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Capacity without Generation: A Comparative Analysis of India's Installed Power Capacity and Electricity Generation Mix, 2014-2026

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Abstract

India's power sector has reached a widely publicised capacity milestone: non-fossil sources crossed 50 per cent of total installed generation capacity in June 2025, five years ahead of the target set under India's Nationally Determined Contribution, and independent capacity trackers report that clean energy sources overtook fossil-fuel capacity for the first time by August 2026. Yet these capacity-side achievements coexist with a far more modest transformation in actual electricity generation: non-fossil sources supplied only 29.2 per cent of total output in FY 2025–26, and coal alone continued to generate more than two-thirds of the country's electricity. This paper undertakes a descriptive-comparative analysis of India's installed capacity mix and its generation mix over 2014–2026, drawing on official data from the Ministry of Power, the Ministry of New and Renewable Energy, the Press Information Bureau, and independent trackers including Ember, Global Energy Monitor, and Climate Action Tracker. The analysis documents a widening structural gap between capacity growth and generation growth, driven principally by the differential in capacity utilisation between intermittent renewable sources and dispatchable thermal plants, compounded by rapidly rising electricity demand and limited grid-scale storage. The paper argues that capacity statistics, while a valid signal of investment direction and future intent, should not be conflated with the present composition of electricity actually consumed, and that closing the gap requires sustained investment in transmission, storage, and demand-flexibility infrastructure rather than capacity addition alone. The paper concludes with policy implications and directions for future empirical research.

***Keywords**: India, Power Sector, Renewable Energy, Installed Capacity, Electricity Generation, Capacity Factor, Energy Transition, Coal.*

Introduction

Energy transition narratives are frequently built on a single, headline-friendly statistic: installed capacity. When a country announces that renewable or non-fossil sources have crossed a particular share of installed capacity, the announcement is typically read as evidence that the underlying electricity system has itself become correspondingly cleaner. In India's case, this reading requires considerable caution.

Over the past decade, India expanded its installed power generation capacity from around 305 gigawatts (GW) in 2015–16 to roughly 476 GW by June 2025, with non-fossil sources - renewables and nuclear combined - accounting for 235.7 GW, or 49 per cent, of that total (Press Information Bureau [PIB], 2025). Within a year, the non-fossil share of installed capacity crossed the symbolic 50 per cent threshold, a milestone the government describes as arriving five years ahead of India's Nationally Determined Contribution (NDC) target under the Paris Agreement (Ministry of New and Renewable Energy [MNRE], 2026). Independent capacity trackers go further still: data compiled by Ember and Global Energy Monitor, reported by Reuters, put India's clean energy capacity at 331.7 GW against 302.0 GW of fossil-fuel capacity by August 2026 - a clean-energy majority in the country's utility power mix for the first time, with solar capacity alone (211 GW) closing in on coal capacity (254.4 GW) (Maguire, 2026).

These are genuine and consequential milestones. But they describe what India has built, not what India is running. Generation statistics for the same period tell a markedly different story. In FY 2025–26, non-fossil sources supplied only 29.2 per cent of India's total electricity generation of 1,845.9 billion units (BU), while coal alone generated 1,250.2 BU - more than two-thirds of national output (MNRE, 2026). An independent assessment by Climate Action Tracker found that as of 2023, renewables constituted 37 per cent of India's installed generation capacity but contributed only 18 per cent of actual electricity generated, and that coal's share of generation had in fact risen, from 69 per cent in 2010 to 75 per cent in 2024, even as the capacity mix diversified (Krishnamurthy, 2025).

This paper investigates that gap. It asks how large the divergence between India's installed capacity mix and its generation mix is, how the divergence has evolved over 2014–2026, and what structural factors explain its persistence. The paper does not treat the gap as evidence of policy failure; rather, it argues that the gap is a predictable, and to a degree temporary, feature of a power system that is simultaneously growing in absolute size and diversifying its generation portfolio - a pattern distinct from the substitution-based transitions observed in mature, slower-growing economies such as those of Western Europe.

The remainder of the paper proceeds as follows. Section 2 outlines the data sources and analytical approach. Section 3 traces the evolution of India's installed capacity mix. Section 4 examines the corresponding generation mix. Section 5 explains the gap with reference to capacity-factor differentials and demand growth. Section 6 reviews the policy response, and Section 7 concludes with implications for research and policy.

Data Sources and Methodology

This is a descriptive-comparative study based on secondary data; it does not involve primary data collection or econometric estimation. Capacity and generation data are drawn from official Government of India sources - the Ministry of Power, the Ministry of New and Renewable Energy, the Central Electricity Authority as cited in Press Information Bureau releases, and industry-body compilations from the India Brand Equity Foundation (IBEF) - supplemented by independent international sources, principally Ember and Global Energy Monitor's capacity tracking as reported in Maguire (2026), and Climate Action Tracker's power-sector decarbonisation assessment as reported in Krishnamurthy (2025). Where available, the paper also draws on peer-reviewed literature, notably Hunt and Bloomfield's (2024) modelling of realised renewable generation against installed capacity across India.

A caveat on data comparability is necessary at the outset. Different agencies define ‘clean,’ ‘non-fossil,’ and ‘renewable’ capacity differently. Indian official statistics distinguish renewable energy - solar, wind, small hydro, and bioenergy - from large hydro and nuclear power, even though all three are non-fossil; the government's 500 GW non-fossil target for 2030 aggregates all three categories (MNRE, 2026). International trackers such as Ember may apply different classification boundaries and data-collection windows, which can produce capacity totals that do not align precisely with domestic figures even for proximate reference dates. Accordingly, this paper reports figures as attributed to their respective sources rather than attempting to force them into a single reconciled series. Such discrepancies are treated here as a data-quality limitation rather than as substantive disagreement about the underlying trend, which is directionally consistent across every source consulted.

India's Installed Capacity Trajectory, 2014–2026

India's installed capacity nearly doubled over the decade under review, expanding from roughly 245 GW in 2014 to 476 GW by June 2025 and beyond 580 GW by early 2026 (PIB, 2025; MNRE, 2026). The composition of that capacity, however, changed far more dramatically than its size. Table 1 summarises the growth of India's officially reported renewable and non-fossil capacity between March 2014 and March 2026.

Metric	March 2014	June 2025	March 2026
Solar capacity (GW)	2.82	110.90	150.26
Wind capacity (GW)	21.04	51.30	56.09
Bioenergy capacity (GW)	n/a	11.60	11.75
Small hydro capacity (GW)	n/a	5.10	5.17
RE subtotal, excl. large hydro (GW)	76.37	226.90	274.68
Large hydro capacity (GW)	35.80*	48.00	51.41
Nuclear capacity (GW)	4.78	8.80	8.78
Total non-fossil capacity (GW)	n/a	235.70	283.46
Total installed capacity (GW)	n/a	476	n/a
Non-fossil share of total capacity (%)	n/a	49	n/a**

Three features of Table 1 stand out. First, solar capacity grew by a factor of more than fifty between 2014 and 2026, easily the fastest-growing segment of the capacity mix and the principal driver of the non-fossil share's rise. Second, wind capacity, while growing more modestly in percentage terms, remains the second-largest renewable source. Third, large hydro and nuclear capacity grew only incrementally over the period, meaning that essentially the entire increase in India's non-fossil capacity share is attributable to solar and, to a lesser extent, wind. Figure 1 visualises this growth across all six capacity components.

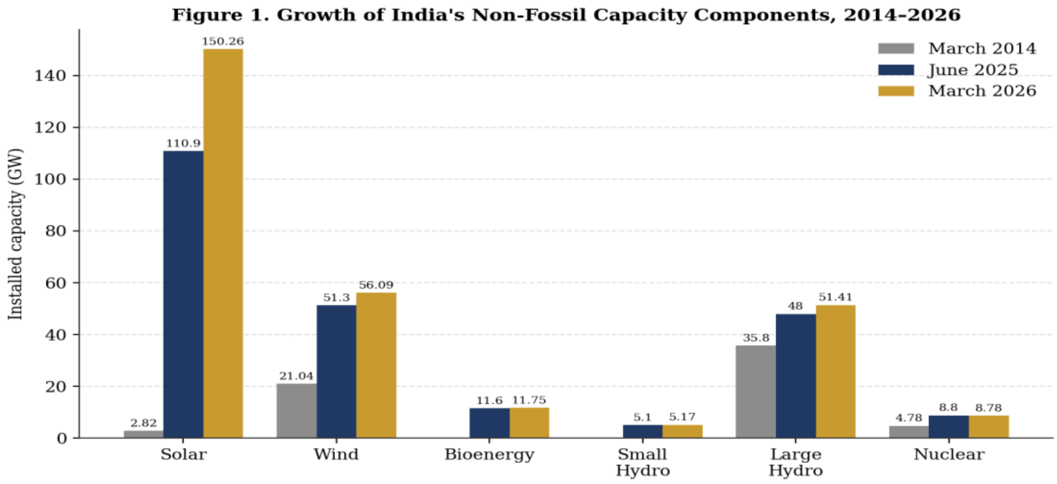

Figure 1: Growth of India's Non-Fossil Capacity Components, 2014–2026 (GW)

Source: PIB (2025); MNRE (2026).

Independent tracking corroborates the scale and pace of this shift, while also illustrating the data-comparability issue flagged in Section 2. Ember and Global Energy Monitor data reported by Maguire (2026) place India's solar capacity at 211 GW and coal capacity at 254.4 GW by August 2026, with clean energy capacity (331.7 GW) having overtaken fossil-fuel capacity (302.0 GW) for the first time. On this reckoning, coal's share of installed capacity fell from approximately 59 per cent in 2014 to 40 per cent by 2026, while the fossil-fuel share overall declined from close to three-quarters of installed capacity in 2000 to less than half by 2026. Between 2025 and mid-2026 alone, India is reported to have added 75.5 GW of solar capacity against just 3.8 GW of new coal capacity - clean capacity additions of nearly 80 GW against fossil additions of only 5.4 GW over the same window (Maguire, 2026). Solar capacity by itself is now larger than India's entire power system was as recently as 2011 (Maguire, 2026). Figure 2 traces this trajectory across all four reference points used in this paper.

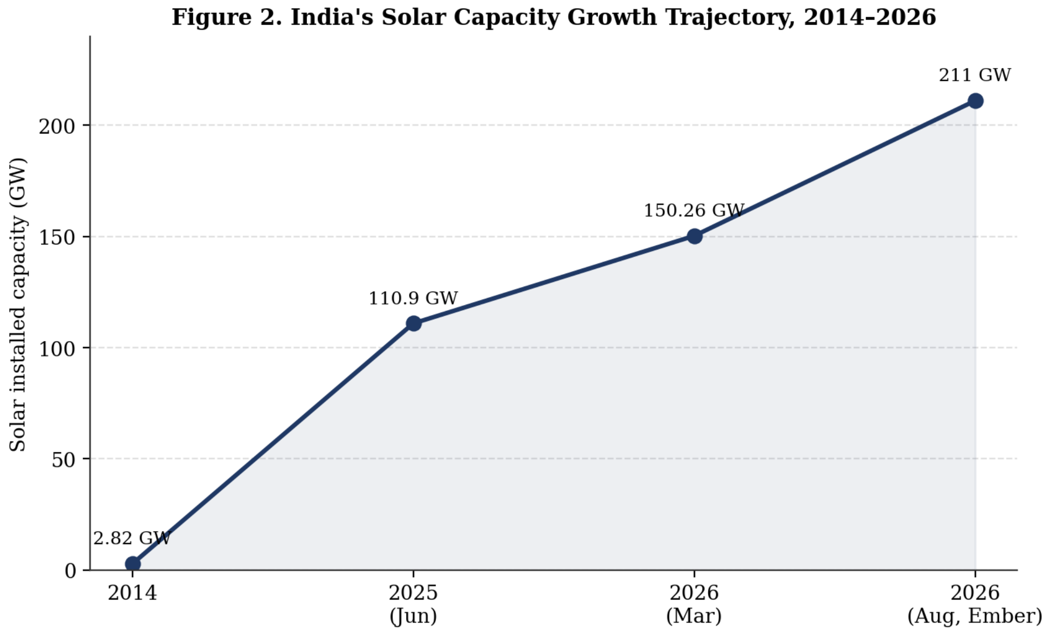

Figure 2: India's Solar Capacity Growth Trajectory, 2014–2026

Source: PIB (2025); MNRE (2026); Maguire (2026).

It is important to note that India continues to add coal capacity in absolute terms even as its relative share declines. This is the central structural feature that distinguishes India's transition from those under way in mature, slow-growing economies: because overall electricity demand continues to surge, coal capacity can keep growing in absolute terms while losing ground in relative terms (Maguire, 2026). India's transition is therefore additive rather than substitutive - renewable capacity is being layered onto, rather than replacing, an expanding conventional base.

The Generation Side: Persistence of Coal Dominance

If Table 1 describes what India has built, Table 2 describes what India has run. Using official data for FY 2025–26, the non-fossil share of actual electricity generation stood at 29.2 per cent - a large increase over the low double digits recorded a decade earlier, but far short of the roughly 48–52 per cent non-fossil share of installed capacity reported for the same period.

Metric	FY 2025-26	FY 2024-25
Total electricity generation (BU)	1,845.92	1,828.88
Fossil fuel generation (BU)	1,306.95	1,363.07
Fossil fuel share of generation (%)	70.8	74.5
Coal-based generation (BU)	1,250.19	-
Non-fossil generation share (%)	29.2	-
RE generation excl. large hydro (BU)	308.81	255.01
Wind generation (BU)	106.09	-
Solar generation (BU)	173.53	-
Wind + solar, share of total generation (%)	15.14	-

Note. "Fossil fuel share of generation" for FY 2024-25 is derived from the reported fossil generation and total generation figures. Sources: MNRE (2026).

Two additional data points sharpen this picture. First, wind and solar together - which by 2026 accounted for roughly a third of total installed capacity - contributed only 15.14 per cent of actual generation in FY 2025–26 (MNRE, 2026). Second, and more strikingly, Climate Action Tracker's independent review of the preceding five-year period found that coal's share of generation rose, from 69 per cent in 2010 to 75 per cent in 2024, even as renewable capacity expanded substantially over the same interval; renewables constituted 37 per cent of installed capacity in that analysis but contributed only 18 per cent of actual electricity generated, with average annual wind-and-solar generation of roughly 11 GW-equivalent against 3.9 GW-equivalent for coal on a like-for-like output basis over the preceding five years (Krishnamurthy, 2025). Total electricity generation itself more than doubled over the same window, rising from 937 terawatt-hours (TWh) in 2010 to 2,058 TWh in 2024 (Krishnamurthy, 2025) - underscoring that renewable generation has grown in absolute terms even while losing, or barely holding, relative ground against a rapidly expanding demand base. Figure 3 visualises the resulting gap for coal and non-fossil sources, contrasting each source's June 2025 capacity share with its FY 2025–26 generation share.

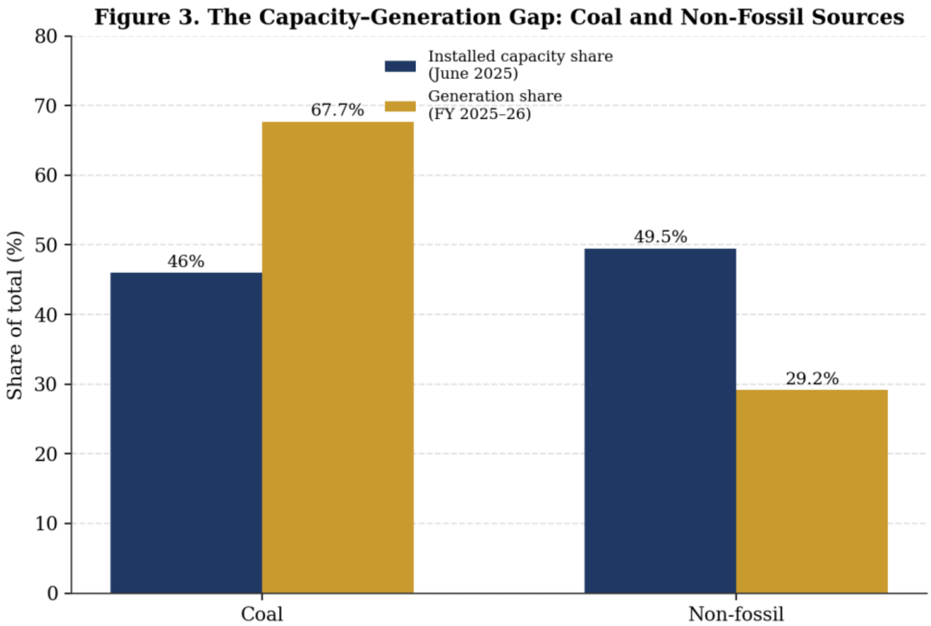

Figure 3: The Capacity–Generation Gap: Coal and Non-Fossil Sources

Source: PIB (2025); MNRE (2026). Capacity share as of June 2025; generation share for FY 2025–26.

The gap is not uniformly wide at every point in time. On occasion, India's grid has demonstrated substantial short-run renewable penetration: the Ministry of New and Renewable Energy reported that in July 2025, renewables met a record 51.5 per cent of the country's electricity demand of 203 GW at a single peak moment (MNRE, 2026). Such peaks, however, are weather- and time-of-day-dependent and are not representative of the system's average operating condition; they illustrate the technical ceiling of instantaneous renewable contribution rather than a sustained shift in the underlying generation mix.

Explaining the Capacity–Generation Gap

The persistence of a wide gap between capacity share and generation share is not anomalous; it follows directly from the differing capacity factors - the ratio of actual output to theoretical maximum output - of thermal and renewable generation technologies. Coal plants are dispatchable and can operate at high, sustained load factors around the clock, whereas solar output is available only during daylight hours and is further constrained by cloud cover and seasonal irradiance, and wind output varies with meteorological conditions across seasons and regions (Hunt & Bloomfield, 2024). A plant with a lower capacity factor must be installed at a correspondingly larger nameplate capacity to deliver the same average power output as a plant with a higher capacity factor, which mechanically inflates the renewable share of installed capacity relative to its share of actual generation.

Hunt and Bloomfield (2024), using historical meteorological and installed-capacity data spanning 1979–2022, model realised renewable generation across India and identify pronounced spatial and seasonal patterns in solar and wind capacity factors - solar generation peaking in the pre-monsoon period and being relatively homogeneous across most of the country except the western Himalaya, and wind generation peaking during the summer monsoon with high values concentrated along the southern coast, the Western Ghats, and Gujarat. Their analysis further identifies a lack of complementarity between wind and solar production in northern India and heightened vulnerability to generation deficits in winter - structural features of the Indian renewable resource base that compound the basic capacity-factor gap between renewables and thermal generation.

Rising electricity demand compounds the mechanical capacity-factor effect. Climate Action Tracker's analysis attributes part of the widening gap to a 14 per cent year-on-year increase in power consumption in May 2024 relative to May 2023, driven by extreme heat, which prompted increased coal and fossil-gas generation and imports to meet demand that renewable output alone could not reliably serve (Krishnamurthy, 2025). Limited grid-scale storage compounds this further: night-time and evening demand continues to be met predominantly by dispatchable fossil generation, since battery storage remains commercially immature at the scale required and pumped-hydro storage remains at a nascent stage of development in India (Krishnamurthy, 2025; India Brand Equity Foundation [IBEF], 2026).

Taken together, these factors explain why capacity parity between clean and fossil sources does not translate into generation parity, and why it may not do so for a considerable period even under continued rapid capacity addition. As Maguire (2026) observes, the question for India's power system is no longer whether renewable capacity can be built at scale - that capability has been amply demonstrated - but whether that capacity can be converted into generation through investment in transmission, storage, and flexible balancing resources.

Policy Response and the Road Ahead

India's policy architecture has, in recent years, begun to shift emphasis from pure capacity addition toward addressing the conversion bottleneck identified in Section 5. Several measures are notable. A Viability Gap Funding scheme of Rs. 5,400 crore has been launched for 30 gigawatt-hours (GWh) of Battery Energy Storage Systems, alongside an extension of the Inter-State Transmission System charge waiver for storage projects until June 2028 (IBEF, 2026). The Central Electricity Regulatory Commission has introduced a non-solar-hour connectivity framework intended to improve utilisation of transmission networks during periods when solar output is unavailable, together with guidelines for Virtual Power Purchase Agreements and a pilot Contract-for-Difference mechanism designed to provide revenue stability for renewable generators (MNRE, 2026).

Transmission investment has likewise been prioritised. The Green Energy Corridor programme, aimed at strengthening grid infrastructure for renewable energy evacuation, has seen its first phase substantially completed, with a second phase under implementation and a third phase planned; a further 345 GW of Renewable Energy Potential Zones have been identified beyond the existing 500 GW transmission plan, intended to provide advance visibility to developers and investors (MNRE, 2026; PIB, 2025). Distributed generation schemes - principally PM-Surya Ghar: Muft Bijli Yojana for rooftop solar and PM-KUSUM for agricultural solarisation - have also become significant contributors to capacity growth, together accounting for over a third of India's solar capacity addition in FY 2025–26 (MNRE, 2026).

Looking ahead, the government's stated capacity trajectory implies a continuation, rather than a resolution, of the capacity–generation divergence documented in this paper, at least in the near term. Citing the Central Electricity Authority's National Generation Adequacy Plan for 2026–27 to 2035–36, the Union Minister for New and Renewable Energy projected in July 2026 that solar capacity would reach 510 GW against 315 GW of coal capacity by 2036, with non-fossil capacity reaching 786 GW - nearly 70 per cent of a projected total installed capacity of 1,121 GW (Business Standard, 2026). Even on this trajectory, however, official commentary accompanying the projection acknowledges that coal is likely to remain the largest single source of actual electricity generation for a considerably longer period, since the capacity crossover chiefly reflects the direction of future investment rather than an imminent change in what the grid currently dispatches (Maguire, 2026).

Climate Action Tracker's assessment frames the scale of the remaining challenge starkly: to remain consistent with a 1.5°C-compatible pathway, renewables would need to supply 52–65 per cent of India's electricity by 2030 and 91–96 per cent by 2040 - far above the 29.2 per cent generation share recorded in FY 2025–26 - and the report rates India's overall pace of coal phase-down as “slow,” warning that continued coal capacity additions risk becoming stranded assets under a more ambitious decarbonisation pathway (Krishnamurthy, 2025).

Conclusion

India's power sector has crossed a genuine and closely watched threshold: non-fossil and, on some measures, clean-energy sources now account for a majority of installed generation capacity, a milestone reached well ahead of India's own Paris Agreement commitments. This paper has shown, however, that the same period has produced a far smaller shift in the composition of electricity actually generated and consumed, with coal continuing to supply roughly two-thirds to three-quarters of national output across the sources reviewed here.

The distinction between capacity and generation statistics is not a semantic one. Capacity figures are a valid and useful signal of investment direction, technology preference, and future intent; generation figures describe the electricity system as it presently operates. Conflating the two risks overstating the pace of India's decarbonisation and understating the scale of complementary investment - in transmission, storage, and demand flexibility - still required to convert installed capacity into displaced fossil generation. The gap documented in this paper is best understood as a predictable feature of an additive, demand-driven transition rather than as evidence that renewable investment has failed to deliver: solar and wind capacity have grown at a pace with few global parallels, even as an expanding economy has continued to lean on coal to meet the incremental demand that renewable generation, given current storage and grid constraints, cannot yet reliably serve.

This analysis has been descriptive rather than causal, and several extensions would strengthen the evidence base. Future research could apply panel or time-series econometric methods to estimate the elasticity of generation share with respect to capacity share across Indian states, examine the relationship between storage investment and capacity-factor realisation empirically, or evaluate the financial and operational implications of the capacity–generation gap for power-sector firms and utilities. Such work would extend the largely descriptive account offered here into a more rigorous empirical assessment of the pace and mechanics of India's ongoing energy transition

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