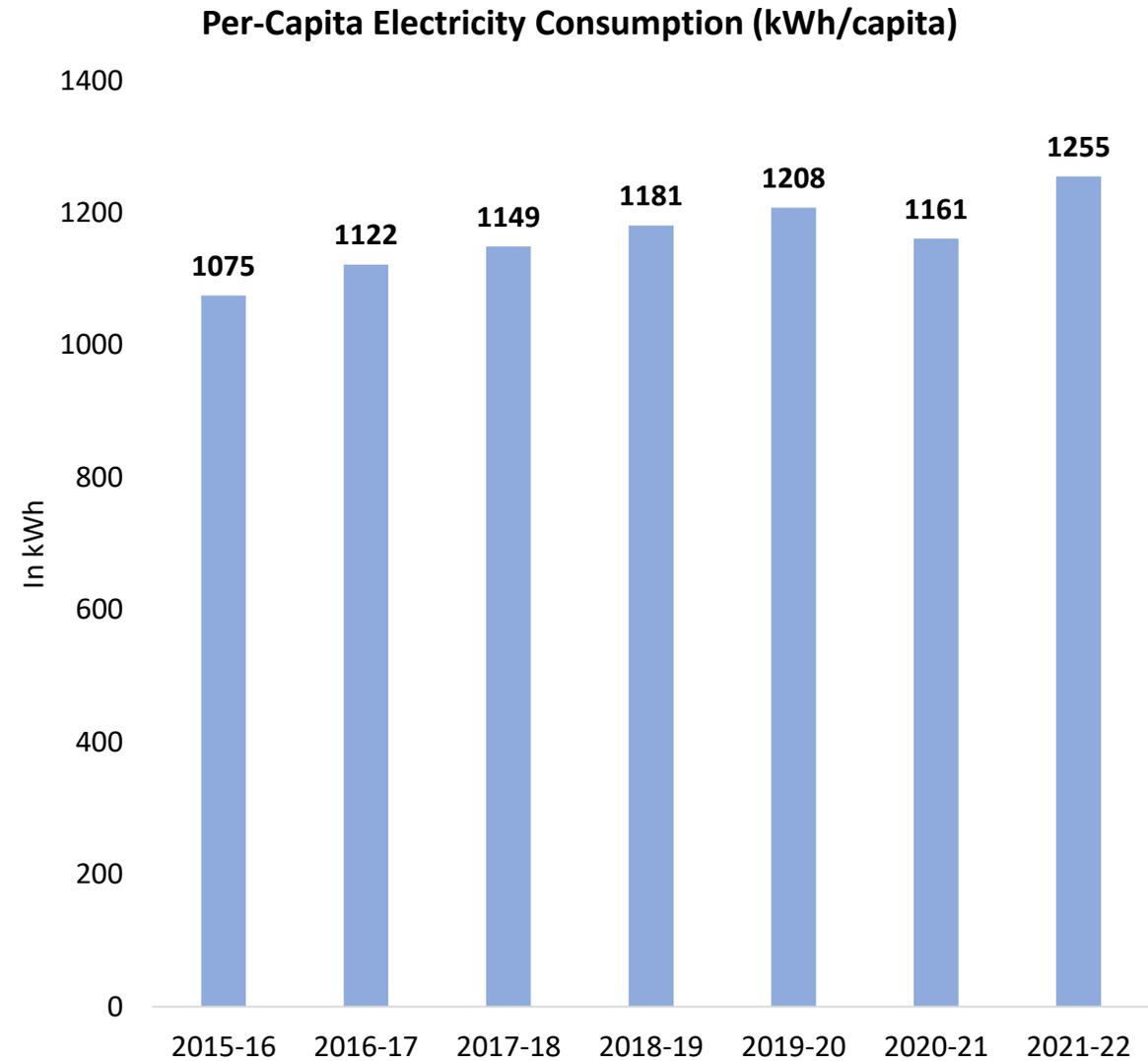
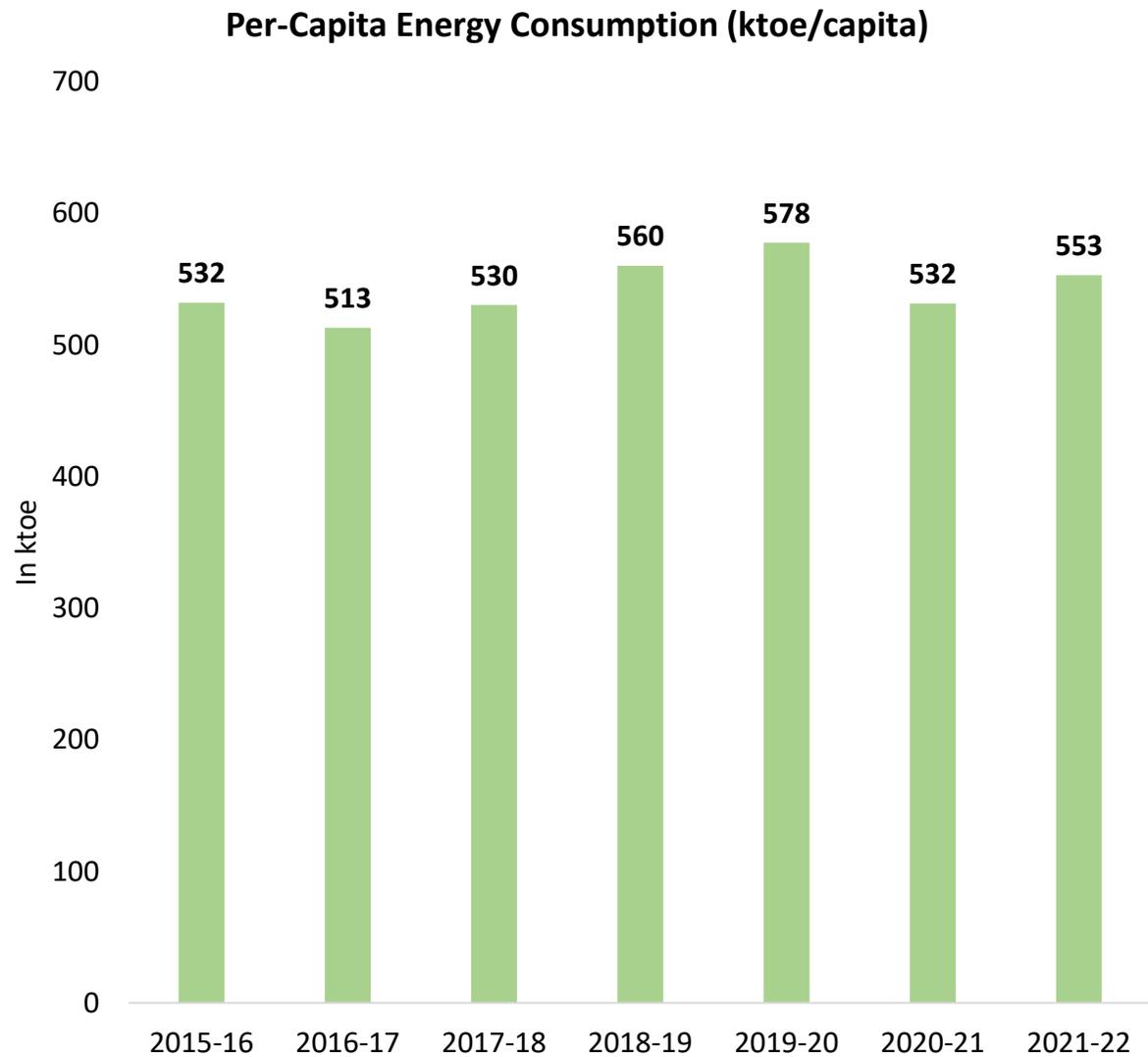
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Primary Energy Mix* in India



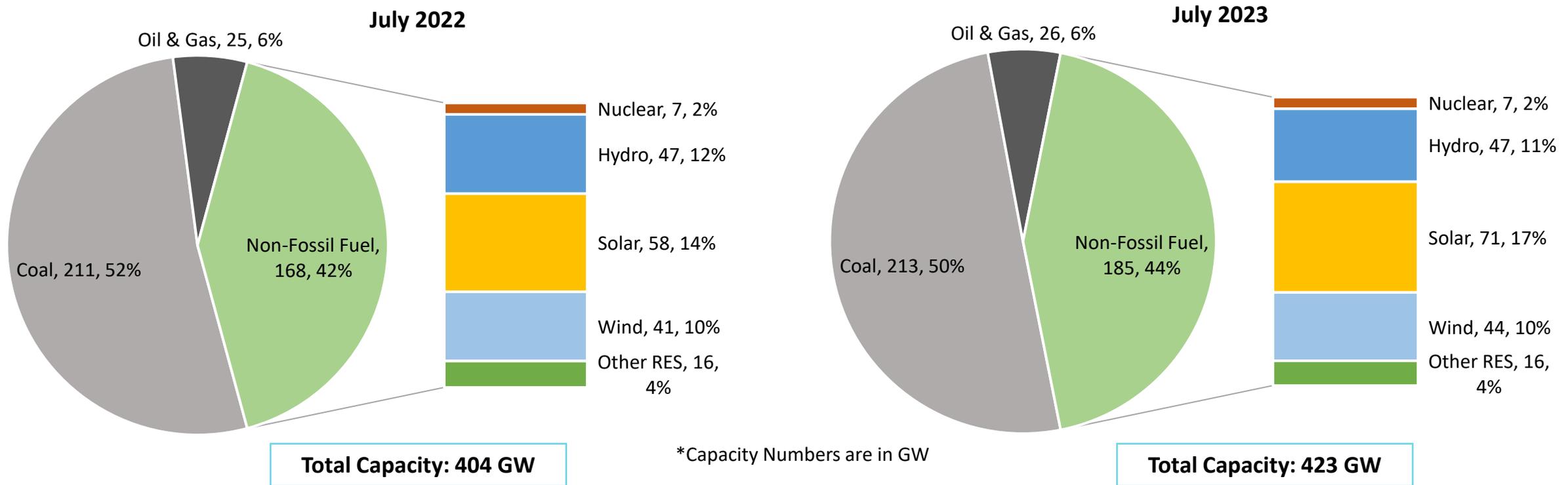
*Excluding biofuels, waste, and other non-commercial source of energy

Per-Capita Energy and Electricity Consumption



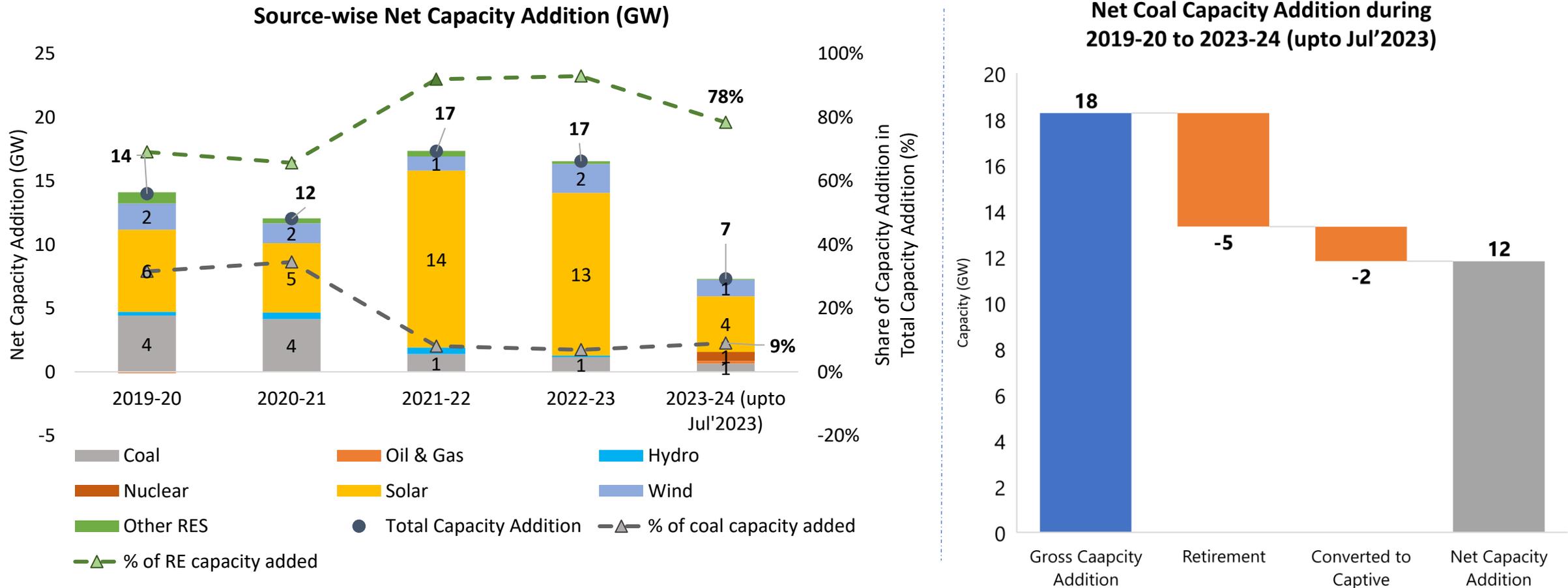
Note: Per Capita energy consumption is calculated on energy supply basis.

India's Electricity Capacity Mix (Utility-scale)



- India's electricity generating capacity is 423 GW as on Jul'2023 [coal 213 GW (50%), solar 71 GW (17%), hydro 47 GW (11%), and wind 44 (10%)].
- As on Jul'2023, the share of non-fossil-based electricity capacity is 44% against the set target of 50% non-fossil capacity by 2030.
- As on Jul'2023, India's renewable energy capacity (including large hydro) stood at 178 GW out of 422 GW.

India's Electricity Capacity Addition in last 5 years



- A total of 55 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 12 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).

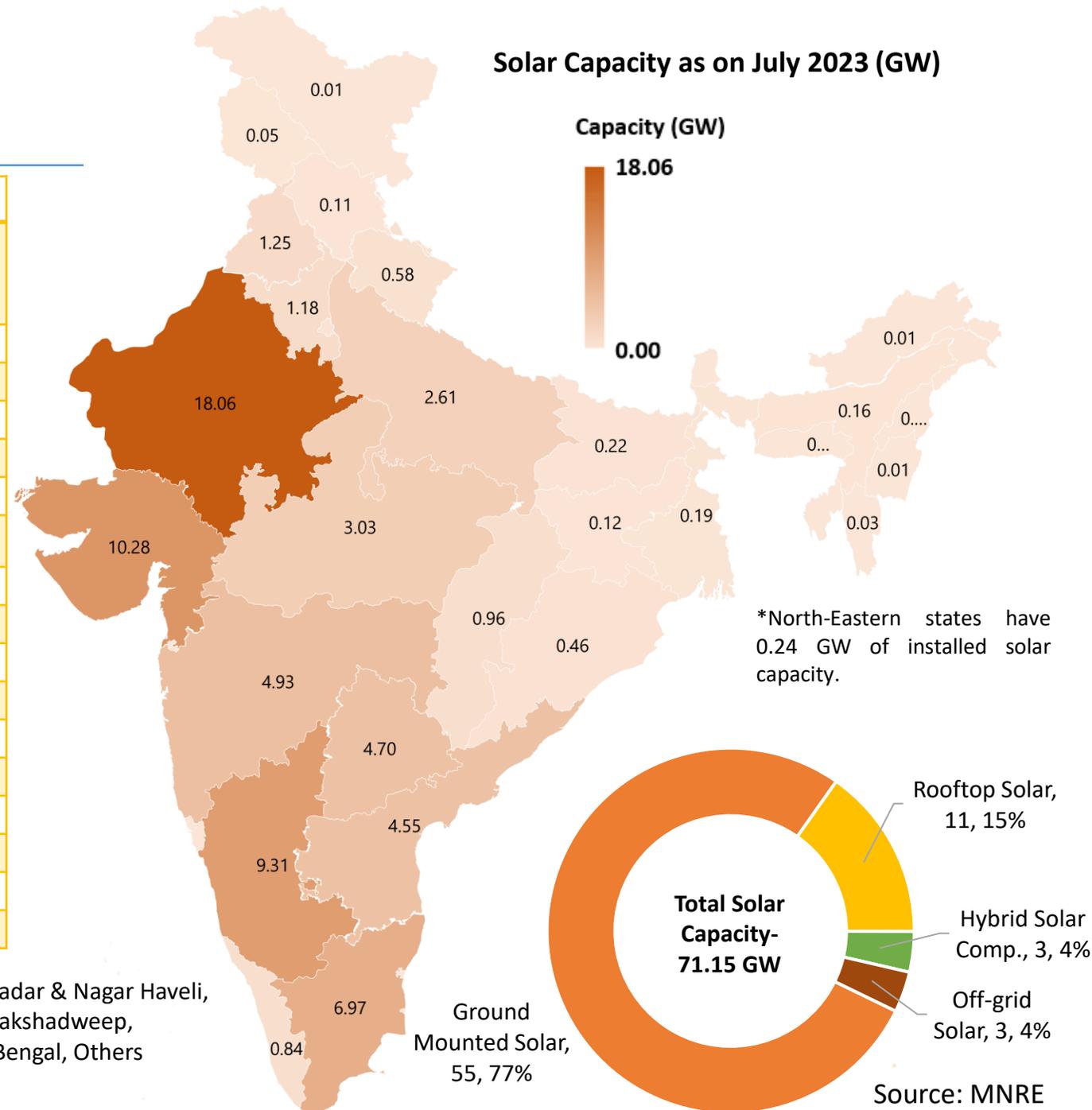
State-wise Solar Capacity

as on July 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	18.06
Gujarat	6.8	2.8	0.6	0.1	10.28
Karnataka	7.7	1.6	0.0	0.0	9.31
Tamil Nadu	6.5	0.4	0.0	0.1	6.97
Maharashtra	3.0	1.7	0.0	0.2	4.93
Telangana	4.4	0.3	0.0	0.0	4.70
Andhra Pradesh	4.3	0.2	0.0	0.1	4.55
Madhya Pradesh	2.7	0.3	0.0	0.1	3.03
Uttar Pradesh	2.1	0.3	0.0	0.2	2.61
Punjab	0.9	0.3	0.0	0.1	1.25
Haryana	0.3	0.5	0.0	0.4	1.18
Chhattisgarh	0.5	0.1	0.0	0.4	0.96
Kerala	0.3	0.5	0.0	0.0	0.84
Uttarakhand	0.3	0.3	0.0	0.0	0.58
Others	0.9	0.7	0.0	0.3	1.90
All India	55.16	10.87	2.55	2.56	71.15

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

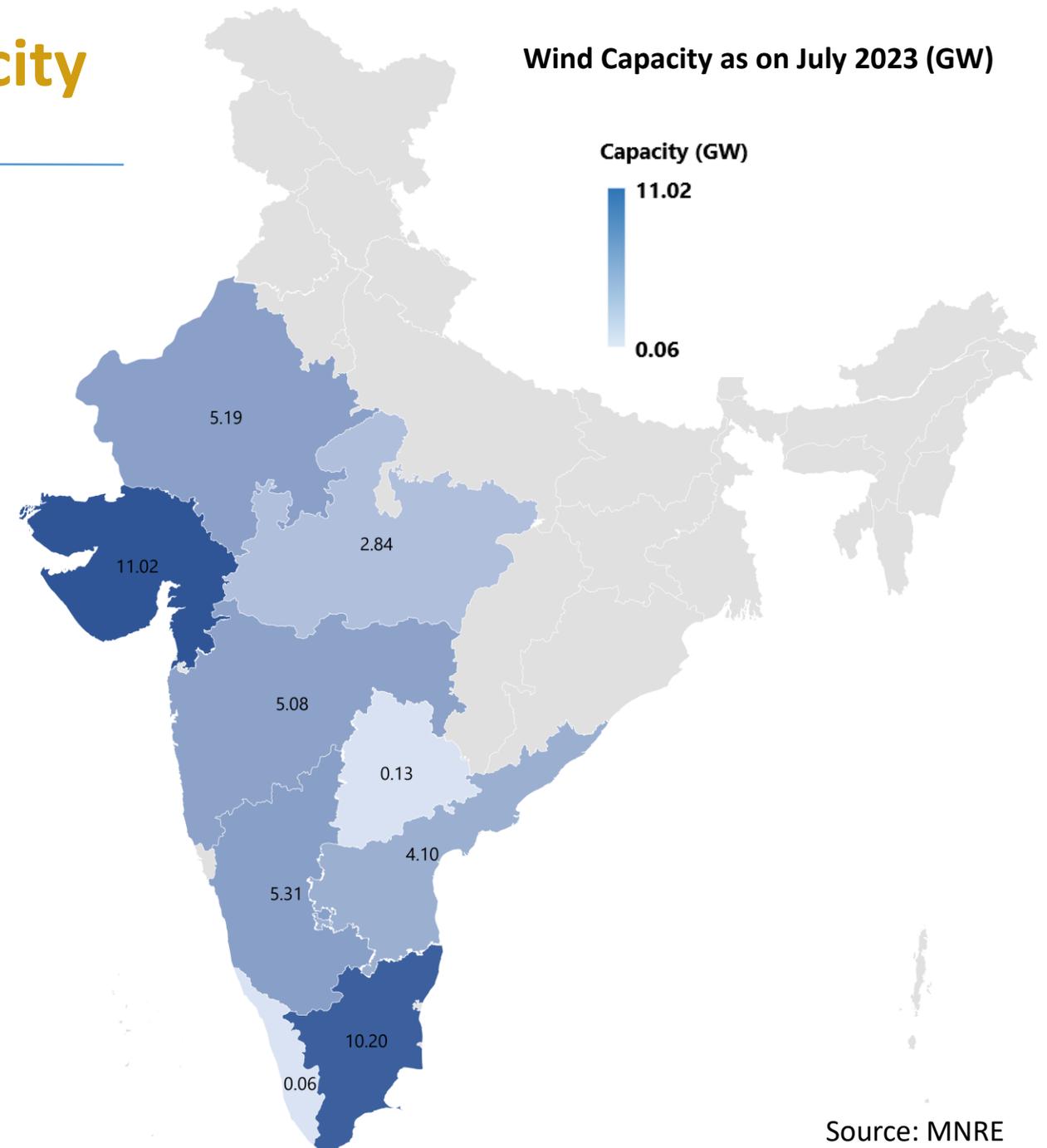
Solar Capacity as on July 2023 (GW)



State-wise Wind Onshore Capacity

as on July 2023

State-wise installed capacity of Wind (Onshore) Power	
States	Installed Capacity (GW)
Gujarat	11.02
Tamil Nadu	10.20
Karnataka	5.31
Rajasthan	5.19
Maharashtra	5.08
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
India Total	43.94

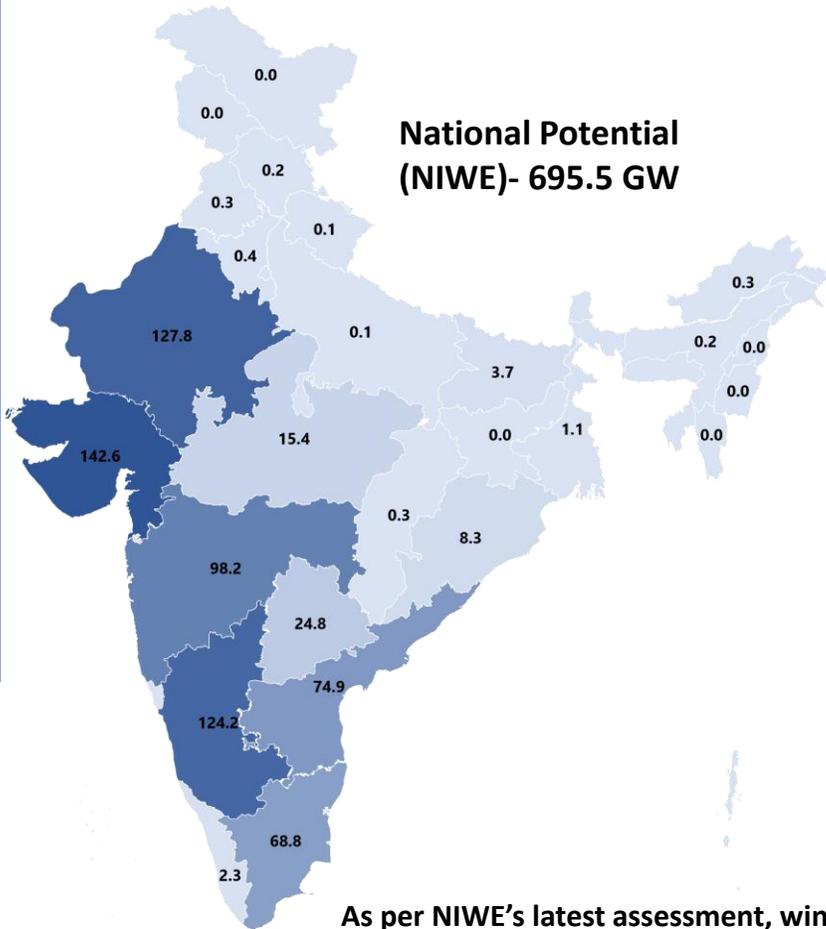


RE Potential and Installed Capacity (1/2)

RE potential in the state

Wind Onshore Potential at 120m agl

State Potential (GW)  0.0 142.6

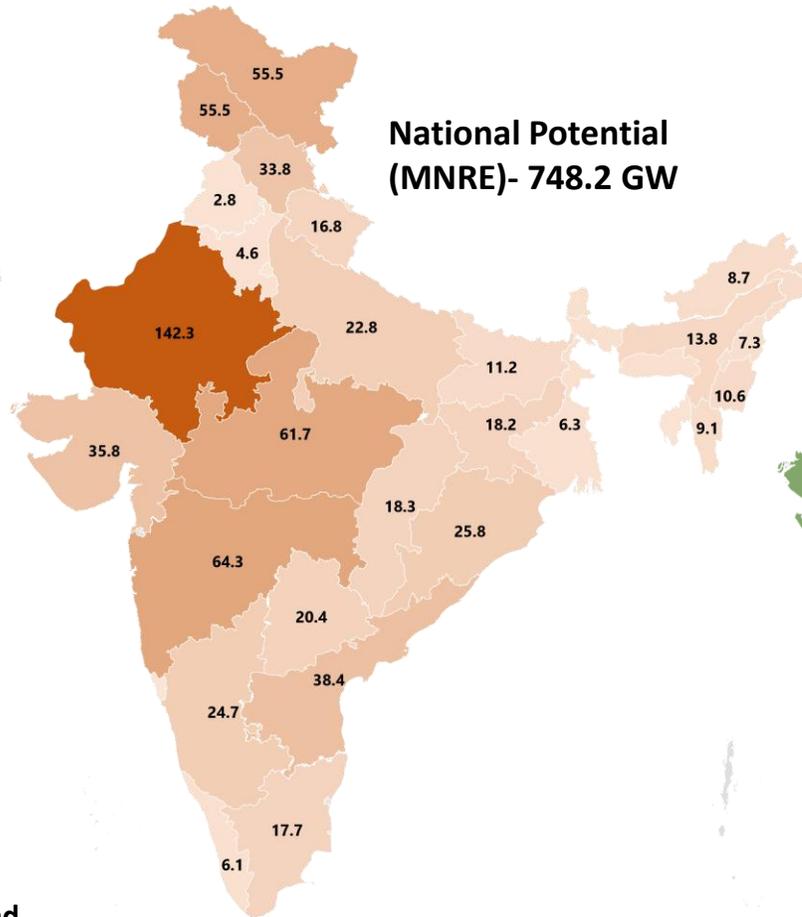


National Potential (NIWE)- 695.5 GW

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

Solar Potential

State Potential (GW)  0.9 142.3

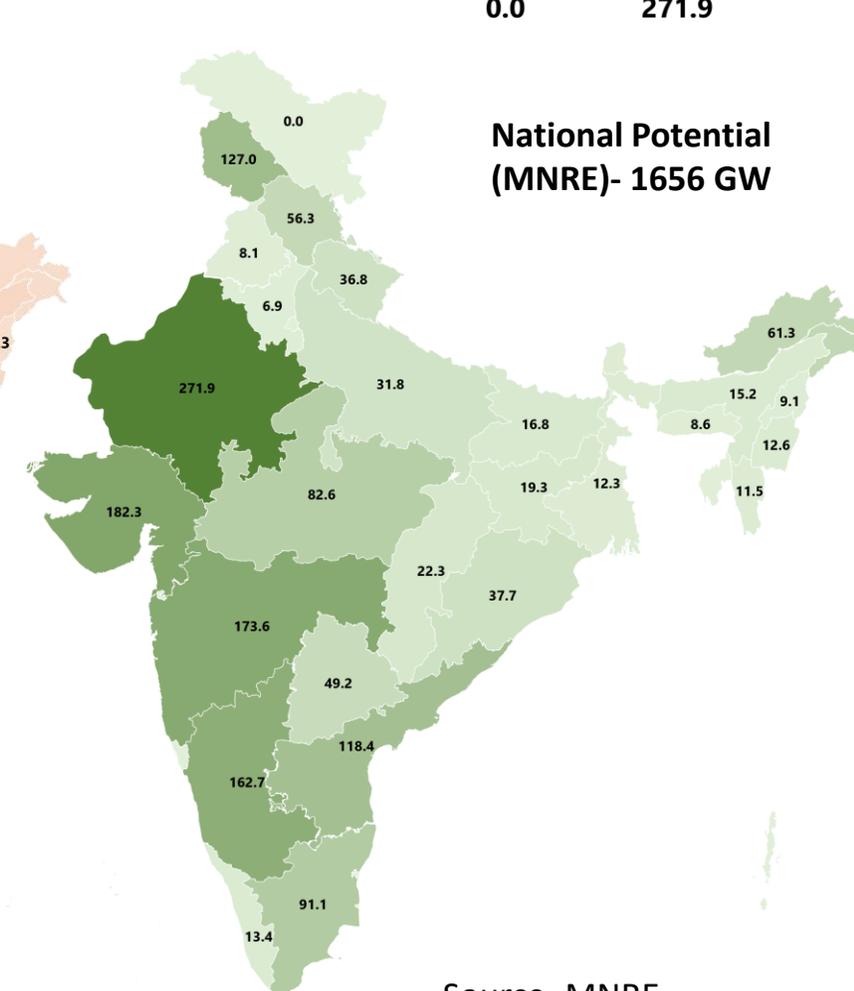


National Potential (MNRE)- 748.2 GW

Market potential for SPV rooftops: 124 GW.

Renewable Energy Potential (all sources including large Hydro)

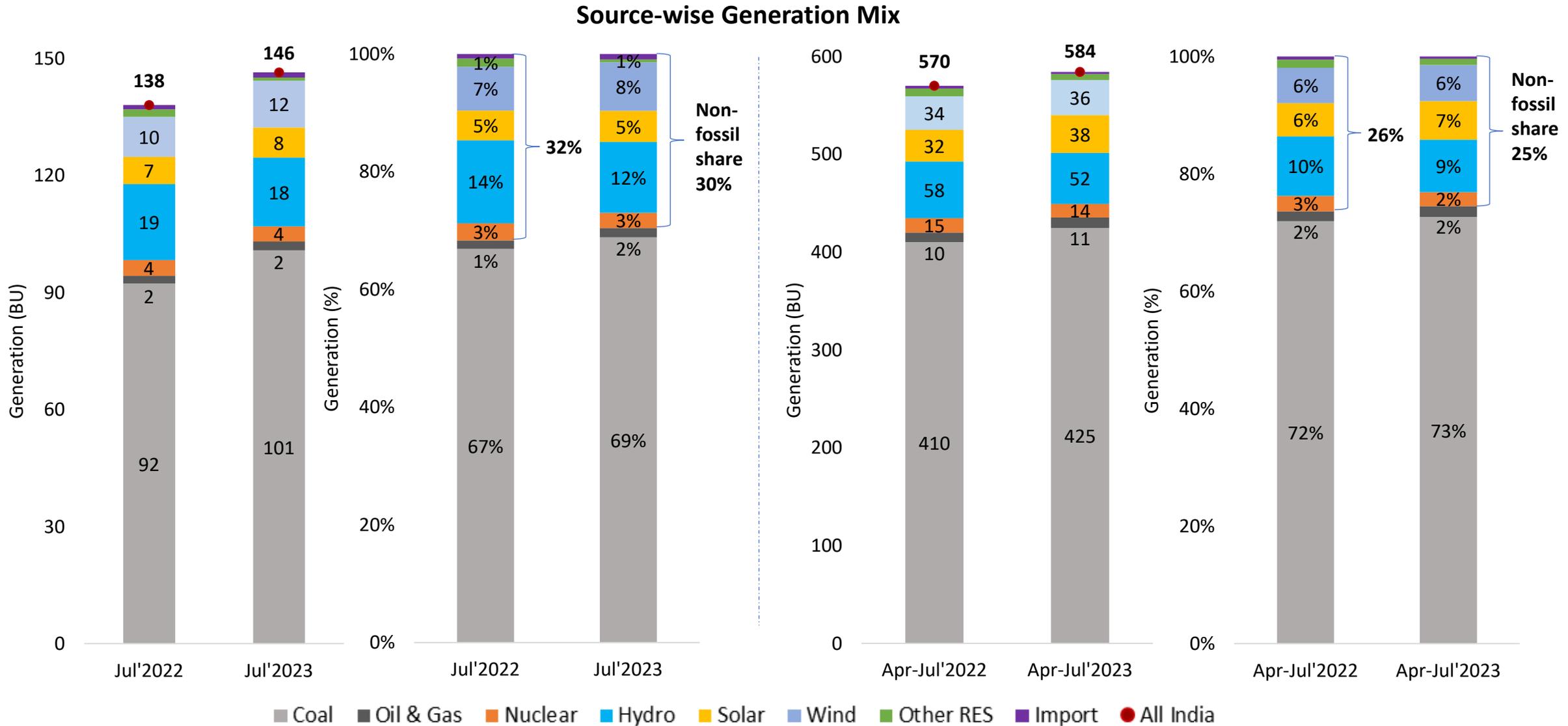
State Potential (GW)  0.0 271.9



National Potential (MNRE)- 1656 GW

Source- MNRE

India's Electricity Generation Mix

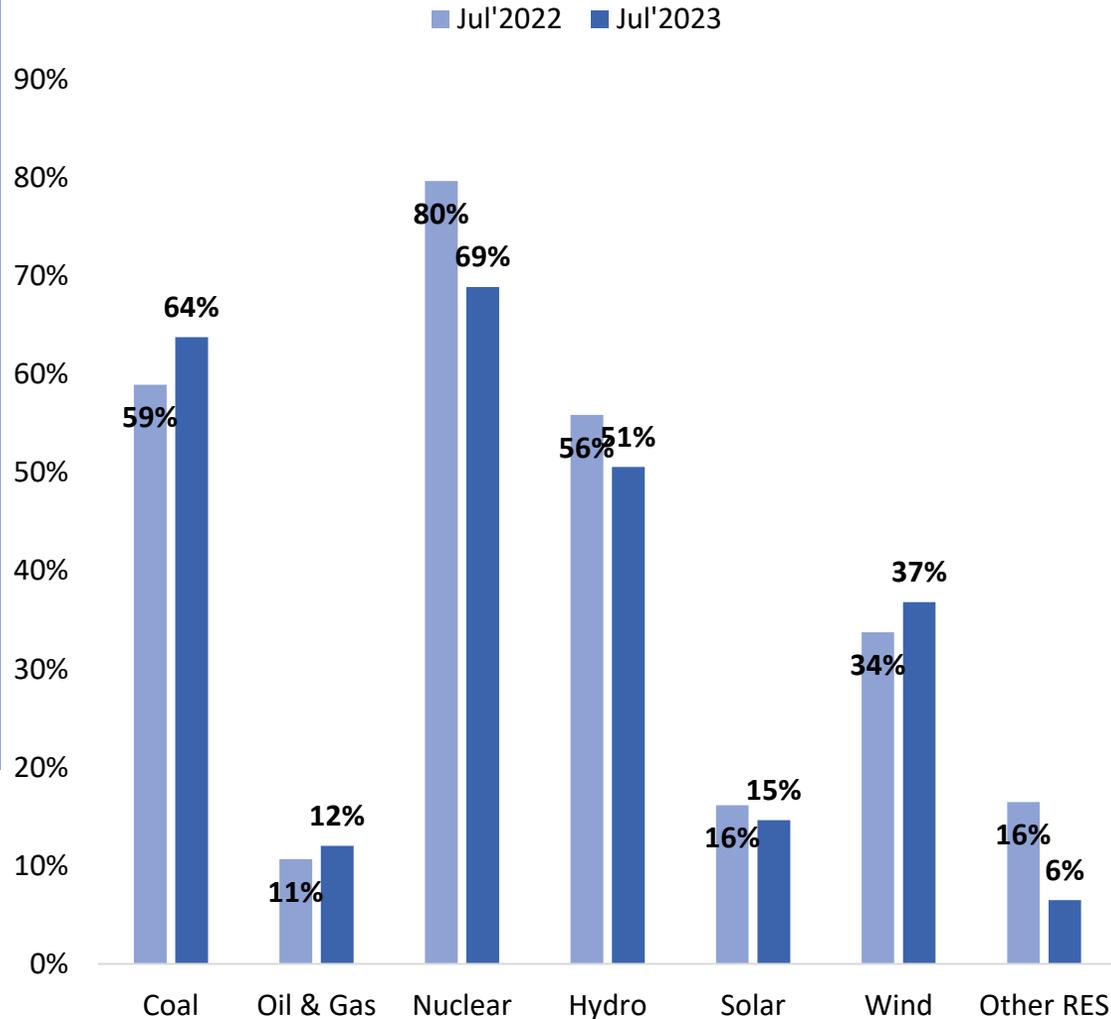


NOTE: The generation data for Jul'2023 is provisional.

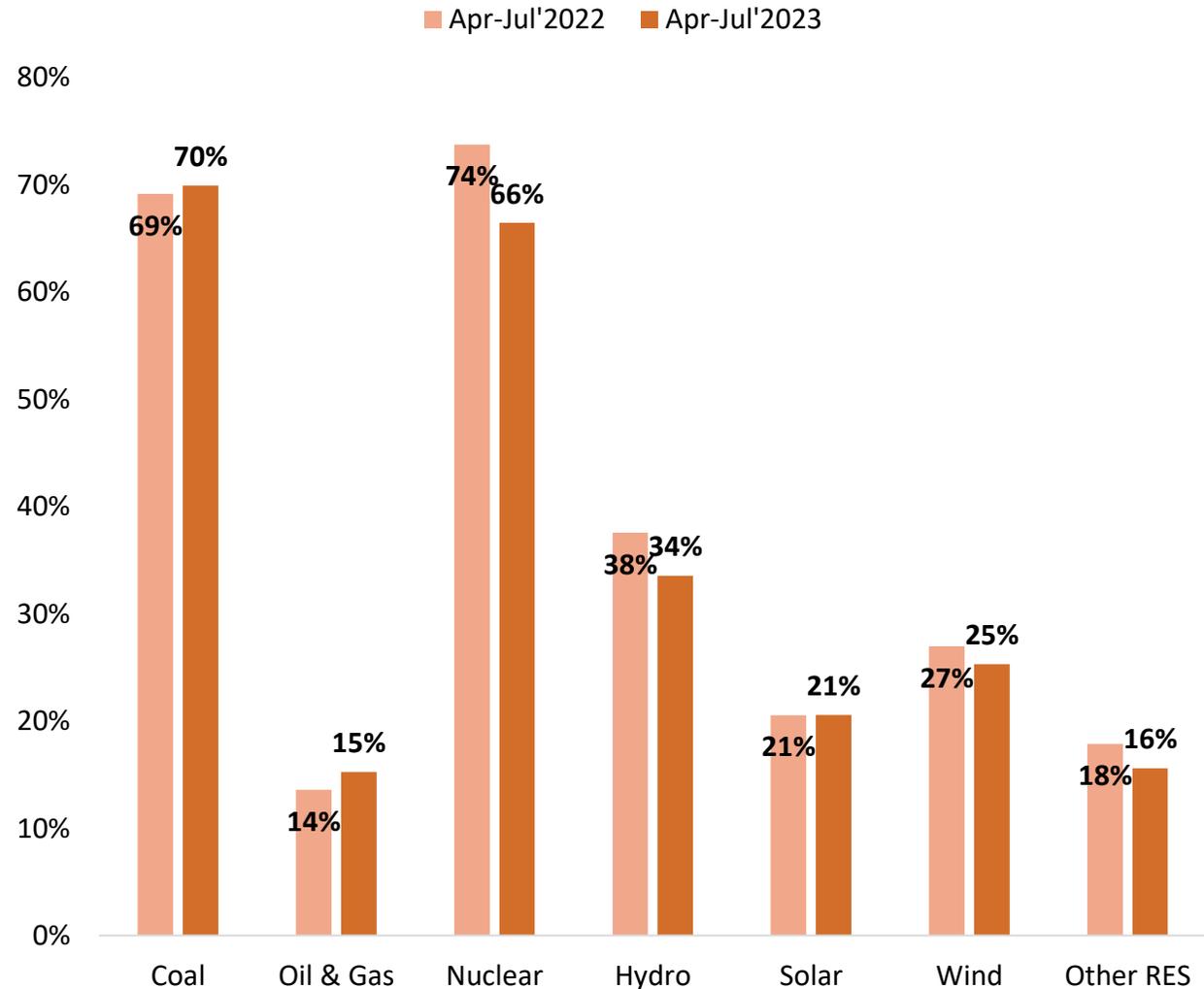
Source: CEA

Source-wise PLF/CUF

Source-wise PLF/ CUF in July (%)



Source-wise PLF/ CUF Comparison (%)

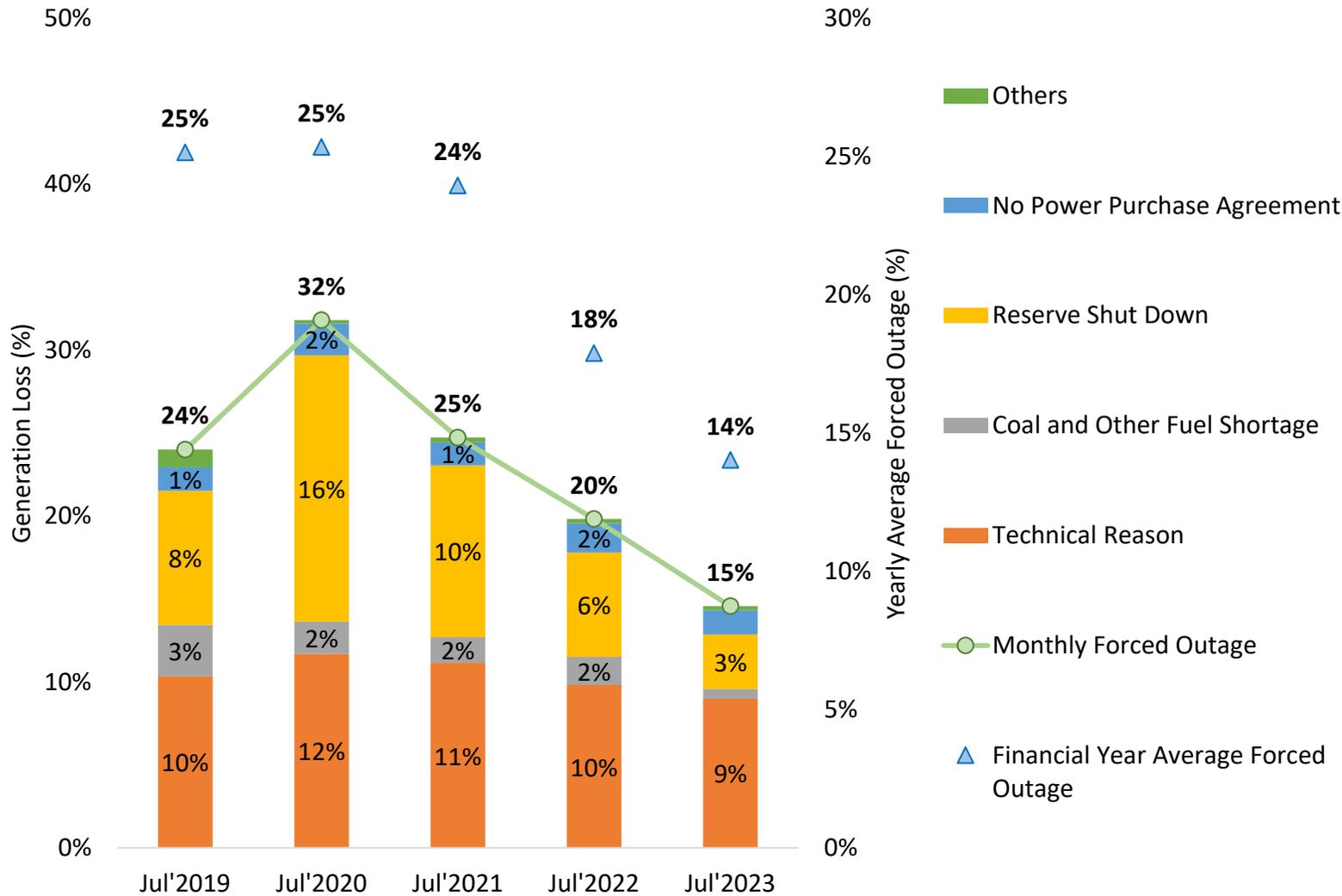


NOTE: The PLF/CUF data is based on provisional generation for Jul'2023.

Source: CEA & MNRE

Thermal Generation Loss and Reasons for Forced Outages

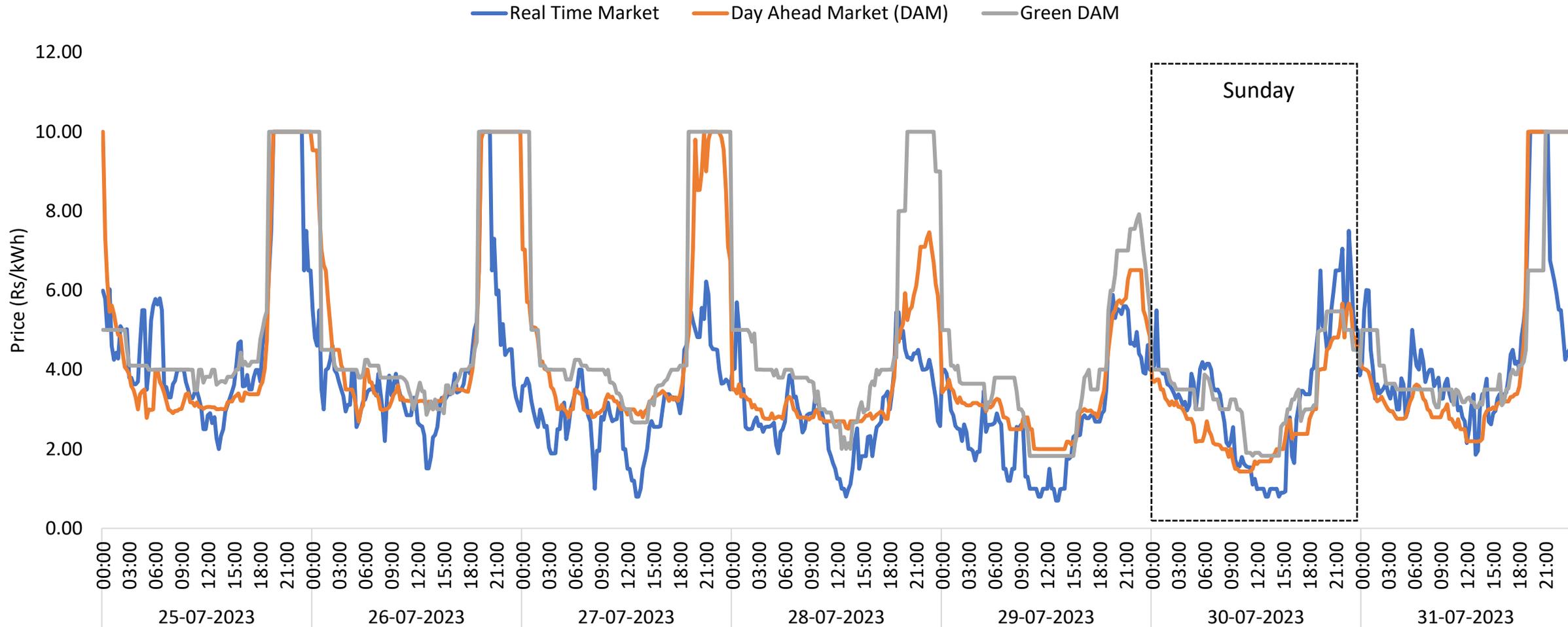
Forced Outages for July over the years



Year/ Month		Average Forced Outage Share
Yearly	FY 2021-22	24%
	FY 2022-23	18%
	FY 2023-24 (up to Jul'2023)	14%
Monthly	Jul'2021	25%
	Jul'2022	20%
	Jul'2023	15%

Indian Electricity Exchange (IEX) Market Snapshot

Market Clearing Prices of last 7 days of July 2023



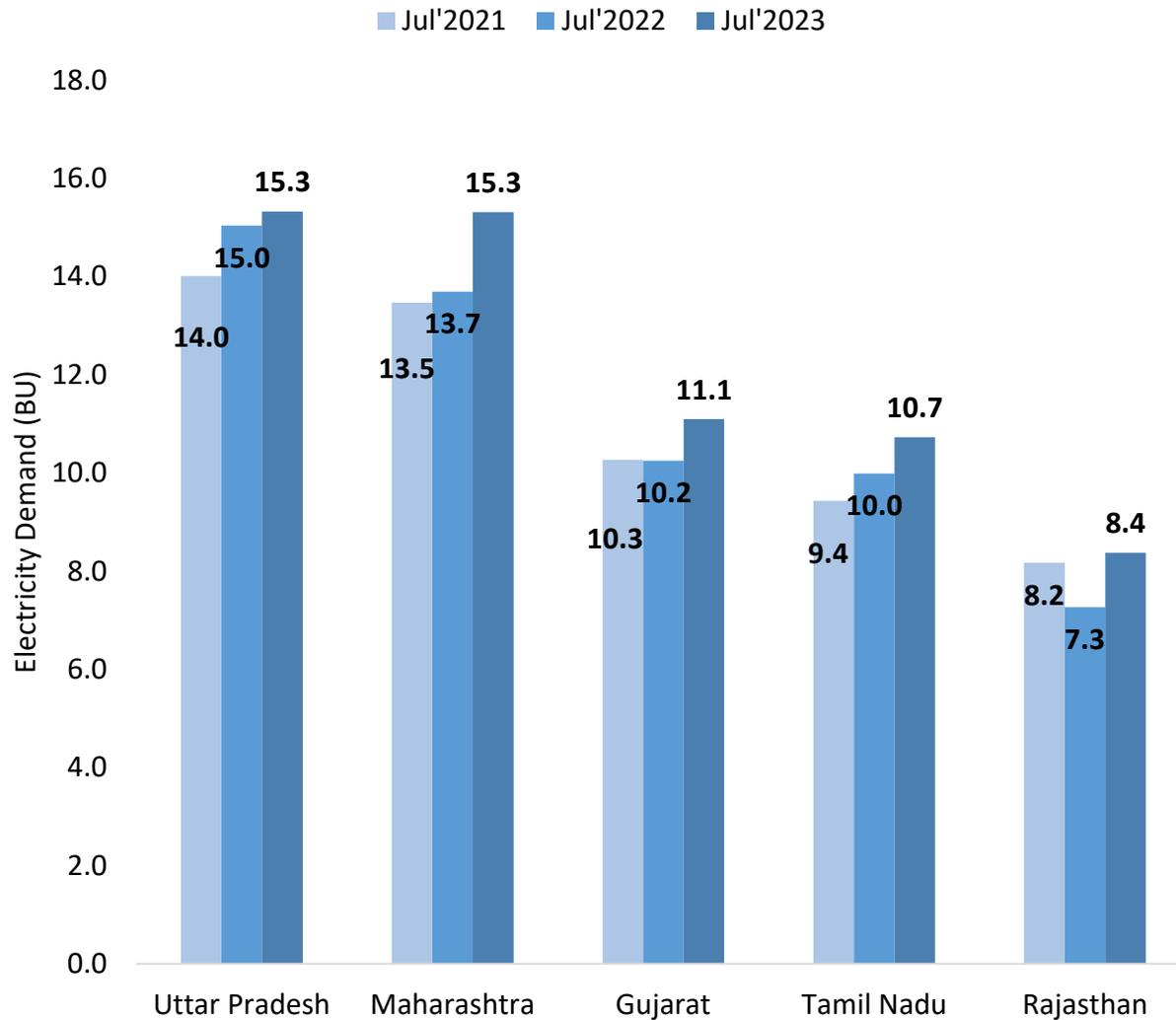
In April 2023, CERC revised the price ceiling from ₹12/kWh to ₹10/kWh in the power exchange market.

India's Monthly Electricity Requirement and Supply

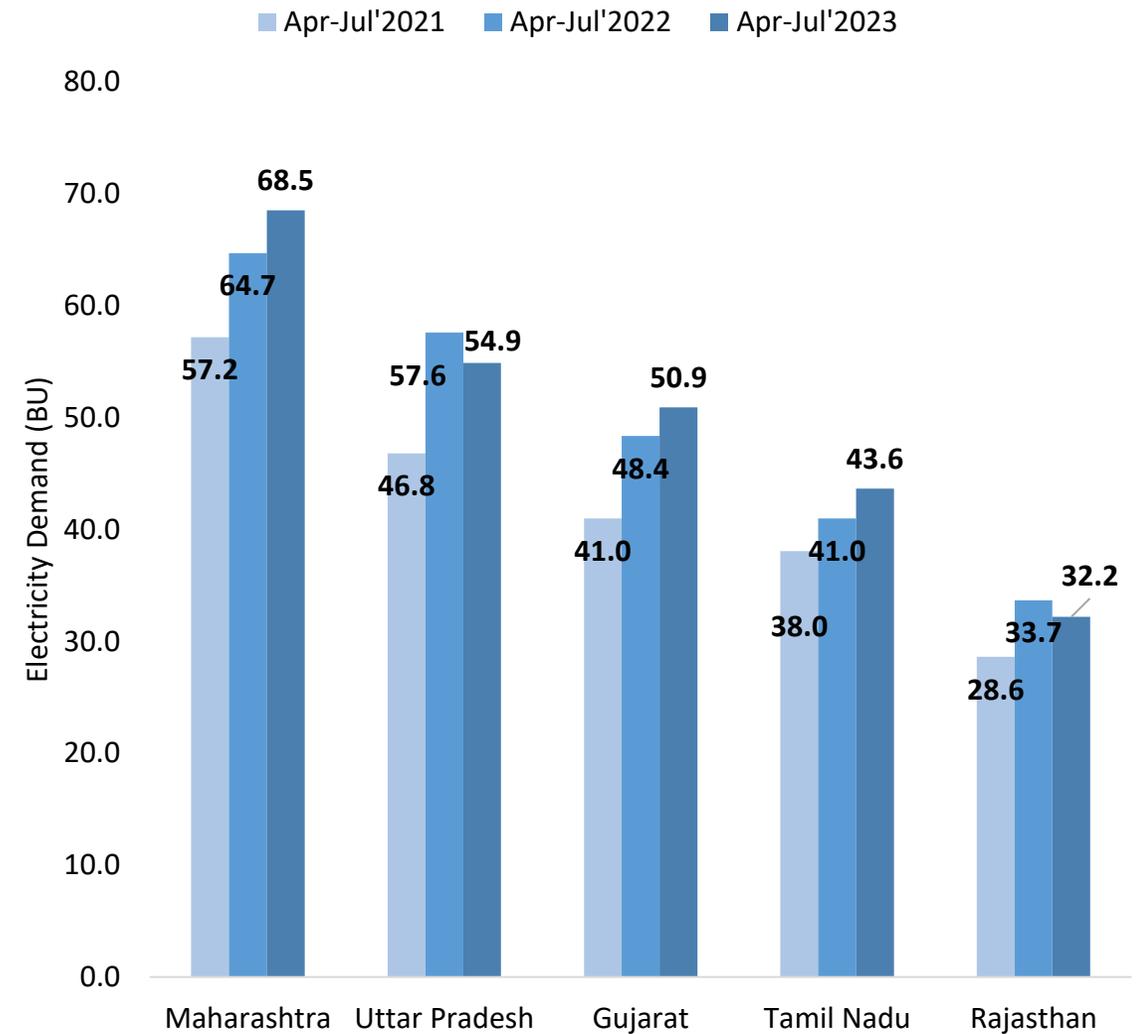


Monthly Electricity Demand of the top 5 states

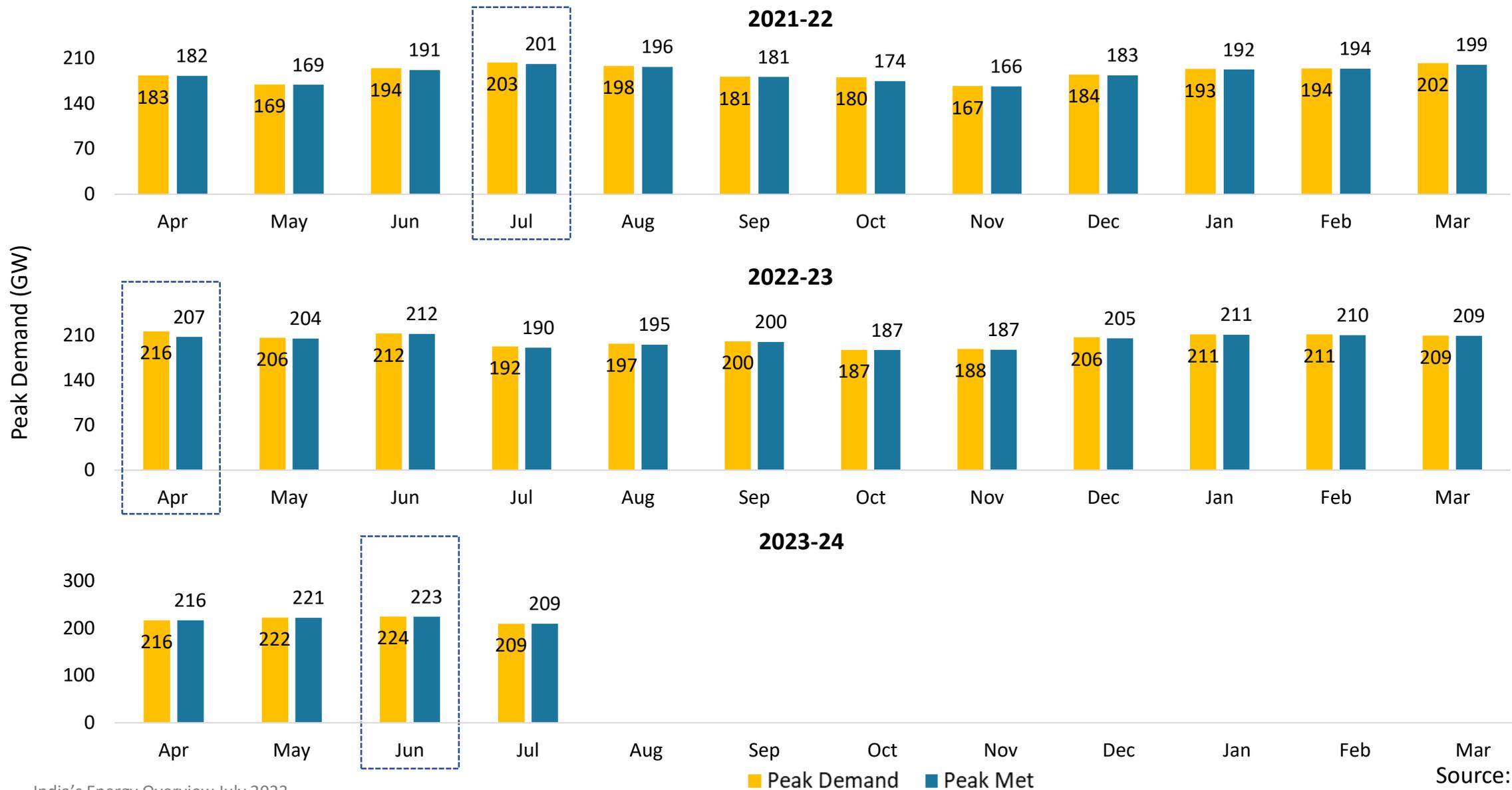
States with Highest Electricity Demand in July (BU)



States with Highest Electricity Demand (BU)

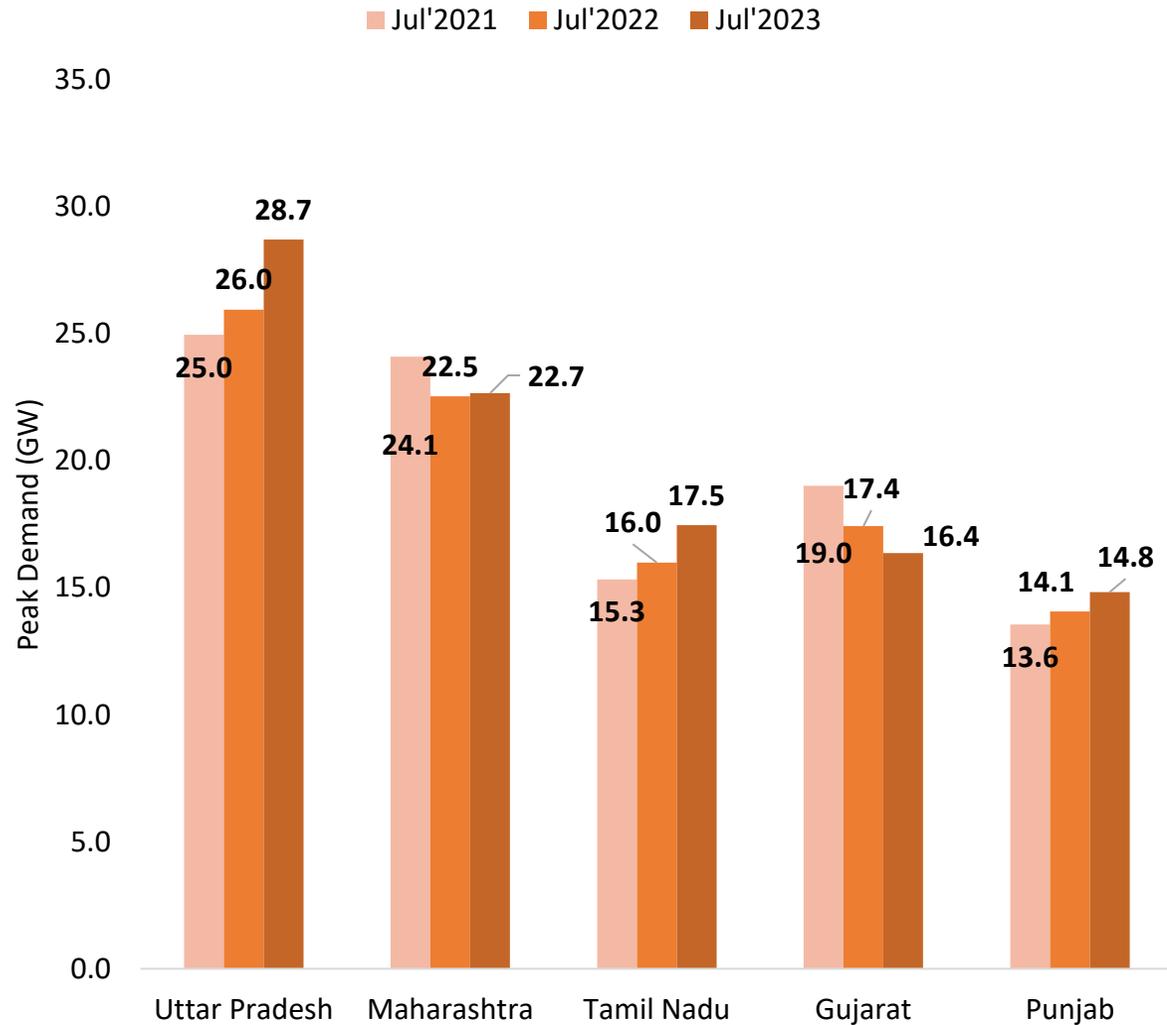


India's Monthly Peak Electricity Demand and Supply

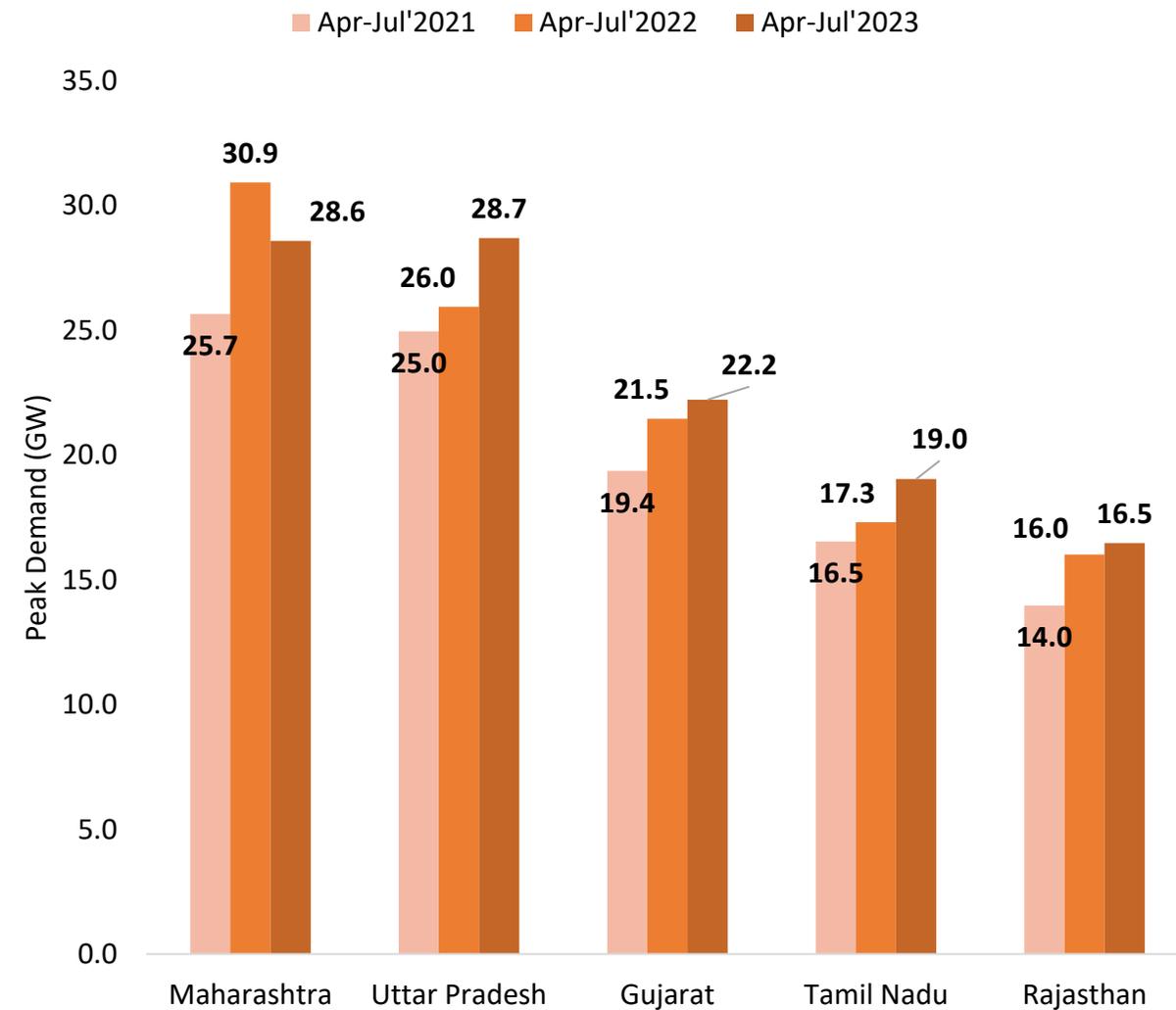


Monthly Peak Electricity Demand of the top 5 states

States with Highest Peak Electricity Demand in July (GW)

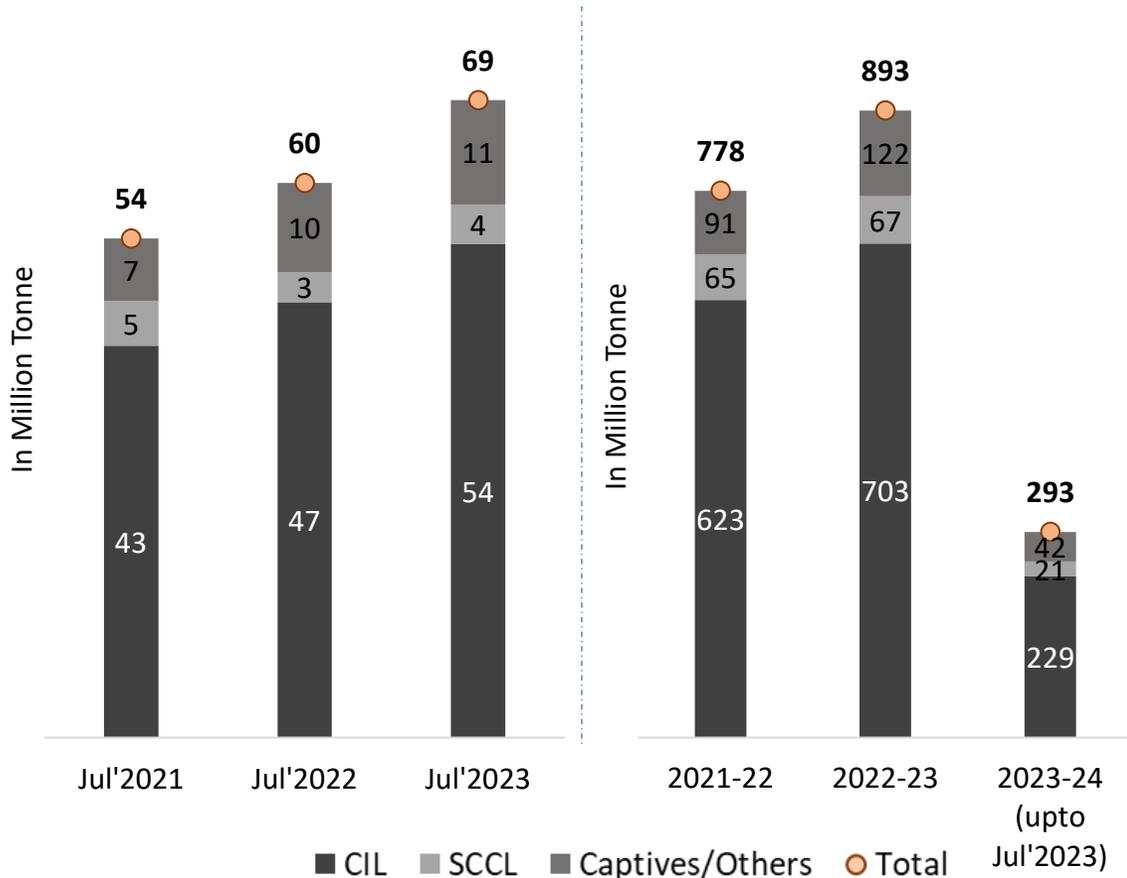


States with Highest Peak Electricity Demand (GW)



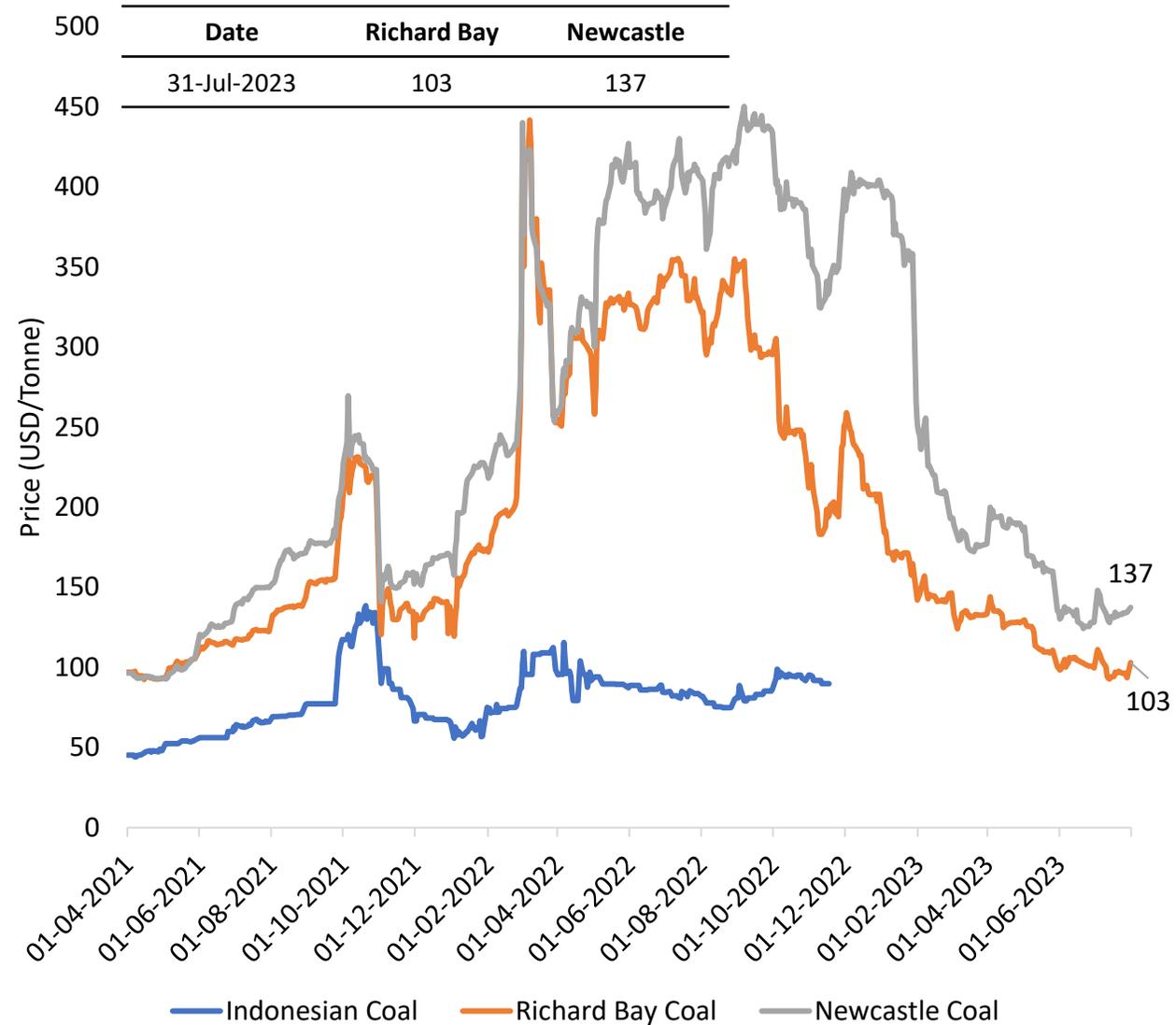
Monthly Coal Statistics

Monthly/ Annual Coal Production (in Million Tonnes)



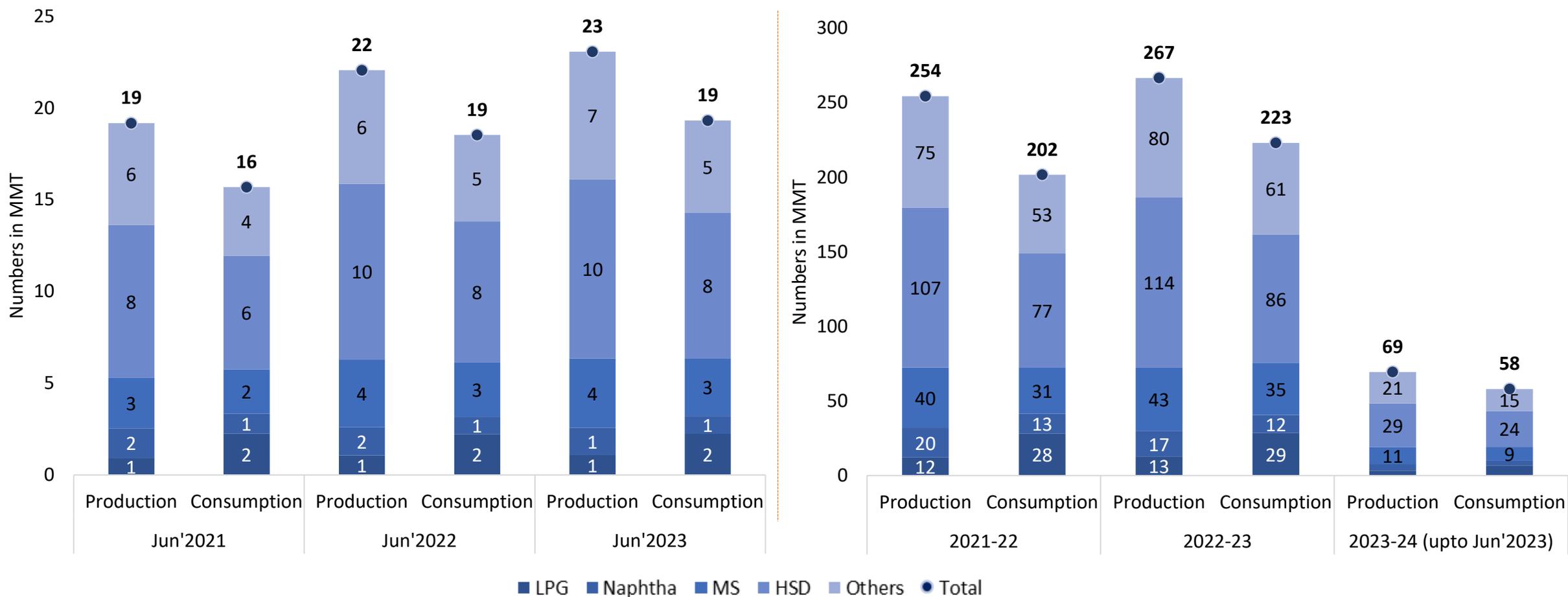
India's coal production increased in Jul'2023 (69 MT) by 15% as compared to Jul'2022.

International Coal Prices



Petroleum Products Market Scenario (1/3)

Petroleum Product-wise Production & Consumption (MMT)



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

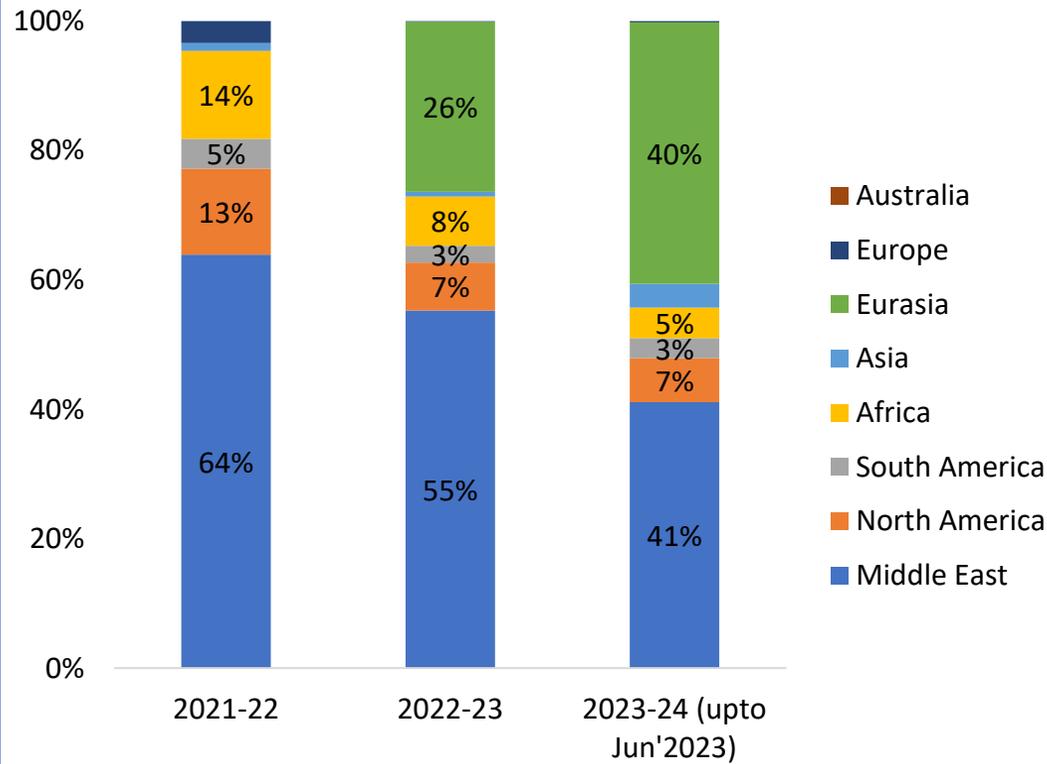
Petroleum Products Market Scenario (2/3)

Import/Export of Crude Oil and Petroleum Products ('000 Tonnes)							
Petroleum Products	Import/ Export	Monthly			Yearly		
		Jun'21	Jun'22	Jun'23	2021-22	2022-23	2023-24 (up to Jun'2023)
Crude Oil	Import	15905	19441	19182	212382	232732	59708
	Export	0	0	0	0	0	0
	Net Import	15905	19441	19182	212382	232732	59708
LPG	Import	1389	1264	1320	17043	18309	3769
	Export	36	50	41	513	534	127
	Net Import	1353	1214	1279	16530	17775	3642
Diesel	Import	1	115	6	43	328	14
	Export	2834	2456	1949	32407	28535	6235
	Net Import	-2832	-2342	-1943	-32364	-28206	-6221
Petrol	Import	0	127	146	671	1069	146
	Export	1146	1162	1225	13482	13118	3733
	Net Import	-1146	-1034	-1079	-12812	-12049	-3587
Others	Import	1405	1633	2133	21259	24835	6460
	Export	1496	1839	1797	16352	18853	4590
	Net Import	-91	-205	336	4907	5983	1870

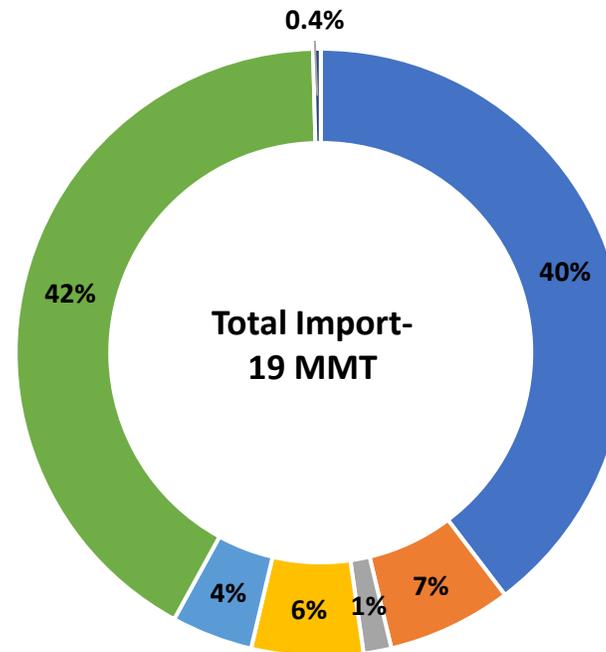
*Others include ATF, Naphtha, SKO, LDO, Lubes, FO, LSHS, Bitumen, pet coke, and others.

Petroleum Products Market Scenario (3/3)

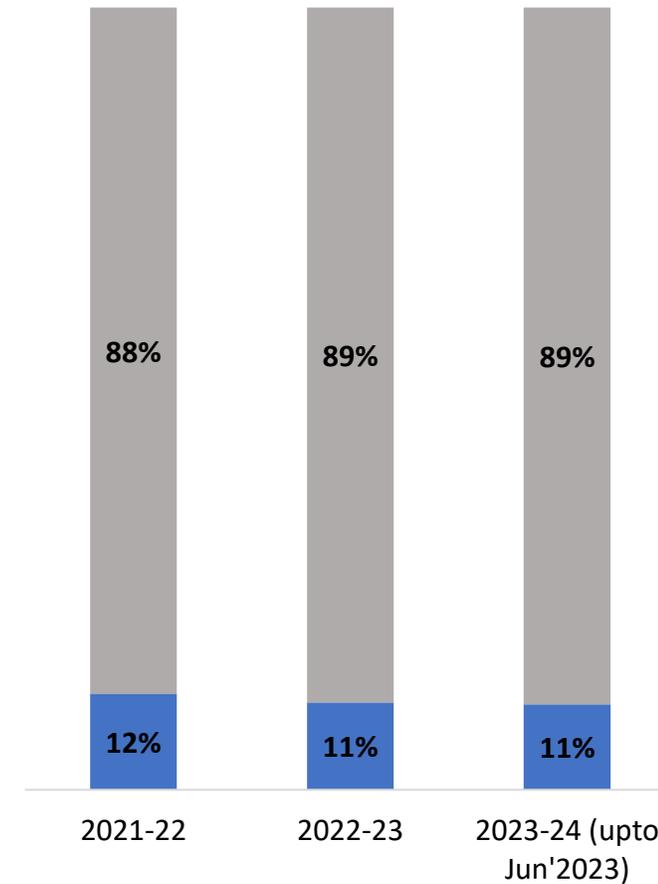
Region-wise Share in Import of Crude Oil (%)



Regional share of Imported Crude oil in Jun'2023



Domestic and Imported Crude Oil share in India (%)



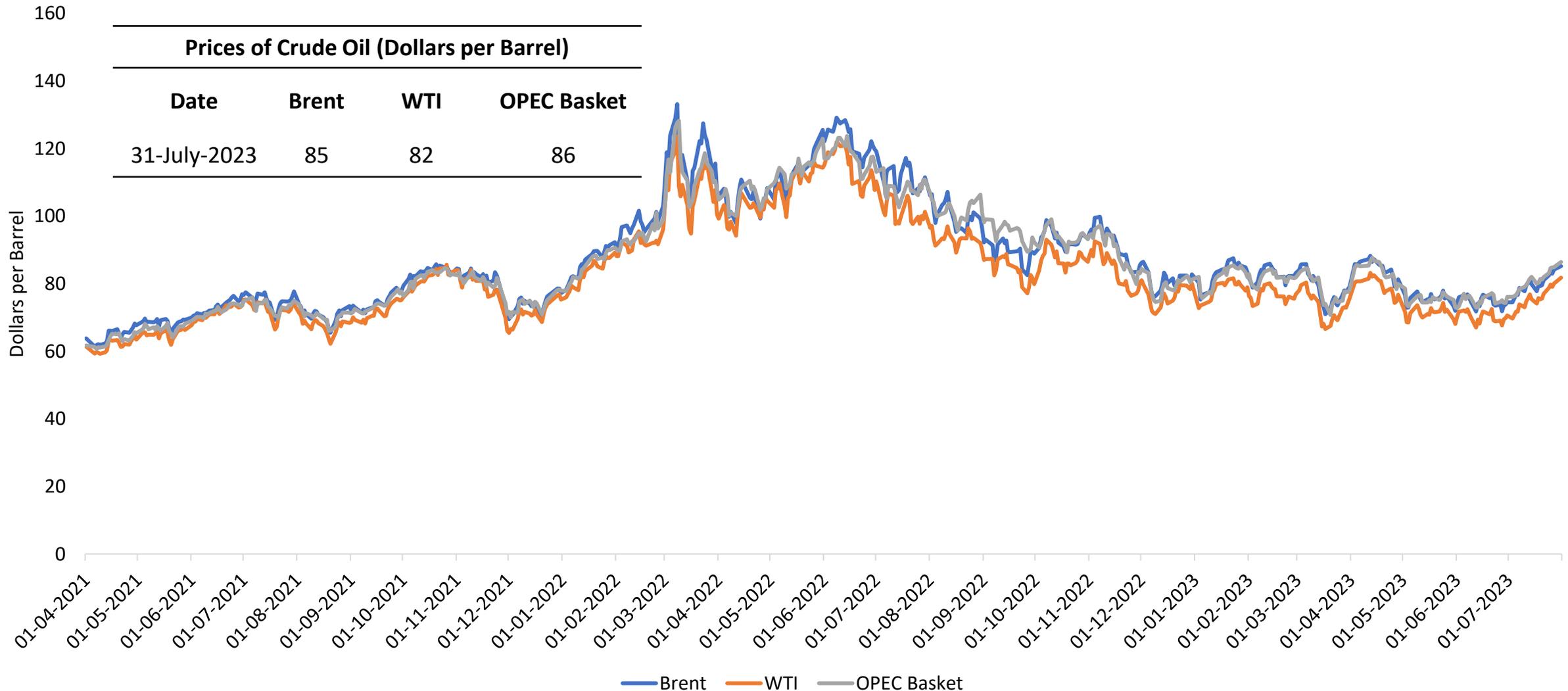
Total Import of Crude Oil (MMT)

Total Import	2021-22	2022-23	2023-24 (up to Jun'2023)
Crude Oil	212	233	60

■ Domestic Crude Oil ■ Imported Crude Oil

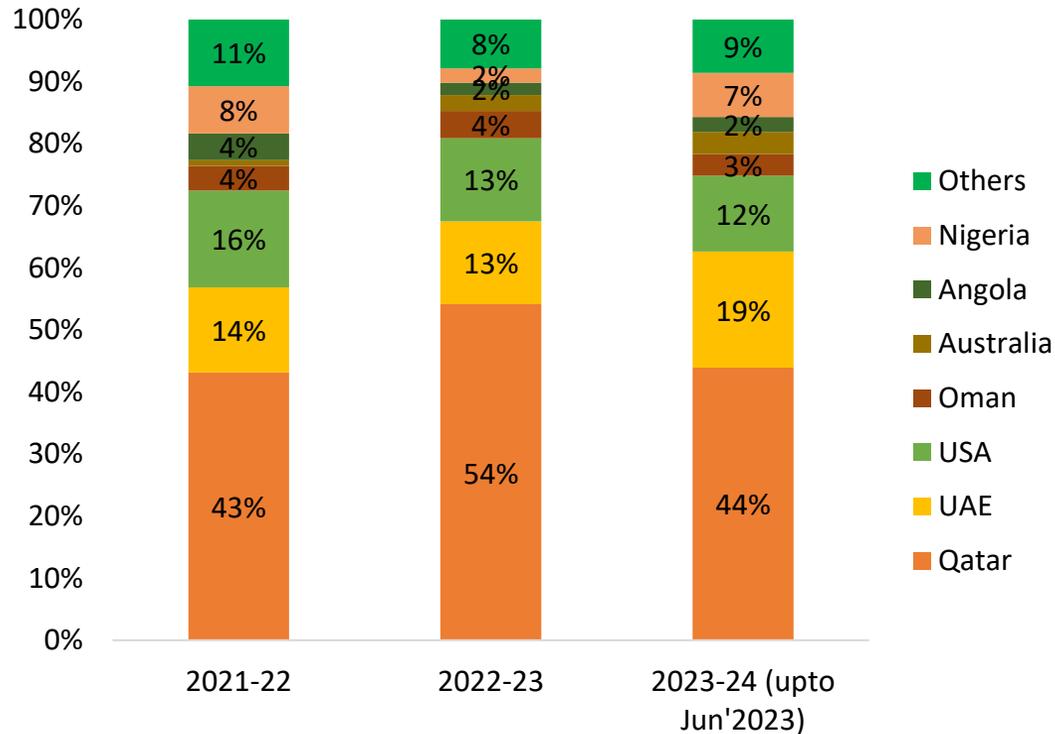
Daily Prices of Crude Oil

Daily Prices of Crude Oil

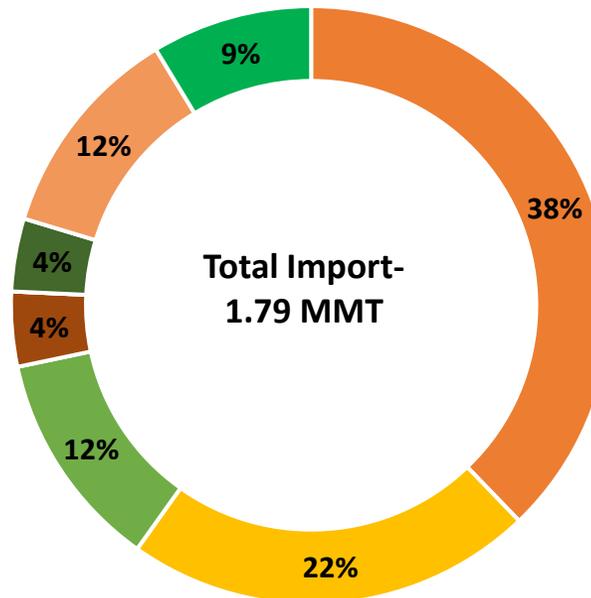


Gas Market Scenario

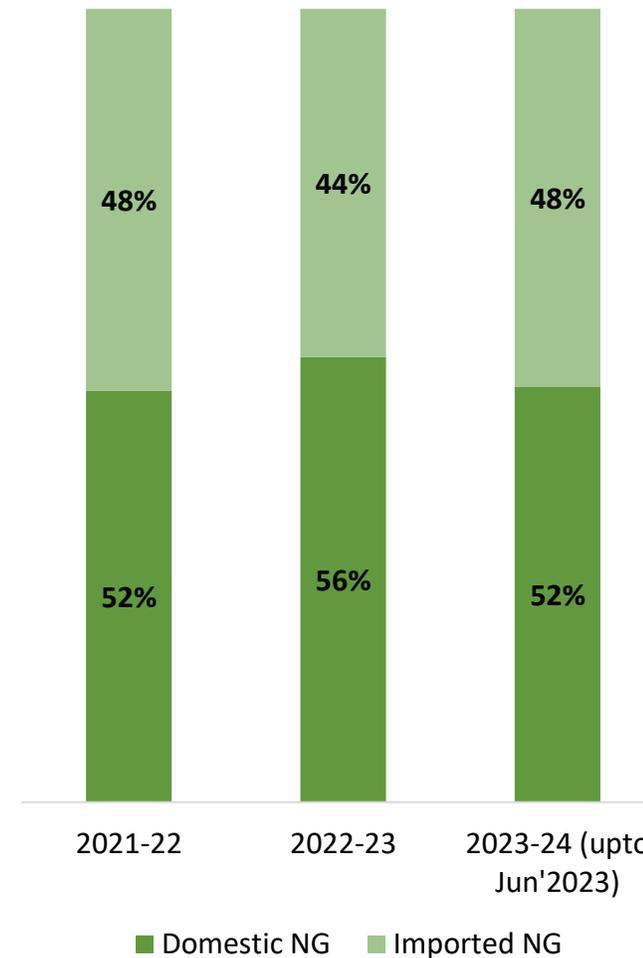
Region-wise Share in Import of LNG (%)



Country Share of Imported LNG in Jun'2023



Domestic and Imported Natural Gas share in India (%)

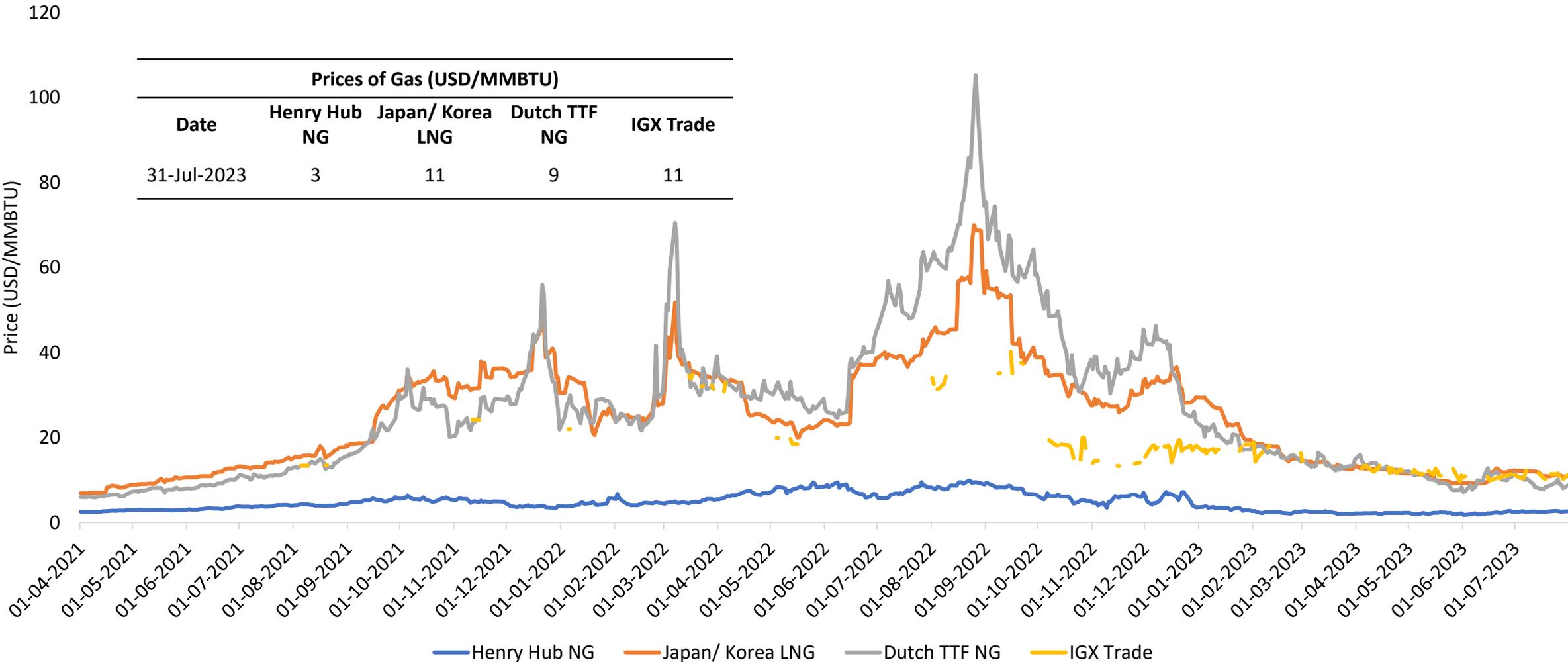


Others include- Equatorial Guinea, Trinidad, Cameroon, Egypt, France, Algeria, Belgium, Indonesia, Turkey, Russia, Spain, Malaysia, Brunei, Netherlands, Norway, and others.

Total Import of Liquefied Natural Gas (LNG) (MMT)			
Total Import	2021-22	2022-23	2023-24 (upto Jun'2023)
LNG	23.42	19.85	5.85

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
31-Jul-2023	3	11	9	11

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 July 2023

- The Ministry of Power notified the [Electricity \(Amendment\) Rules, 2023](#). The key changes are:
 - Qualification criteria for captive generators: a power plant may qualify to be a captive generation plant if the captive user owns at least 26% of the generation plant and if the plant is established by a captive user's affiliate company, the captive user must own at least 51% of that company.
 - Uniform RE Tariff: The amendment changes the basis of tariff calculation from energy supplied to energy scheduled. Also, the RE tariff will be set by the intermediary between the discom and the generation company. It also specifies that the RE tariff will only be applicable to discoms and open-access providers.
- The CEA has released the [Amendment to the Procedure for approval and facilitating Import/Export \(Cross Border\) of Electricity by the Designated Authority](#). The key changes are:
 - Participation of entities of neighboring countries in the Real-Time Market (RTM) segment of Indian power exchanges may be permitted on a case-to-case basis.
 - Indian power traders, on behalf of entities from neighboring countries with power cooperation agreements with India, can trade in Indian Power Exchanges (DAM/RTM/Both DAM and RTM segment) up to a specified quantum (MW) and duration, subject to approval from the Designated Authority.
- Grid Controller of India Limited has released the [“Procedure for Grant of Green Energy Open Access”](#). The procedure outlines the guidelines for the grant of Green Energy Open Access in accordance with the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022.
- The Ministry of Power notified the [Electricity \(Second Amendment\) Rules, 2023](#) on 26th July 2023. These new rules seek to streamline subsidy accounting and payment, establish a financial sustainability framework, and set prudent cost management guidelines.
- MNRE has unveiled a [draft Research & Development Roadmap for Green Hydrogen Ecosystem in India](#). The roadmap recommends research and development actions to improve the efficiency, reliability, and cost-effectiveness of green hydrogen production, storage, and transportation as the nation aims to become a global hub of green hydrogen.

Key Highlights or Announcements of July 2023

- CEA released the [Guidelines for Medium and Long-Term Power Demand Forecast](#). It aims to provide a basic framework of medium-term (1 to 5 years) and long-term (at least 10 years) power demand forecasts for discoms/state/union territory.
- Ministry of New and Renewable Energy has released the **guidelines for a tariff-based competitive bidding process for procurement power from grid-connected [solar](#) and [wind](#) power projects**. The key highlights are:
 - Applicable for solar with or without energy storage projects through competitive bidding.
 - For wind power projects the procurer is given an option to conduct reverse bidding if it wants. In such a case the same will be clearly specified in the bid document.
 - Penalty for not meeting the minimum CUF. The penalty will be calculated at 50% of the PPA tariff for wind and solar for the shortfall in energy terms.
 - The commissioning timeline will be 24 months for projects till 1 GW and 30 months for project capacity beyond 1 GW.
 - Delay beyond 6 months of the scheduled commissioning date will lead to the bidder being debarred from bidding in any tenders by any procurer/intermediary procurer for a period of 1 year for 1st default and thereafter for 2-3 years for any future defaults.
- In July 2023, the Government of Maharashtra released the **Maharashtra Green Hydrogen Policy 2023** to promote renewable energy and green hydrogen projects with an outlay of Rs 8,562. The key highlights are:
 - 50% and 60% concessions in transmission charges and wheeling charges respectively for the next ten years from the implementation of the project.
 - Standalone and hybrid power plants will be given 100% concession in power tariff for the next 10 years and 15 years respectively and will also be exempted from cross-subsidy and surcharge.
 - Land designated for green hydrogen projects will receive complete exemptions from local body tax, non-agricultural tax, and stamp duty.
 - A subsidy of Rs 50 per kg will be provided for blending green hydrogen into gas for a period of 5 years.
 - First 20 green hydrogen refueling stations will receive a 30% capital cost subsidy, with a maximum limit of Rs 4.50 crore.
 - First 500 green hydrogen-based fuel cell passenger vehicles will be eligible for a capital cost subsidy of up to Rs 60 lakh per vehicle, subject to a 30% subsidy.
 - Rs 4 crore per annum for ten years for recruitment of skilled manpower, their training, skill development, single window facility



VASUDHA
FOUNDATION
Green ways for a good earth!

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