August 2026

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Delhi's electricity transition challenges and opportunities: A SCOPE study

- *Delhi's total energy requirement reached 38,482 million units (MU) in financial year (FY) 2026, accounting for around 2.2% of India's total energy requirement.*
- *Delhi has so far effectively managed its peak demand, which rose from 7.7 gigawatts (GW) in FY2023 to 8.7GW in FY2027 by June 2026. The emergence of significant night-time peaks underscores the importance of energy storage to utilise renewable energy resources in meeting evolving demand patterns.*
- *Delhi has untapped rooftop solar potential with ~446 megawatts (MW) achieved as of June 2026 against the 750MW target set under the Delhi Solar Energy Policy 2023.*
- *The introduction of solar-hour-aligned time-of-day (ToD) tariffs would encourage consumers to shift flexible loads to periods of high renewable energy generation and improve overall system efficiency. This will require smart meter deployment to enable dynamic pricing and informed consumer participation to achieve the desired scale.*

1. Introduction

The National Capital Territory (NCT) of Delhi is one of India's most urbanised regions and occupies a unique position in the country's electricity transition. The city's high electricity requirement is shaped by rising cooling demand, high commercial activity, and growing electrification of transport and services. It has limited own generation capacity and depends heavily on electricity purchased from neighbouring states. This makes it particularly sensitive to power market dynamics, transmission availability, and renewable energy integration. At the same time, Delhi has emerged as an important policy testing ground for distributed solar with group and virtual net-metering, a constant push for electric mobility, battery storage, and power distribution reforms. Its experience therefore offers important lessons for how rapidly urbanising areas in India can balance reliability, affordability, and decarbonisation objectives in an increasingly electricity-dependent economy.

This assessment also builds on insights from the Indian States' Electricity Transition (SET) 2026 report launched by the Institute for Energy Economics and Financial Analysis (IEEFA) and Ember in February 2026. It assesses the progress of 21 Indian states across three key dimensions of electricity transition: decarbonisation, readiness and performance of the power ecosystem, and market enablers.

This briefing note discusses Delhi's electricity transition through the lens of SCOPE — (S)trengths, (C)omplexities and (O)pportunities, (P)olicies, and (E)nablers.

2. Power system snapshot

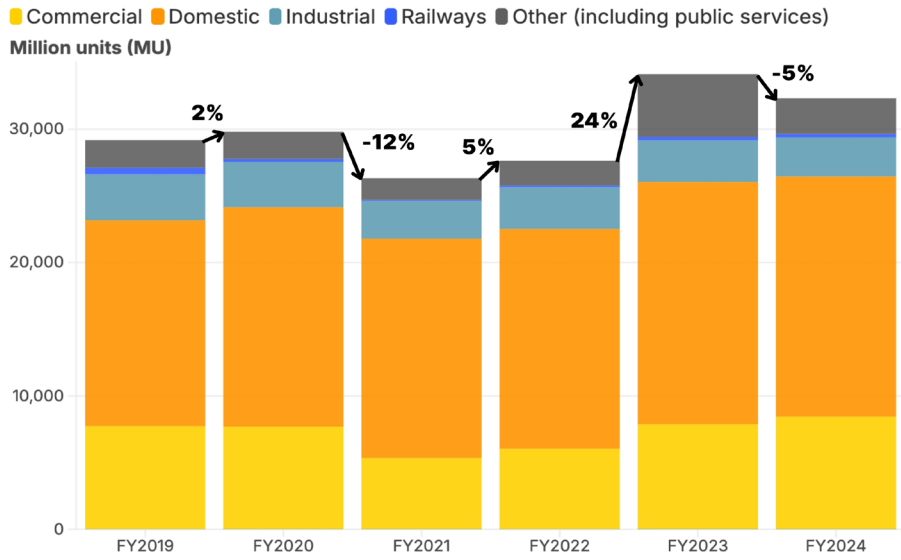
2.1. Consumer mix: Domestic consumption-led demand

Delhi's dense population and concentrated economic activity drive its substantial electricity demand. The city accounts for almost 1.6% of India's total population, with a population density of approximately 15,762 people per square kilometre (sq. km) spread over nearly 1,484 sq. km.

Its energy requirement reached a new high of 38,482 million units (MU) in financial year (FY) 2026, accounting for about 2.2% of India's total energy requirement. Demand is further amplified by relatively high electricity consumption levels, with per capita consumption reaching 1,934 kilowatt-hour (kWh) in FY2024, roughly 38% higher than the national average of 1,400kWh. This consumption profile is further reflected in Delhi's demographic structure, with nearly 97.5% of its population classified as urban as per the 2011 Census of India (publicly available electricity consumption data is only until FY2024. The same has been used throughout the document).

Delhi's power consumption profile is structurally distinct from most Indian states due to its highly urbanised and service-oriented economy. The city's electricity demand is dominated by domestic and commercial consumers, while the industrial and agricultural share remains comparatively limited.

Figure 1: Category-wise electricity consumption



Source: India Climate & Energy Dashboard; Note: Agriculture has about 0.1% of electricity consumption across the years.

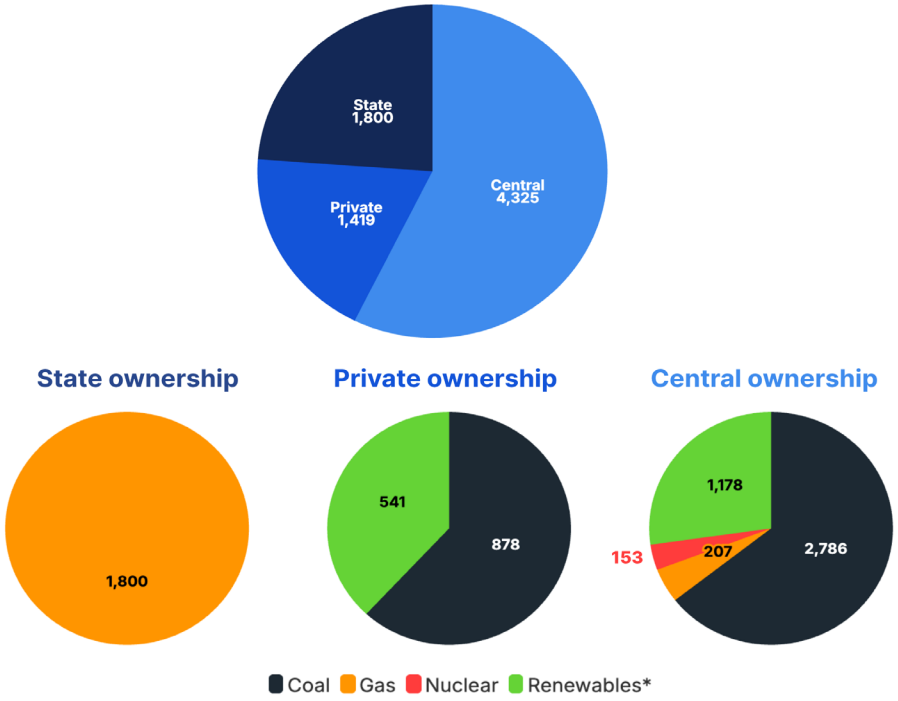
As shown in Figure 1, Delhi's total electricity consumption rose at a compound annual growth rate (CAGR) of around 2.07% from 29,171MU in FY2019 to 32,319MU in FY2024, accounting for approximately 2.1% of India's total electricity consumption in FY2024. Domestic consumers accounted for around 56% of total electricity consumption in Delhi in FY2024, up from 53% in FY2019, reflecting the growing prominence of residential demand.

Commercial consumers remained the second-largest consumer category, consistently accounting for 26% of total consumption in both FY2019 and FY2024, whereas the share of industrial consumption declined from 12% to 9%. The low industrial consumption aligns with the broader contraction of Delhi's manufacturing sector, as stricter environmental regulations resulted in relocation of industrial units to neighbouring states. Agricultural consumption remained negligible at nearly 0.1% in both years.

2.2. Delhi's power generation capacity mix

As of June 2026, Delhi's total allocated power generation capacity reached around 7,544 megawatts (MW), accounting for nearly 1.4% of India's total installed capacity. Power generation capacity here means the capacity earmarked for Delhi's electricity supply, irrespective of the location of the generating station.

Figure 2: Delhi's allocated power generation capacity (in MW) (as of 30 June 2026)



Source: Central Electricity Authority; Note: Renewables include large hydro

The figure above shows that the central sector accounts for the largest share of Delhi's allocated capacity at around 4,325MW, contributing nearly 57% of the total portfolio. Within the central sector portfolio, coal-based power constitutes the largest share at around 64% (2,786MW), followed by renewable energy (including large hydro) at around 27% (1,178MW), followed by gas-based power at nearly 5% (207MW), and nuclear power at around 4% (153MW). Together, they reflect a relatively diversified central sector portfolio.

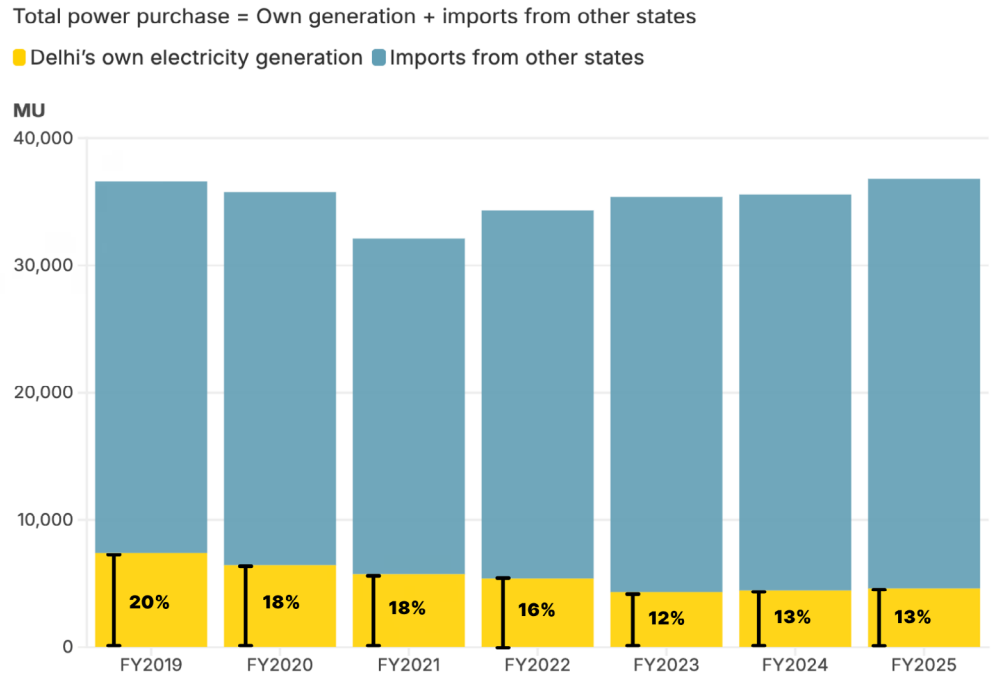
State-owned generation capacity is the second-largest contributor with around 1,800MW, or 24% of Delhi's total allocated capacity. Notably, Delhi's state-owned portfolio is entirely gas-based.

Private sector participation remains comparatively limited, contributing just around 19% of the total allocated capacity at 1,419MW. The private sector portfolio primarily comprises coal-based power, which accounts for around 62% (878MW) of the private capacity, while the remaining 38% (541MW) comes from renewable energy sources. A significant share of renewable energy capacity is driven by distributed solar energy generated within Delhi, which accounted for nearly 446MW by June 2026.

2.3. Increasing dependency on power imported from other states

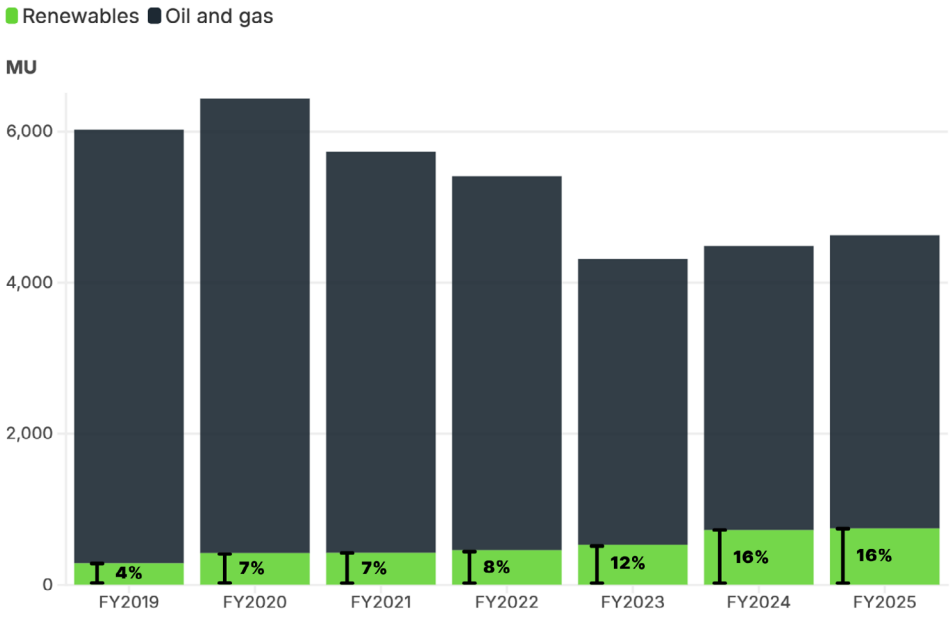
Given its limited land availability and resource constraints, electricity generation within Delhi remains significantly lower than its overall electricity procurement. Land scarcity also poses challenges with power distribution companies (DISCOMs) reporting difficulties in securing space for substations and other network infrastructure in the city. All of this contributes to making Delhi dependent on external power to meet its electricity demand.

Figure 3: Delhi's own electricity generation and total power purchase



Source: India Climate & Energy Dashboard

Figure 4: Source-wise classification of Delhi's own electricity generation



Source: India Climate & Energy Dashboard

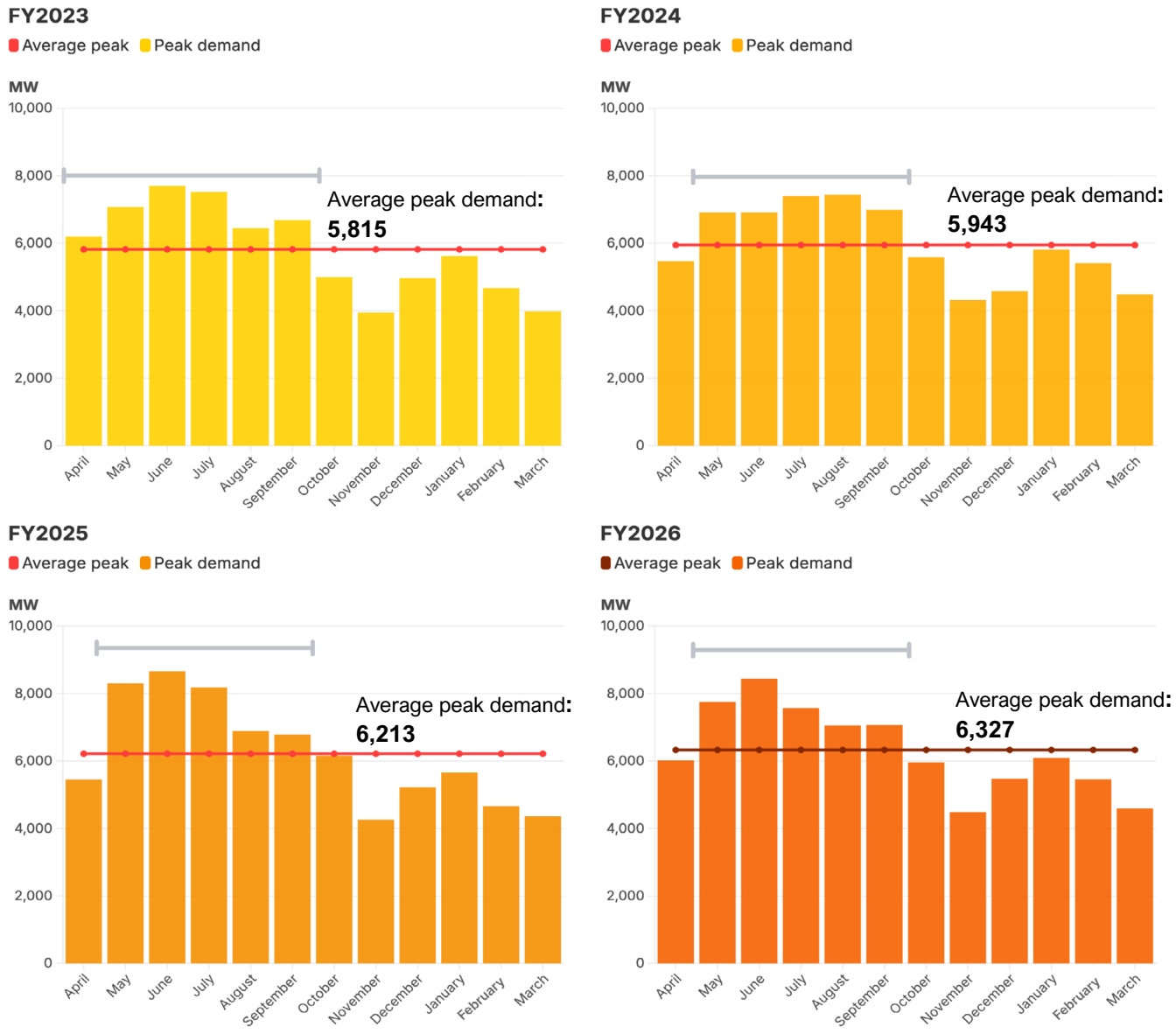
The contribution of Delhi's own power generation to its total power purchase (latest data available for FY2025) has been decreasing. In FY2019, Delhi's total power purchase stood at

36,606MU, of which 7,424MU was met through its own generation, contributing 20% of total power purchase. In FY2025, Delhi's total power purchase stood at 36,813MU, while its own generation declined to 4,627MU, accounting for 13% of total power purchase. The widening gap between electricity demand and own generation is filled through electricity procured from long-term power purchase agreements (PPAs) with generation stations situated in other states and through short-term power market purchases.

Delhi's own generation has declined due to a strategic reduction in gas-based power generation. Its share went from 93% in FY2020 and FY2021 to 84% in FY2024 and FY2025. This gradual reduction can be attributed to a shortage of cheaper domestic gas supply in India and volatile import prices. While the share of renewable energy generation has increased, its pace has not been sufficient to offset the decline in gas-based generation, resulting in a growing reliance on power purchase from other states for electricity.

2.4. Heat stress driving peak demand in Delhi

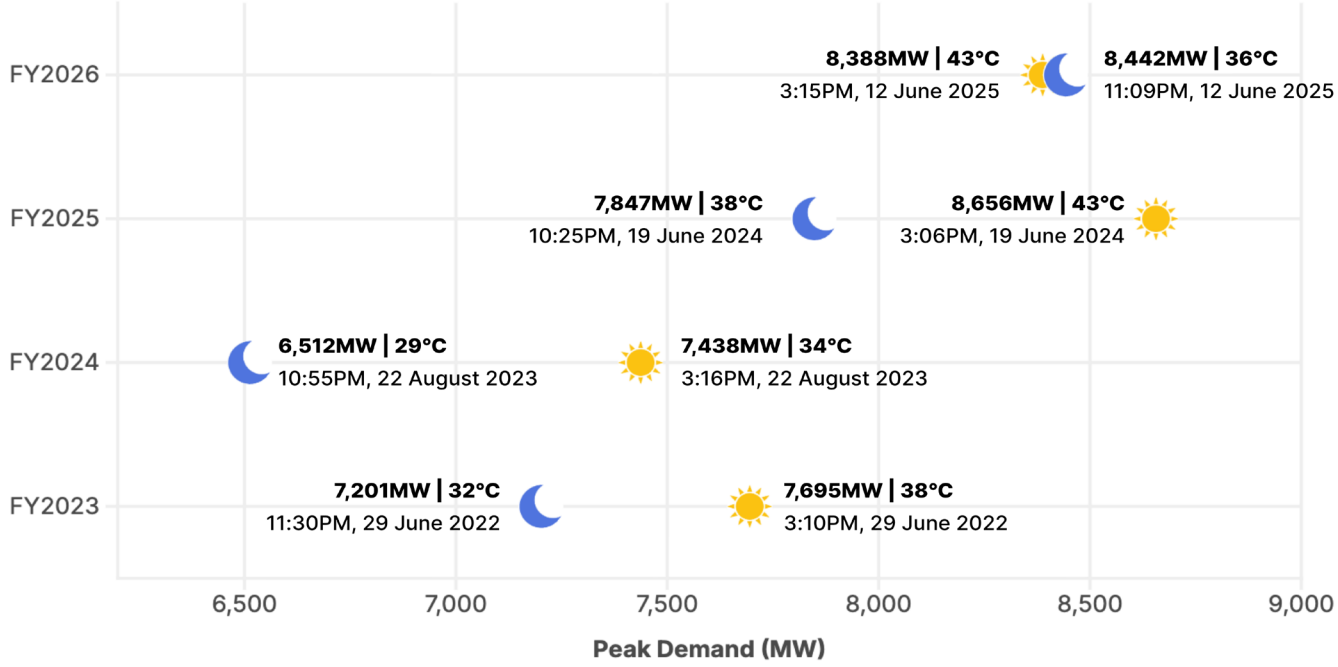
Figure 5: Yearly peak demand of Delhi



Source: Grid-India

As demonstrated above, Delhi's peak demand reached 8,442MW in June 2025 (FY2026), which is a CAGR of 3.1% from June 2022 (FY2023). This upward trajectory highlights growing dependence on electricity amid rising cooling needs, led by increasing heat stress across Delhi. Delhi's electricity demand also has pronounced seasonal variation as monthly energy requirement trends indicate substantially higher demand during May–September compared to winter months.

Figure 6: Day-time and night-time peak demand on annual peak-demand days



Source: State Load Despatch Centre, Delhi; Meteologix

Delhi's peak demand profile has evolved in recent years. The figure above shows that the city now experiences two distinct demand peaks, a day-time peak and a second peak during the night, reflecting sustained electricity demand across both periods.

Recent trends indicate that Delhi's electricity demand cycle is intensifying amid worsening heat stress. On 29 June 2026, the city recorded its highest peak demand for the month at 8,748MW, for the period of FY2023–FY2027.

3. (S)trengths: Delhi's transition readiness

Delhi's power sector demonstrates several structural strengths that support its transition readiness, particularly in distributed renewable energy adoption, distribution sector efficiency, power procurement planning, and supply reliability. Despite being a demand-heavy and resource-constrained city with limited in-state generation capacity, Delhi has maintained a relatively resilient and efficient power system.

3.1. Efficient distribution sector and low Aggregate Technical and Commercial (AT&C) losses

Delhi also benefits from a relatively advanced and efficient power distribution. Its AT&C losses for FY2025 (latest publicly available data) are estimated at around 6.48%, down from 9.12% in FY2019, and significantly lower than the national average of around 15.04%. This performance is largely due to majority DISCOMs operating under a public-private partnership (PPP) model.

Distribution operations are managed by the New Delhi Municipal Council (NDMC) and three private DISCOMs, Tata Power Delhi Distribution Limited (TPDDL), BSES Rajdhani Power Limited (BRPL), and BSES Yamuna Power Limited (BYPL), where 51% ownership is held by private operators and the rest by the Government of NCT of Delhi through Delhi Power Company Limited (DPCL).

In FY2025, DISCOM-level AT&C losses stood at around 5.7% for TPDDL, 6.7% for BRPL, and 7.15% for BYPL, compared to 7.99%, 9.04%, and 10.76%, respectively, in FY2019. This improvement in loss reduction reflects their strong operational performance. Collection efficiency improved across all three utilities in FY2024–FY2025, exceeding 99.5% in FY2025 (latest publicly available data). Billing efficiency also improved for TPDDL (94.09% to 94.50%) and BYPL (92.95% to 93.30%), while BRPL maintained a rate of over 93%. These performance improvements further demonstrate the operational strengths of Delhi's power distribution model.

3.2. Distributed solar adoption

A key strength of Delhi's transition readiness is the rapid growth of distributed solar capacity contributing to increasing power generation within Delhi. Distributed solar offers one of the most viable pathways for expanding renewable energy deployment despite the city's geographical constraints. As of June 2026, Delhi has installed around 446MW of distributed solar capacity, accounting for nearly 98% of its total installed solar capacity and about 82% of its overall renewable energy capacity within its geographical boundaries. This marks a significant increase from 119MW as of March 2019, reflecting a CAGR of around 20% over approximately seven years.

The expansion has been supported by a combination of government subsidies, awareness campaigns, and digital facilitation measures aimed at simplifying consumer adoption. The pace of deployment accelerated further in FY2026, when Delhi recorded its highest-ever annual rooftop solar addition, with 5,378 new installations.

3.3. Strong peak demand management and reliable electricity supply

Delhi also benefits from its strong power procurement planning and peak demand management capability. Despite fluctuations in demand and rising peak load intensity, the power system was able to meet its peak electricity demand across FY2025 and FY2026. The only exception was a marginal power shortage of 0.074% in September 2024. Overall, this reflects effective advance power procurement planning and relatively strong supply management by the distribution utilities. Maintaining this performance will become increasingly important as peak demand continues to rise due to increasing cooling needs and penetration of electric vehicles (EVs).

Delhi's active participation in short-term power markets and exchanges has further strengthened its ability to balance seasonal demand surges and maintain supply reliability even during periods of extreme weather.

As per the latest publicly available data, in FY2025 Delhi recorded total power exchange transactions (sales and purchase combined) of around 4,783MU. Of this, around 174MU (4%) was transacted through the Green Day-Ahead Market (GDAM).

4. Converting (C)omplexities into (O)pportunities

Delhi's evolving power system has structural and emerging complexities, which can also create certain opportunities. The table below outlines targeted actions to use these opportunities to create a cleaner, more resilient, and consumer-centric electricity system.

Table 1: Complexities, opportunities, and enablers in Delhi's power sector transition

Complexity	Opportunity	Enabler(s)
Heavy dependence on fossil fuel-based electricity purchased from neighbouring states amid continuously rising electricity demand and growing peak loads	Higher local or imported (from other states) infusion of renewable energy to meet growing demand	• Utilisation of untapped rooftop solar potential • Higher clean power procurement on power exchanges through green market segments to meet peak demand • If importing from other states, focus on clean power procurement and integrate storage in new renewable energy PPAs
Untapped distributed renewable energy potential	Leverage the capital subsidies and benefits under Delhi Solar Energy Policy 2023 and PM Surya Ghar Muft Bijli Yojana to maximise distributed renewable energy for peak demand management and simultaneously build energy storage portfolio	• Promotion of behind-the-meter battery storage with rooftop solar projects for managing night-time peak • Access group and virtual net-metering • Scale-up the existing peer-to-peer (P2P) electricity trading pilot by building on Delhi Electricity Regulatory Commission's (DERC) 2024 guidelines
Delhi's building-dominated load profile with rising cooling demand intensifies the peak, requiring targeted energy efficiency interventions	Improve energy efficiency to lower overall electricity consumption, reduce peak demand, and avoid costly power procurement	• Strengthen and enforce building energy efficiency codes through implementation of a unified Energy Conservation and Sustainable Building Code (ECSBC) • Accelerate adoption of the Bureau of Energy Efficiency's (BEE) revised air conditioner efficiency standards effective January 2026 • Mainstream passive cooling design such as reflective surfaces, shading, natural ventilation, and better insulation
Delayed tariff order release undermines regulatory predictability and transparency	Timely release of tariff orders; price signals to guide consumer behaviour	• Issuance of tariff orders before the start of each financial year • Providing clarity on provisions like green tariff and time-of-day (ToD) tariff incentives

To benefit from the opportunities, the actions identified in the table are discussed in detail in the (E)nablers section.

5. (P)olicy and regulatory ecosystem

The city has developed a relatively supportive policy and regulatory ecosystem for clean energy transition. Delhi Solar Energy Policy 2023 targets the installation of 750MW of rooftop solar capacity, alongside procurement of 3,750MW of utility-scale solar power from other states by FY2027. The policy complements the Pradhan Mantri Surya Ghar: Muft Bijli Yojana and provides generation-based incentives, capital subsidies of up to USD104 (INR10,000 at conversion rate of USD1 = INR96.3918 as on 27 July 2026) per residential consumer, and group and virtual net-metering provisions for rooftop solar. It also mandates the solarisation of government buildings with rooftop areas of 500 sq.m. or more.

Further, the DERC's February 2026 approval of P2P solar energy trading pilot signals an emerging decentralised market architecture that allows rooftop prosumers to directly buy and sell surplus electricity through digital trading platforms, reinforcing both energy security and the clean energy transition. To promote P2P energy transactions, the commission also released guidelines in 2024, setting out the operational framework for P2P trading, including participant eligibility, transaction procedures, metering, billing, and settlement.

The DERC also adopted Green Energy Open Access Regulations in 2024, in line with the Ministry of Power's national framework. This enables small and medium enterprises (SMEs) above a contracted demand of 100 kilowatts (kW) to procure renewable electricity through open access mechanisms, supporting greater integration of clean energy into the city's power mix.

Delhi also recently approved its new EV policy in June 2026. The policy proposes stronger electrification targets across vehicle segments, expansion of charging infrastructure, and enables a robust EV supply chain. Notably, the policy proposes that from 1 January 2027, only electric three-wheelers will be permitted fresh registration in the NCT of Delhi, followed by a proposal to allow fresh registration only for electric two-wheelers from 1 April 2028. Additionally, all schools are required to achieve minimum 30% electrification of their bus fleet by 31 March 2030.

6. (E)nablers

Based on the gaps and opportunities identified earlier, this briefing note provides recommendations to accelerate Delhi's electricity transition. The recommendations are based on a roadmap derived from the detailed assessment conducted under the SET 2026 framework for Delhi's electricity transition across three dimensions: decarbonisation, readiness and performance of the power ecosystem, and market enablers. **The action areas are categorised under short-to-medium term (one–three years) and long-term (four–six years).**

Decarbonisation

Decarbonisation assesses states' progress in shifting to renewable electricity and decoupling economic growth from emissions. In the SET 2026 assessment, Delhi showcased potential to accelerate on this front as the share of renewable energy in its overall power procurement mix in FY2024 was only 24%.

Delhi can explore the following actions to improve its performance:

Short-to-medium term

- **Improve energy efficiency:** Given that the city's electricity demand is heavily driven by buildings, especially cooling loads, energy efficiency should be treated as the first and most cost-effective option. A buildings-focused plan covering replacement of sub-5-star appliances, implementation of the unified (for commercial and residential buildings) ECSBC, and mandating passive cooling measures can structurally reduce overall consumption and cooling-driven peak demand apart from directly improving Delhi's State Energy Efficiency Index (SEEI) scores.
- **Utilise rooftop solar potential:** The Delhi Solar Energy Policy 2023 already provides generation-based incentives, capital subsidy of up to USD104 (INR10,000) per consumer, and group and virtual net-metering provisions. To increase the utilisation of rooftop potential, Delhi should streamline approvals and expand on group and virtual net-metering.

Long-term

- **Ensure new PPAs are not fossil fuel-based:** New PPAs should embed renewable energy with storage through innovative procurement mechanisms like firm and dispatchable renewable energy (FDRE) and round-the-clock (RTC) contracts. This would ensure clean electricity supply during night-time peak and non-solar hours, reducing power sector emissions intensity over time.

Readiness and performance of the power ecosystem

The readiness is examined on the base of parameters such as the uptake of distributed solar, reliability of power supply, and DISCOM health. Delhi emerged as a high performer on this front in the SET 2026 assessment and can raise its performance further with the following measures:

Short-to-medium term

- **Deployment of smart metering infrastructure:** Delhi has 3,521 sanctioned smart meters under the Revamped Distribution Sector Scheme (RDSS) as of July 2026. However, it is yet to progress on the installation front. Accelerating smart meter rollout under RDSS equips DISCOMs with granular hourly consumption data, thus enabling better procurement alignment, improved billing accuracy, and reduction in commercial losses, which strengthen overall DISCOM performance. Smart meters are fundamental to operationalising ToD tariffs that incentivise consumers to shift flexible loads, including EV charging, to solar hours.
- **Access green products on power exchanges:** Delhi has been successful in meeting its electricity demand through procurement from power exchanges. However, with GDAM standing at only 4% of overall electricity transacted through power exchanges in FY2025, there remains a significant scope to deepen participation in green power market segments on exchanges. This would increase the share of renewable energy in meeting the rising electricity demand.
- **Building on P2P solar energy trading pilot**: The city emerged as an early mover in decentralised electricity market reforms. Delhi already has guidelines to promote P2P energy transactions and building on the existing P2P pilot project will enable consumers and prosumers to directly buy and sell surplus electricity through digital trading platforms.
- **Moving beyond conventional rooftop solar:** Delhi has 446MW of distributed solar capacity installed. However, for a future-proof system, promoting behind-the-meter energy storage is becoming increasingly essential. Extending incentives to rooftop solar-plus-storage systems supports uptake of distributed solar energy and builds grid resilience at the consumer level.

Market enablers

Market enablers are state-level initiatives to accelerate the transition to renewable energy. Apart from facilitating the adoption of EVs and green hydrogen, these include green tariffs, green energy open access, energy storage deployment, and solar-hour-aligned ToD tariffs. In the SET 2026 assessment, Delhi showcased potential to accelerate market enablers, although it did demonstrate a strong EV adoption rate of 11.6% for FY2025. To improve its performance, Delhi can explore the following pathways:

Short-to-medium term

- **Timely release of distribution tariff orders:** One way of managing continuous rise in peak demand is to implement solar-hour-aligned ToD tariff and incentivise consumers to shift their non-critical demand to solar hours. As of July 2026, tariff orders were available in public domain only up to FY2023. Timely issuance and publication of tariff orders will enhance regulatory predictability and support peak-demand management by providing clarity on solar-hour-aligned ToD tariffs.

- **Build more energy storage:** Given its limited land availability, rising night-time peaks, and dependence on electricity purchased from neighbouring states, Delhi needs to build on its existing energy storage capacity of 10MW/10 megawatt-hour (MWh) battery energy storage system (BESS) (by TPDDL) and 20MW/40MWh BESS (by BRPL) in its power portfolio. This would enhance system flexibility and ensure availability of clean electricity during non-solar hours.
- **Ease adoption of green energy open access for SMEs:** Enabling SMEs to avail the benefits of the provisions of the 2024 Green Energy Open Access Rules mentioned earlier requires capacity building alongside streamlined application and approval processes by DISCOMs.

Delhi's unique urban characteristics require a different transition pathway from states with abundant land and renewable resources. Rather than relying on utility-scale renewable energy buildout within its geographical boundaries, Delhi's transition will depend on optimising clean power procurement, scaling rooftop solar and storage, improving energy efficiency, enabling demand-side flexibility, and leveraging power markets. A coordinated focus on these measures can help meet rising demand while advancing affordability, reliability, and decarbonisation objectives.

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