POWERup

Update on India's electricity capacity, generation and investment

Institute for Energy Economics and Financial Analysis

1Q 2024

1. Installed Capacity

First Quarter (1Q) 2024 Update:

Record power capacity installations of 13.7GW in 1Q 2024; Renewables accounted for 71.5% of new capacity additions; In a first, coal slips under 50% of total installed capacity

India added a record total power generating capacity of **13,669 megawatts (MW)** in **1Q 2024** (January – March), with renewables accounting for **71.5%** of all new capacity additions (**Table 1**). With these additions, India's cumulative power generation capacity reached nearly **442 gigawatts (GW)** by the end of March 2024.

Among renewables, solar and wind recorded the majority of capacity additions, accounting for **62.1% and 8.4%**, respectively, of the total capacity added during the quarter.

India also expanded its nuclear power capacity with the commissioning of Unit 4 (**700MW**) of Nuclear Power Corporation of India Limited (NPCIL)'s Kakrapar Atomic Power project on 31 March 2024.

India recorded a net coal power capacity addition of **3,193MW** during 1Q, one of the highest in recent quarters, taking the total installed base of coal power capacity close to **218GW** or **49.2%** of the total installed power generation capacity. Coal capacity additions are from state undertakings that include commissioning of:

- Unit 2 (**660MW**) of NTPC's North Karanpura supercritical thermal power project at Tandwa, Jharkhand, in March 2024;
- Tamil Nadu's biggest coal power unit (**800MW**) at the North Chennai Super Critical Thermal Power Station by Tengedco in March 2024;
- **Two units of 660MW** each by Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd. (UPRVUNL) at OBRA-C and Jawaharpur in Uttar Pradesh in February 2024; and
- Unit 2 (**800MW**) of NTPC's Telangana STPP in February 2024.

Despite the coal capacity additions in 1Q 2024, given the increasing renewable power capacity installations in recent years, the coal capacity's share in total power capacity dropped under 50% for the first time. This is in line with the Government of India's target of establishing 50% cumulative power generation capacity from non-fossil fuel based sources by 2030.[1]

Table 1: Installed power generation capacity, by source (MW), 1Q 2024

Energy Source	As on 31 December 2023	As on 31 March 2024	Change (MW)	% of New Capacity Added
Wind Power	44,736	45,887	1,150	8.4
Solar Power*	73,318	81,814	8,495	62.1
Small Hydro	4,987	5,003	17	0.1
Biomass	10,262	10,355	94	0.7
Waste-to Energy*	583	586	3	0.0
Large Hydro	46,910	46,928	18	0.1
Nuclear	7,480	8,180	700	5.1
Coal (+ Lignite)	214,396	217,589	3,193	23.4
Gas	25,038	25,038	0	0.0
Diesel	589	589	0	0.0
Total	**428,300**	**441,969**	**13,669**	**100.0**

Source: Central Electricity Authority, GoI; IEEFA
**Includes grid and off-grid capacities*

[1] *A moving target in terms of absolute capacity numbers as India will likely add power generation capacity from all sources to meets its growing electricity demand.*

Capacity additions trend:

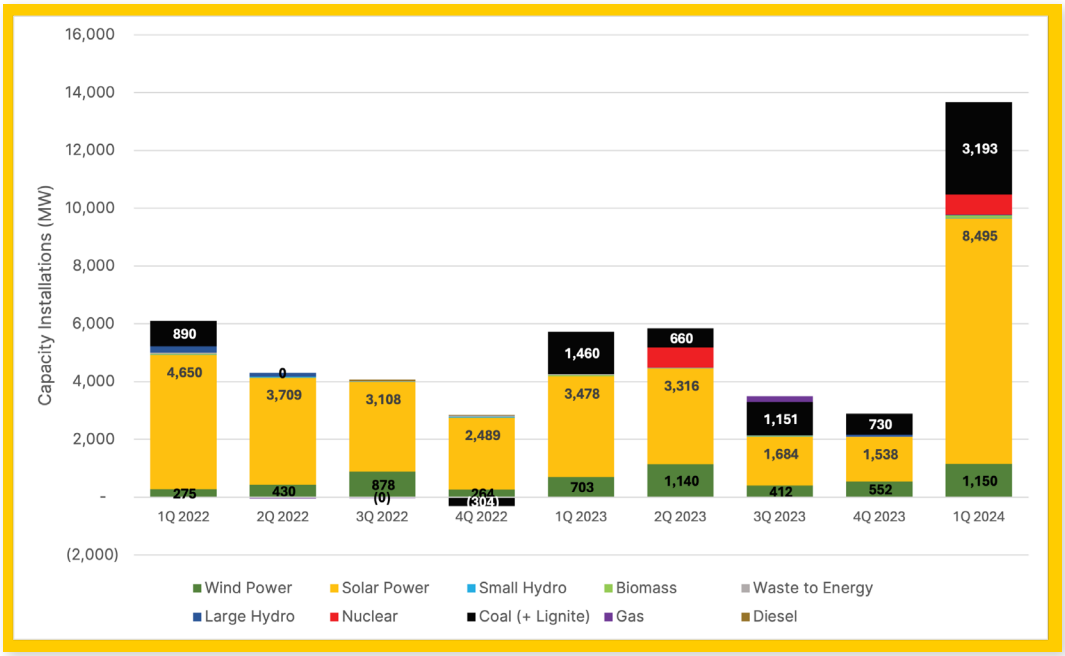
India witnessed a **record solar power capacity installation of 8.5GW** during the quarter, driven by many projects coming online, including Adani's 1.6GW solar project at Khavda in Gujarat.

Solar, wind, and coal continue to drive the growth in capacity additions consistently

Solar capacity additions have significantly increased even from the peak of 4,650MW achieved in 1Q 2022 to register 8,495MW in 1Q 2024, the highest in the last nine quarters (**Figure 1**). Some reasons for record-high solar installations are:

- A sustained year-on-year increase in tendered capacity, which increased by about 33% in 2022 and by about 163% to reach 124GW in 2023. The tendered capacity has been increasing over the period, driven by India's need to add about 40.7GW of non-fossil fuel power capacity every year from 2023 to achieve 500GW of the said capacity by 2030.
- Another key driver for record solar installations in this quarter may have been the applicability of the Approved List of Models and Manufacturers (ALMM) from 1 April 2024, which expedited the commissioning of the projects in the pipeline.

Figure 1: Capacity Additions Trend by Energy Source (MW), Last Nine Quarters



Source: Central Electricity Authority, MNRE, IEEFA

Solar, wind, and coal continue to drive the growth in capacity additions across the quarters, except for another 700MW commissioning of nuclear power capacity this quarter in addition to the 700MW of nuclear capacity installed in 2Q 2023.

- NPCIL even announced that India will be in a position to commission a nuclear reactor every year going forward with 19 reactors in various stages of implementation currently.

India registered five consecutive quarters of **coal power capacity additions totalling 4,001MW** in 2023 and **3,193MW alone in 1Q 2024,** driven by the need to meet the increasing electricity demand.

Capacity additions among large states[2]:

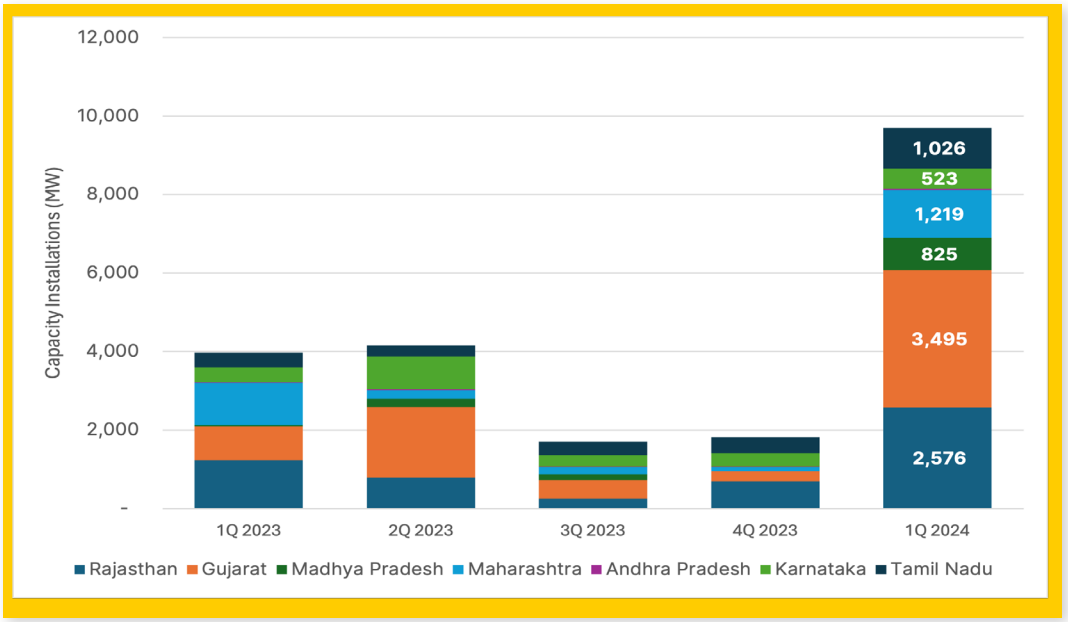
Among large states (in terms of installed renewables power generation capacity of close to 10GW or more), Gujarat and Rajasthan are the main drivers of renewable energy capacity expansion by adding 3,495MW and 2,576MW in 1Q 2024 (Figure 2).

Other notable capacity additions in 1Q 2024 happened in Maharashtra (1,219MW), Tamil Nadu (1,026MW), and Madhya Pradesh (825MW).

Andhra Pradesh continues to be a laggard in this group with only 27MW of renewables capacity added in 1Q 2024.

Gujarat, Rajasthan, Maharashtra and Tamil Nadu lead the record renewables capacity installations in 1Q 2024

Figure 2: Renewable Energy Capacity Installations (MW), Large States



Source: Central Electricity Authority, MNRE, IEEFA

[2] *States with an installed renewables capacity of close to 10GW or more.*

2. Generation

Total power generation grew by 7.8% in 1Q 2024 compared with 1Q 2023; while solar and wind power generation grew by 7.6%, overall renewables contribution remained the same due to a drop in generation from large hydro projects.

Total power generation from all sources increased by **7.8%** from **396.13 billion units (BUs)** in 1Q 2023 to **427.02BUs in 1Q 2024** led by increases in power generation from coal, solar, and wind (**Figure 3**).

Solar and wind power generation increased by **7.6%** from 41.37BUs in 1Q 2023 to **44.51BUs in 1Q 2024** (January-March). However, total renewables generation growth is flat at 0.05% due to a **20.7% drop** in generation from large hydro projects.

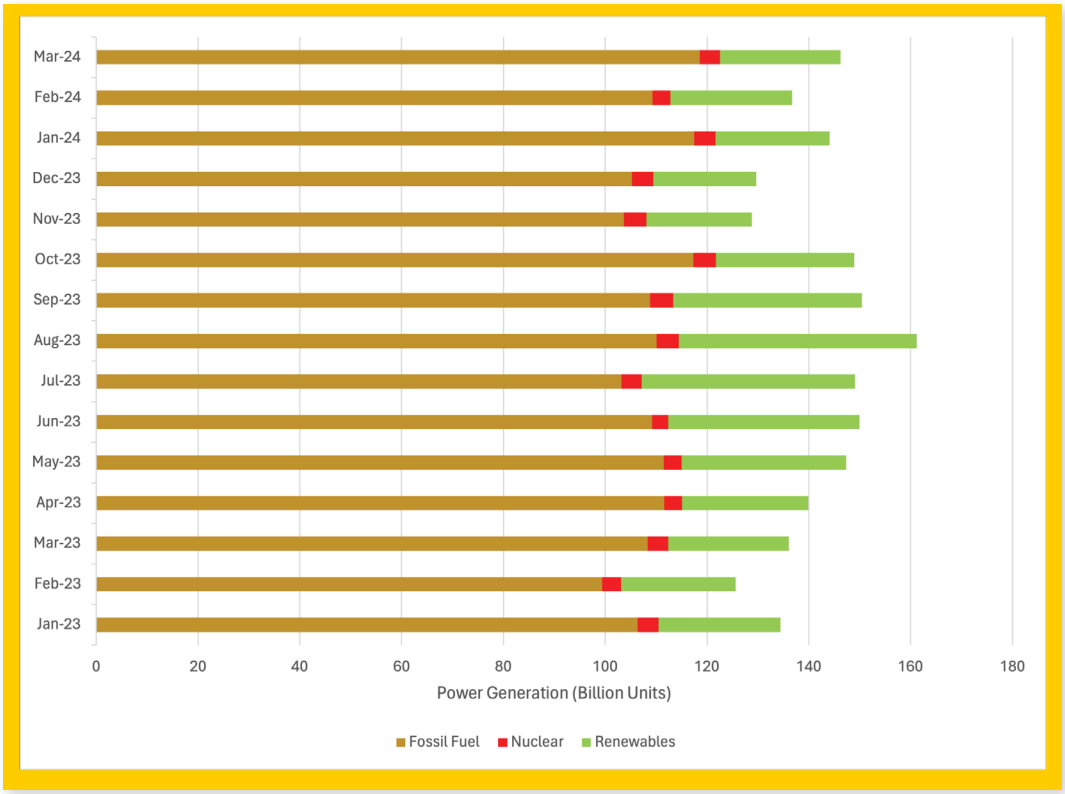
- Low rainfall resulted in a record drop (the steepest fall in nearly four decades) in power generation from large hydro projects.

In the same period, fossil fuel-based thermal power generation increased by 9.9% from 314.12 BU in 1Q 2023 to 345.30 BU in 1Q 2024.

Power generation from fossil fuel sources continues to rise as new coal power plants have been commissioned every quarter since 2023 to meet the growing electricity demand. Further, the increase in thermal generation is also due to a government directive (under Section 11 of the Electricity Act) to operate imported coal-based power plants at full capacity until 15 October 2024 to meet the rising summer power demand.

In the first three months of 2024 (1Q 2024), fossil fuel-based generation accounted for 80.9%, while renewables accounted for 16.4% of the total power generation. Fossil fuels will likely account for 70-75% of the total power generation for the full year 2024.

Figure 3: Power Generation by Source (BU), Monthly, 2024*



Source: Central Electricity Authority, MNRE, JMK Research, IEEFA
** Data for March 2024 is provisional*

3. Investments

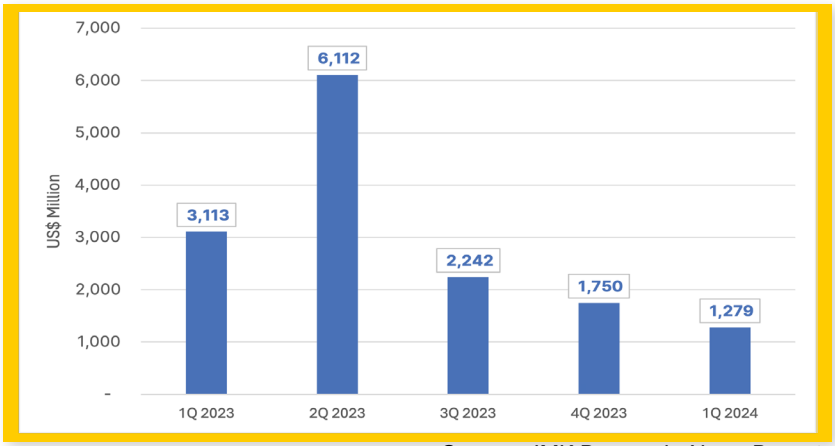
Investments into the renewable energy sector declined by 58.9% year-over-year from US$3,113 million in 1Q 2023 to **US$1,279 million in 1Q 2024 (Figure 5)**.

- Investments also declined in sequential quarters by 26.9% from US$1,750 million in 4Q 2023.
- High interest rates continue to weigh on investment decisions in the sector. Further, the onset of the national election season may also have induced a sense of policy uncertainty among the investors in 1Q 2024.
- Investments will likely rise in the second half of 2024 after the constitution of the new administration.

According to the Indian government estimates, India will witness a surge in investments this year and will attract about US$16.5 billion into the renewable energy sector in 2024.

- It is pertinent to note that India recorded an investment of approximately US$13.2 billion in 2023 against the government's expectations of US$25 billion in the year. Investments in 2023 were affected by high interest rates and material costs.

Figure 4: India Renewable Energy Sector Investments (US$ million)



Source: JMK Research, News Reports

Investments fall to the lowest in the last five quarters due to continued high interest rates and policy uncertainty

Some of the major investments and deals made during the quarter are:

REC Limited	REC Limited is set to lend Rs1.2 trillion (US$14.3 billion) under Pradhan Mantri Suryodaya Yojana, aimed at installing rooftop solar systems in 10 million Indian households. This credit has been approved to go towards willing power sector companies for the implementation of the scheme across the country.
Adani Group	The Adani Group is set to expand its investments in FY2024-25. A reported Rs1.2 trillion (US$14 billion) is expected to be invested across its portfolio with 70% allocated to green business, including renewable power and green hydrogen.
Tata Power Renewable Energy	Tata Power Renewable Energy has signed two memorandums of understanding with the government of Tamil Nadu with plans to invest Rs699 billion (US$8.4 billion) into renewable energy projects in the state. The first MoU aims to set up power projects of up to 10,000MW, including round-the-clock, solar, wind, and hybrid projects. The second MoU is aimed at setting up solar cells and module plants in the state.
Government of Uttar Pradesh	The Uttar Pradesh government plans to develop eight renewable and hydroelectric energy projects to increase the power sector capacity. Private players such as Greenko Group, Acme Cleantech, and Avaada will be developing these projects. With a combined capacity of 13,250MW, these deals are worth over Rs666 billion (US$8 billion).
Avaada Group	The Gujarat government and Avaada group have signed an MoU for developing 6,000MW solar-wind hybrid projects in the state at an investment of around Rs399 billion (US$4.8 billion).
ACME Group	The Odisha government announced that ACME Greentech Urja Pvt Ltd. is planning to set up a solar panel manufacturing unit with an investment of Rs358 billion (US$4.3 billion).
SJVN	SJVN, a public sector undertaking, secured Rs100 billion (US$1.2 billion) for a construction financing facility to fund its upcoming renewable energy projects. The facility was financed by Deutsche Bank, Mitsubishi UFJ Financial Group (MUFG), State Bank of India, Punjab National Bank, and Bank of India.
JSW Neo Energy	A 1,500MW capacity pumped storage project has been announced by the Telangana government and JSW Neo Energy. An MoU for the same was signed by the parties at the World Economic Forum in a deal valued at around Rs83 billion (US$1 billion).
RenewSys India	RenewSys India, headquartered in Singapore, signed an MoU with the Government of Telangana to set up a Solar PV module and cell manufacturing facility with a phased investment of Rs60 billion (US$719 million) over five years.
Adani Green Energy	Adani Green Energy plans to establish pump storage projects (PSP) totaling 1.35GW in Telangana, with an investment exceeding Rs50 billion (US$601.48 million). The PSPs include an 850MW facility at Koyabestagudem and a 500MW facility at Nacharam.
NTPC and NTPC Renewbale Energy	NTPC Limited and NTPC Renewable Energy Limited (NREL) and Japan Bank for International Cooperation (JBIC) have signed a pact valued at Rs16.6 billion (US$200 million) towards financing clean energy projects. This deal involves sourcing foreign currency loans and extends a loan of Rs80 crore (US$9.6 million) to both NTPC and NREL.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. **www.ieefa.org**

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