POWER SECTOR

Primer Report

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Girishkumar Kadam
Senior Vice-President & Group Head
022– 6114 3441
girishkumar@icraindia.com

Ankit Jain
Vice-President & Co-Group Head
0124 – 4545 865
ankit.jain@icraindia.com

Rachit Mehta
Vice-President & Sector Head
022 – 6169 3328
rachit.mehta2@icraindia.com

Asmita Pant
Assistant Vice-President & Sector Head
0124 – 4545 856
asmita.pant@icraindia.com

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Overview

- India's power sector value chain encompasses four key segments—**generation, transmission, distribution, and policy/regulation**—each playing a vital role in delivering electricity from source to end-user. Power is generated from thermal, hydro, nuclear, and renewable sources by central, state, and private entities. It is then transmitted via high-voltage lines managed primarily by central and state utilities such as Power Grid Corporation. Distribution involves stepping down the voltage and delivering electricity to consumers, largely handled by state-owned discoms. The sector is governed jointly by central and state governments, with regulatory oversight from bodies such as the Central Electricity Authority (CEA) and state electricity regulatory commissions (SERCs), which manage tariffs, policy implementation, and dispute resolution. This integrated structure has enabled India to build one of the world's largest power grids and achieve universal electrification.
- Over the past two decades, the sector has transitioned from a state-dominated model to a market-oriented one, driven by the **reforms in the Electricity Act of 2003**, which enabled private investment and universal electrification. However, structural challenges persist, especially in distribution, which faces financial stress due to high aggregate technical and commercial (AT&C) losses, inadequate tariffs, and rising debt.
- **The 10-year CAGR in FY2025 for electricity demand stood at 4.7% against GDP CAGR of 6.0% during this period.** Historically, power demand has demonstrated a degree of correlation with GDP growth. However, factors such as changing weather patterns, adoption of energy-efficient appliances, increasing deployment of solar pumps under the PM-KUSUM scheme, and expansion of rooftop solar capacity are likely to moderate overall demand growth and hamper the historical correlation with economic activity. Industrial consumers have been the top consuming sector, followed by domestic and agricultural sectors. Also, there has been significant reduction in India's **power deficit** over the years, especially over the last one-and-a-half decades—from over **12% in FY2010 to almost nil in FY2025**. Further, the energy and peak deficit levels continue to be low, with the supply keeping up with the growing demand requirements.
- **India's per capita electricity consumption of 1.54 MWh** is significantly lower than that of developed countries like the US, Japan, China, the UK and Germany. Even among emerging economies, India lags countries like Brazil and South Africa. **The global average is 3-4 MWh**, which is nearly 2.5-3 times higher than India's current consumption. Going forward, our per capita electricity demand is set to rise with growing urbanisation and industrialisation.
- The share of **coal-based power generation capacity** is expected to reduce to **36% by 2030 from 47% as of March 2025**, while the share of **renewables including large hydro** is estimated to increase to **59% by 2030 from 46% as of March 2025** due to commitments made by the Government of India (GoI) to reduce dependence on fossil fuels and promote renewable sources.
- Nonetheless, **coal-based power generation** would continue to dominate **with 59% share by 2030** compared to 73% in FY2025. Further, the **share of renewables and hydro** is likely to increase to over **35% by 2030** from 22% in FY2025, led by the large renewable energy (RE) capacity addition. Though there has been a revival in long-term power purchase agreement (PPA) bids for thermal projects after a

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decade of dormancy, with discoms in Maharashtra, Uttar Pradesh, Bihar and West Bengal awarding projects through long-term PPA bids aggregating to 7.2 GW in the past 12 months, the coal power segment is likely to see lower capacity addition than the renewable segment by 2030.

- Given the intermittent nature of wind and solar power generation and the expected rise in the share of renewables including large hydro, there is growing focus on the need for energy storage capacities. Also, there is growing impetus on making use of hybrid RE projects complemented with storage systems to provide round-the-clock/ firm and dispatchable supply of RE to the grid.
- Transmission infrastructure has expanded steadily, with **central and state utilities** leading the development. Private participation is growing under tariff-based competitive bidding (TBCB), supported by pooling mechanisms and long-term transmission service agreements (TSAs). The sector faces **execution challenges due to right-of-way (RoW) issues and regulatory delays** but **significant capacity addition in transmission infrastructure** remains critical for integrating upcoming renewable energy into the grid.
- Distribution remains the weakest link in the power value chain. **State-owned discoms face persistent financial stress due to modest tariff hikes, high AT&C losses, and delayed cost recovery**. Regulatory assets have accumulated to unsustainable levels, and **discom debt has risen to Rs. 7.4 trillion as of March 2024**. While subsidy payouts have improved, cross-subsidisation and resistance to tariff rationalisation continue to impact financial viability. Reform initiatives such as **Ujwal DISCOM Assurance Yojana (UDAY) scheme, Revamped Distribution Sector Scheme (RDSS), Electricity (Late Payment Surcharge) Rules, and the fuel and power purchase cost adjustment (FPPAS)** regulations have aimed to improve discom performance. However, uneven implementation of FPPAS regulations and delays in tariff orders have led to the weak financial profile of discoms. The cash gap between cost of supply and tariff remains high, exacerbated by rising power purchase costs and interest expenses. Further, there are risks from the **high-tariff commercial and industrial (C&I) customers increasingly shifting to RE through open access and group captive models**, driven by competitive tariffs and policy support. This trend poses risks to discoms by eroding their high-paying consumer base and undermining the cross-subsidy model.
- Overall, while India’s power sector has made commendable strides in capacity addition, electrification, and policy reforms, sustained progress will depend on addressing financial stress in distribution, accelerating renewable integration, and ensuring regulatory consistency across states.

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Business Contacts

L Shivakumar
Chief Business Officer
E-mail: shivakumar@icraindia.com
022-61693304

Sai Krishna
Head - Research Sales and Investor Connect
E-mail: sai.krishna1@icraindia.com
9840774883

Rohit Gupta
Head Business Development – Infrastructure Sector
E-mail: rohitg@icraindia.com
0124-4545340

Vivek Bhalla
Head Business Development – Financial Sector
E-mail: vivek.bhalla@icraindia.com
022-61693372

Vinita Baid
Head Business Development – East
E-mail: vinita.baid@icraindia.com
033-65216801

Shivam Bhatia
Head Business Development –
Corporate Sector – North & South
E-mail: shivam.bhatia@icraindia.com
0124-4545803

Sanket Kulkarni
Head Business Development –
Corporate Sector – West
E-mail: sanket.kulkarni@icraindia.com
022-6169 3365

Media and Public Relations

Naznin Prodhani
Head - Group Corporate Communications & Media Relations
E-mail: communications@icraindia.com
0124-4545860

Registered Office

B-710, Statesman House 148,
Barakhamba Road
New Delhi-110001
Tel: +91 11 23357940-45

Corporate Office

Building No. 8, 2nd Floor,
Tower A, DLF Cyber City, Phase II,
Gurgaon - 122 002
Tel: +91-124-4545300

Ahmedabad

1809-1811, Shapath V,
Opp: Karnavati Club,
S.G.Highway, Ahmedabad - 380015
Tel: +91 79 4027 1500/501

Bengaluru 1

'The Millenia', Tower B Unit No. 1004,
10th Floor, 1 & 2 Murphy Road,
Bengaluru - 560 008
Tel: +91 80 4332 6400

Bengaluru 2

2nd Floor, Vayudooth Chamber
15-16, Trinity Circle, M.G. Road,
Bengaluru - 560 001
Tel: +91 80 4922 5500

Chennai

5th Floor, Karumuttu Centre
634, Anna Salai, Nandanam
Chennai - 600 035
Tel: +91 44 4596 4300

Hyderabad

Unit No 1006, 10th Floor, Gowra
Fountain Head, Patrika Nagar,
Madhapur, High-Tech City,
Hyderabad, Telangana – 500081
Tel: +91 040-69396464

Kolkata

Siddha Esplanade, 3rd Floor,
6 Jawaharlal Nehru Road,
Esplanade, Kolkata,
West Bengal - 700013
Tel: +91 33 6521 6800

Mumbai

3rd Floor, Electric Mansion
Appasaheb Marathe Marg,
Prabhadevi,
Mumbai - 400 025
Tel: +91 22 6169 3300

Pune

5A, 5th Floor, Symphony, S. No. 210
CTS 3202 Range Hills Road,
Shivajinagar, Pune - 411 020
Tel: +91 20 2556 1194

Email: Info@icraindia.com
Helpdesk: 9354738909
Website: www.icra.in/ www.Icraresearch.in