POWER

IBEF
INDIA BRAND EQUITY FOUNDATION
www.ibef.org

Table of Contents

Executive summary

2. ELECTRIFICATION ACHIEVEMENTS

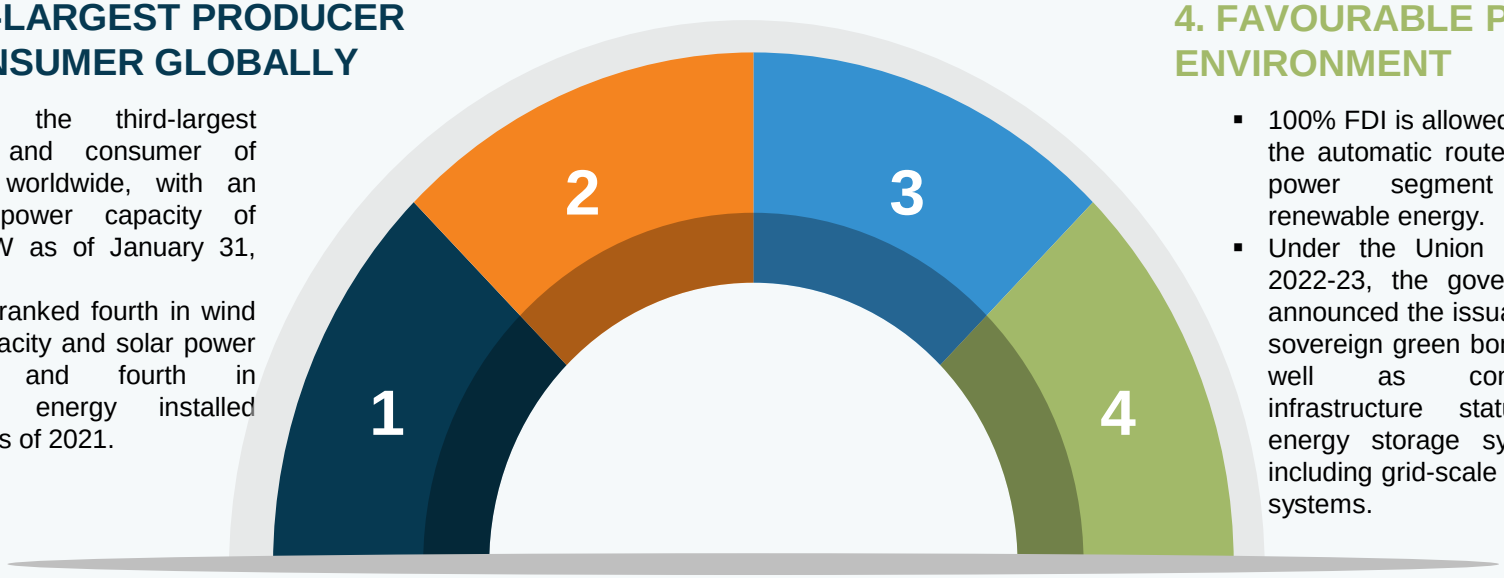
- India has been on a path to achieve 100% household electrification as envisaged under the Saubhagya scheme. As of March 2023, more than 2.86 crore households were electrified under the Saubhagya scheme.
- A total of 187.05 GW of capacity from non-fossil fuel sources has been installed in the country as of November 30, 2023.

3. ROBUST GROWTH IN RENEWABLES

- As of January 31, 2024, India's installed renewable energy capacity (including hydro) stood at 182.04 GW, representing 42.34% of the overall installed power capacity.
- As of January 31, 2024, Solar energy contributed 74.31 GW, followed by 44.99 GW from wind power, 10.26 GW from biomass, 4.99 GW from small hydropower, 0.58 from waste to energy, and 46.93 GW from hydropower.
- The non-hydro renewable energy capacity addition stood at 15.27 GW in FY23, up from 14.07 GW in FY22.

1. THIRD-LARGEST PRODUCER AND CONSUMER GLOBALLY

- India is the third-largest producer and consumer of electricity worldwide, with an installed power capacity of 429.96 GW as of January 31, 2024.
- India was ranked fourth in wind power capacity and solar power capacity, and fourth in renewable energy installed capacity, as of 2021.



4. FAVOURABLE POLICY ENVIRONMENT

- 100% FDI is allowed under the automatic route in the power segment and renewable energy.
- Under the Union Budget 2022-23, the government announced the issuance of sovereign green bonds, as well as conferring infrastructure status to energy storage systems, including grid-scale battery systems.

Source: *Ministry of Power, PIB, Renewable 2022 Global Status Report, Invest India*

Advantage India

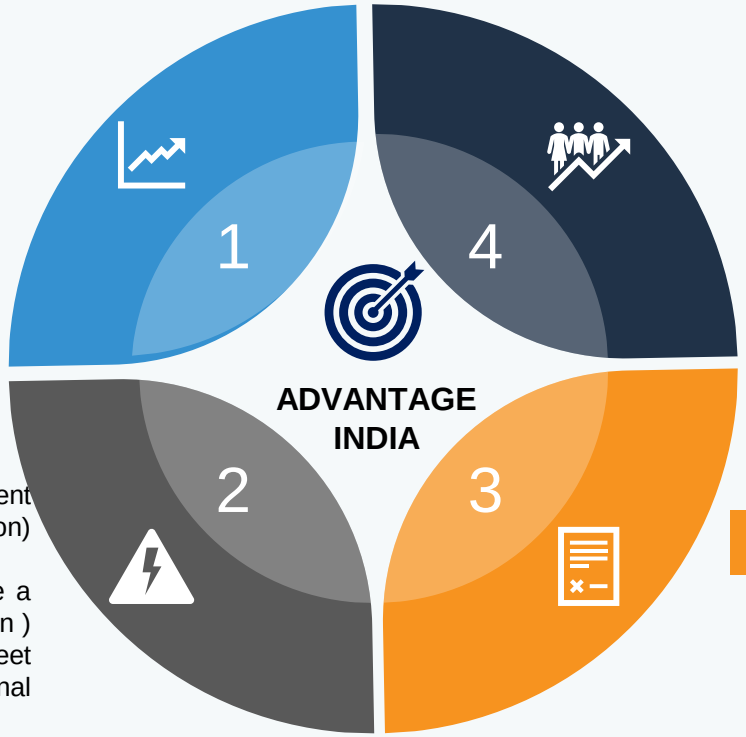
Advantage India

1. Growing demand

- Expansion in industrial activity to boost demand for electricity.
- Growing population along with increasing electrification and per-capita usage to provide further impetus.
- Power consumption in India in FY23 logged a 9.5% growth to 1,503.65 billion units (BU), as compared to 1,374.02 BU in FY22.
- India's electricity generation from renewable and non-renewable sources for FY21, FY22, and FY23 was 1,373.08 BU, 1,484.36 BU, and 1,617.72 BU, respectively.
- India ranked fourth in the list of countries to make significant investments in renewable energy by allotting US$ 77.7 billion between 2015 and 2022.

2. Higher investment

- India's power sector is expected to attract investment worth Rs. 9-9.5 trillion (US$ 128.24-135.37 billion) between FY19-FY23.
- The power generation industry in India will require a total investment of Rs. 33 lakh crore (US$ 400 billion) and 3.78 million power professionals by 2032 to meet the rising energy demands, as per the National Electricity Plan 2022-32.
- Cumulative FDI inflow in the power sector stood at US$ 18.17 billion between April 2000-December 2023.
- India has the potential to attract an investment of over US$ 20 billion in renewables in 2023.
- As per the National Infrastructure Pipeline 2019-2025, energy sector projects accounted for the highest share (24%) out of the total expected capital expenditure of Rs. 111 lakh crore (US$ 1.4 trillion).



4. Opportunities

- In the Budget for 2024, the government's power sector initiatives have been allocated funds that are 50% higher. Increased funds have been allocated to green hydrogen, solar power, and green-energy corridors in line with the renewable energy target for 2030.
- In order to meet India's 500 GW renewable energy target and tackle the annual issue of coal demand supply mismatch, the Ministry of Power has identified 81 thermal units which will replace coal with renewable energy generation by 2026.

3. Policy support

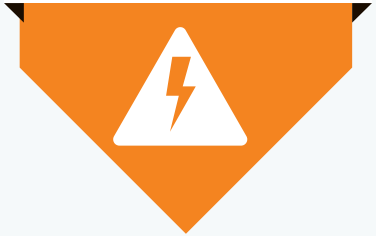
- 100% FDI allowed in the power sector has boosted FDI inflow in this sector.
- Electrification in the country is increasing with support from schemes like Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY), Ujwal DISCOM Assurance Yojana (UDAY), and Integrated Power Development Scheme (IPDS).
- Cabinet approves PM-Surya Ghar: Muft Bijli Yojana for installing rooftop solar in One Crore households

Source: *DPIIT, ICE 360 Survey 2016, Blue Star Investor Presentation August 2018, *BARC India Universe Update July 2018, Bombay Stock Exchange, News Articles*

Market Overview

Evolution of the Indian power sector

Before 1956 Introductory Stage



- Electricity (Supply) Act 1948
- Establishment of semi-autonomous State Electricity Boards (SEBs)

1956-1991 Nationalisation Stage

- Industrial Policy Resolution (1956)
- Generation and distribution of power under state ownership
- Power losses, subsidies, infrastructure bottlenecks and resource constraints

1991-2003 Liberalisation Era

- Legislative and policy initiatives (1991)
- Fast-track clearing mechanism of private investment proposals
- Electricity Regulatory Commissions Act (1998) for establishing Central and State Electricity Regulatory Commissions and rationalisation of tariffs

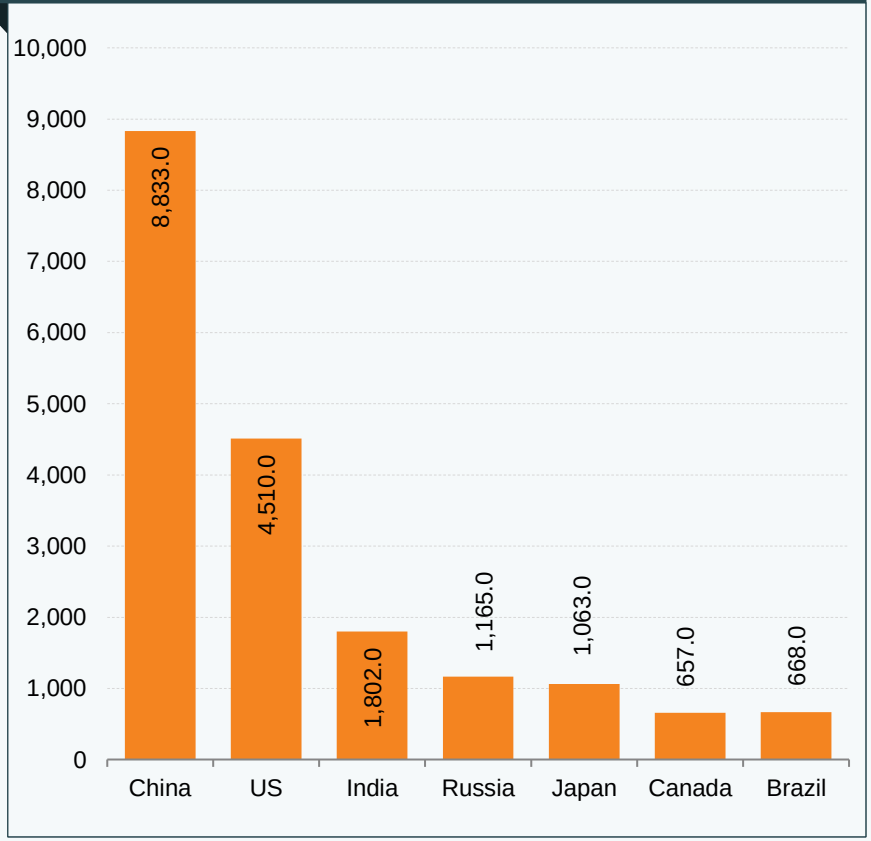
2003 onwards Growth Era

- Electricity Act (2003)
- Implementation of Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme for rural and urban areas, Implementation of Ujwal DISCOM Assurance Yojana (UDAY) which will be helpful to all villages and tracking it using the Grameen Vidyutikaran App

India among top four power generating nations

- With a generation capacity of 429.96 GW, India is the third-largest producer and consumer of electricity in the world.
- Although power generation has grown more than 100-fold since independence, growth in demand has been even higher due to accelerating economic activity.
- India's energy firms have made significant progress in the global energy sector. According to the S&P Global Platts Top 250 Global Energy Rankings 2022, Oil and Natural Gas Corp. Ltd. ranked 14th.
- In June 2021, the Export-Import Bank of India (Exim Bank) announced that it has extended a line of credit (LOC) worth US$ 100 million to the Sri Lankan government for the purpose of funding projects in the solar energy sector and assuring that the country's 70% power requirements are met by renewable energy sources by 2030.

Countries leading in electricity generation in 2022 (TWh)

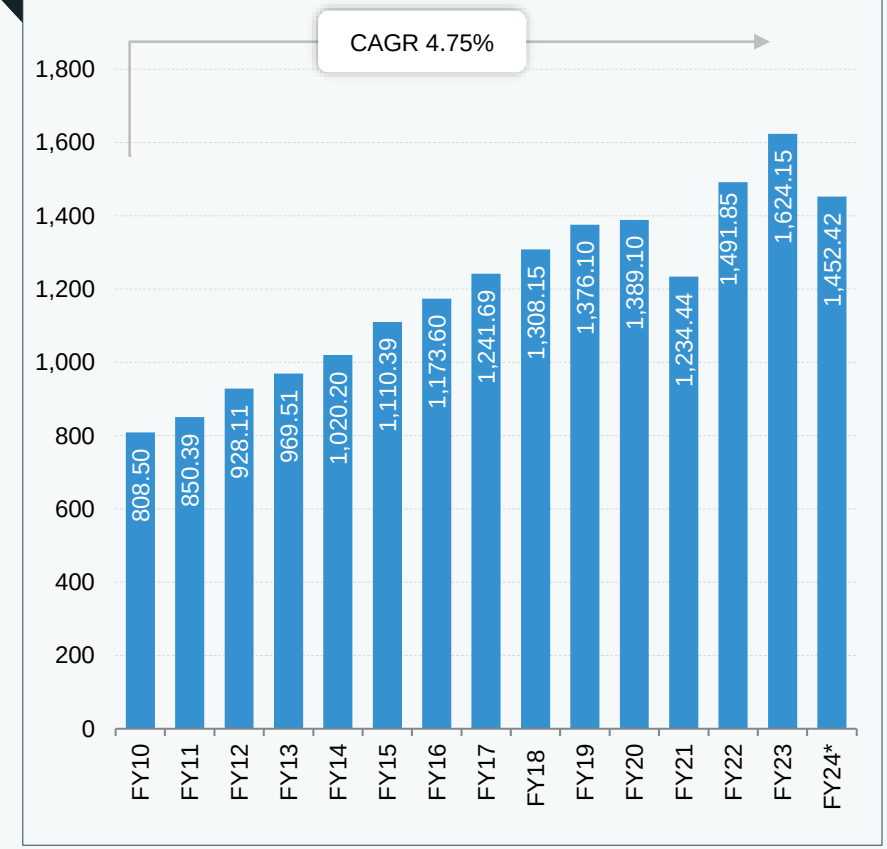


Note: *TWh - Terawatt Hours*
Source: *S&P Global, BP Statistical Review World Energy 2022*

Power generation has grown rapidly over the years

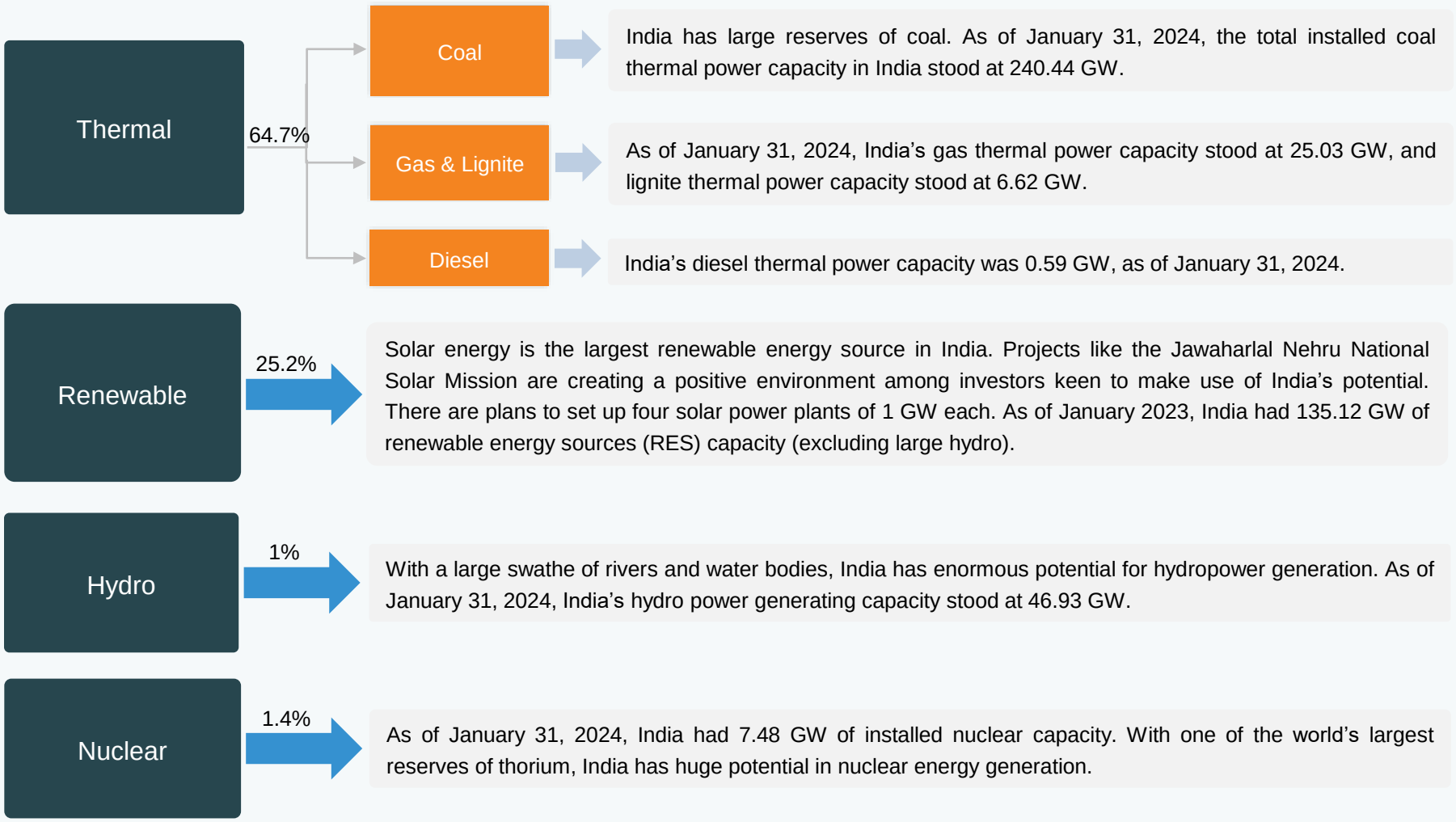
- India's power generation witnessed its highest growth rate in over 30 years in FY23. Power generation in India increased by 8.87% to 1,624.15 billion kilowatt-hours (kWh) in FY23.
- In FY24 (until January 2024), the power generation in India was 1,452.42 BU.
- During FY10-FY23, electricity generation in India increased at a CAGR of 4.75%.
- In the Union Budget 2022-23, the government allocated Rs. 7,327 crore (US$ 885 million) for the solar power sector including grid, off-grid, and PM-KUSUM projects
- For FY24, the electricity generation target from conventional sources has been fixed at 1,750 BU, comprising 1,324.11 BU of thermal energy, 156.70 BU of hydro energy, 46.19 BU of nuclear energy, 215 BU of RES (excluding hydro), and 8 BU to be imported from Bhutan.
- India's power consumption grew over 8% to 127.79 BU in February 2024 as compared to the year-ago period, according to government data.
- The Nathpa Jhakri Hydro Electricity Station of Satluj Jal Vidyut Nigam (SJVN) has set a new monthly power generation record, increasing from 1,213.10 million units to 1,216.56 million units on July 31, 2021.

Total generation in India (including renewable sources) (BU)



Notes: *BU - Billion Unit, *Until January 2024*
Source: *BP Statistical Review, Ministry of Power, News Articles*

Sources of power with shares in total installed capacity… (1/2)

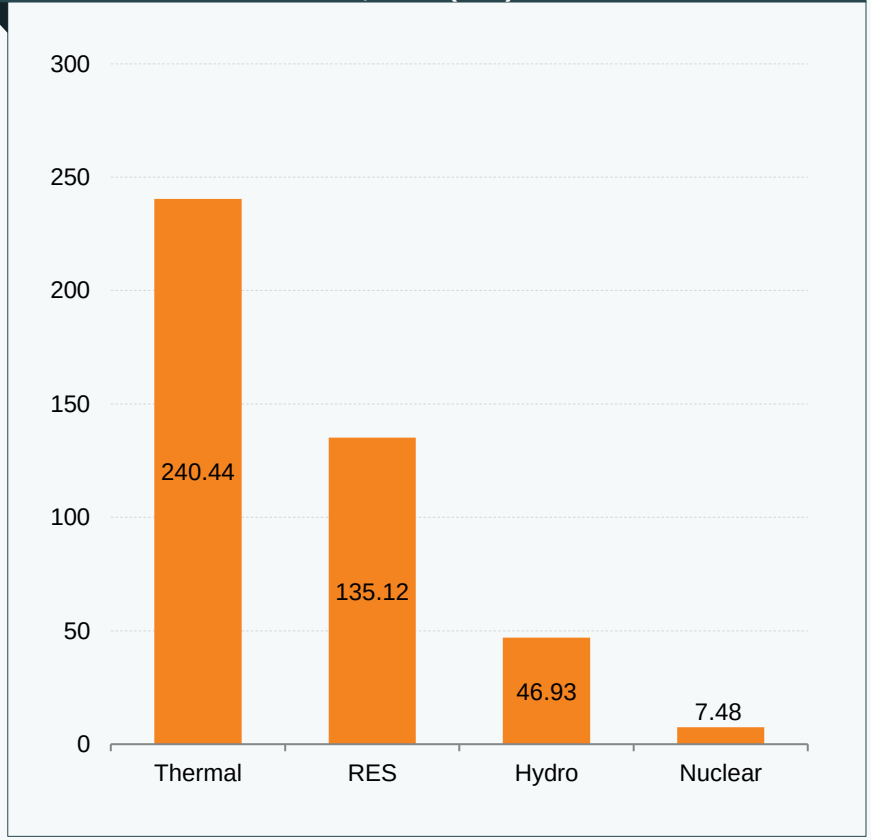


Notes: *GW - Gigawatt*
Source: *Ministry of Coal, NHPC, CEA, Corporate Catalyst India, Indian Power Sector, Ministry of Power*

Sources of power with shares in total installed capacity… (2/2)

- In order to further sustainable development and people's wellbeing, Prime Minister Mr. Narendra Modi launched PM Surya Ghar: Muft Bijli Yojana. This project, with an investment of over Rs. 75,000 crore (US$ 9 billion), aims to light up one crore households by providing up to 300 units of free electricity every month.
- On March 10, 2024, NTPC signs agreement with Rajasthan Rajya Vidyut Utpadan Nigam (RVUNL) for adding supercritical units and reducing electricity generation cost of Chhabra Thermal Power Plant
- NTPC generated 399 BU in FY23, an increase of 11% over the previous year.
- Looking towards the future, the coal sector aims to ramp up renewable energy capacity to over 9 GW by the year 2030
- Thermal power plant load is estimated to improve by 63% in FY24, fuelled by strong demand growth along with subdued capacity addition in the sector.

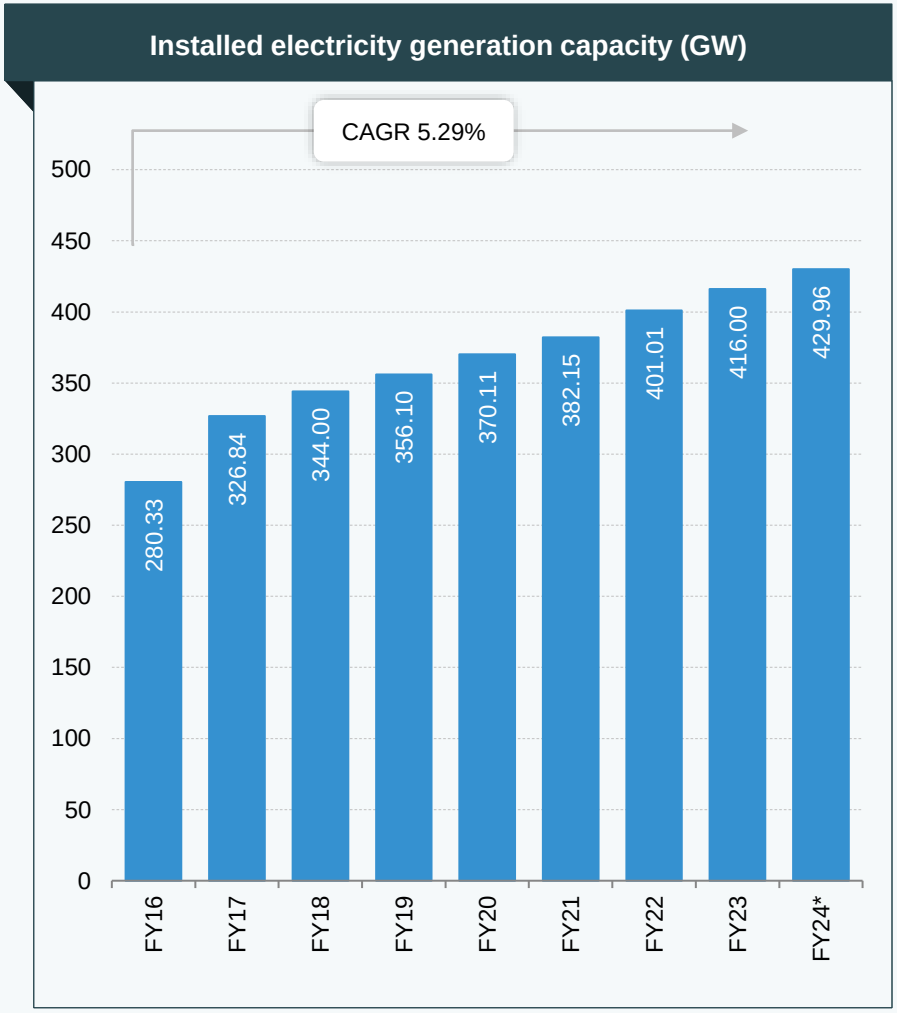
Installed Capacity for Different Sources of Power as of January 31, 2024 (GW)



Notes: *GW – Gigawatt, PLF- Plant Load Factor*
Source: *Ministry of Coal, NHPC,Central Electricity Authority (CEA), Corporate Catalyst India*

Generation capacity has increased at a healthy pace

- Installed capacity has increased steadily over the years, posting a CAGR of 5.80% between FY16-FY23.
- Coal-based power installed capacity in India stood at 208.19 GW in January 2024 and is expected to reach 330-441 GW by 2040.



Note: *GW – Gigawatt, *Until January 31, 2024*
Source: *CEA (Central Electricity Authority)*

Major players in the power sector … (1/4)

1

- NTPC is the largest power producer in India, and is also the sixth-largest thermal power producer in the world.
- The company has an installed capacity of 73.024 GW (including 15.98 GW through joint ventures/subsidiaries). NTPC has 50 power stations comprising 26 coal, seven combined cycle gas/liquid fuel, one large and one small hydro and 15 solar PV, along with 39 subsidiary and JV power stations.
- The group has over 18 GW of capacity under construction.
- It has also diversified into hydro power, coal mining, power equipment manufacturing, oil and gas exploration, power trading, and distribution.
- In March 2023, NTPC signs agreement with Rajasthan Rajya Vidyut Utpadan Nigam (RVUNL) for adding supercritical units and reducing electricity generation cost of Chhabra Thermal Power Plant.
- In February 2023, First Solar Project of NTPC Renewable Energy Limited begins operations.
- In December 2023, NTPC Group achieves its fastest-ever 300 Billion Units Electricity Generation.
- As informed in August 2023, towards achieving carbon-neutral Ladakh, NTPC is setting up a hydrogen fuelling station, and solar plant and providing five fuel cell buses for operation on intracity routes of Leh.
- In August 2023, North Eastern Electric Power Corporation Limited (NEEPCO), a 100% subsidiary of NTPC, took a significant step towards sustainable energy development by signing a Memorandum of Agreement (MoA) with the Government of Arunachal Pradesh.
- In July 2023, NTPC's Group installed capacity touched 73,024 MW.
- In June 2023, NTPC Limited climbed an impressive 52 positions to secure the 433rd rank in Forbes' Global 2000 List for 2023.
- In May 2023, NTPC commenced its venture into hydrogen and energy storage solutions with the establishment of a hydrogen hub in Andhra Pradesh.
- In October 2022, NTPC and GE Gas Power signed a MoU for demonstrating hydrogen co-firing in gas turbines to further decarbonize power generation.

2

- Power Finance Corporation Limited (PFC) is an NBFC, engaged in financing and development activities within the Indian power sector.
- Major products and services include project term loans, lease financing, direct discounting of bills, short-term loans and consultancy services.
- In January 2024, PFC signs MoU with Govt. of Gujarat for Power Projects worth Rs. 25,000 Crore (US$ 3 billion).

Note: *JV- Joint Ventures*

Source: *Company Website, News Articles, Industry Sources*

Major players in the power sector … (2/4)

3

- Tata Power is India's largest integrated power company with a significant presence in solar, hydro, wind and geothermal energy space. The company accounts for 52% of the total generation capacity in the private sector.
- The company has an installed capacity of 14.11 GW. The company plans to increase the generating capacity to 18 GW, distribution networks to 4 GW, and energy resources to 25 million tonnes per annum.
- In March 2024, Tata Power Solar Commissions India's Largest Solar and Battery Energy Storage project in Chhattisgarh.
- In March 2024,Tata Power achieves a milestone of 1000 green energy-powered EV charging points in Mumbai.
- In February 2024, Blusmart collaborates with TATA Power to source green power, goes 100% renewable to decarbonise mobility at Scale.
- In January 2024, Tata Power Renewable Energy Limited Lights up Asia's Largest Tea Estate with Innovative Solar Power Technology.
- In August 2023, Tata Power Renewable Energy signed two separate agreements to provide Maharashtra State Electricity Distribution Company (MSEDCL) with a total of 350 MW of electricity generated by its solar projects.
- In August 2023, Tata Power EV Charging Solutions Limited (TPEVCSL), a Tata Power group Company and Zoomcar, a leading marketplace for car sharing, entered into a Memorandum of Understanding (MoU) to promote widespread electric vehicle adoption and deliver a seamless, user-friendly charging experience to EV users nationwide.
- In August 2023, Tata Power signed an MoU with the Government of Maharashtra for the development of 2,800 MW of pumped hydro storage projects.
- In June 2023, Tata Power, one of the leading players in the electric vehicle (EV) charging infrastructure space, collaborated with the Ayodhya Development Authority to set up EV charging points in public parking locations across the city.
- Tata Power Company has been recognised as the country's 'Most Attractive Employer Brand', according to the recently published Randstad Employer Brand Research (REBR) 2023 report by HR services provider Randstad India.
- In May 2023, TP Saurya Tata Power Trading Company Ltd. signed a power purchase agreement to set up a 200 MW solar project at Bikaner, Rajasthan.
- In March 2023, Tata Power Renewable Energy Limited and ISS India joined hands to promote clean and sustainable energy solutions in facility management space.

TATA POWER

Note: *JV- Joint Ventures*

Source: *Company Website, News Articles, Industry Sources*

Major players in the power sector … (3/4)

4

- Adani Power is one of India's largest private thermal power producers, with total capacity at 15.25 GW.
- Adani Group is exploring a US$ 3 billion investment in Vietnam's seaport ecosystem and wind and solar energy projects.
- In November 2023, Adani Power To Co-Fire Green Ammonia At Its Mundra Plant For A Sustainable Future.
- In July 2023,Adani Group Commissions India's First Transnational Power Project.
- In June 2023,Adani Power's Godda Plant Becomes Fully Operational.

5

- CESC Limited is a vertically integrated player engaged in coal mining and generation and distribution of power.
- As of January 2022, it owns and operates three thermal power plants, generating 1,125 MW of power. These are the Budge Budge Generating Station (750 MW), Southern Generating Station (135 MW), and Titagarh Generating Station (240 MW).
- In February 2022, Kolkata-based Eminent Electricity Distribution Ltd., a subsidiary of CESC Limited, bid Rs. 871 crore (US$ 113.24 million) to take over Chandigarh's power supply department, which was approved and the transition will happen by the end of March,2022.

6

- NHPC is the largest hydropower utility in India.
- In February 2024, Prime Minister Shri Narendra Modi lays Foundation Stone of NHPC's 300 MW Karnisar-Bhatiyan, Bikaner Solar Power Plant with investment of over Rs. 1,732 crore (US$ 208.4 million).
- In January 2024, NHPC signs MoU with GPCL, Government of Gujarat; to invest Rs. 4,000 crore (US$ 481.4 million) in proposed 750 MW Kuppa Pumped Hydro Storage Project.
- In August 2023, NHPC signed an MoU with RITES for Construction of Railway Siding at Pasighat (Arunachal Pradesh) for NHPC's 2,880 MW Dibang Multi Purpose Project.
- In July 2023, a Memorandum of Understanding (MoU) was signed between NHPC Limited and Universal Health Foundation under the CSR initiative of NHPC.
- In June 2023, a Memorandum of Understanding (MoU) was signed between NHPC Limited and the Government of Odisha through GRIDCO Limited for "Development of Pumped Storage Projects (PSPs) and Renewable Energy in the State of Odisha".
- In May 2023, NHPC secured a 200 MW solar project within Gujarat State Electricity Corp Ltd.'s 600 MW solar park at Khavda in Gujarat.
- In September 2022, NHPC signed a MoA with IIT Jammu for undertaking research and development activities.
- In August 2022, NHPC Limited and the Government of Himachal Pradesh inked an implementation agreement for the 500 MW Dugar Hydroelectric Project in the Chamba District of Himachal Pradesh.

Source: *Company Website, News Articles, Industry Sources*

Major players in the power sector … (4/4)

7

- Damodar Valley Corporation (DVC) is engaged in power generation, distribution and transmission of electric power, irrigation and flood control.
- Damodar Valley Corporation achieved the highest power generation in its 75 years of existence, with a 6.5% on-year rise in FY23 to 43.32 billion units, which mostly came from thermal sources.
- In April 2021, DVC's three thermal stations were ranked among the top 10 in the central utility sector.

8

- SJVN Limited is the second-largest hydro power company in India.
- SJVN Limited has plans to put in place pumped hydro storage projects of 5 GW in the next 7-10 years.
- The company plans to diversify into wind power projects.
- In March 2024, 50 MW Solar Project of SJVN to come up in Sontipur district of Assam.
- In March 2024, SJVN inks Long Term Agreements for supply of 600 MW solar power to Rajasthan.
- In February 2024, SJVN inks Power Usage Agreement with Jammu & Kashmir Power Corporation Limited for 300 MW Solar Power.
- In October 2024, CCI approves 100% shareholding of Lanco Amarkantak Power Limited by PFC Projects Limited, REC Limited, SJVN Limited and Damodar Valley Corporation.
- In August 2023, State-owned SJVN Ltd inked two pacts with Punjab State Power Corporation Ltd (PSPCL) to supply 1,200 MW of solar power from its projects.
- In August 2023, the company was conferred with "2nd Annual Greentech Quality & Innovation Award 2023" under the category of Quality Improvement.
- In January 2023, the Union Cabinet (CCEA) approved investment of Rs. 2,614 crore (US$ 315 million) for SJVN's 382 MW Sunni Dam Hydro Project.
- In January 2023, President of India laid foundation stone of SJVN's 1,000 MW Bikaner Solar Power Project in Rajasthan.

9

- Power Grid Corporation of India Limited (PGCIL) is the single largest transmission utility in India. It is responsible for planning, co-ordination, supervision and control over inter-state transmission systems.
- In January 2023, the President of India dedicated transmission system built by Power Grid for 8.9 GW of solar power in Rajasthan.
- As of February 2022, the company managed 172,275 kms of transmission lines and 265 substations.

Source: *Company Website, News Articles, Industry Sources*

Recent Trends and Strategies

Strategies adopted

1. Control generation costs

- Companies are developing captive coal fields to reduce price volatility and ensure uninterrupted supply of fuel to control generation costs.
- Most of the power companies are now located near the energy source. This helps minimise costs of fuel transport.

2. Acquiring sources of fuel supply

- Power companies are now looking at securing adequate supplies of fuel by targeting not only domestic but also overseas resources.
- Reliance Power has coal reserves in Indonesia.
- Essar Power has captive coal mines in Indonesia from which it extracts coal for power plants in India.
- Government has enabled power utilities for swapping their coal supplies with the nearest source to save miscellaneous costs and decongest the rail network.

3. Diversifying generation technologies

- Companies are using multiple-generation technologies based on a project's requirement.
- Companies such as NTPC and Reliance Power have coal-fired, gas-fired and hydroelectric capacity. This helps them diversify and reduce dependence on a single source.

6. Aatmanirbhar Bharat

- In March 2024, PFBR has been fully designed and constructed indigenously by BHAVINI with significant contribution from more than 200 Indian industries including MSMEs. Once commissioned, India will only be the second country after Russia to have commercial operating Fast Breeder Reactor.

5. Digital India

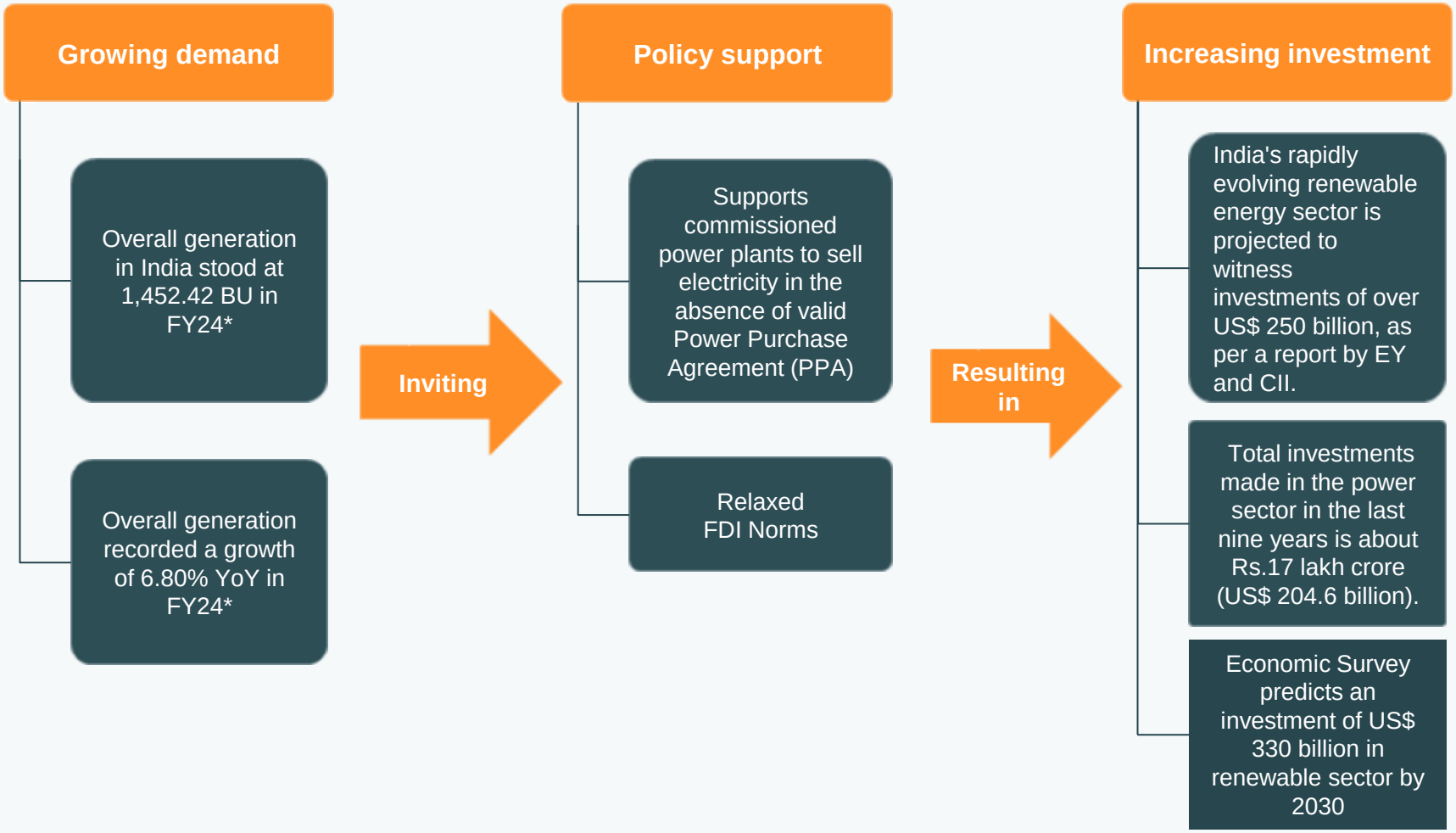
- Launch of smart grid mission with 14 DISCOMS as a pilot. Smart metering for high-end users of electricity.
- In June 2020, Government launched pan-India Real Time Market in electricity.

4. Additional revenue streams

- Most of the companies are now looking to sell their carbon credits to generate additional revenue by employing supercritical technology.

Growth Drivers

Growth drivers in power sector of India

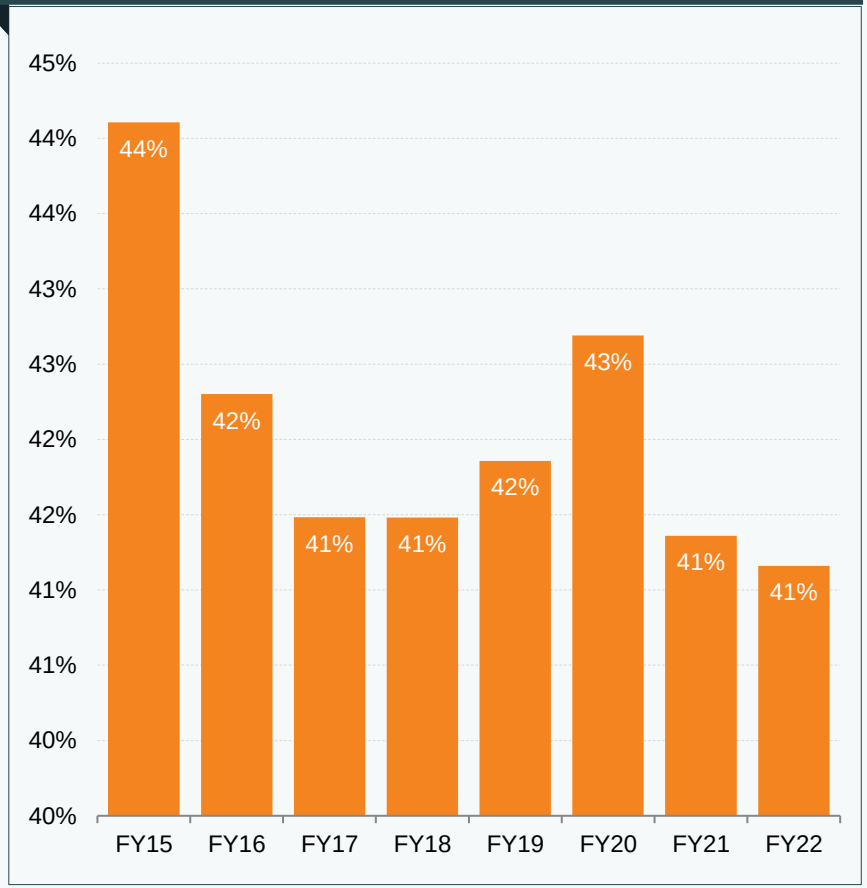


Note: *FDI - Foreign Direct Investment , * Till January 2024*
Source: *Central Electricity Authority of India*

Industrial expansion and strong GDP growth driving power demand… (1/2)

- Multiple drivers (industrial expansion, growing per-capita incomes) are leading to growth in power demand. This is set to continue in the coming years.
- India is set to become a global manufacturing hub with investment across the value chain.
- The demand for power increased by 60% between 2013 and 2014, and it rose by 9% in 2023, attributed to the expansion and enhancement of infrastructure. The power industry is currently augmenting approximately 85 GW of thermal capacity, with 14 GW of hydro capacity under construction and an additional 14 to 15 GW of hydro capacity awaiting clearances.
- In 2024*, power demand in India Peak at 243.3 GW jumped ~12% from a year ago.
- The Central Electricity Authority (CEA) estimates India's power requirement to grow to reach 817 GW by 2030.
- The industrial sector accounted for largest share 41.16% followed by domestic 25.77%, agriculture 17.67% and commercial sector 8.29% in FY22.

Share of electricity consumption in industrial sector

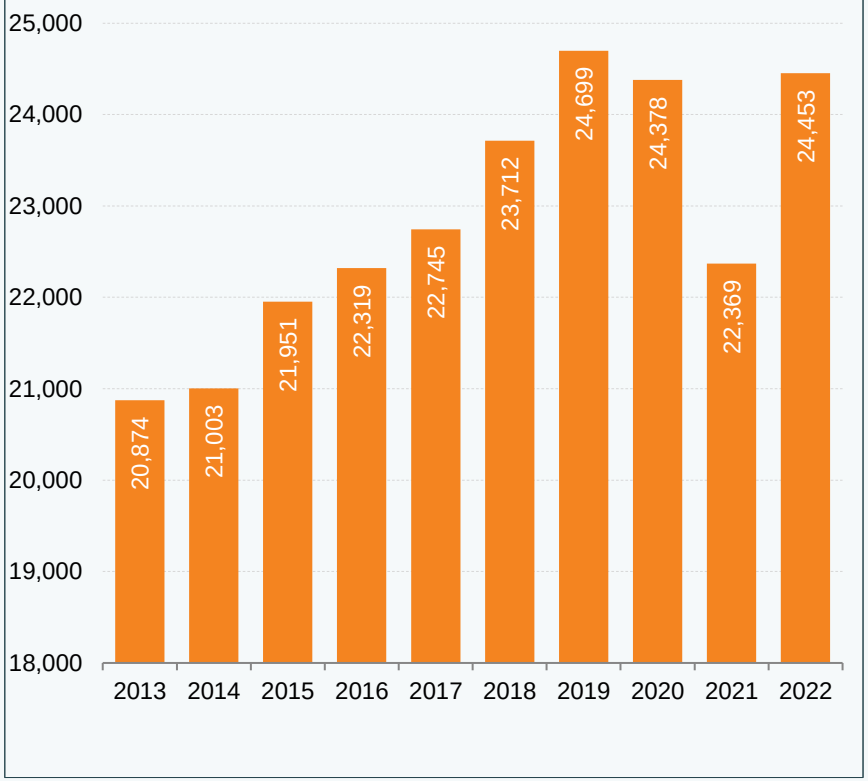


Note: *TWh - Terawatt Hours, P – Provisional, E-Estimated, * Till January 2024*
Source: *Ministry of Statistics and Program Implementation, CEA*

Industrial expansion and strong GDP growth driving power demand… (2/2)

- Future investment will benefit from strong demand fundamentals, policy support and increasing government focus on infrastructure.
- Per capita electricity consumption in India grew reaching 24,453 Megajoule/Person in 2022.
- This growth was mainly attributed to electrification of villages and households across the country.
- By 2030, India aims to reduce the emissions intensity of its gross domestic product (GDP) by 33%, to end up at 35%, and increase the share of non-fossil fuels to 40% of the total electricity generation capacity.

Per-capita electricity consumption (Megajoule/Person)



Note: *P : Provisional, data as per latest available figures, BU - Billion Units*
Source: *CEA, KPMG*

Policy support and initiatives… (1/6)

1

National Policy on Biofuels - 2018

- In May 2022, the Government of India approved the Amendment to the National Policy on Biofuels 2018.
- The advantages of this policy were linked to improved health, a cleaner environment, job creation, decreased import reliance, and increased investment in infrastructure in rural regions. The proposed amendment will facilitate the "Make in India" initiative.

2

Ultra Mega Power Projects (UMPPs)

- Launch of UMPP scheme through tariff-based competitive bidding.
- Ease of land possession, provision of fuel, water and necessary clearances for enhancing investor confidence.

3

R-APDRP

- Linking disbursement of Central Government funds (to states) with actual reduction in transmission and distribution losses. Sanctioned projects of more than US$ 5.8 billion.
- In June 2019, the state administrative council sanctioned Rs. 173 crore (US$ 24.3 million) for Supervisory Control and Data Acquisition (SCADA) and Distribution Management System (DMS) under the R-APDRP Scheme for Jammu and Srinagar cities.

4

Saubhagya Scheme

- The Pradhan Mantri Sahaj Bijli Har Ghar Yojana, “Saubhagya” was launched by the Government of India with an aim of achieving universal household electrification. As of March 2023, 2.86 crore households have been electrified under this scheme.
- The total financial outlay of the project was Rs. 16,320 crore (US$ 2.19 billion) while the gross budgetary support (GBS) was Rs. 12,320 crore (US$ 1.65 billion).

Notes: *R-APDRP - Restructured Accelerated Power Development and Reform Programme*
Source: *Ministry of Power, Asian Development Bank, KPMG, News Articles*

Policy support and initiatives… (2/6)

5

UnnatJyoti by Affordable LEDs for All (UJALA) and Street Lighting National Programme (SLNP)

- As of August 24, 2022, over 36.86 crore LED bulbs, 72.18 lakh LED tube lights and 23.59 lakh energy-efficient fans have been distributed across the country, saving around 48,411 million kWh per year and around Rs. 19,332 crore (US$ 2.47 billion) in cost savings.

6

Loans

- In February 2022, a parliamentary standing committee recommended the government to take steps to increase the loan limit for renewable energy sector under priority sector lending. The current limit stands at Rs. 30 crore (U$ 3.93 million).
- In December 2021, West Bengal got a loan approval for US$ 135 million from the International Bank for Reconstruction and Development (also called the World Bank) to improve the operational efficiency and reliability of electricity supply in select regions in the state.

7

Energy Conservation Campaign

- Replacing nationwide streetlights with LED lights. Plan to save 10% energy that would light up 11 crore lives. Replacing 1 crore bulbs in Delhi within one year.

8

Interim Union Budget 2024-25

- In the Budget for 2024, the government's power sector initiatives have been allocated funds that are 50% higher. Increased funds have been allocated to green hydrogen, solar power, and green-energy corridors in line with the renewable energy target for 2030.

Source: *Ministry of Power, Asian Development Bank, KPMG, News Articles, Union Budget 2022-23*

Policy support and initiatives… (3/6)

9

Tariff

- Feed-in tariff scheme is used for promoting generation of electricity from renewable energy sources. The Ministry of New and Renewable Energy set solar power tariff caps at Rs. 2.50 (US$ 0.04) and Rs. 2.68 (US$ 0.04) per unit for developers using domestic and imported solar cells and modules, respectively, in August 2018.
- Solar tariffs in India have reduced from around Rs. 7.36/kWh (10 cents/kWh) in FY15 to Rs. 2.45/kWh (3.2 cents/kWh) in July 2021.

10

Boost to manufacturing

- To create potential for domestic manufacturers and developers, the Government will auction 40 GW of renewable energy projects, including 30 GW solar and 10 GW wind, every year until 2028.
- > 70% of equipment used for generation of wind power is manufactured in India.

11

Smart Meter

- Under the Union Budget 2020-21, the government has set a target of installing smart electricity meters in all households across the country by 2023.
- As of November 2022, over 51.62 lakh smart metres have been deployed under the National Smart Grid Mission (NSGM), with a further 61.13 lakh to be deployed.

12

India Energy Modelling Forum (IEMF)

- In October 2020, the government announced a plan to set up an inter-ministerial committee under NITI Aayog to forefront research and study on energy modelling. This, along with a steering committee, will serve the India Energy Modelling Forum (IEMF), jointly launched by NITI Aayog and the United States Agency for International Development (USAID).

Source: *Ministry of Power, Asian Development Bank, KPMG, News Articles*

Policy support and initiatives… (4/6)

13

Direct Benefit Transfer (DBT) Scheme

- Union and State Governments have agreed to implement Direct Benefit Transfer (DBT) scheme in the electricity sector for better targeting of subsidies.

14

Vision '24x7 Power for All'

- All the States and Union Territories of India were on board to fulfil the government's vision of ensuring 24x7 affordable and quality power for all, as per the Ministry of Power and New & Renewable Energy, Government of India.

15

No environment clearance required for solar projects

- The Ministry of Environment, Forest and Climate Change, Government of India, has clarified that solar PV (photovoltaic) power, solar thermal power projects, and solar parks will not require the environmental clearance which was mandatory under the provisions of Environment Impact Assessment (EIA) notification, 2006.

16

Green Energy Corridor Project

- The Green Energy Corridor projects have been initiated to facilitate renewable power evacuation and reshaping the grid for future requirements.
- As on October 2022, 8,651 ckm of intra-state transmission lines have been constructed and 19,558 MVA intra-state substations have been charged.

Note: *ckm- Circuit Kilometre*
Source: *Ministry of Power, Asian Development Bank, KPMG, News Articles*

Policy support and initiatives… (5/6)

17

Rooftop solar

- To encourage rooftop solar (RTS) throughout the country, Ministry New and Renewable Energy has developed a National Portal wherein any residential consumer from any part of the country can apply for rooftop solar without waiting for Discom to finalize tender and empanel vendors.
- Since the launch on July 30, 2022, the total number of applications received on the national portal is for 117 MW solar capacity and the feasibility of more than 18 MW projects is granted.

18

National Electricity Policy 2021

- In April 2021, the Ministry of Power (MoP) released the draft National Electricity Policy (NEP) 2021.
- The MoP has created an expert committee, including members from state governments, the Ministry of New and Renewable Energy (MNRE), NITI Aayog and the Central Electricity Authority (CEA).

19

PLI Scheme

- In November 2021, the government announced future plans to increase the funding under the PLI scheme for domestic solar cells and module manufacturing to Rs. 24,000 crore (US$ 3.17 billion) from the existing Rs. 4,500 crore (US$ 594.68 million) to make India an exporting nation.
- Production Linked Incentive Scheme (Tranche II) on ‘National Programme on High Efficiency Solar PV Modules’, with an outlay of Rs. 19,500 crore (US$ 2.35 billion) was approved and launched.

20

Hydroelectric Power

- The government has spent US$ 4.63 billion on hydroelectric projects to provide electricity to villages in Jammu and Kashmir between 2018-21.

Source: *News Articles*

Policy support and initiatives… (6/6)

21

National Bioenergy Programme

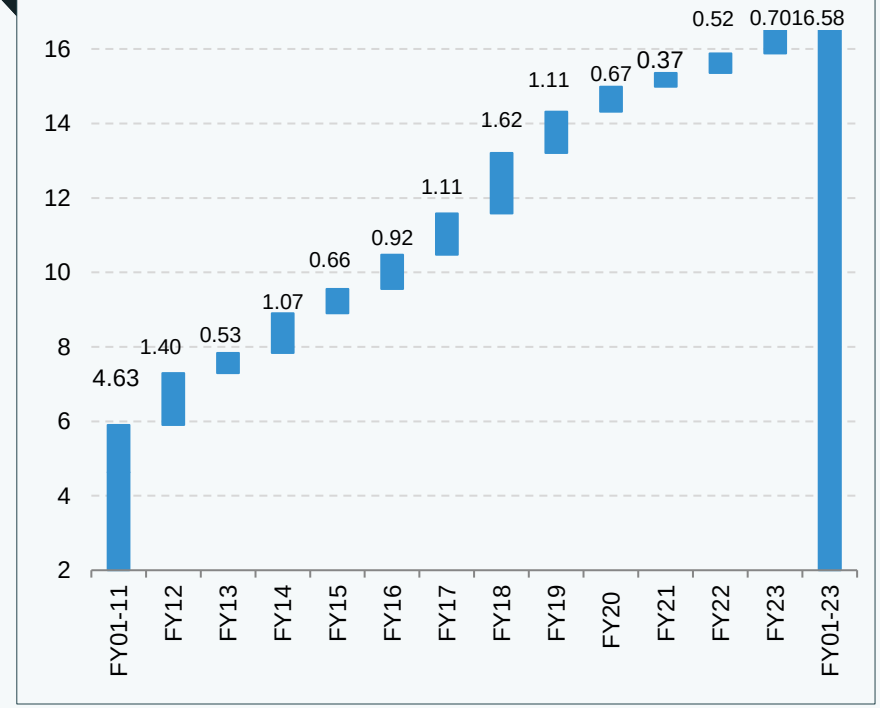
- The Government launched the National Bioenergy Programme on November 2, 2022.
- The programme has been recommended for implementation in two phases. The Phase-I of the programme has been approved with a budget outlay of Rs. 858 crore (US$ 103 million).
- The subschemes of the programme are: Waste to Energy Programme, Biomass Programme, and Biogas Programme.

Source: *News Articles*

Increasing investments: FDI inflow and domestic deals… (1/3)

- Power is one of the key sectors attracting FDI inflow into India, and it accounted for about 2.73% of the total FDI inflow until December 2023.
- From April 2000- December 2023, India recorded FDI inflow worth US$ 16.27 billion in the non-conventional energy sector.
- Cumulative FDI inflow in the power sector stood at US$ 18.17 billion between April 2000-December 2023.
- From April 2020 to September 2023, the renewable energy sector in India attracted US$ 6.1 billion in FDI equity investment.
- India has received a cumulative amount of US$ 3.8 billion in foreign direct investment (FDI) in the solar energy sector over the past three fiscal years and the ongoing fiscal year until September 2023.
- Mumbai headquartered Essar Group has formed the Essar Energy Transition (EET) with the objective to invest a total of US$ 3.6 billion in developing a range of low carbon energy transition projects over the next five years.
- In August 2022, Norfund, who manage the Norwegian Climate Investment Fund, and KLP, Norway's biggest pension company, signed an agreement to buy a 49% share of a 420 MW solar power plant in Rajasthan for Rs. 2.8 billion (US$ 35.05 million).
- Renew Power is planning to develop renewable energy projects in Maharashtra across wind, solar, hybrid power, battery storage and green hydrogen, at an investment of Rs. 50,000 crore (US$ 6.39 billion) over the next six years.
- In September 2021, the Government of the UK announced that it will invest US$ 1.2 billion through public and private investments in green projects and renewable energy in India to support the latter's target of 450 GW of renewable energy by 2030.

FDI inflow into the power sector (US$ billion)



Source: *DPIIT*

Increasing investments: FDI inflow and domestic deals… (2/3)

Important deals

Acquirer	Target	Date	Value (US$ million)
REC	Avaada Energy	July 2023	2436
IndiGrid	Sterlite Power Transmission Ltd. (STPL)	March 2023	100%
JSW Energy	Ind-Bharath Energy	Dec 2022	127.3 (95%)
Shell Overseas Investment B.V.	Solenergi Power Private Limited	Aug 2022	100% stake
Secure Meters	Adaptricity AG	Nov 2021	100% stake
Reliance New Energy Solar Ltd (RNESL)	REC Solar Holdings	Oct 2021	100% stake
Adani Green Energy	SB Energy India	Oct 2021	100% stake
Ayana Renewable	ReNew Power (Wind Farm in Karnataka)	Nov 2020	219
Global Infrastructure Partners	RattanIndia	Sep 2020	232
Actis	Acme Solar	Aug 2020	312
Adani Power Limited	Odisha Power Generation Corporation (OPGC)	Jul 2020	135
TOTAL Gas & Power Business Services	Adani Green Energy Limited (AGEL)	Apr 2020	530.40
IndiGrid	Sterlite Power	Jan 2020	145.94
Bharti Airtel Limited	AMPSolar Evolution	Oct 2019	1.20 (26%)
Adani Transmission	Bikaner-Khetri Transmission Limited (BKTL)	Sept 2019	-
SunEdison Infrastructure	Megamic Electronics	Jul 2019	10 million
Power Finance Corporation (PFC) Ltd.	Rural Electrification Corporation (REC) Ltd.	Dec 2018	52.63% of holding

Note: *FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker*
Source: *Thomson One Banker, Industry News, VC Circle*

Increasing investments: FDI inflow and domestic deals… (3/3)

Important deals

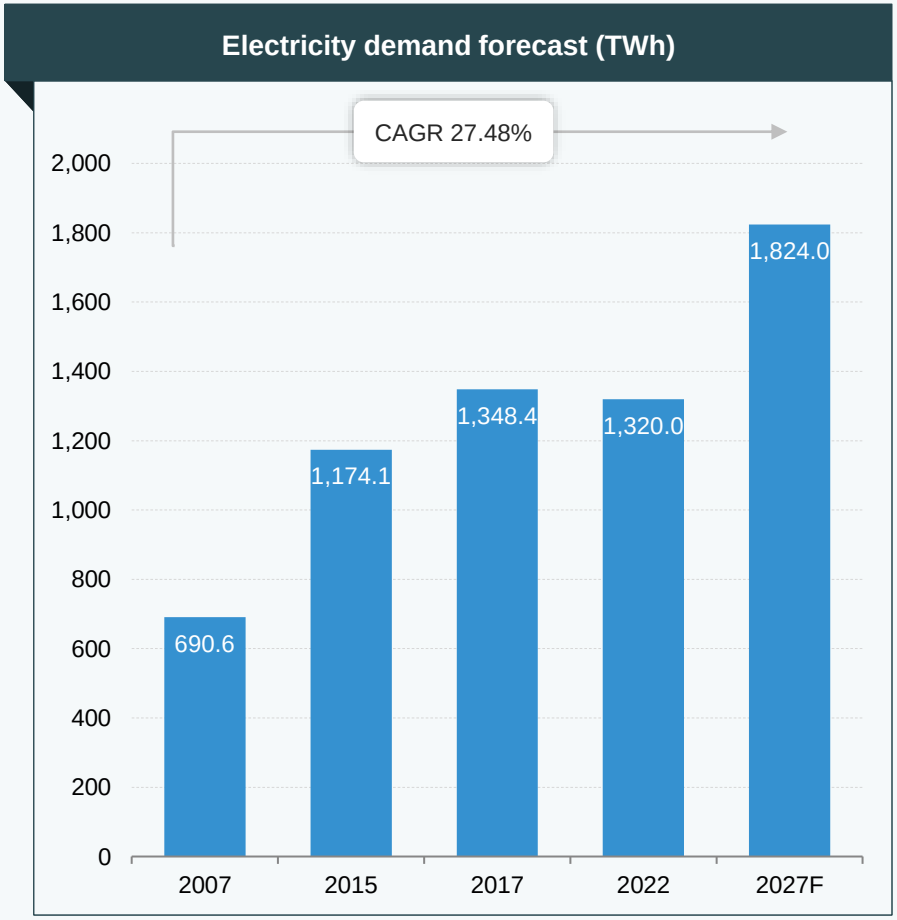
Acquirer	Target	Date	Value (US$ million)
Renascent Power Ventures Pte Ltd.	Prayagraj Power Generation Company Ltd (PPGCL)	Nov 2018	854.94 (75.01% stake)
Kohlberg Kravis Roberts & Co (KKR)	Ramky Enviro Engineers Limited	Aug 2018	530
ReNew Power	Ostro Energy	Apr 2018	1,668.21
Canada Pension Plan Investment Board (CPPIB)	ReNEW Power Ventures Ltd.	Jan 2018	144 (6.3% stake)
ReNew Power	Wind power assets of KC Thapar Group	21 Nov 2017	155.55
Adani Transmission Limited	Reliance Infrastructure Limited (Mumbai)	Oct 2017	2,932

Note: *FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker*
Source: *Thomson One Banker, Industry News, VC Circle*

Opportunities

Power generation: overall fundamentals will remain strong

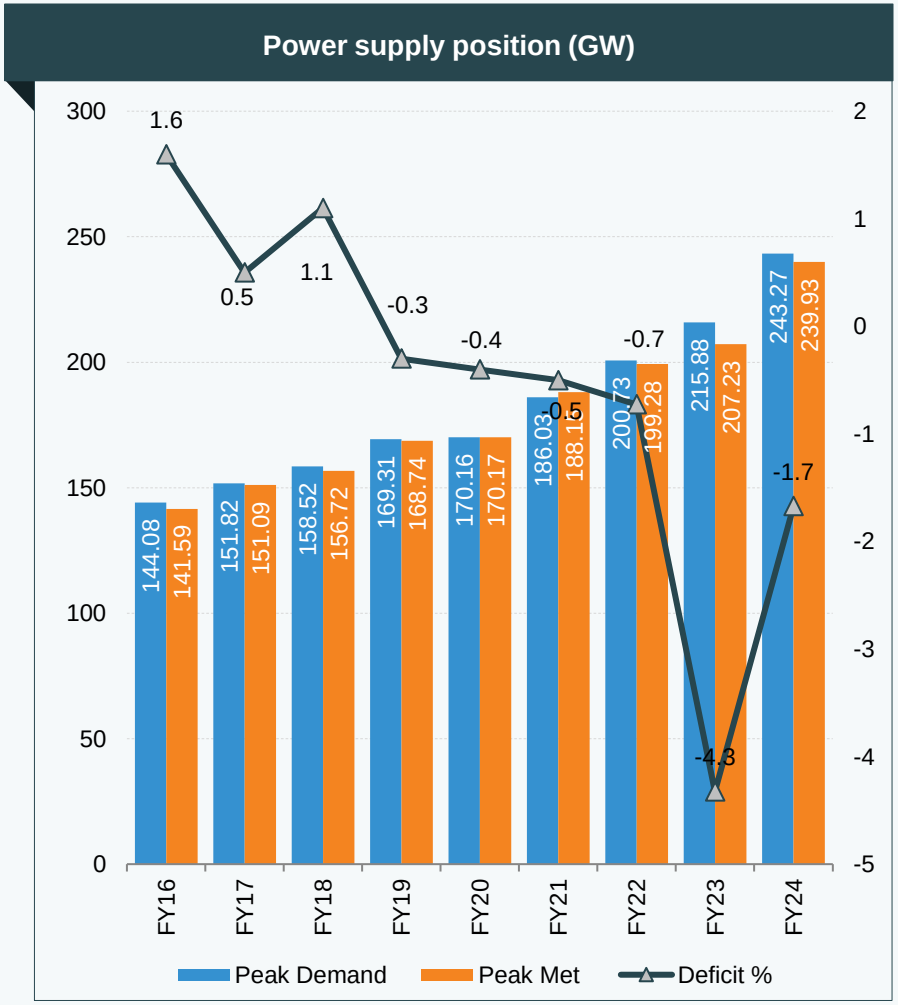
- In the current decade (2020-2029), the Indian electricity sector is likely to witness a major transformation with respect to demand growth, energy mix and market operations.
- Demand for electricity is expected to increase - per capita consumption of electricity is estimated to stand at 1,824 TWh by FY27.
- Current production levels are not enough to meet demand - annual demand outstrips supply by about 7.5%.
- Various reforms being undertaken by the government are positively impacting India's power sector. In the wake of the surging domestic coal production, the country's power sector is becoming increasingly stable.
- Non-coking coal consumption is forecast to grow at a CAGR of 5.4% to reach 1,076 MT in FY23 from 826 MT in FY18. Domestic supply is forecast to reach 931 MT in FY23 from 664 MT in FY19, growing at a CAGR of 7%.
- In order to decarbonise energy consumption, India needs a 30-fold increase in renewable energy, 30-fold increase in nuclear energy and doubling of thermal energy, which would make 70% of energy consumed carbon-free.
- In November 2021, Energy Efficiency Services Limited (EESL) stated that it will partner with private sector energy service companies to scale up its Building Energy Efficiency Programme (BEEP).



Notes: *TWh - Terawatt Hour, MT- Metric Tonnes, CAGR- Compounded Annual Growth Rate*
Source: *International Energy Agency (IEA), CEA, Demand estimates based on IEA forecasts*

Indian power sector: market with enormous growth potential

- India is witnessing a deficit in meeting the peak demand over the last three fiscal years.
- The peak power demand in the country stood at 243.27 GW in January 2024.

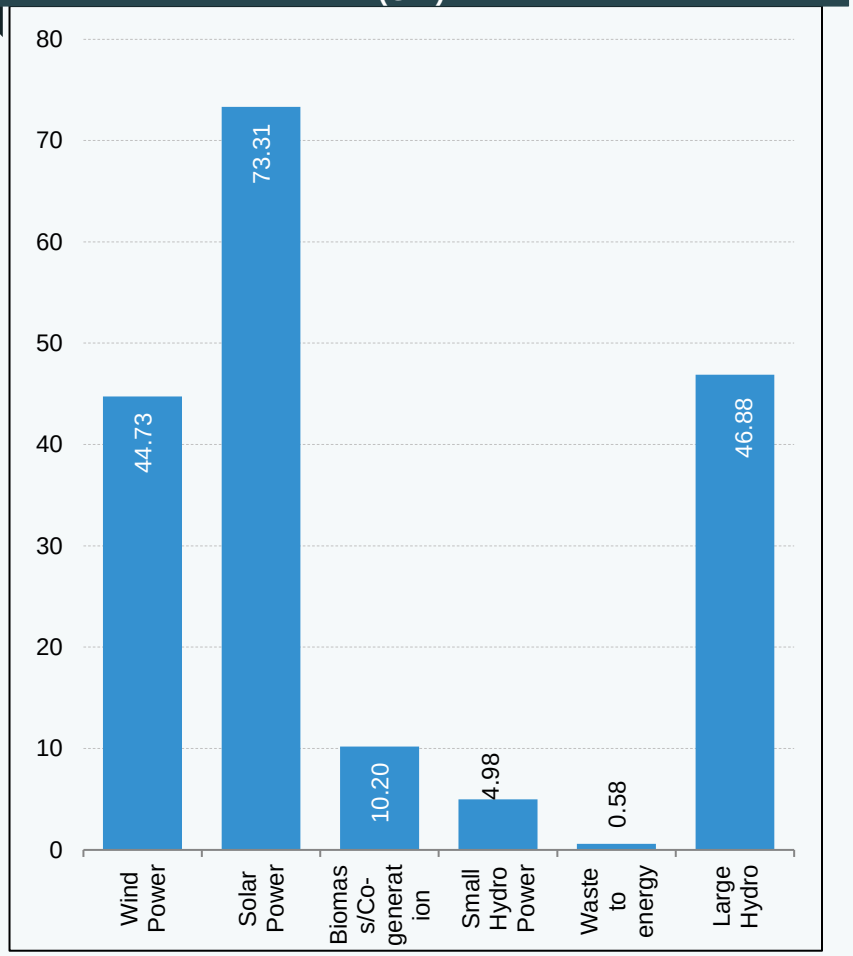


Note: *GW - Gigawatt , P – Provisional, *- Until January 202*
Source: *CEA*

Renewable energy is fast emerging as a major source of power

- As per the Central Electricity Authority (CEA) estimates, by 2029-30, the share of renewable energy generation would increase from 18% to 44%, while that of thermal is expected to reduce from 78% to 52%
- India ranks fourth worldwide in terms of installed Renewable Energy Capacity, which includes Large Hydro. It holds the fourth position in Wind Power capacity and Solar Power capacity as well. The nation has raised its target at COP26 to achieve 500 gigawatts of non-fossil fuel-based energy by 2030.
- Over the past 8.5 years, India's non-fossil fuel capacity has surged by 396%, reaching over 179.57 GW, which includes large hydro and nuclear power. This accounts for approximately 42% of the nation's total capacity as of November 2023.
- In 2022, India experienced the most significant year-on-year increase in renewable energy additions at 9.83%. Over the past nine years, the installed solar energy capacity has surged by 30 times, reaching 74.30 GW as of January 2024. The National Institute of Solar Energy (NISE) estimates India's solar energy potential to be 748 GWp.
- As of December 2023, India has a total installed capacity of 180.79 GW for renewable energy sources, including large hydropower. The breakdown is as follows: Wind power at 44.73 GW, solar power at 73.31 GW, biomass/co-generation at 10.2 GW, small hydro power at 4.98 GW, waste to energy at 0.58 GW, and large hydro at 46.88 GW. This diverse mix highlights India's significant strides in expanding renewable energy infrastructure for a more sustainable energy future.
- In India, approvals have been granted for 50 solar parks with a combined capacity of 37.49 GW. Additionally, there is a target of 30 GW for offshore wind energy by 2030, with identified potential sites.

Renewable Energy generation capacity as of December 2023 (GW)

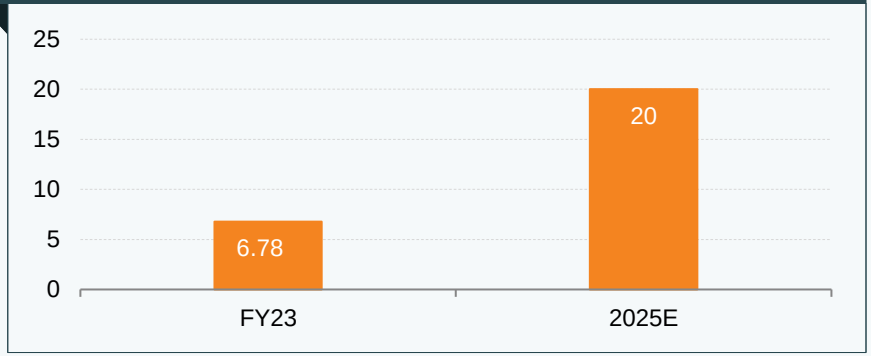


Source: *Invest India, BP Statistical Review World Energy 2020, CEA, News Articles, Ministry of Power*

Strong upward momentum in nuclear energy likely in medium to long term

- India has a net nuclear energy installed capacity of 7.48 GW as of January 2024. India's nuclear sources are expected to contribute nearly 9% of the electricity share by 2047. The Department of Atomic Energy is targeting a nuclear power generation capacity of 20 GW by 2030, positioning India as the world's third largest producer of atomic energy, following the USA and France
- By 2031, the current installed nuclear power capacity is expected to rise from 7,480 MW to 22,800 MW because of the progressive completion of projects under construction and accorded sanction.
- India has developed comprehensive nuclear fuel cycle capabilities. In 2003, Bhartiya Nabhikiya Vidyut Nigam Ltd (BHAVINI) was established to construct and operate the advanced Prototype Fast Breeder Reactor (PFBR). Designed and built indigenously by BHAVINI with contributions from over 200 Indian industries, including MSMEs, the PFBR will make India the second country, after Russia, to have a commercial Fast Breeder Reactor.
- The Nuclear Power Corporation of India Limited (NPCIL) plans to construct 5 nuclear energy parks with a capacity of 10,000 MW.
- The Government of India will set up 21 new nuclear power reactors with a total installed capacity of 15,700 MW by 2031.
- In December 2022, India announced the plans to commission 20 nuclear power plants by 2031, adding nearly 15,000 MW in power generating capacity.
- In July 2021, Bharat Heavy Electricals Limited (BHEL) received a large contract from Nuclear Power Corporation of India Limited (NPCIL) for the supply of 12 steam generators of India's highest rated indigenously-developed 700 MW Pressurized Heavy Water Reactors (PHWR) worth Rs. 1,405 crore (US$ 189.20 million).

Nuclear energy installed capacity in India (GW)



Nuclear power plants and reactors under construction in India

Power station	Operator	Capacity (MW)	Expected Operation	Sanctioned Cost (Rs. Crore)
Madras	Bhavini	500	2024	5,677
Kakrapar (Units 3 and 4)	NPCIL	1400	2023	11,459*
Gorakhpur	NPCIL	1,400	2025	20,594
Rajasthan (Units 7 and 8)	NPCIL	1,400	2026	12,320
Kudankulam (Units 3, 4, 5 and 6)	NPCIL	2,000	2025-2027	39,849

Note: *GW - Gigawatt, E – Estimates, *- Under revision*

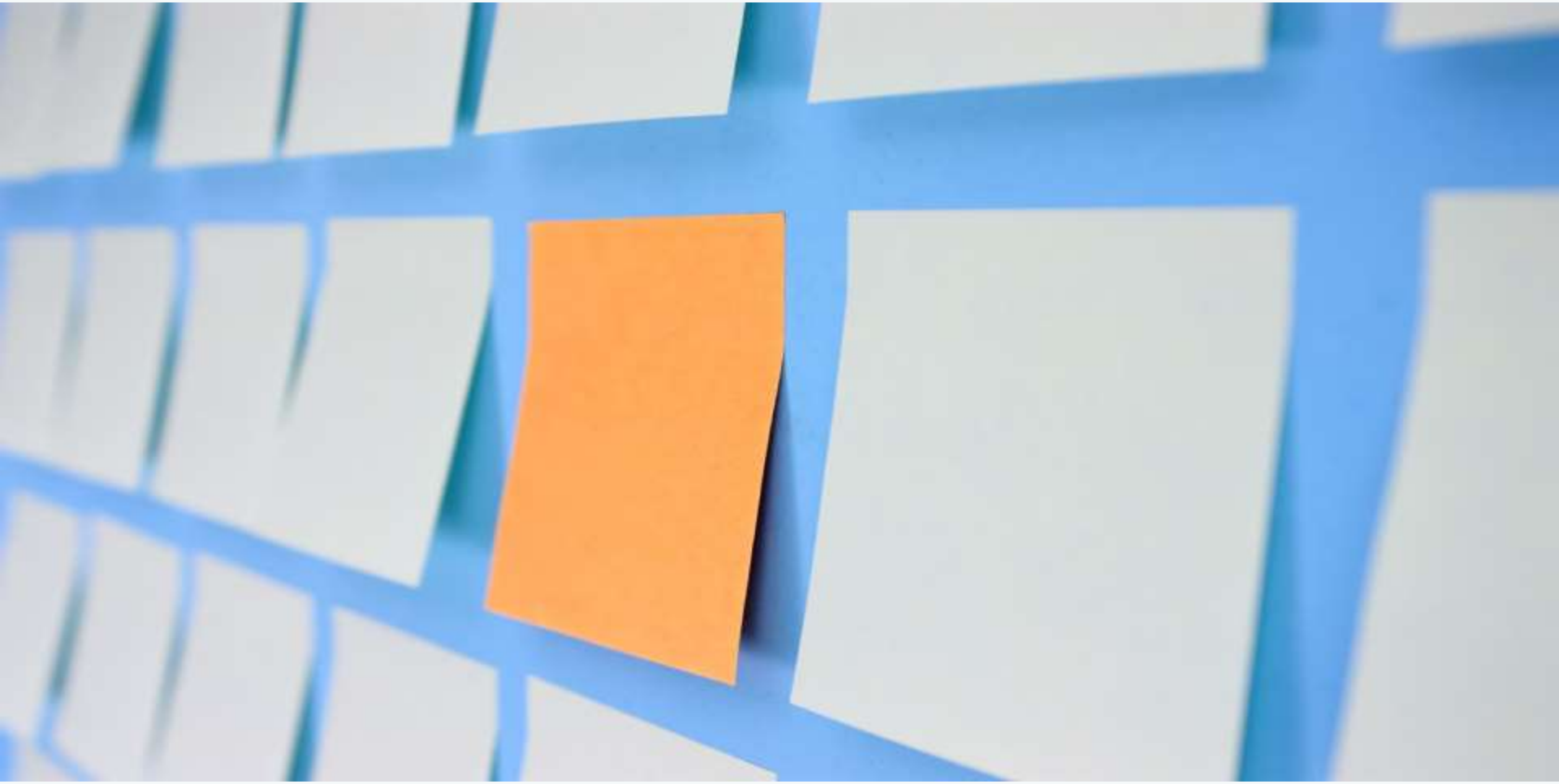
Source: *Ministry of New and Renewable Energy, Business Monitor International, CEA, News Articles*

Key Industry Contacts

Key industry contacts

Agency	Contact Information
Council of Power Utilities	Address: A-2/158, Janakpuri, New Delhi-110058, India Tel: 91 11 25618472, 45652708 Fax: 25611622 E-mail: councilofpowerutilities@gmail.com Website: www.indiapower.org
Bureau of Energy Efficiency (BEE)	Address: Ministry of Power, 4th Floor, SEWA Bhawan, R. K. Puram, New Delhi - 110066, India Tel: 91 11 26179699 Fax: 91 11 26178352 E-mail: dg-bee@nic.in Website: www.beeindia.in
Hydro Power Association (India)	Address: Flat no 6, Green Park Apartment, Shriram Society, Warje, Pune - 411058, Maharashtra, India Tel: 91 20 25233338 E-mail: hypaindia@gmail.com, president@hpaindia.org, secretary@hpaindia.org Website: www.hpaindia.org
Indian Wind Energy Association (INWEA)	Address: 2nd Floor, All India Federation for the Deaf (AIFD) Building, 12-13, Special Institutional Area, Shaheed Jeet Singh Marg, New Delhi-110067, India Tel: 91 11 4652 3042 E-mail: manish@inwea.org Website: www.inwea.org

Appendix



Glossary

- CAGR: Compound Annual Growth Rate
- FDI: Foreign Direct Investment
- FY: Indian Financial Year (April to March)
  - So FY10 implies April 2009 to March 2010
- GW: Gigawatt
- M&A: Merger and Acquisition
- MW: Megawatt
- NBFC: Non-Banking Financial Company
- PE: Private Equity
- PLF: Plant Load Factor
- Rand D: Research and Development
- R-APDRP: Restructured Accelerated Power Development and Reform Programme
- TandD: Transmission and Distribution
- TWh: Terawatt-Hour
- RGGVY: Rajiv Gandhi Grameen Vidyutikaran Yojana
- US$: US Dollar
- Rs.: Indian Rupee
- Wherever applicable, numbers have been rounded off to the nearest whole number

Exchange rates

Exchange Rates (Fiscal Year)

Year	Rs. Equivalent of one US$
2004-05	44.95
2005-06	44.28
2006-07	45.29
2007-08	40.24
2008-09	45.91
2009-10	47.42
2010-11	45.58
2011-12	47.95
2012-13	54.45
2013-14	60.50
2014-15	61.15
2015-16	65.46
2016-17	67.09
2017-18	64.45
2018-19	69.89
2019-20	70.49
2020-21	73.20
2021-22	74.42
2022-23	78.60

Exchange Rates (Calendar Year)

Year	Rs. Equivalent of one US$
2005	44.11
2006	45.33
2007	41.29
2008	43.42
2009	48.35
2010	45.74
2011	46.67
2012	53.49
2013	58.63
2014	61.03
2015	64.15
2016	67.21
2017	65.12
2018	68.36
2019	69.89
2020	74.18
2021	73.93
2022	79.82
2023	82.61
2024*	83.09

Note: **- Until February 2024*
Source: *Foreign Exchange Dealers' Association of India*

Disclaimer

This presentation is for information purposes only. While due care has been taken during the compilation of this presentation to ensure that the information is accurate to the best of IBEF's knowledge and belief, the content is not to be construed in any manner whatsoever as a substitute for professional advice.

IBEF neither recommend nor endorse any specific products or services that may have been mentioned in this presentation and nor do they assume any liability, damages or responsibility for the outcome of decisions taken as a result of any reliance placed on this presentation.

IBEF shall not be liable for any special, direct, indirect or consequential damages that may arise due to any act or omission on the part of the user due to any reliance placed or guidance taken from any portion of this presentation.

IBEF
INDIA BRAND EQUITY FOUNDATION
www.ibef.org