

# India's Energy Overview

June 2023



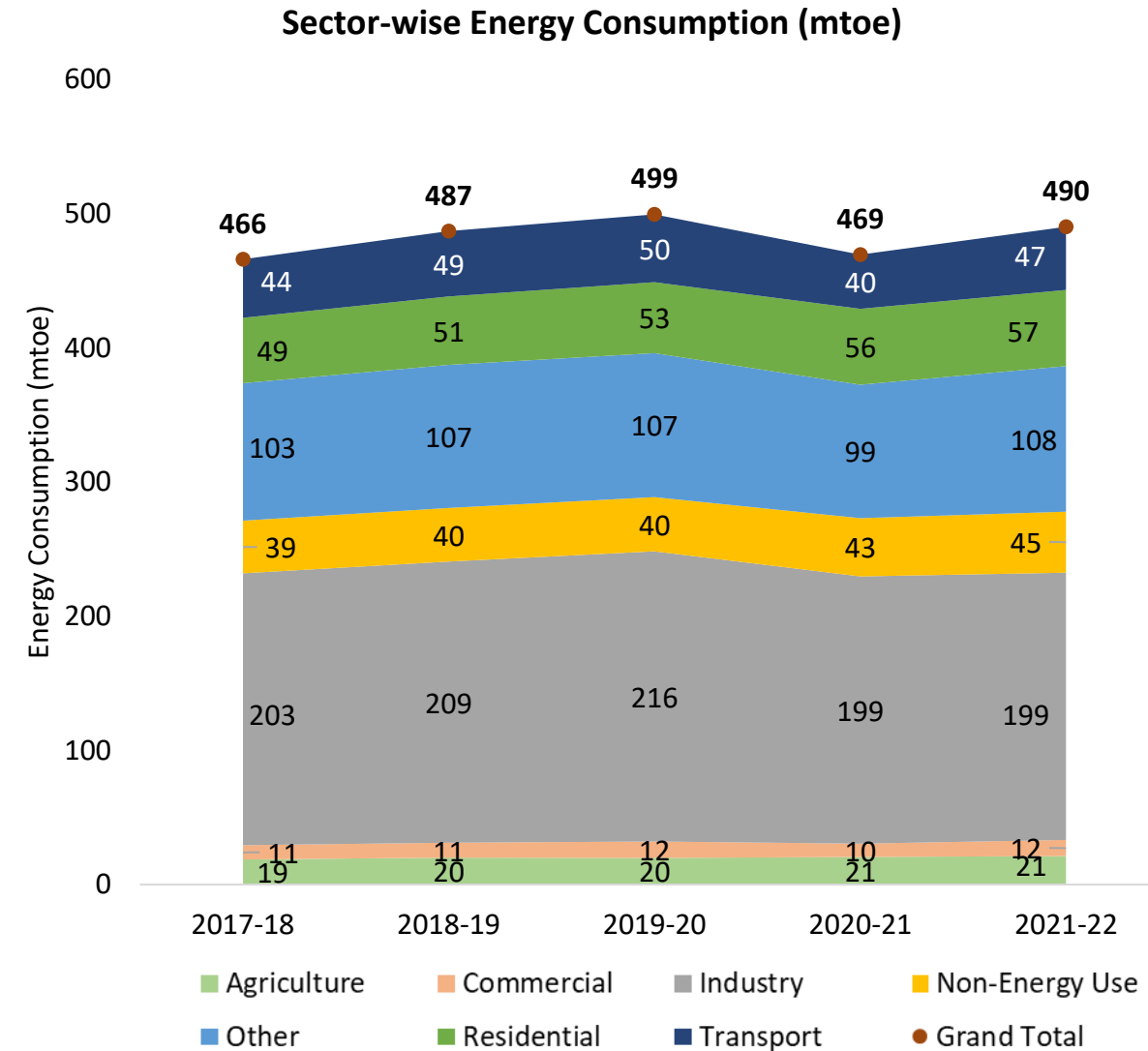
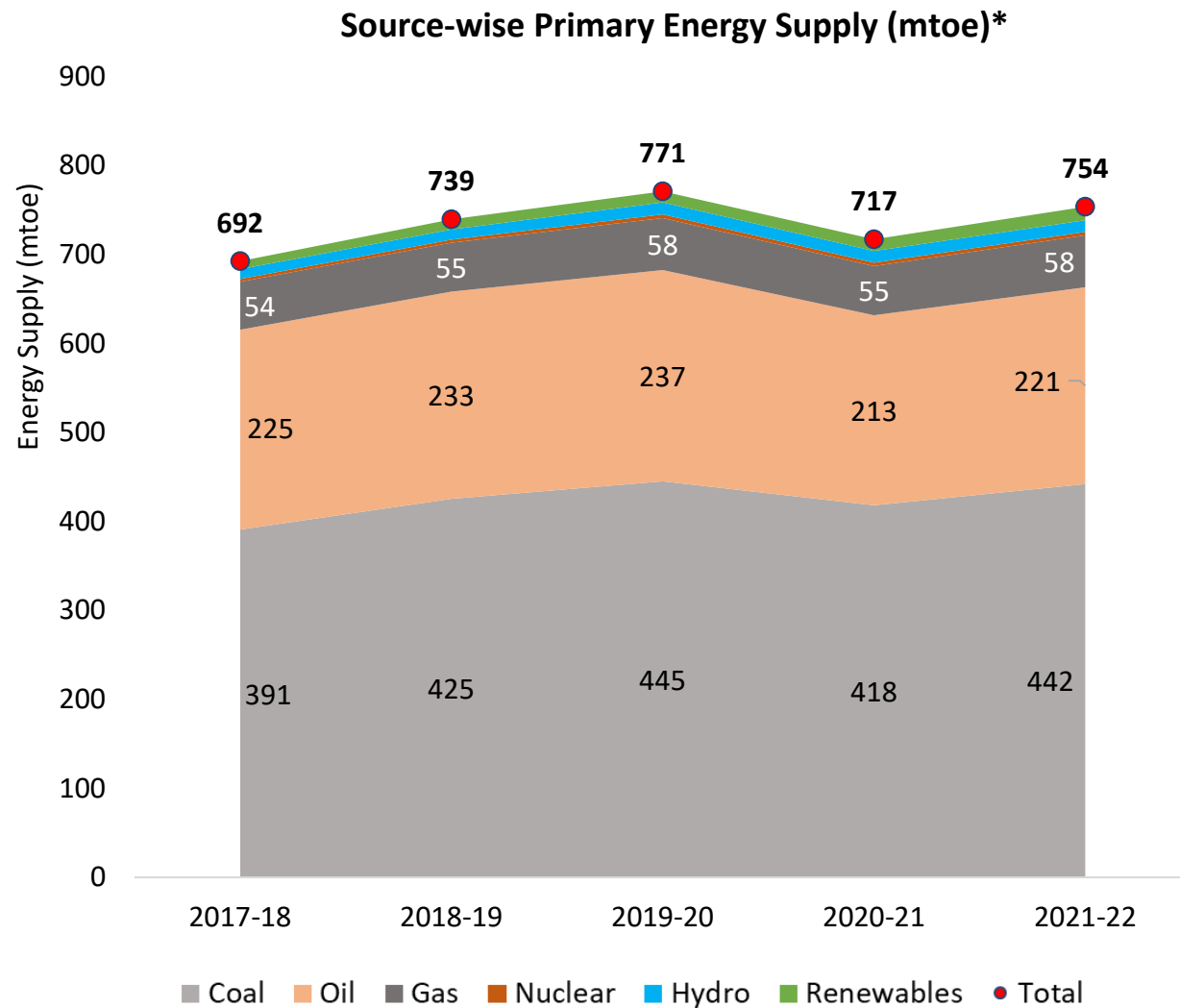
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Green ways for a good earth!

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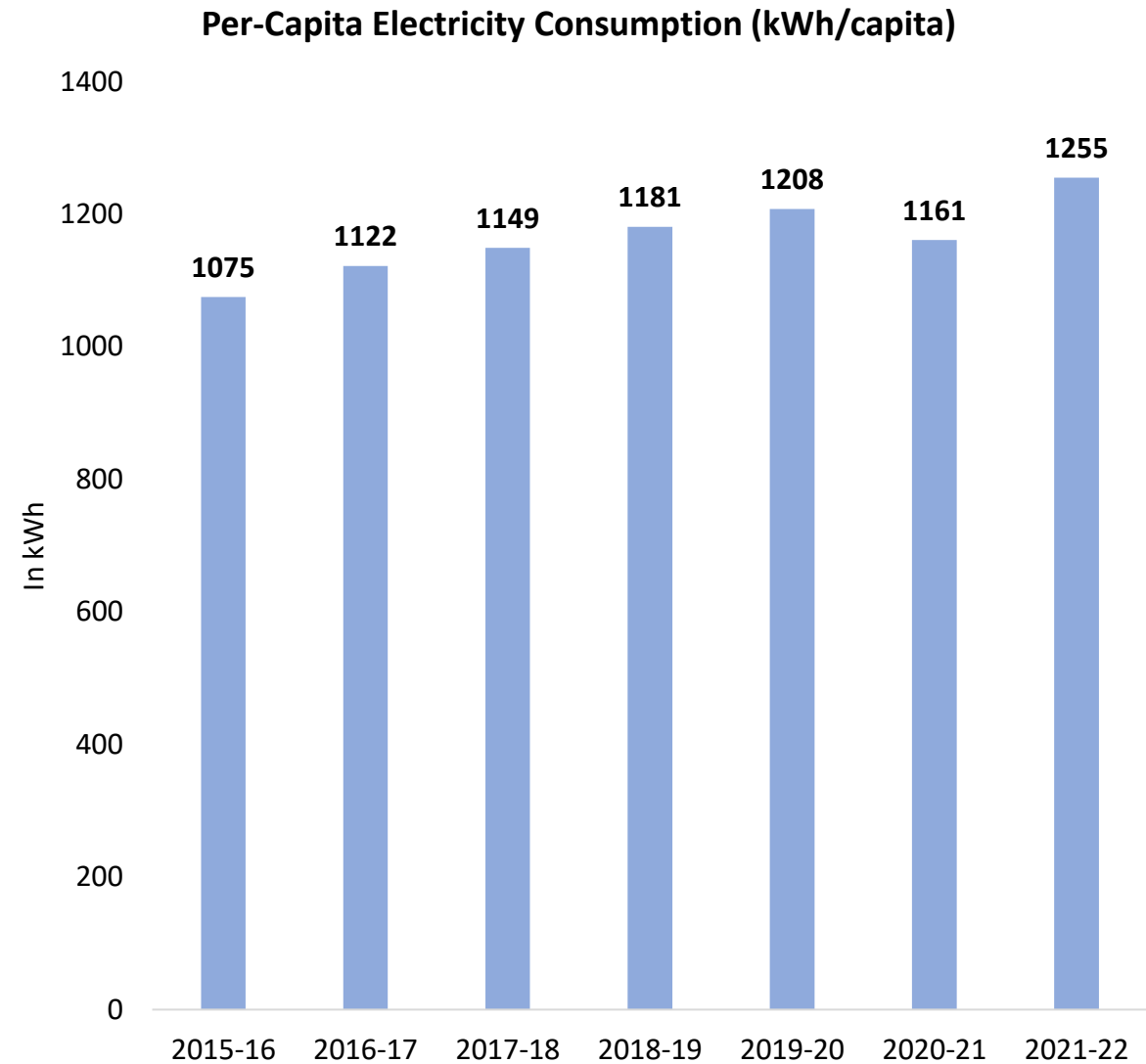
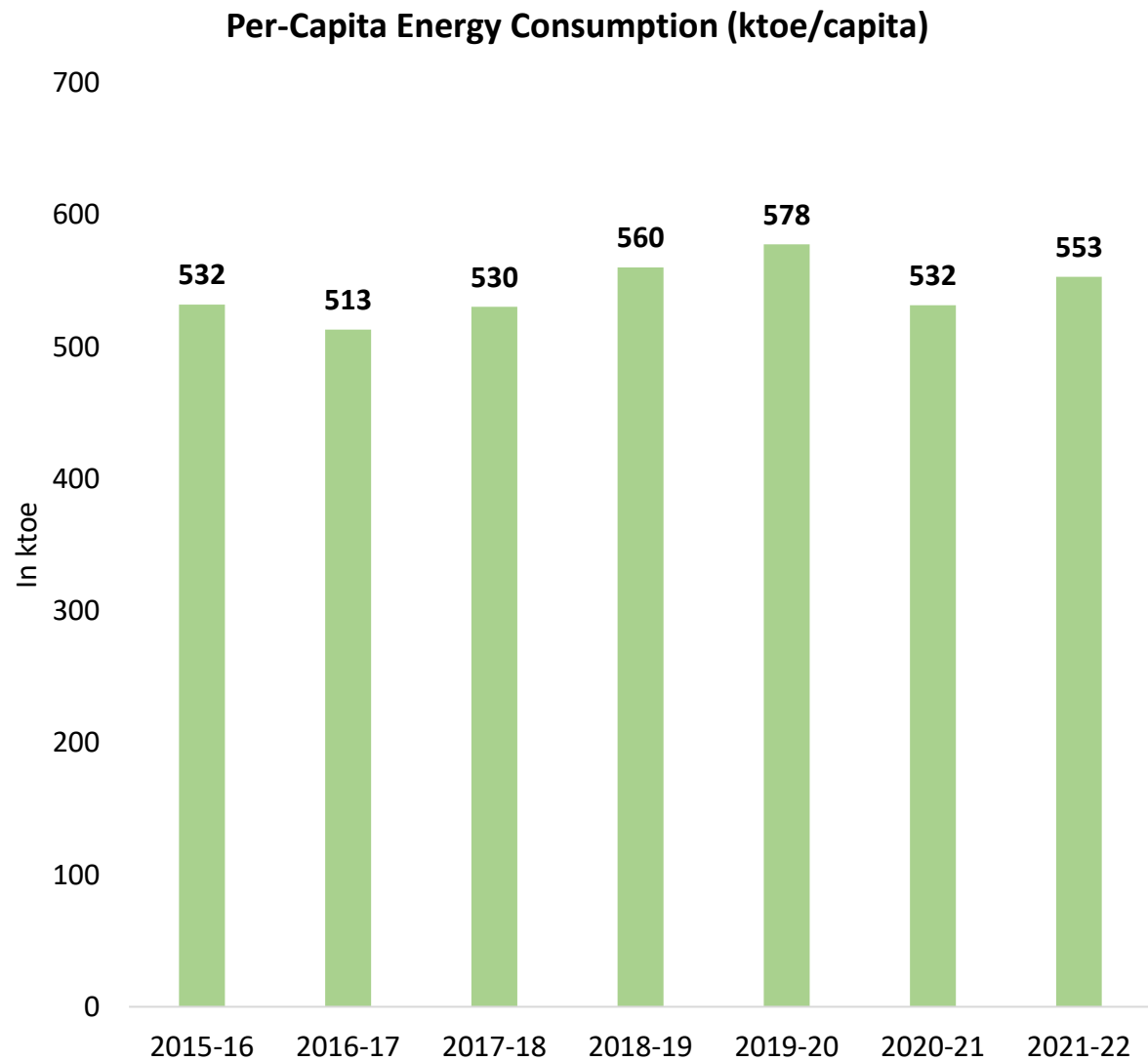
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# India's Energy supply\* and consumption mix

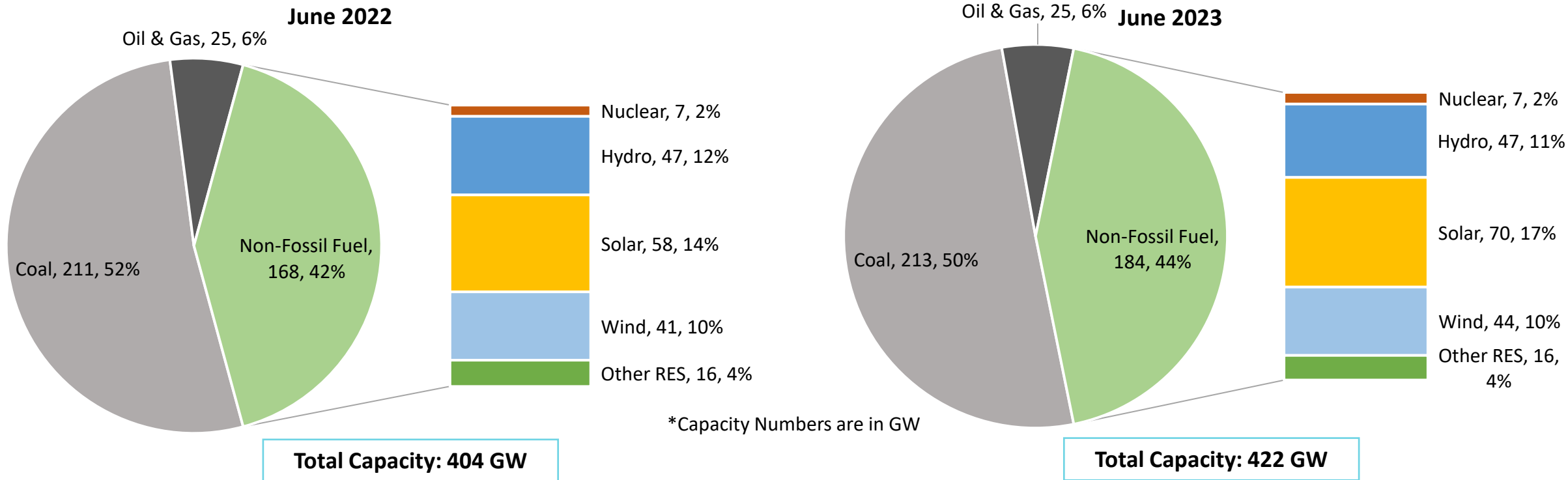


\*Excluding biofuels, waste, and other non-commercial source of energy

# Per-Capita Energy and Electricity Consumption

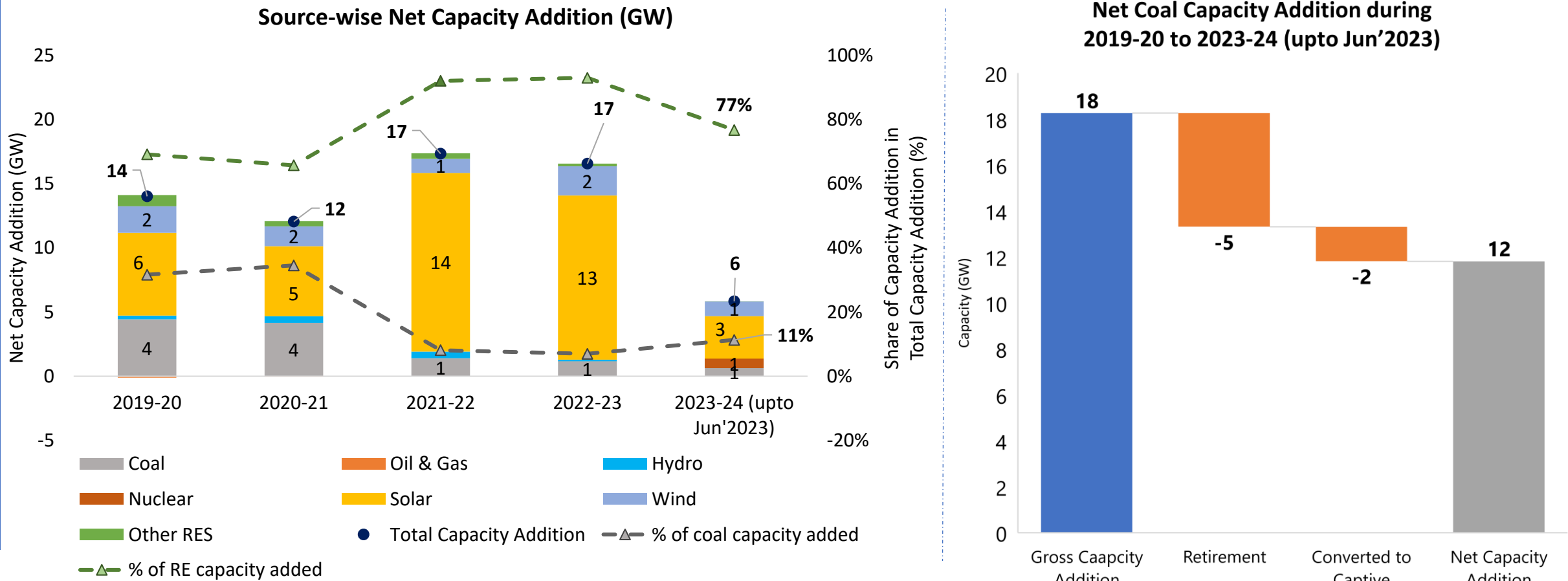


# India's Electricity Capacity Mix (Utility-scale)



- India's electricity generating capacity is 422 GW as on May'2023 [coal 213 GW (50%), solar 70 GW (17%), hydro 47 GW (11%), and wind 44 (10%)].
- As on Jun'2023, the share of non-fossil-based electricity capacity is 44% against the set target of 50% non-fossil capacity by 2030.
- As on Jun'2023, India's renewable energy capacity (including large hydro) stood at 176 GW out of 422 GW.

# India's Electricity Capacity Addition in last 5 years



- A total of 53 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).

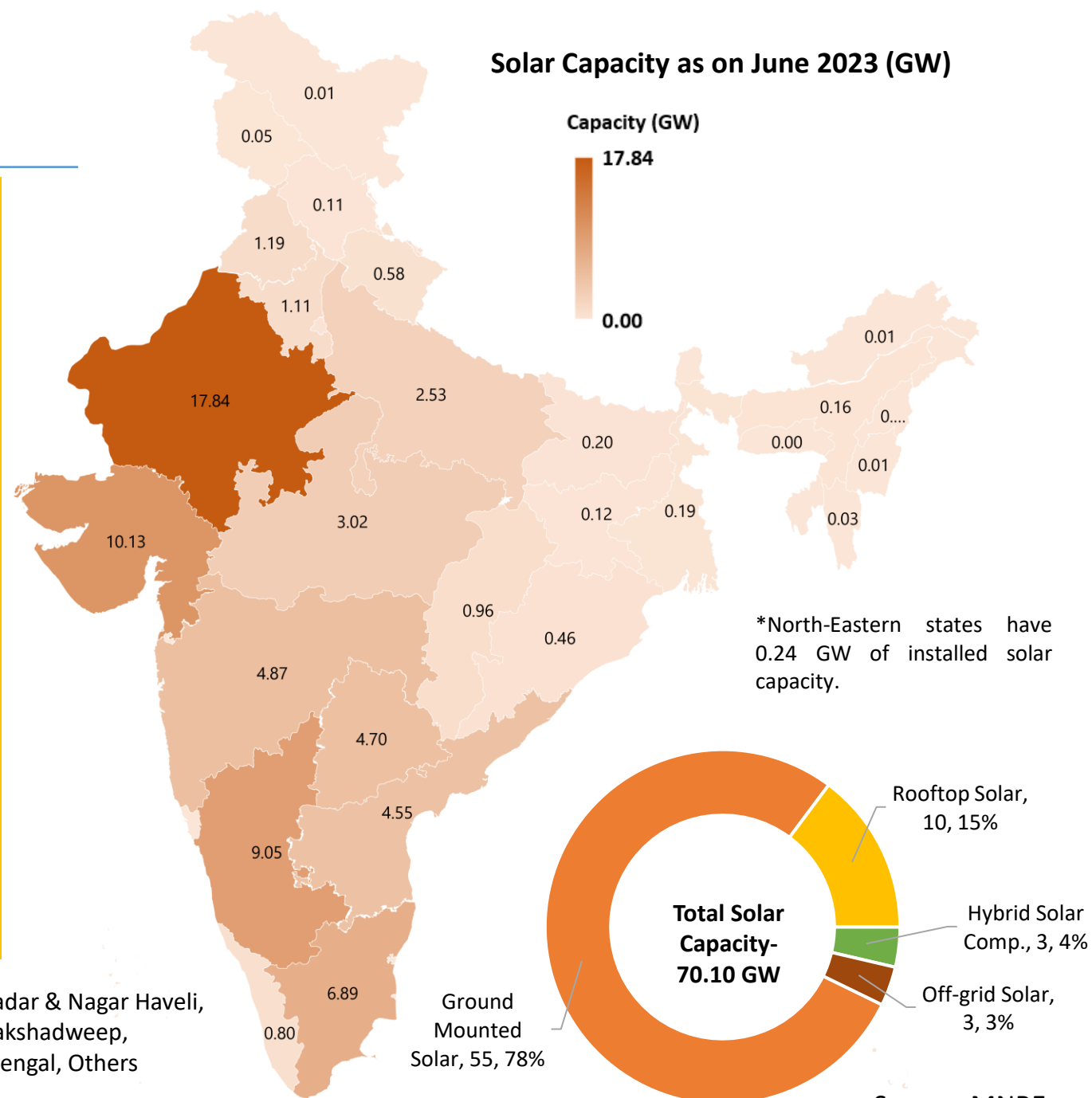
# State-wise Solar Capacity

as on June 2023

State-wise installed capacity of Solar Power (GW)					
States	Ground Mounted	Rooftop	Solar Component in Hybrid	Off Grid	Total Solar Power
Rajasthan	14.3	1.0	2.0	0.6	17.84
Gujarat	6.8	2.8	0.6	0.1	10.13
Karnataka	7.7	1.3	0.0	0.0	9.05
Tamil Nadu	6.4	0.4	0.0	0.1	6.89
Maharashtra	3.0	1.6	0.0	0.2	4.87
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	3.02
Uttar Pradesh	2.1	0.3	0.0	0.2	2.53
Punjab	0.8	0.3	0.0	0.1	1.19
Haryana	0.3	0.4	0.0	0.4	1.11
Chhattisgarh	0.5	0.1	0.0	0.4	0.96
Kerala	0.3	0.5	0.0	0.0	0.80
Uttarakhand	0.3	0.3	0.0	0.0	0.58
Others	0.9	0.7	0.0	0.3	1.88
All India	54.67	10.37	2.55	2.51	70.10

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 June 2023 (GW)

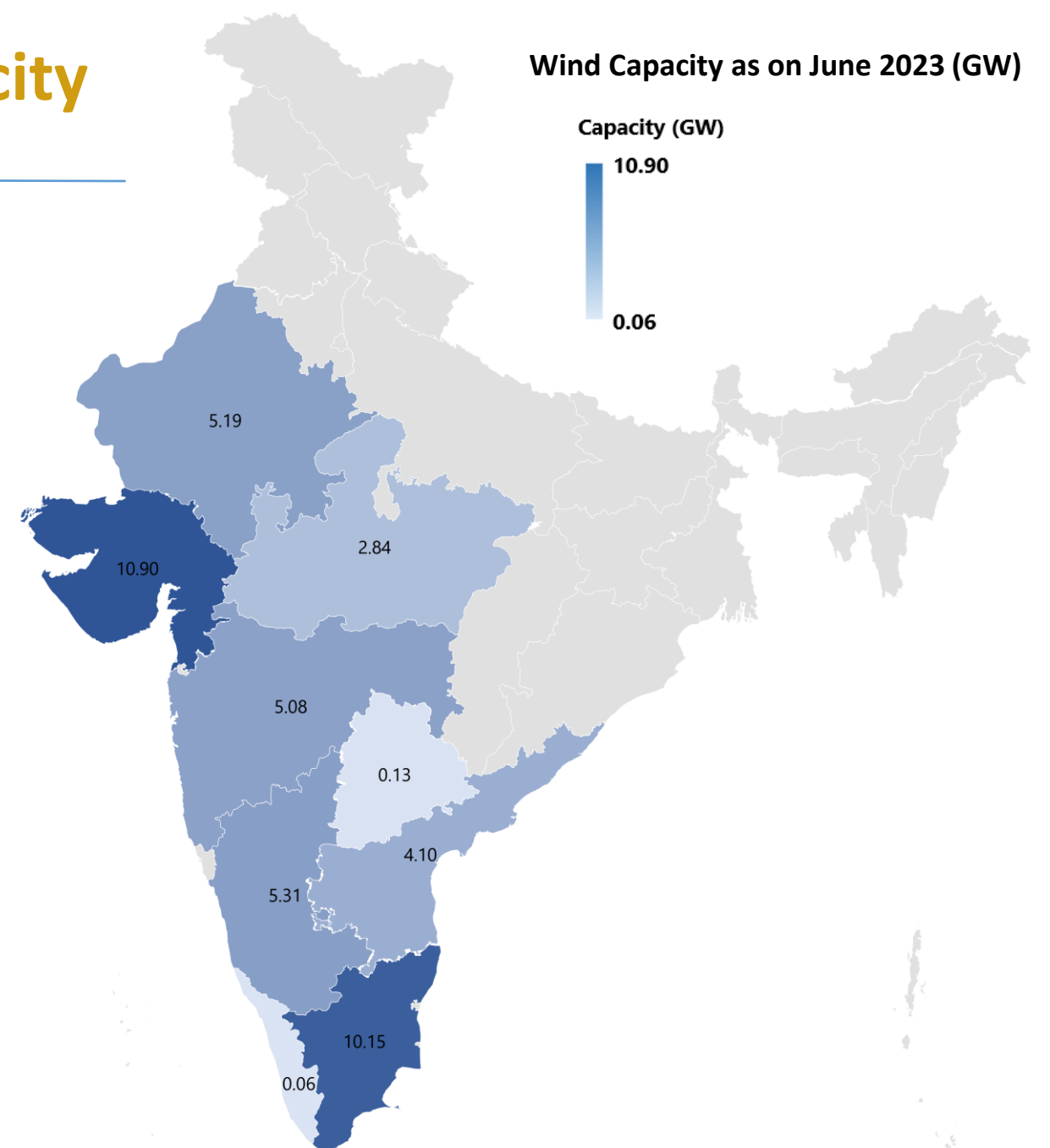


Source: MNRE

# State-wise Wind Onshore Capacity

as on June 2023

State-wise installed capacity of Wind (Onshore) Power	
States	Installed Capacity (GW)
Gujarat	10.90
Tamil Nadu	10.15
Karnataka	5.31
Rajasthan	5.19
Maharashtra	5.08
Andhra Pradesh	4.10
Madhya Pradesh	2.84
Telangana	0.13
Kerala	0.06
<b>India Total</b>	<b>43.77</b>



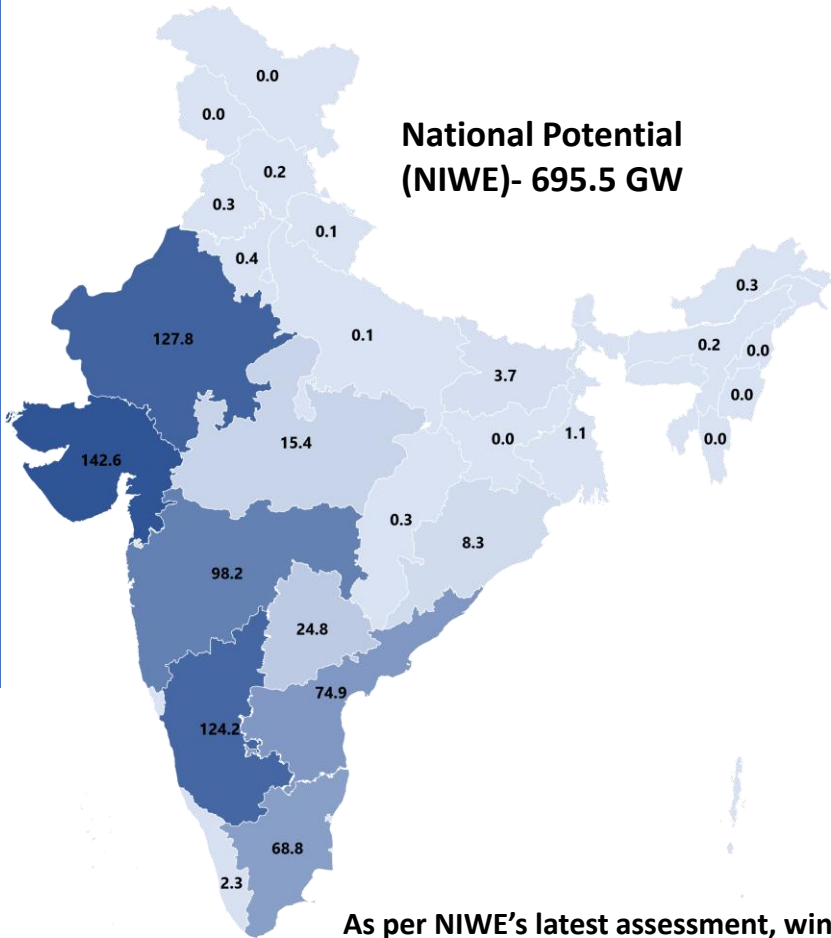


# RE Potential and Installed Capacity (1/2)

## RE potential in the state

Wind Onshore Potential at 120m agl

State Potential (GW) 0.0 142.6

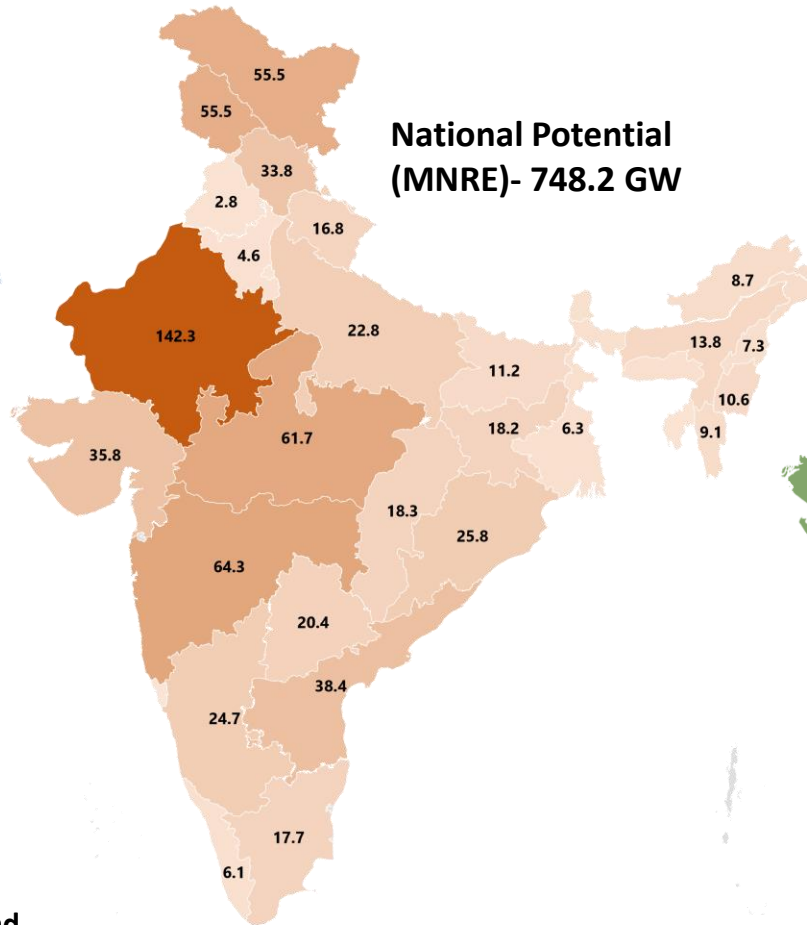


National Potential (NIWE)- 695.5 GW

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

Solar Potential

State Potential (GW) 0.9 142.3

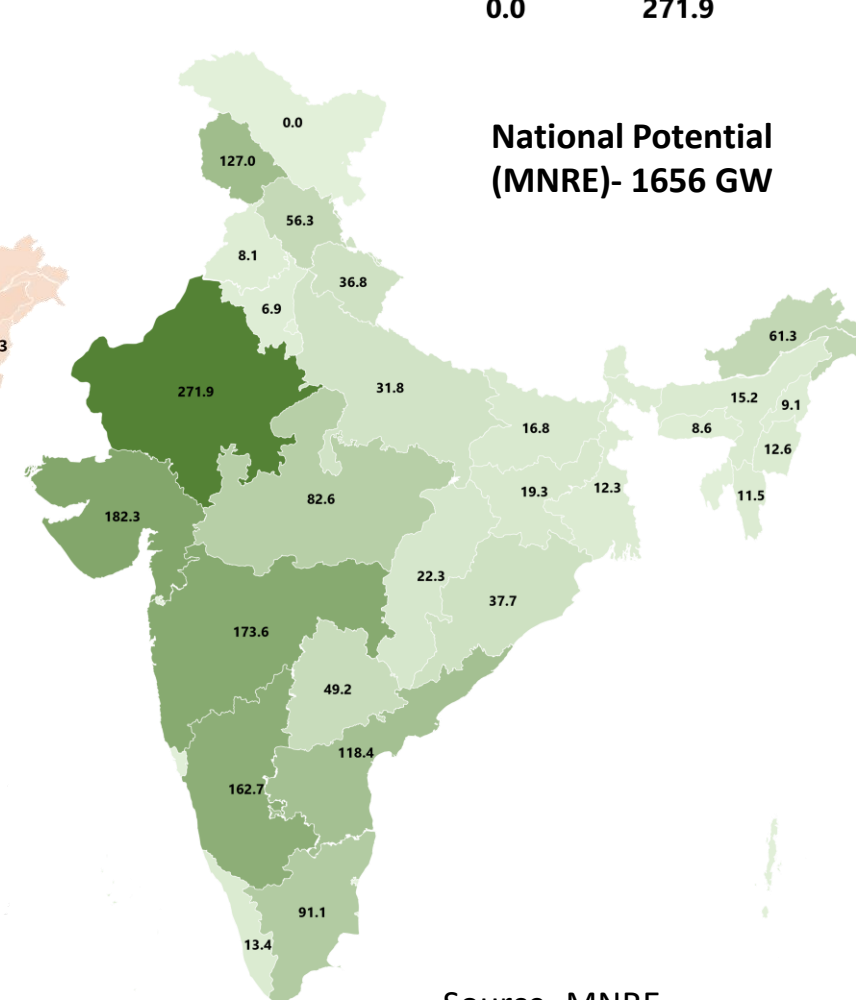


National Potential (MNRE)- 748.2 GW

Market potential for SPV rooftops: 124 GW.

Renewable Energy Potential (all sources including large Hydro)

State Potential (GW) 0.0 271.9

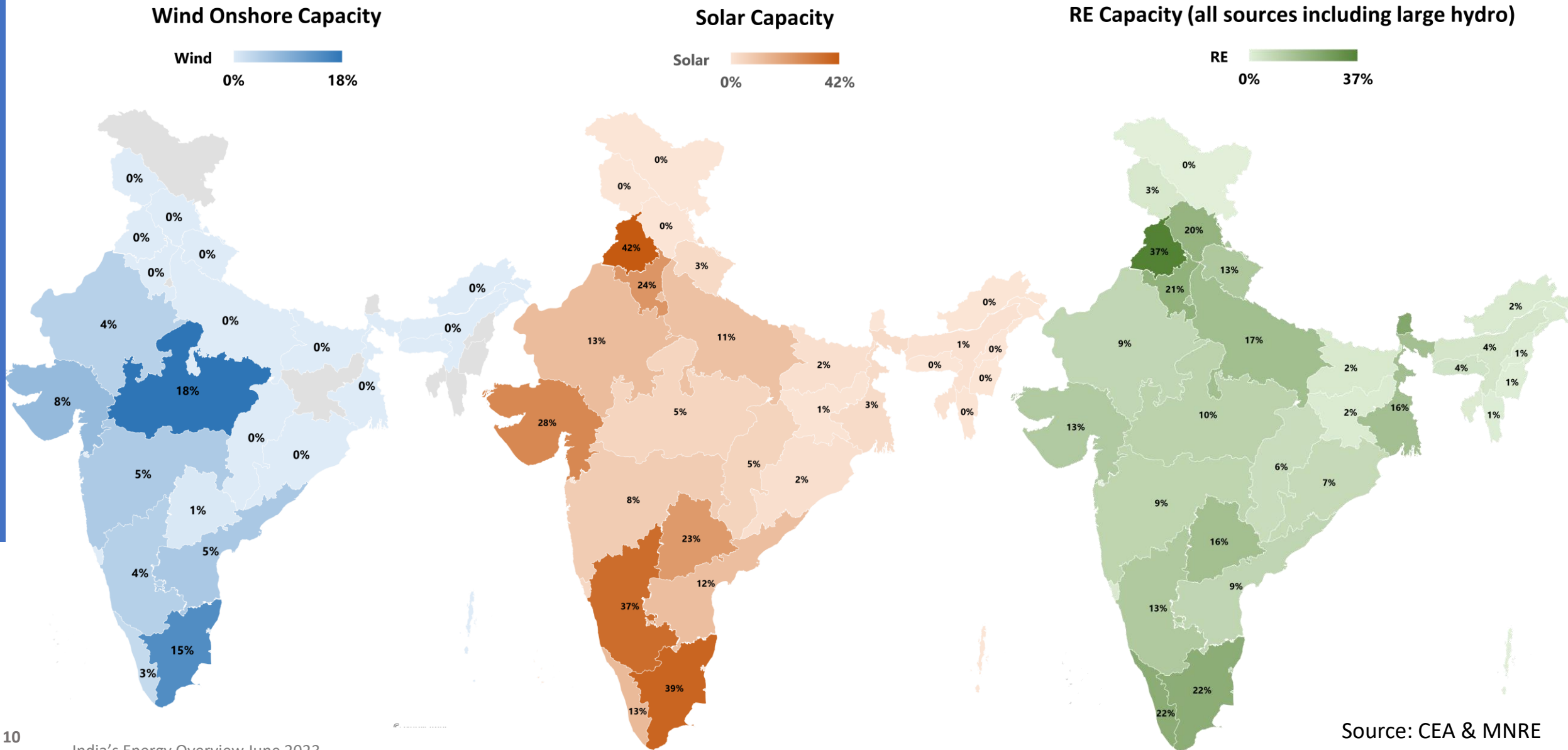


National Potential (MNRE)- 1656 GW

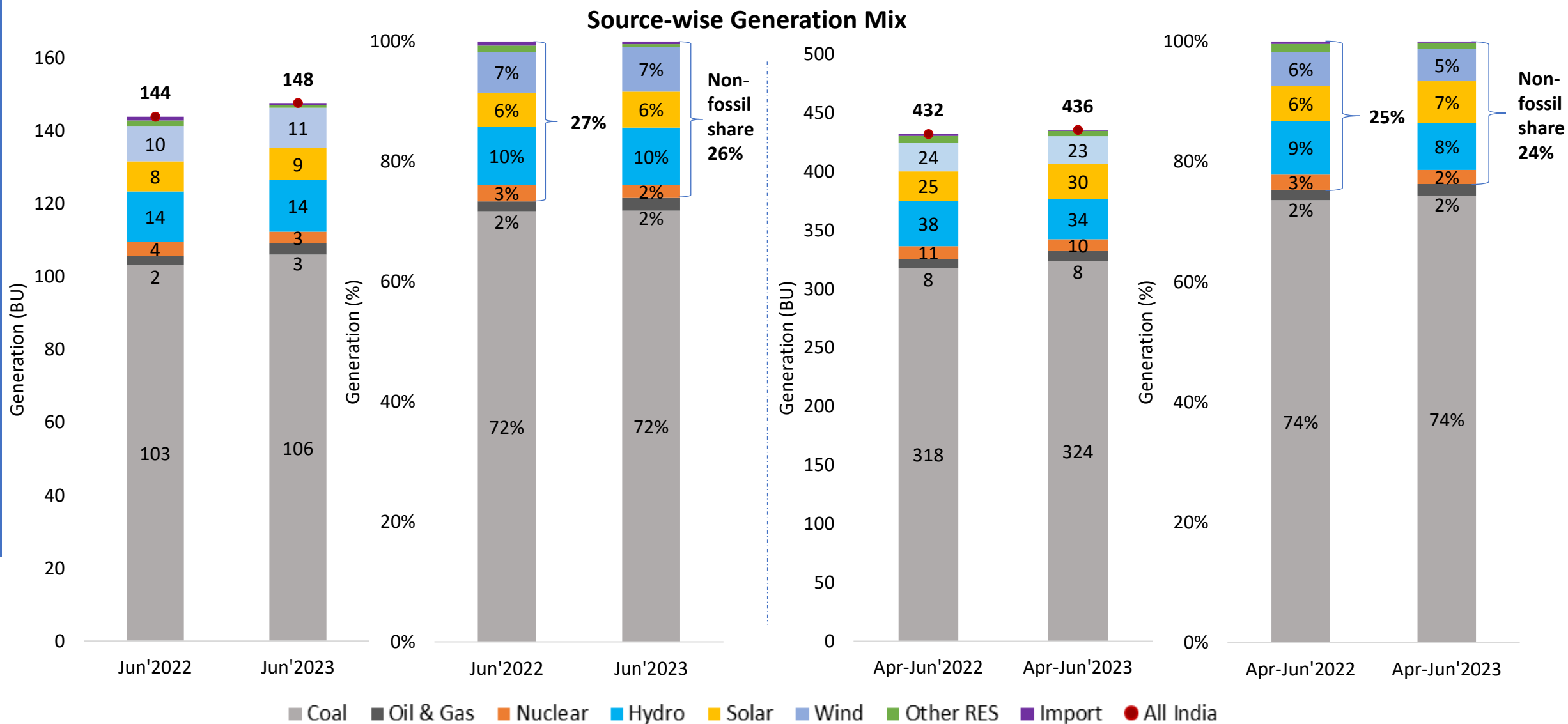
Source- MNRE

# RE Potential and Installed Capacity (2/2)

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



# India's Electricity Generation Mix

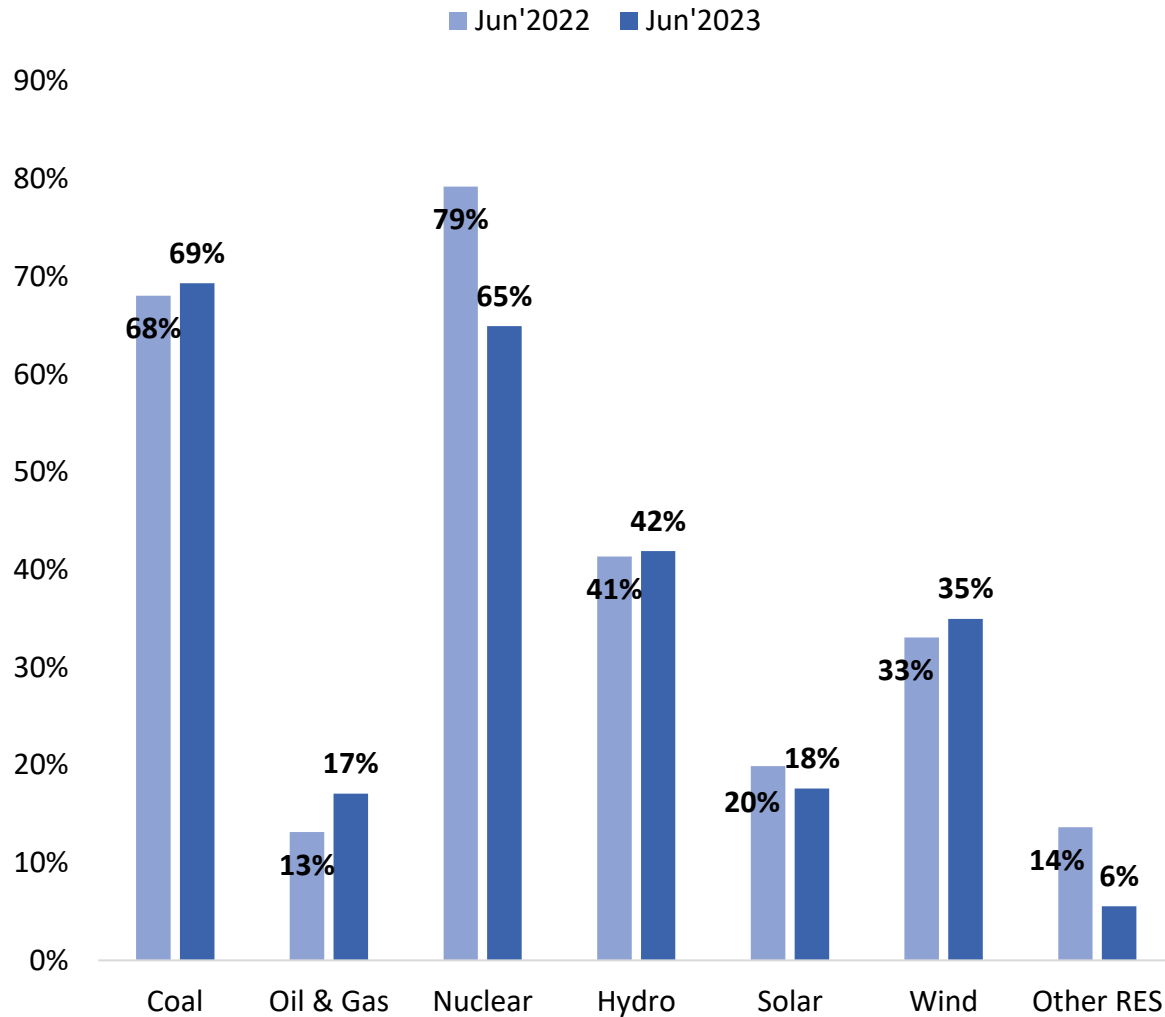


NOTE: The generation data for Jun'2023 is provisional.

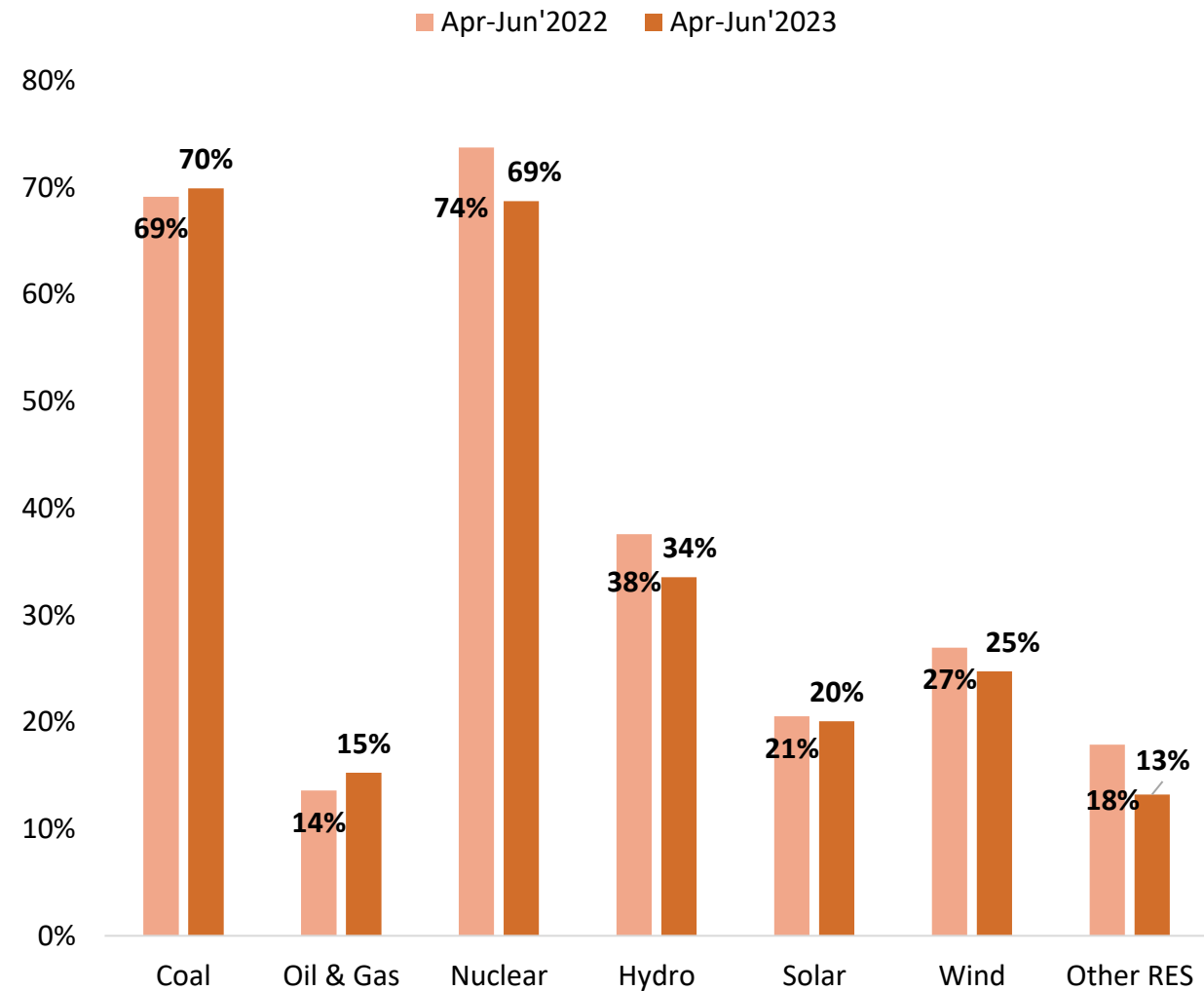
Source: CEA

# Source-wise PLF/CUF

Source-wise PLF/ CUF in June (%)



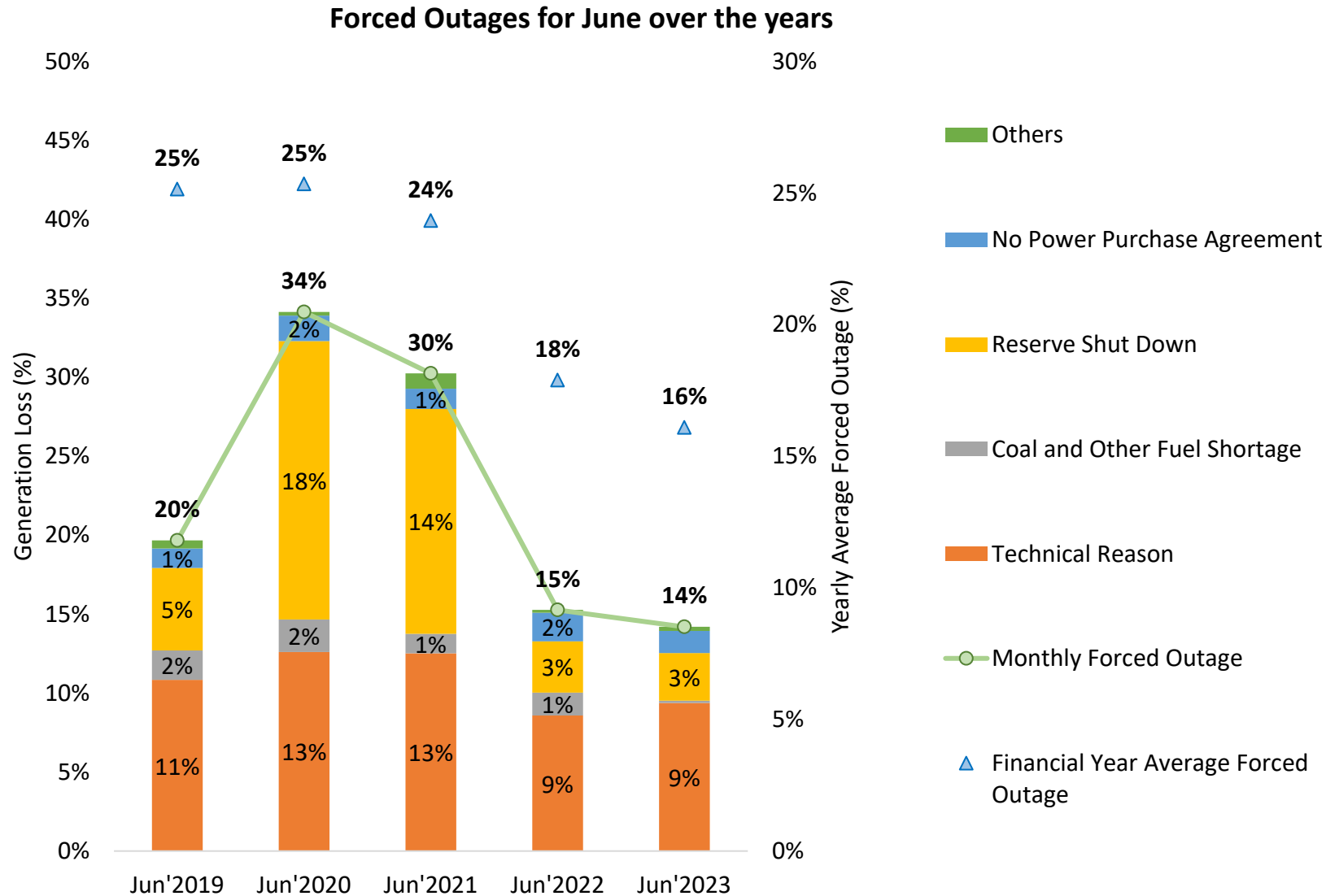
Source-wise PLF/ CUF Comparison (%)



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

Source: CEA & MNRE

# Thermal Generation Loss and Reasons for Forced Outages

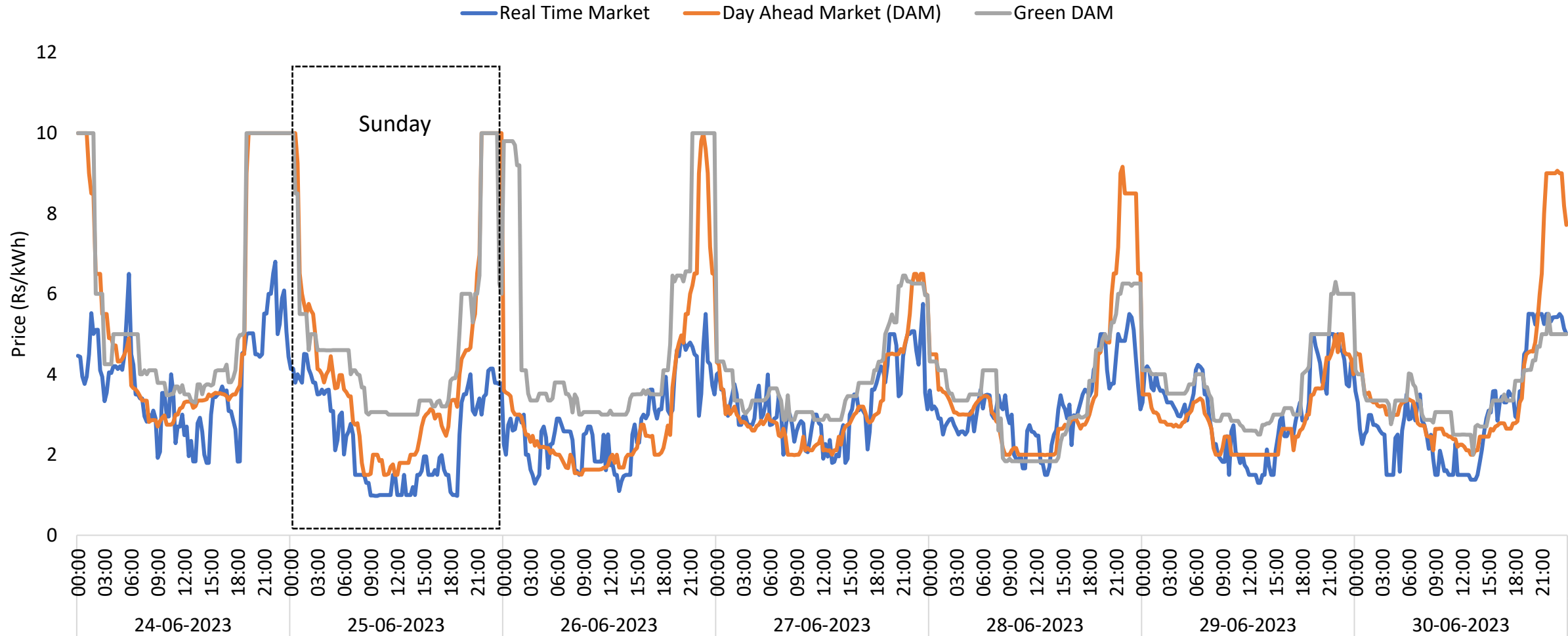


Year/ Month		Average Forced Outage Share
Yearly	FY 2021-22	24%
	FY 2022-23	18%
	FY 2023-24 (up to Jun'2023)	16%
Monthly	Jun'2021	30%
	Jun'2022	15%
	Jun'2023	14%

Thermal includes only Coal and Lignite Plants.

# Indian Electricity Exchange (IEX) Market Snapshot

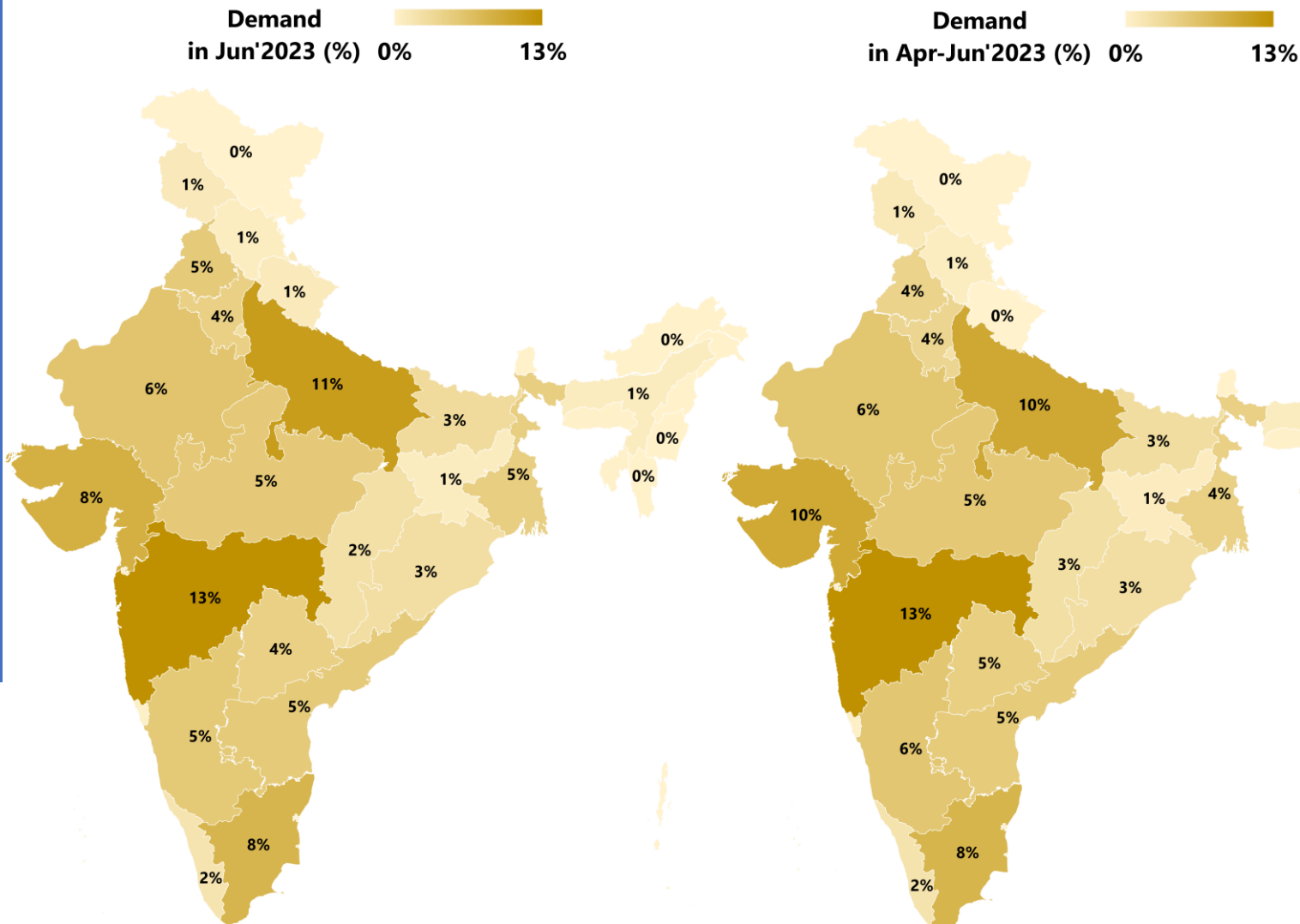
## Market Clearing Prices of last 7 days of June 2023



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

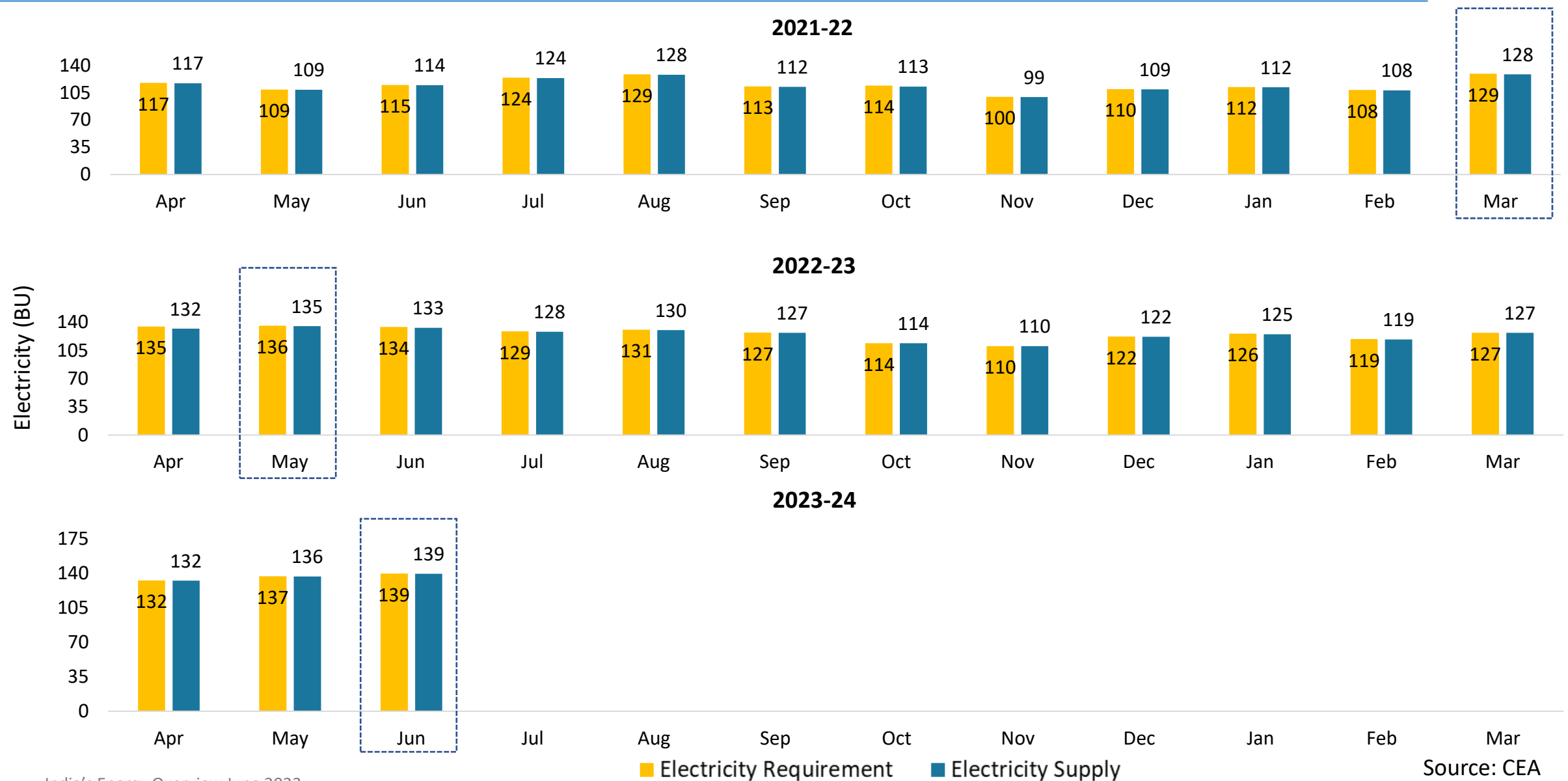
State-level Electricity Demand as a percent of National Demand (%)



Month	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
Jun'2021	115	114	0.4
Jun'2022	134	133	0.8
Jun'2023	139	139	0.2

Apr-Jun	Electricity Demand (BU)	Electricity Supply (BU)	Gap (BU) (+/-)
FY 2021-22	341	340	1
FY 2022-23	405	400	4
FY 2023-24	409	408	1

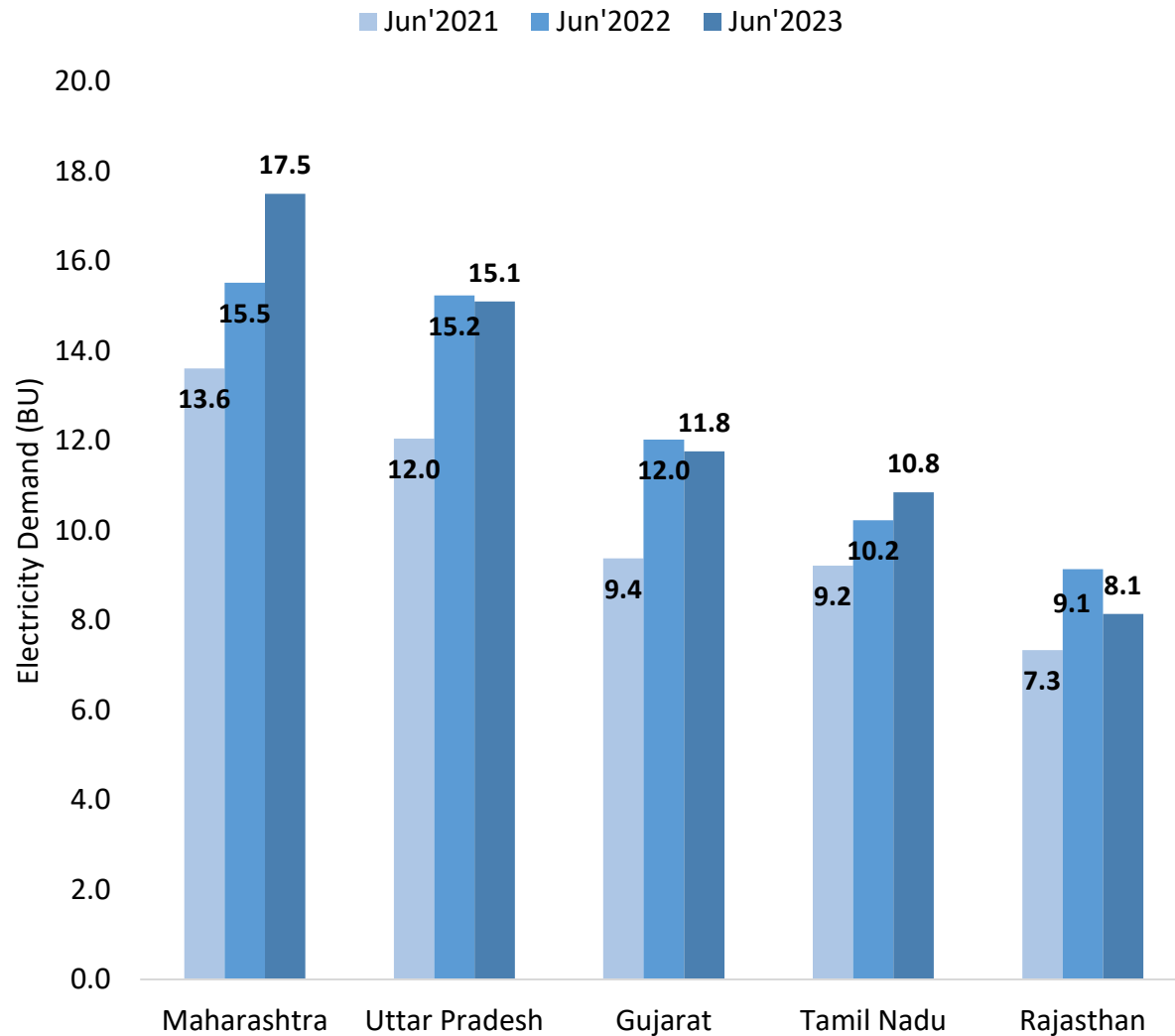
# India's Monthly Electricity Requirement and Supply



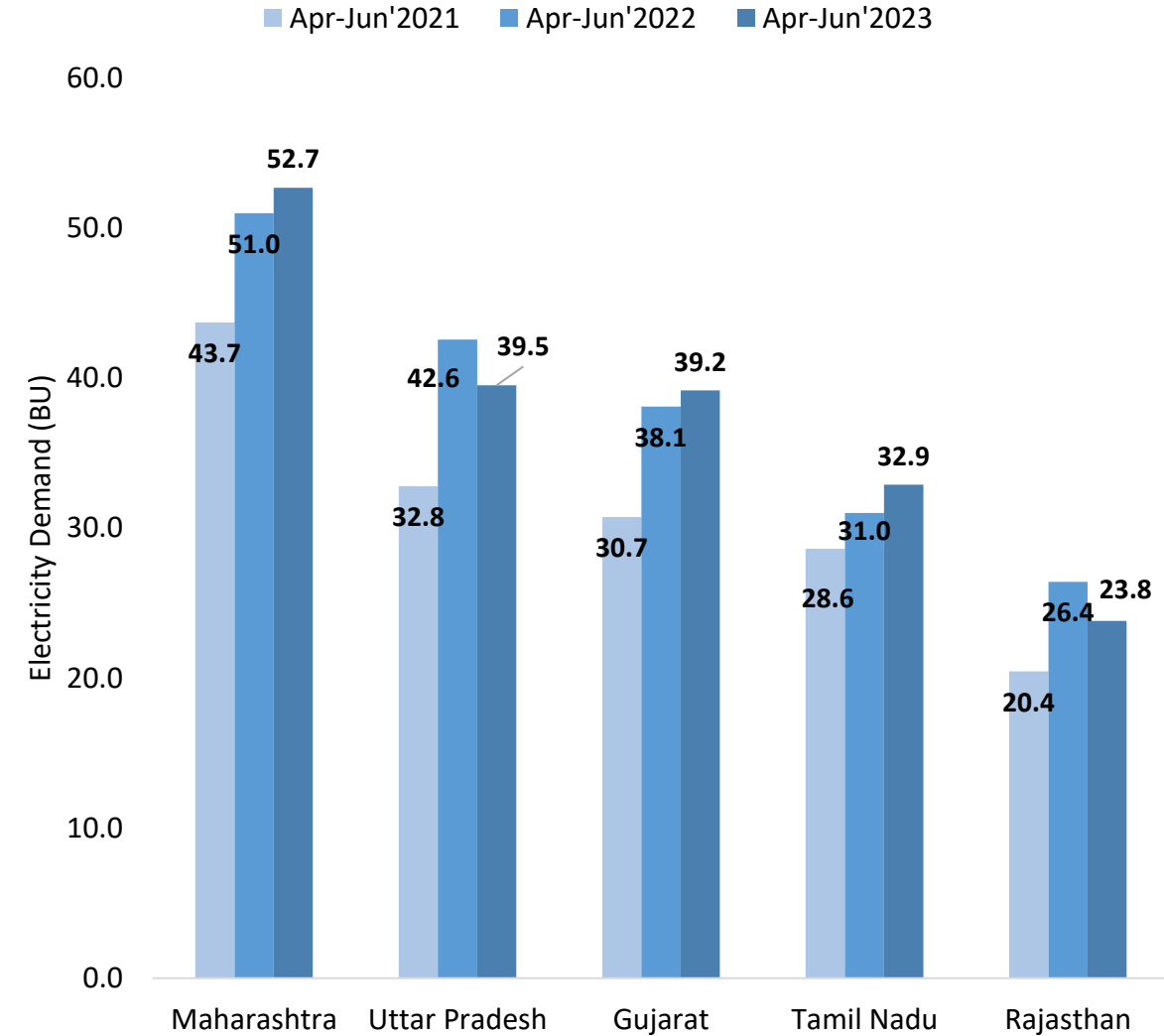


# Monthly Electricity Demand of the top 5 states

## States with Highest Electricity Demand in June (BU)

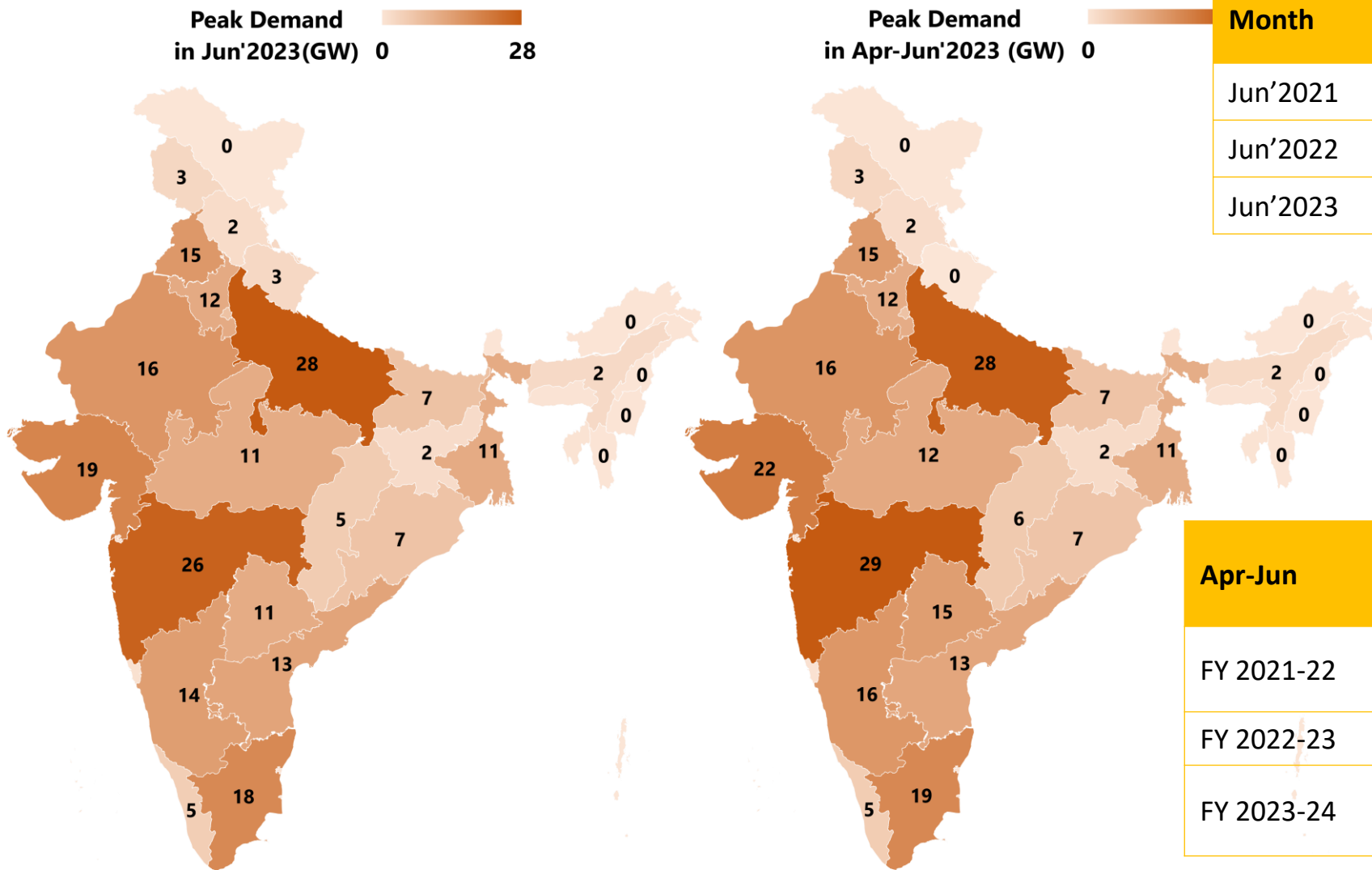


## States with Highest Electricity Demand (BU)



# National and State level Peak Electricity Demand

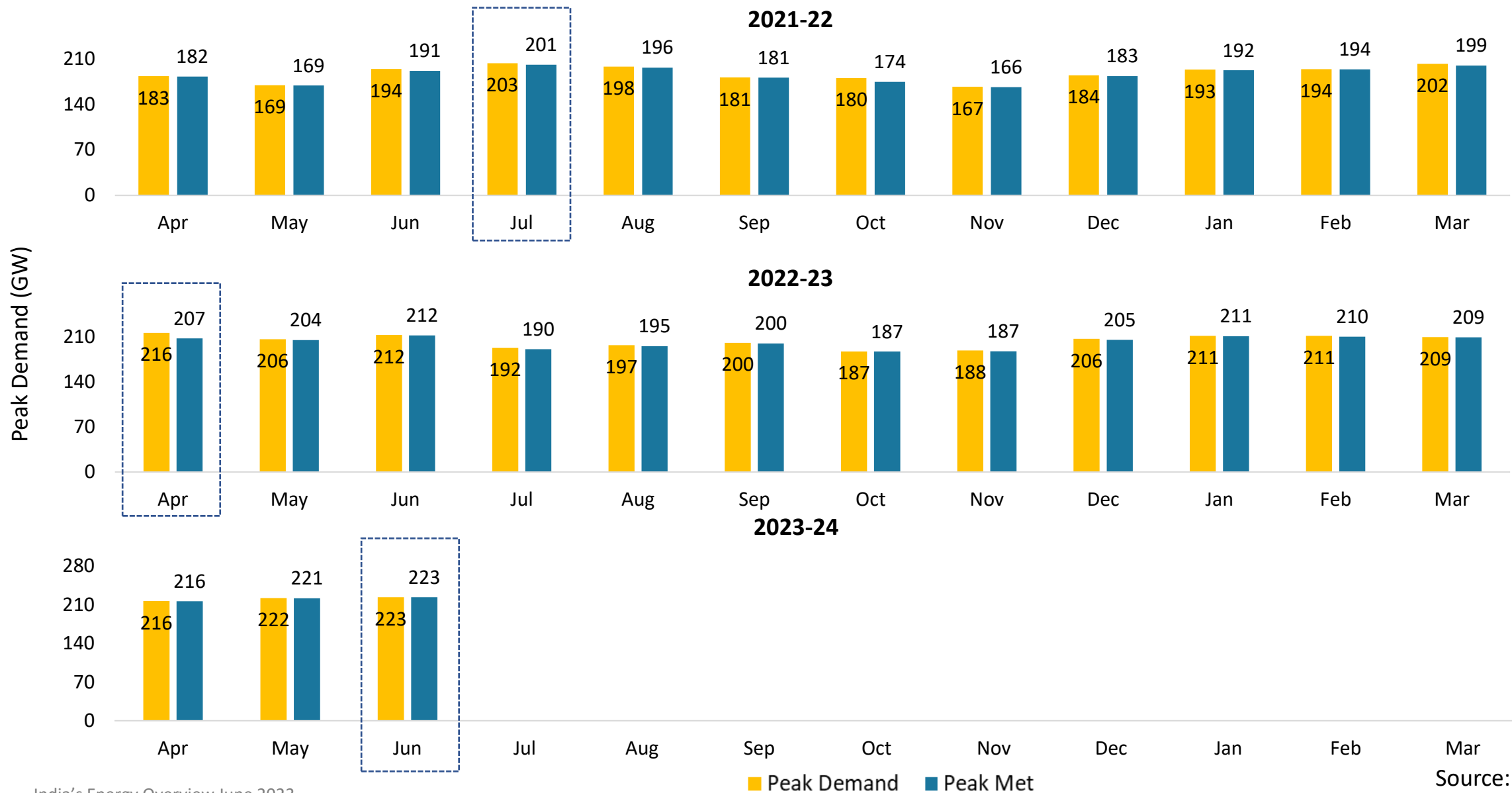
State-level Peak Electricity Demand (GW)



Month	Peak Demand (GW)	Peak Supply (GW)	Gap(BU) (+/-)
Jun'2021	194	191	3
Jun'2022	212	212	0.6
Jun'2023	223	223	0.2

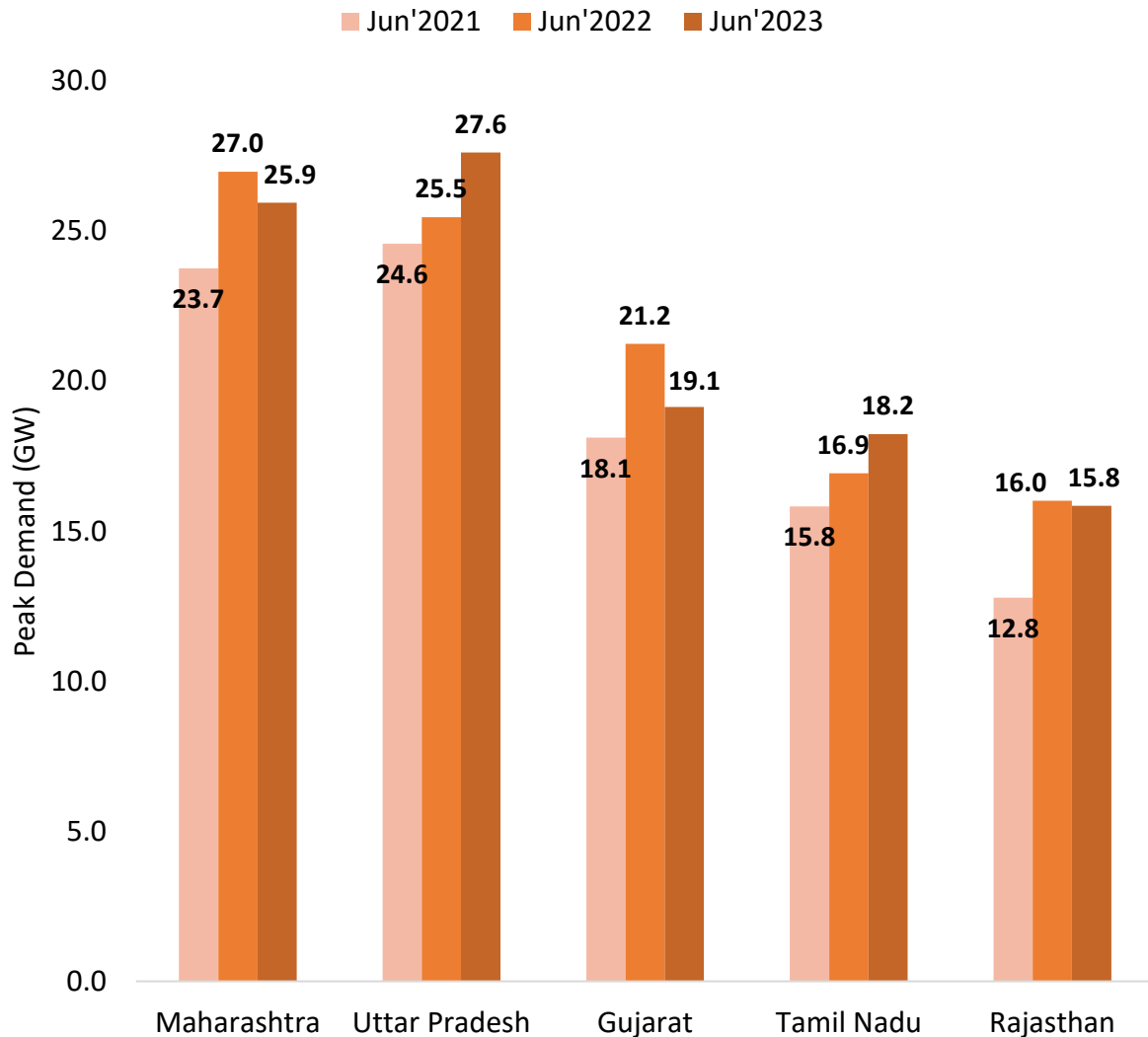
Apr-Jun	Peak Demand (GW)	Peak Supply (GW)	Gap (BU) (+/-)
FY 2021-22	194	191	3
FY 2022-23	216	207	9
FY 2023-24	223	223	0.2

# India's Monthly Peak Electricity Demand and Supply

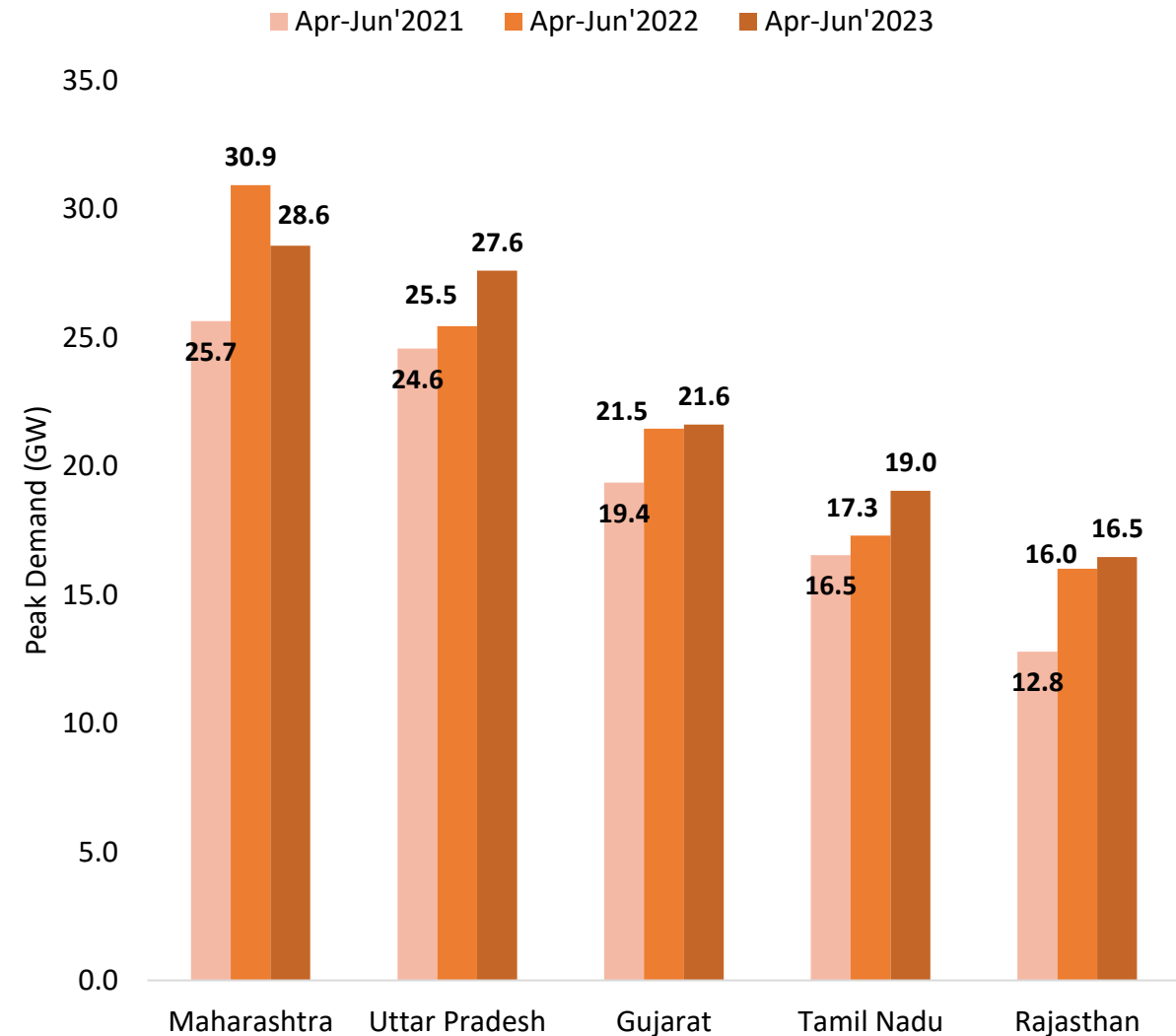


# Monthly Peak Electricity Demand of the top 5 states

## States with Highest Peak Electricity Demand in June (GW)

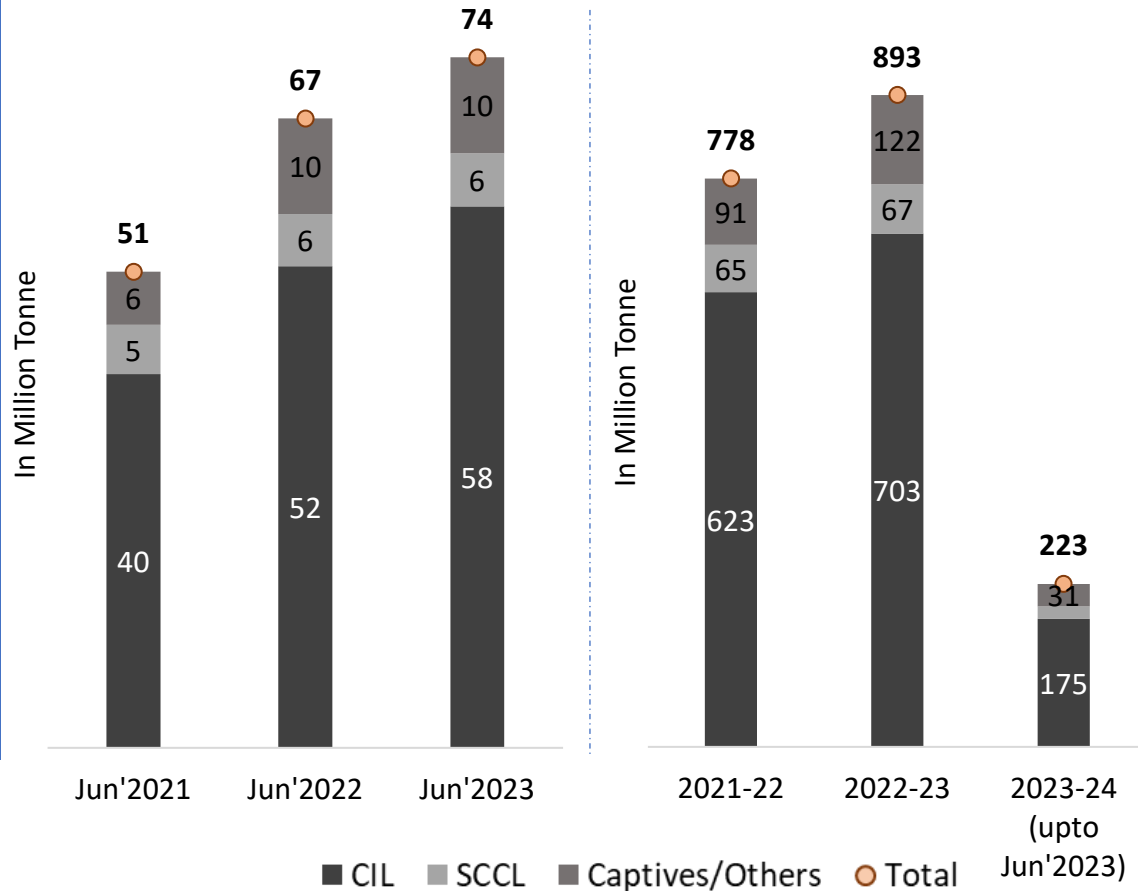


## States with Highest Peak Electricity Demand (GW)



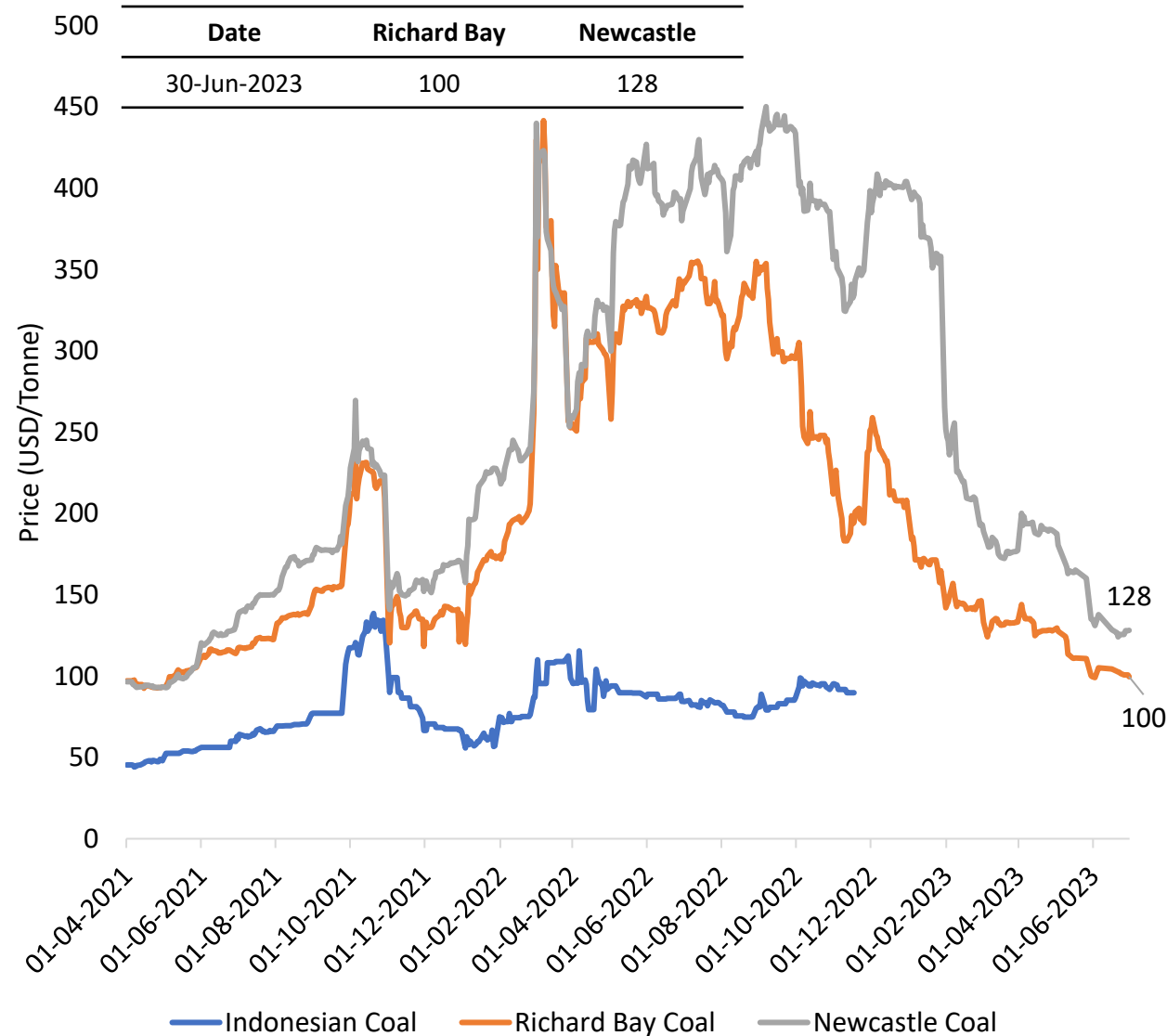
# Monthly Coal Statistics

Monthly/ Annual Coal Production (in Million Tonnes)



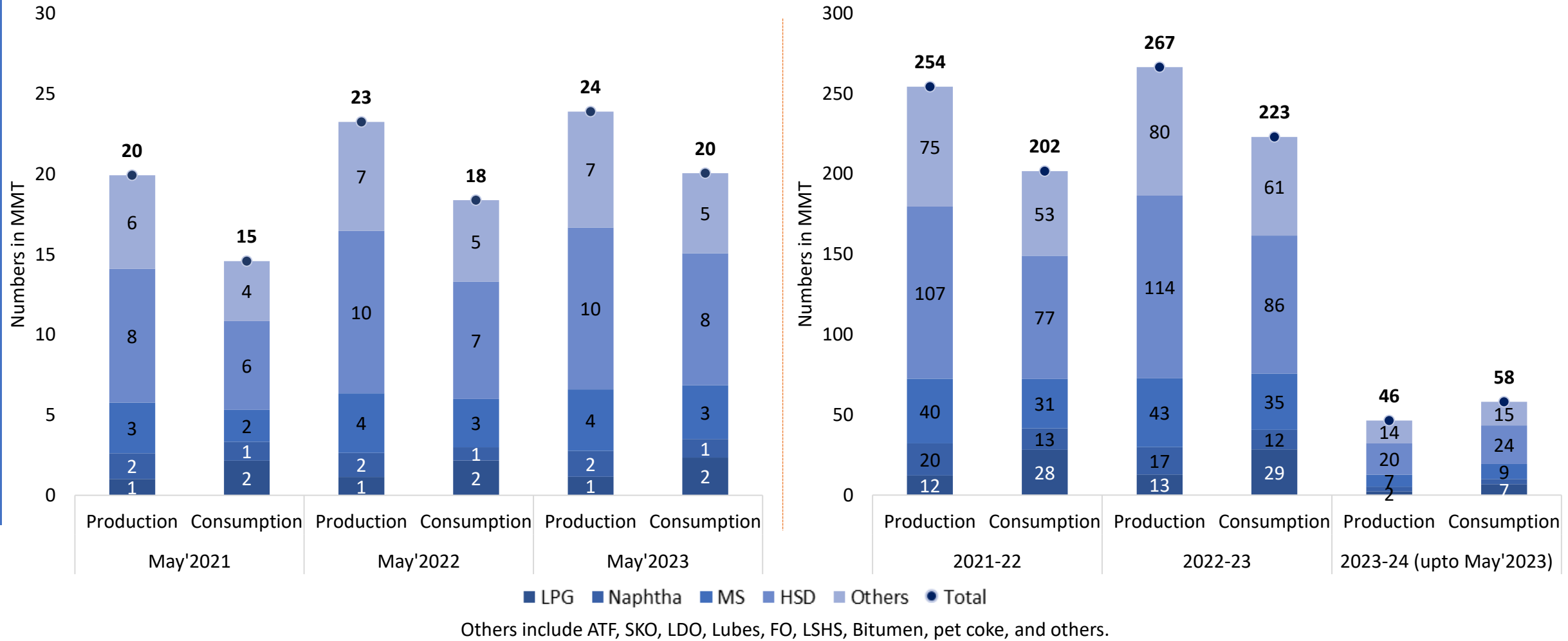
India's coal production increased in Jun'2023 (74 MT) by 10% as compared to Jun'2022.

International Coal Prices



# Petroleum Products Market Scenario (1/3)

Petroleum Product-wise Production & Consumption (MMT)



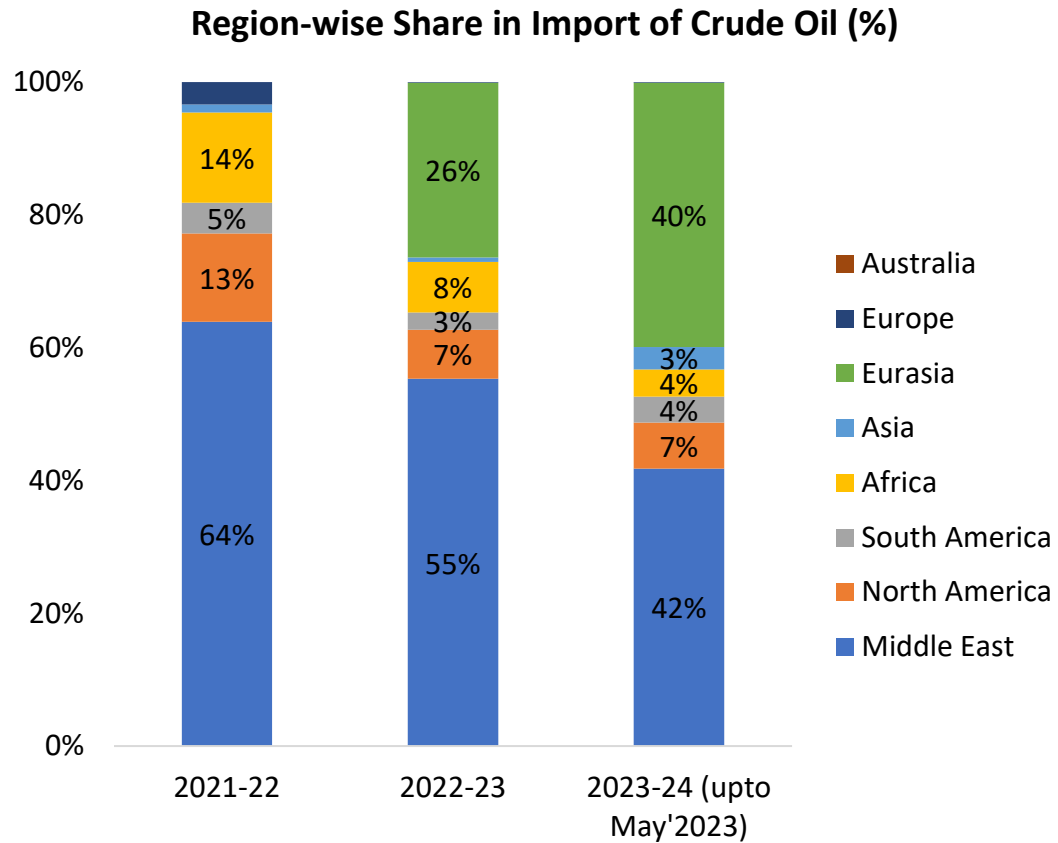
**Abbreviations:** ATF- Aviation Turbine Fuel, FO- Furnace Oil, HSD- High-Speed Diesel, LDO- Light Diesel Oil, MS- Motor Spirit (Petrol), SKO- Superior Kerosene Oil, LSHS- Low Sulphur Heavy Stock, LPG- Liquefied Petroleum Gas, MMT- Million Metric Tonne

# Petroleum Products Market Scenario (2/3)

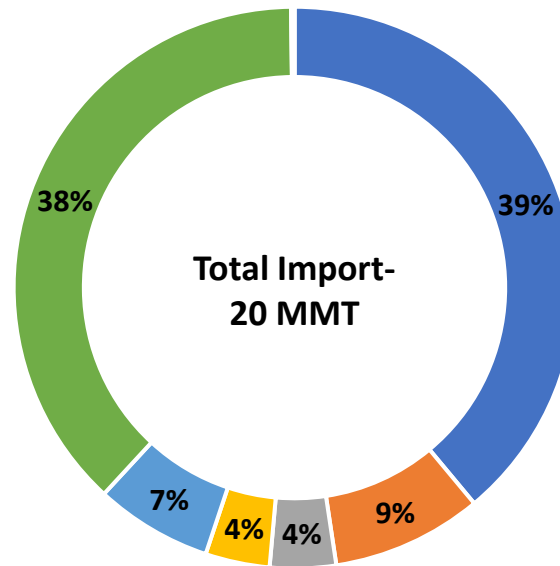
Import/Export of Crude Oil and Petroleum Products ('000 Tonnes)							
Petroleum Products	Import/ Export	Monthly			Yearly		
		May'21	May'22	May'23	2021-22	2022-23	2023-24 (up to May'2023)
Crude Oil	Import	17259	19644	20042	212382	232732	39988
	Export	0	0	0	0	0	0
	<b>Net Import</b>	<b>17259</b>	<b>19644</b>	<b>20042</b>	<b>212382</b>	<b>232732</b>	<b>39988</b>
LPG	Import	1046	1363	1444	17043	18309	2448
	Export	46	47	46	513	534	86
	<b>Net Import</b>	<b>999</b>	<b>1316</b>	<b>1398</b>	<b>16530</b>	<b>17775</b>	<b>2363</b>
Diesel	Import	4	9	6	43	328	12
	Export	2945	3063	2375	32407	28535	4286
	<b>Net Import</b>	<b>-2942</b>	<b>-3054</b>	<b>-2369</b>	<b>-32364</b>	<b>-28206</b>	<b>-4274</b>
Petrol	Import	0	30	0	671	1069	0
	Export	1334	1157	1251	13482	13118	2508
	<b>Net Import</b>	<b>-1334</b>	<b>-1127</b>	<b>-1251</b>	<b>-12812</b>	<b>-12049</b>	<b>-2508</b>
Others	Import	1538	1883	2186	21259	24835	4175
	Export	1411	1415	1637	16352	18853	2795
	<b>Net Import</b>	<b>127</b>	<b>468</b>	<b>549</b>	<b>4907</b>	<b>5983</b>	<b>1380</b>

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

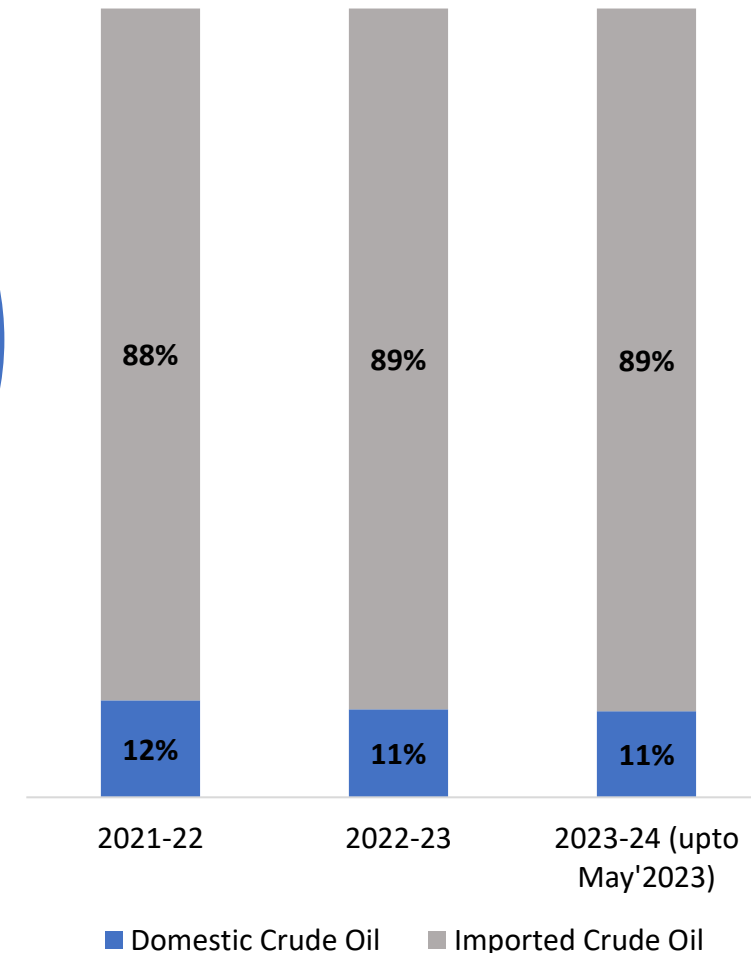
# Petroleum Products Market Scenario (3/3)



### Regional share of Imported Crude oil in May'2023



### Domestic and Imported Crude Oil share in India (%)

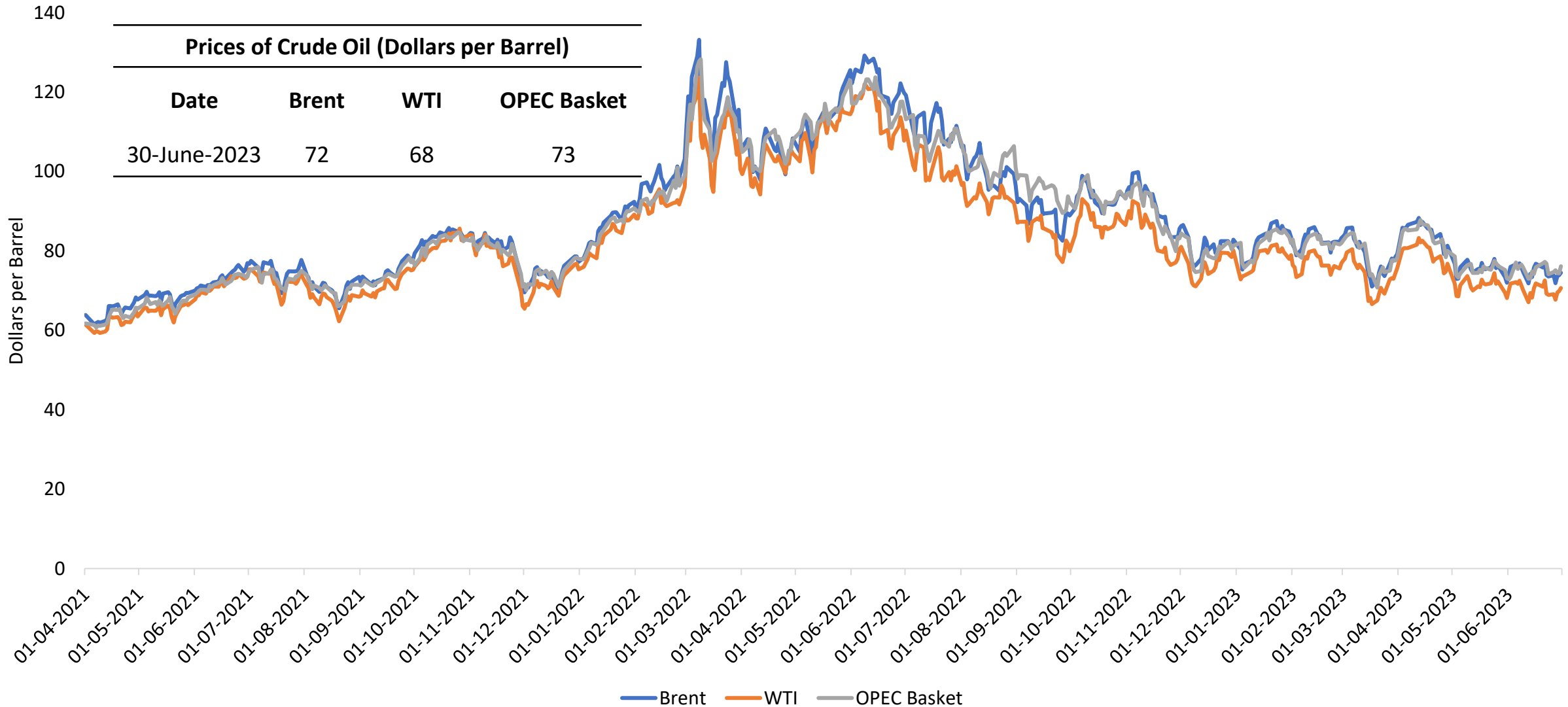


Total Import of Crude Oil (MMT)			
Total Import	2021-22	2022-23	2023-24 (up to May'2023)
<b>Crude Oil</b>	<b>212</b>	<b>233</b>	<b>40</b>



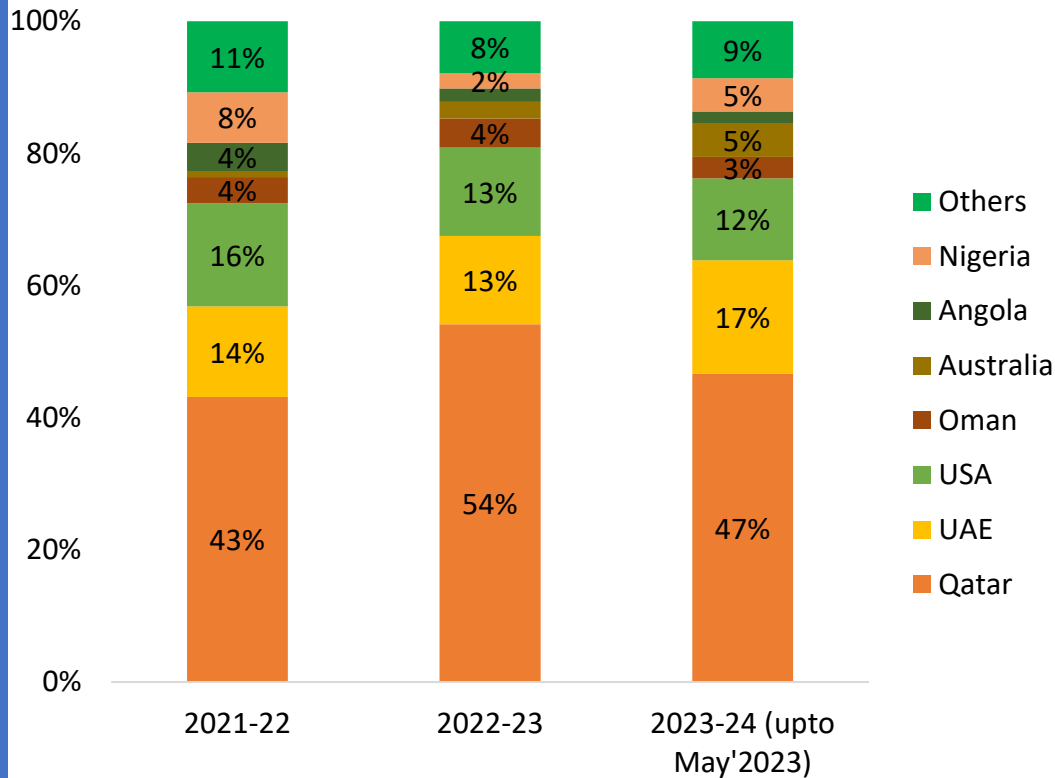
# Daily Prices of Crude Oil

Daily Prices of Crude Oil

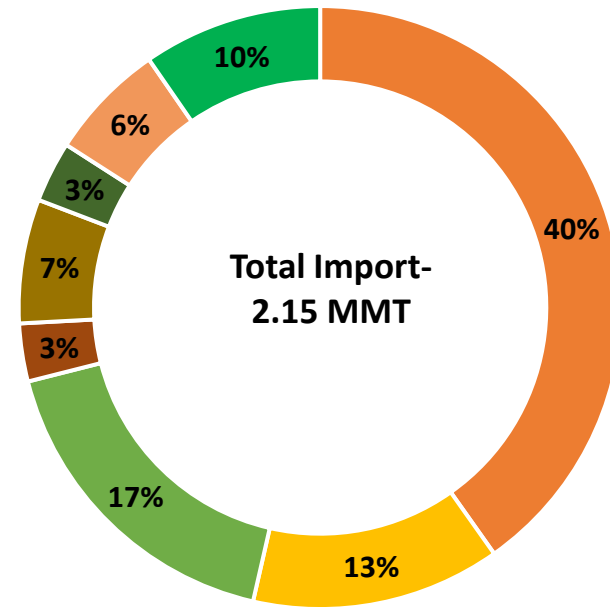


# Gas Market Scenario

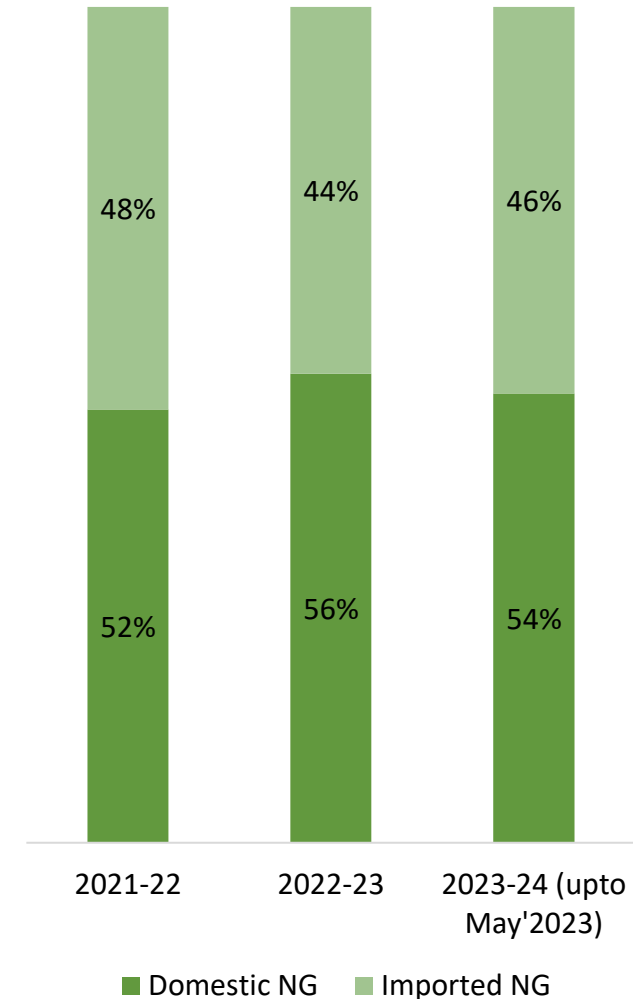
### Region-wise Share in Import of LNG (%)



### Country Share of Imported LNG in May'2023



### Domestic and Imported Natural Gas share in India (%)



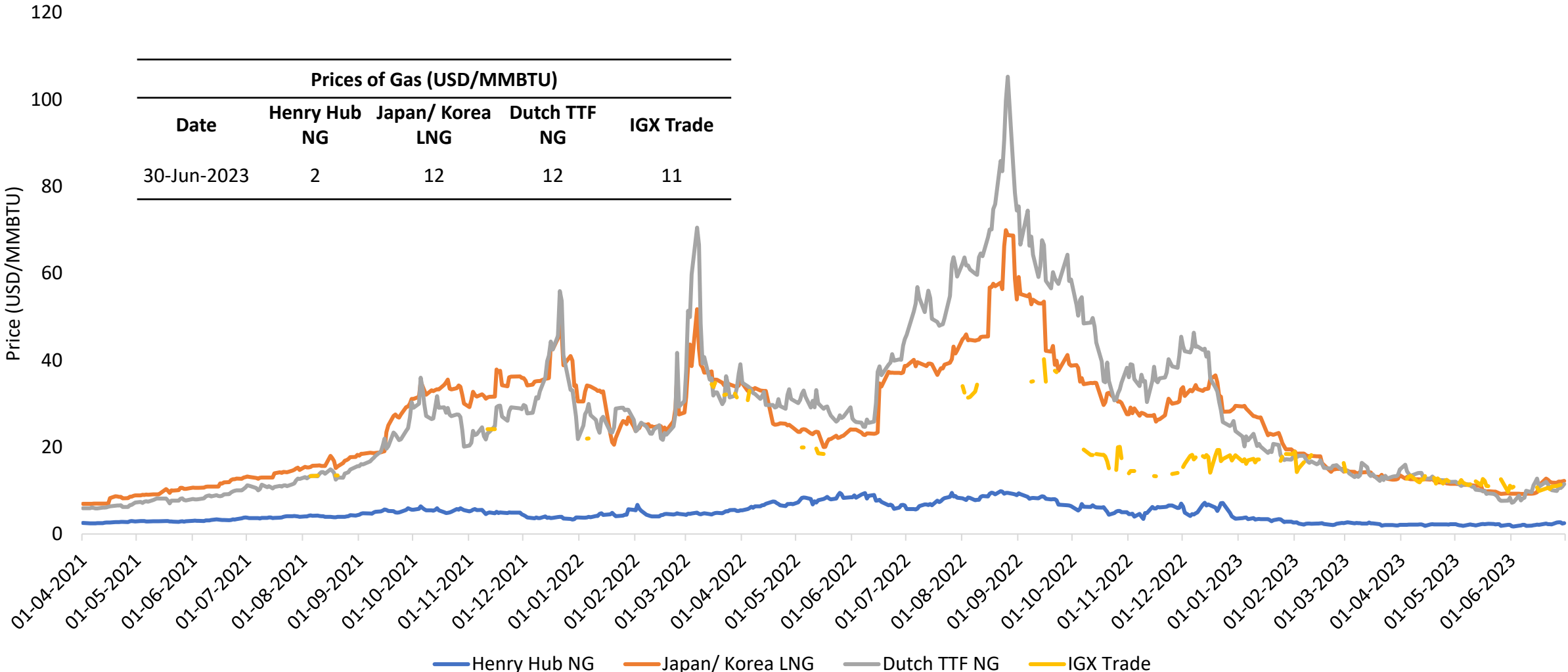
Others include- Equatorial Guinea, Trinidad, Cameroon, Egypt, France, Algeria, Belgium, Indonesia, Turkey, Russia, Spain, Malaysia, Brunei, Netherlands, Norway, and others.

Total Import of Liquefied Natural Gas (LNG) (MMT)			
Total Import	2021-22	2022-23	2023-24 (upto May'2023)
<b>LNG</b>	<b>23.42</b>	<b>19.85</b>	<b>4.05</b>

Source: MoCI and PPAC

# Daily Prices of Gas

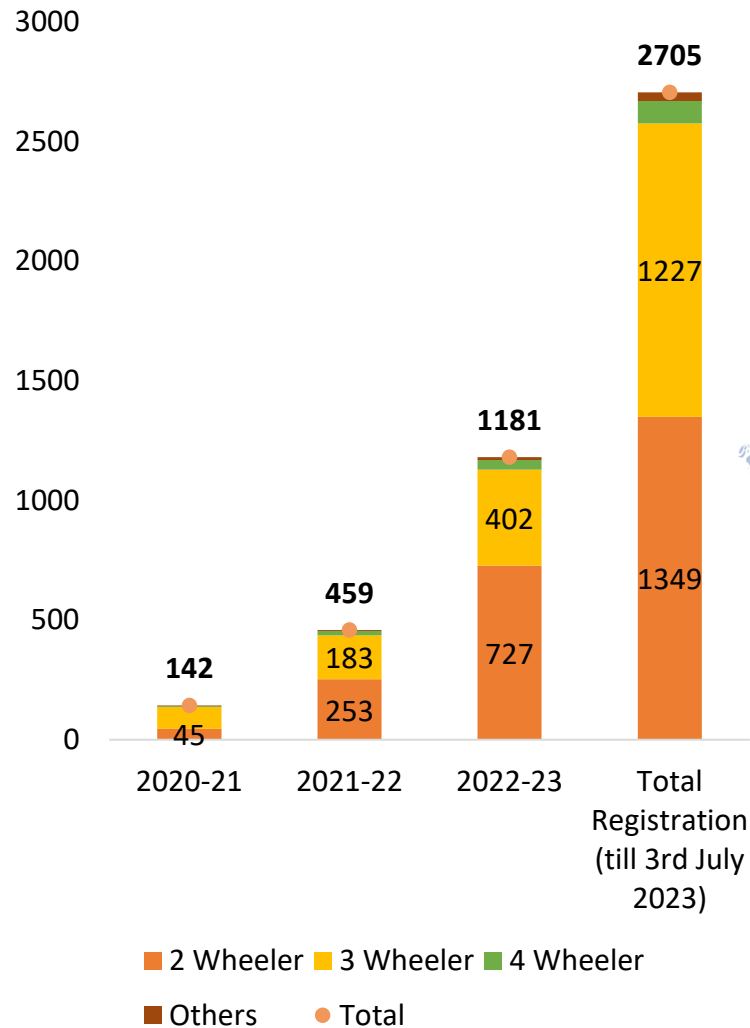
Gas Daily Market Price



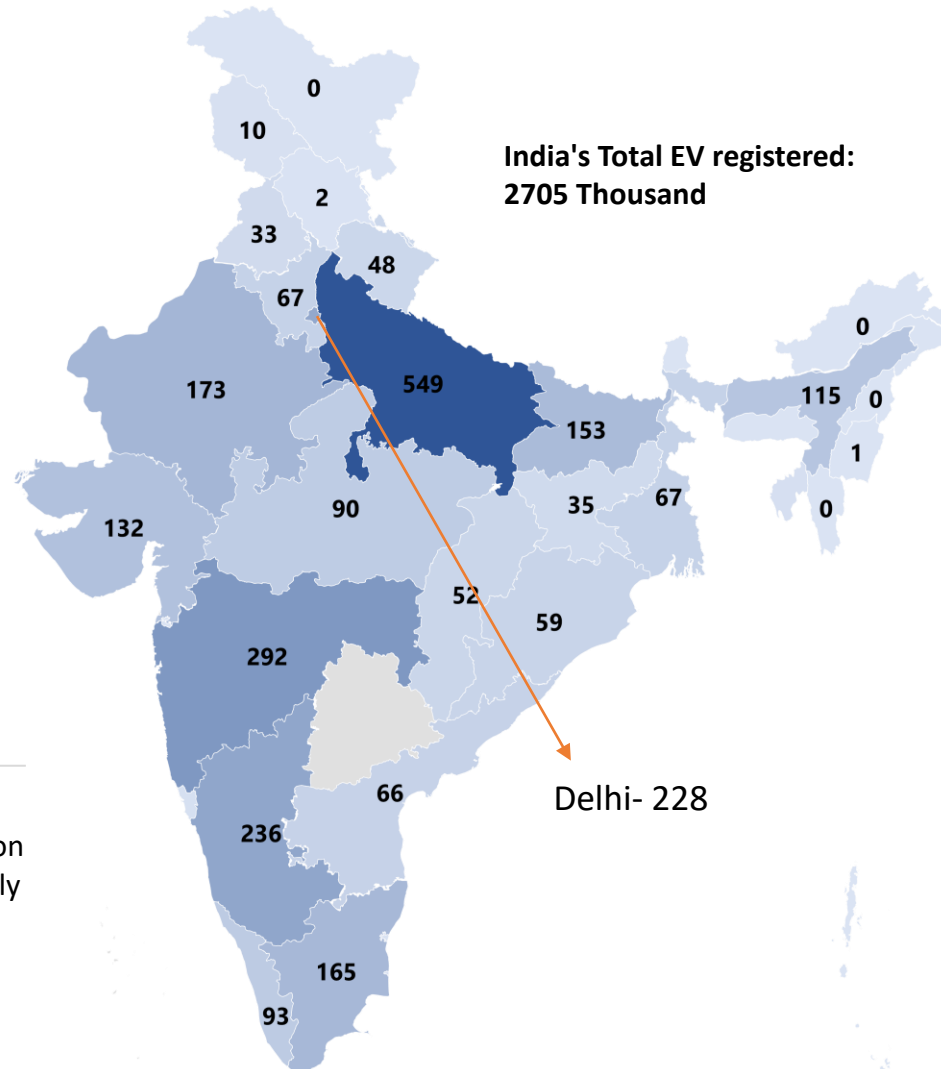
Prices of Gas (USD/MMBTU)				
Date	Henry Hub NG	Japan/ Korea LNG	Dutch TTF NG	IGX Trade
30-Jun-2023	2	12	12	11

# Status of Electric Mobility in India

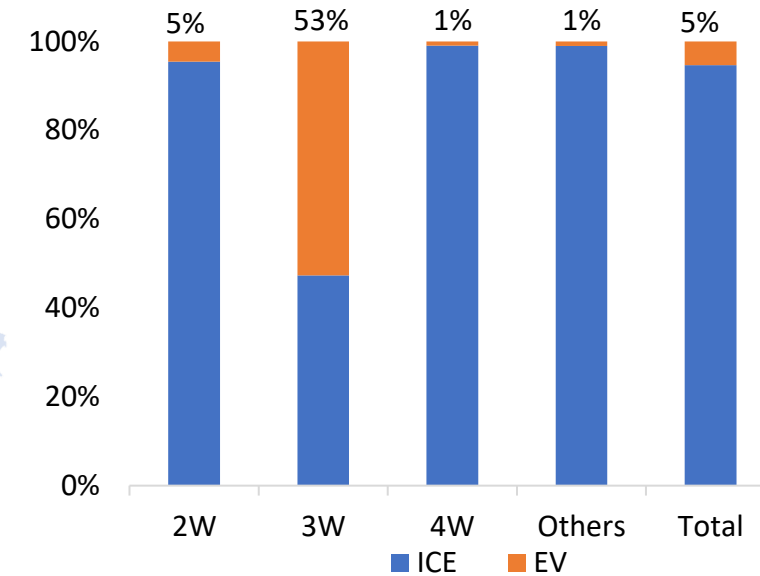
National EV registration (in Thousands)



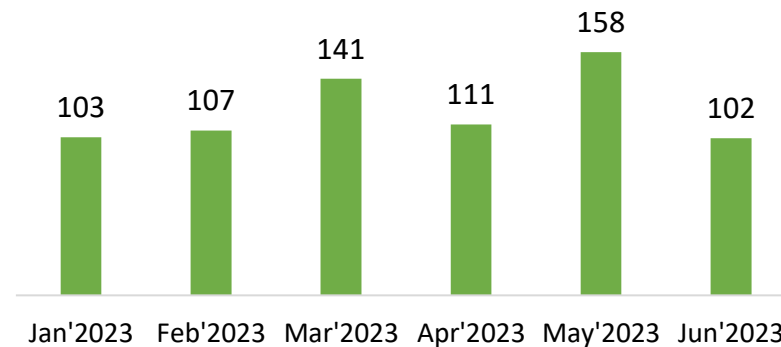
Cumulative State-wise EV registration as on 3<sup>rd</sup> July 2023 (in Thousands)



EV and ICE sale composition in 2022-23



Provisional monthly EV registered (in Thousands)



Note: Others include bus, truck and others

# 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 30<sup>th</sup> 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 30<sup>th</sup> June 2025 and for [off-shore projects](#) on or before 31<sup>st</sup> 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 (H<sub>2</sub>)

[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 30<sup>th</sup> June 2025 to 31<sup>st</sup> December 2030.

MNRE has proposed using [green H<sub>2</sub> in Direct Reduced Iron \(DRI\) production](#) by partly replacing natural gas with H<sub>2</sub> 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 June 2023

- The Ministry of Power notified [amendments to the Electricity \(Rights of Consumers\) Rules, 2020](#). The updated rules focus on changes related to the utilization of smart meters and pre-paid meters, as well as the implementation of Time of Day Tariffs (ToD Tariffs). The amendments aim to provide consumers with more flexibility in managing their electricity usage and encourage the adoption of renewable energy sources. Under the ToD Tariff system, the tariff during solar hours (duration of eight hours in a day as specified by the State Electricity Regulatory Commission) of the day shall be 10% to 20% less than the normal tariff, while the tariff during peak hours will be 10% to 20% higher.
- CEA has issued the notification pertaining to the [Calculation Methodology for the computation of Aggregate Technical and Commercial \(AT&C\) Losses](#). The addendum to the calculation methodology for AT&C losses specifies that the collection efficiency of subsidy received and realization from the sale of power together will be restricted to 100%.
- The government of Andhra Pradesh has released the [Green Hydrogen and Green Ammonia Policy- 2023](#) shall be applicable for 5 years or remain in force until a new policy is issued. The main objectives are:
  - Green Hydrogen production up to the capacity of 0.5 MTPA or Green Ammonia production up to the capacity of 2.0 MTPA in the next five years by harnessing the RE potential in the State.
  - To create 12,000 jobs per MTPA production of green hydrogen in the state.
  - To promote the setting up of green hydrogen and green ammonia and its related equipment manufacturing facilities in the state.

# Key Highlights or Announcements of June 2023

- National Institute of Wind Energy (NIWE), Government of India has come up with a state-wise [wind power installable capacity estimated as 1164 GW at 150m above ground level \(agl\) height](#). The state-wise wind potential at 150m agl is:

State	Rajasthan	Gujarat	Maharashtra	Karnataka	Andhra Pradesh	Tamil Nadu	Madhya Pradesh	Telangana	Odisha	Bihar	Chhattisgarh	Kerala	Others*	All India
Installed Capacity (GW)	284.25	180.79	173.87	169.25	123.34	95.11	55.42	54.72	12.13	4.02	2.75	2.62	5.59	1163.86

\*Others include West Bengal, Andaman & Nicobar Islands, Haryana, Uttar Pradesh, Assam, Punjab, Puducherry, Arunachal Pradesh, Himachal Pradesh, Meghalaya, Uttarakhand, Lakshadweep, Dadar and Nagar Haveli, Jharkhand, Goa, Ladakh.

- Gujarat Electricity Regulatory Commission (GERC) has issued the [draft Terms and Conditions for Green Energy Open Access Regulation 2023](#). The regulation aims to provide non-discriminatory open access for renewable energy to different categories of power consumers and a methodology for the determination of open access charges and banking charges, etc. for green energy open access consumers. Under the proposed regulations, three types of power consumers are eligible: long-term consumers (12 to 25 years), medium-term users (over three months up to three years), and short-term users (as short as one month). Consumers with a contracted demand of 100 kW or above are eligible for open access to sourcing green energy.

# Key Highlights or Announcements of June 2023

- Ministry of Environment, Forest, and Climate Change issued the notification for the [Draft Green Credit Programme Implementation Rules, 2023](#). The main objectives are as follows:
  - Create a market-based mechanism for providing incentives in the form of Green Credits to individuals, farmer producer organizations, cooperatives, forestry enterprises, sustainable agriculture enterprises, urban and rural local bodies, private sectors, industries, and organizations for environment-positive actions.
  - Create mass movement around environment positive actions and realize the vision of "Mission LiFE".
- Ministry of New and Renewable Energy has released the guidelines for implementing Strategic Interventions for Green Hydrogen Transition (SIGHT) Programme of the National Green Hydrogen Mission from 2025-26 to 2029-30. The components of the programme are:
  - i. [Component I: Incentive Scheme for Electrolyser Manufacturing](#) with an outlay of Rs. 4,440 crores under this component. The main objectives are:
    - Maximize the indigenous electrolyzer manufacturing capacity.
    - Achieving lower levelized cost of hydrogen production
    - Supporting established and promising technologies.
  - ii. [Component II: Incentive Scheme for Hydrogen Production \(under Mode I\)](#) with an outlay of Rs. 13,050 crores. The main objectives are:
    - To maximize the production of green hydrogen and its derivative in India.
    - To enhance the cost-competitiveness of green hydrogen and its derivatives vis-à-vis fossil-based alternatives.
    - To encourage large-scale utilization of green hydrogen and its derivatives.



# Key Highlights or Announcements of June 2023

- [MNRE has allotted a physical target for the installation of small biogas plants under the Biogas Programme Phase- II during FY 2023-24.](#) The target for this year is to set up 15,205 biogas plants (1-25 cubic meter), with an additional 1,165 sanitary toilets linked to biogas plants. Additionally, the ministry has outlined targets for 14 new implementing agencies, requiring them to conduct four training courses during the year.
- [CEA has fast-tracked the process for concurrence on the Detailed Project Report \(DPR\) of pumped storage projects.](#) The key changes are:
  - A revamped process for approval of pumped storage projects.
  - Single window for clearance.
  - Speeding up environmental clearances.
  - Compressed timelines for approval of DPRs.
- The Ministry of Power has issued [Guidelines for Resource Adequacy Planning Framework for India](#), in consultation with Central Electricity Authority (CEA). The guidelines will ensure that sufficient electricity is made available to power the country's growth, by putting in place a framework for advance procurement of resources by DISCOMs to meet the electricity demand in a cost-effective manner. The significance is:
  - Guidelines provide for an institutional mechanism for Resource Adequacy ranging from the national level to the discom level such that the availability of resources to meet the demand is ensured at each level.
  - The new generation capacities, energy storage, and other flexible resources, needed to reliably meet future demand growth at optimal cost, will be assessed well in advance.

# Key Highlights or Announcements of June 2023

- The CEA has notified [Central Electricity Authority \(Measures relating to Safety and Electric Supply\) Regulations, 2023](#). These regulations shall be applicable to electrical installation including electrical plant and electric line, and the person engaged in the generation or transmission or distribution or trading or supply or use of electricity. It provides general safety requirements pertaining to the construction, installation, protection, operation, and maintenance of electric supply lines and apparatus and general conditions relating to the supply and use of electricity.
- Ministry of Power notified the [Carbon Credit Trading Scheme 2023](#) on 28<sup>th</sup> June 2023. The scheme entails the formation of a National Steering Committee for the Indian carbon market (NSCICM) for the governance and direct oversight of the Indian carbon market. The committee will be chaired by the Secretary, Ministry of Power (MoP); and co-chaired by the Secretary, Ministry of Environment, Forests and Climate Change (MoEF&CC). The key stakeholders under ICM are:
  - The BEE will be the administrator for the ICM and will be responsible for developing the GHG emissions trajectory and targets for the entities and will issue the carbon credit certificates based on the NSCISM.
  - The Grid Controller of India Limited will be the registry for the ICM, undertaking the tasks such as registration of obligated or non-obligated entities, maintaining a secure database, maintaining records of all transactions, etc.
  - The Central Electricity Regulatory Commission (CERC) will be the regulator for the trading of carbon credit certificates. They will regulate matters relating to the trading of carbon credit certificates, safeguard the interests of the buyers and the sellers, regulate the frequency of carbon credit certificates trading, and take action to prevent fraud or mistrust.
  - The Bureau shall constitute, one or more technical committees for different areas as required under the compliance mechanism.

# Key Highlights or Announcements of June 2023

- The CEA has released the “[Guidelines for field efficiency test in hydropower plants including pumped storage projects \(PSP\)](#)” to bring uniformity in the sector and to minimize disputes. These guidelines primarily focus on formally defining the terms and measurements used in the testing process, determining the validity and timeframe for accepting the tests, designating the authorized entity to carry out the tests, specifying the methodologies and approaches for quantifying the relevant parameters to calculate the Hydraulic/Electrical Efficiency of the unit(s) and assessing compliance with contractual guarantees and imposing penalties for non-fulfillment.
- The Ministry of Power has released [Guidelines for Tariff Based Competitive Bidding Process for Procurement of Firm and Dispatchable Power from Grid Connected Renewable Energy Power Projects with Energy Storage Systems](#). The specific objectives are:
  - to provide firm and dispatchable power to the DISCOMs from renewable energy sources,
  - to facilitate renewable capacity addition and fulfillment of RPO/ Storage Power obligations (SPO) requirement of DISCOMs,
  - to provide a transparent, fair, standardized procurement framework based on open competitive bidding with appropriate risk-sharing between various stakeholders to enable procurement of power at competitive prices in consumer interest, improve the bankability of projects and ensure reasonable returns to the investors,
  - to provide a framework for the inter-state/ intra-state, long-term, sale-purchase of power as a further measure to derisk the sector.



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