



REVIEW PAPER

Scaling EV charging through retrofit: A policy and commercial framework for existing buildings in India

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Abstract

India's electric vehicle (EV) market has scaled sharply, with some 2.3 million EVs registered in 2025 and EVs reaching about 8% of new vehicle registrations, but public charging capacity has not kept pace. In early 2026, there were some 27,000-29,000 public charging points in operation in the country, against an estimated need of some 1.3 million by 2030. This left an EV-to-charger ratio of about 1:235, versus a global norm of 1:6-20. It is relatively simple to provide for charging in new builds, but the more difficult and larger opportunity in the near term is to retrofit the existing stock of commercial buildings, malls, office parks, hotels and multi-level parking facilities that already have captive footfall, dwell time, land and partial electrical capacity. This paper proposes a structured six-phase framework – the REV-FIT model (Retrofit for Electric-Vehicle Fit-out and Integrated Transition)- that guides a building or parking owner through site screening, electrical feasibility, statutory compliance, technology selection, commercial structuring, and deployment and operations. The framework is based on India's existing regulatory architecture, the latest charging technology relevant to the Indian context and current unit economics. The paper concludes that retrofitting is a policy-supported, de-licensed and increasingly bankable asset class, with viability determined primarily by site utilization, electrical capacity headroom and the layering of revenue beyond the charging tariff.

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1. Introduction

The emerging relationship between electric mobility, charging infrastructure, renewable energy, and the electricity grid in India. Figure 1 illustrates the charging hub located beside an urban highway, representing the need to establish accessible charging facilities at locations where vehicles naturally stop or travel frequently, including commercial buildings, parking facilities, transport terminals, residential developments, and intercity corridors. India's charging infrastructure guidelines similarly emphasise the development of safe, reliable, affordable, and publicly accessible charging services to support widespread EV adoption [1], [2]. Overall, the figure presents EV charging as more than the installation of

individual charging points. It represents an interconnected system involving vehicles, buildings, parking areas, renewable generation, distribution networks, digital platforms, and public policy. A reliable and widely distributed charging network can reduce range anxiety, improve consumer confidence, and support the continued expansion of electric mobility across India. The presence of cars, two-wheelers, three-wheelers, buses, and commercial vehicles indicates that charging networks must accommodate different vehicle categories, battery capacities, dwell times, and power requirements. Consequently, infrastructure planning should combine slower destination charging with rapid and high-power chargers at high-demand locations. The location, number, and rating of chargers should be determined from traffic volume, expected

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utilisation, parking duration, electrical capacity, and future EV growth rather than by applying a uniform installation model [2, 3]. Solar panels and wind turbines in the figure signify the opportunity to connect EV charging with renewable electricity. When charging is coordinated with periods of high renewable-energy availability, EVs can reduce petroleum dependence and contribute more effectively to transport decarbonisation. Smart charging, energy storage, time-based tariffs, and managed charging schedules can also limit peak demand and improve the electricity system's ability to accommodate variable solar and wind generation [4, 5]. The transmission network and digitally connected map of India highlight the importance of grid readiness, interoperability, and geographically balanced charger deployment. Charging-station expansion requires coordination among charge-point operators, electricity-distribution companies, property owners, municipal authorities, and transport agencies. The PM E-DRIVE programme has allocated public funding for charging facilities, particularly in urban centres and heavily used transport corridors, demonstrating the strategic importance of this infrastructure to India's electric-mobility transition [6, 7].



Figure 1: EV recharging infrastructure in India

The electrification of road transport is one of India's central strategies for advancing decarbonisation, strengthening energy security and improving urban air quality [1, 2]. National ambitions envisage electric vehicles accounting for approximately 30% of new vehicle sales by 2030, with considerably higher penetration expected in the two- and three-wheeler segments and an increasing share in public transport [3, 4]. However, the development of enabling infrastructure has not kept pace with vehicle adoption. EV registrations and sales continued to grow through FY2025–26, supported by FAME-II, PM E-DRIVE and other national initiatives [5, 6]. Despite this progress, the geographical availability, capacity and operational reliability of public charging facilities remain important constraints on further market expansion. Limited driving range and uncertainty regarding charger availability—commonly described as “range anxiety”—continue to be among the principal barriers influencing consumer acceptance, as illustrated in Fig. 2 [7, 8]. A substantial proportion of policy and private investment has so far been directed towards greenfield charging hubs and charging facilities along national highways and high-traffic transport corridors [9]. Nevertheless, existing commercial buildings and parking facilities may provide a faster and, in many cases, more economical route for expanding charging capacity. These

properties possess three important structural advantages over undeveloped sites. First, they generate regular and relatively predictable vehicle traffic, while the longer parking durations associated with offices, shopping centres, hotels and institutional buildings create natural opportunities for destination charging [10, 11]. Second, many properties already have grid connections and electrical distribution equipment that may support an initial charging load, although the available sanctioned capacity and the need for system upgrades must be verified through a detailed electrical assessment [11, 12]. Third, existing parking areas avoid or reduce the additional cost and planning difficulty associated with acquiring separate land for new charging stations.

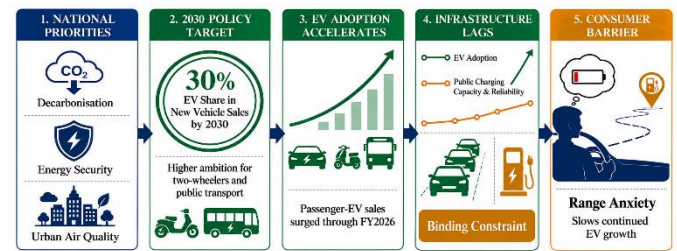


Figure 2: India's EV Transition: Policy Ambition and Charging Infrastructure Gap

Providing conduits, electrical panels, cable routes and EV-ready parking spaces during initial construction is generally less expensive than installing the same infrastructure after a building has been completed [13]. However, much of the commercial property and parking capacity that will serve India's near-term charging demand already exists. Retrofitting this stock therefore represents an important addressable market for the rapid deployment of EV charging, particularly where sufficient dwell time, parking availability, grid capacity and expected charger utilisation can be demonstrated [10–13].

This paper develops a decision-and-deployment framework tailored to that retrofitting task in the Indian regulatory, technical and commercial environment. It is intended to be usable by mall and office park owners, hotel and hospital operators, municipal and private parking operators, real estate investment platforms and charge point operators (CPOs) seeking host sites. The paper's contribution is a single, sequenced framework that integrates the regulatory, electrical, technological and financial dimensions that are usually treated in isolation.

2. Market Context and the Retrofitting Opportunity

2.1 The demand–supply gap

India's public charging network expanded roughly six-fold in three years, from about 5,000 stations in 2022 to the high-twenty-thousands by early 2026. Ministry data reported to Parliament indicated approximately 27,700 public stations installed and around 22,800 operational as of March 2026 an installed-versus-operational gap that is itself a recurring theme in the sector. Against this, projections (including those from the Observer Research Foundation) place the 2030

requirement at roughly 1.3 million public charging points, i.e. more than forty times the current installed base. Figure 2 shows the results of the growth described above [1-3].

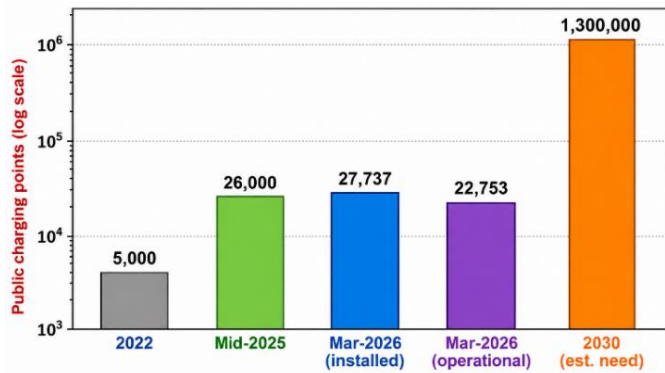


Figure 3: India's public EV charging network: growth and the 2030 gap

The mismatch is stark on a per-vehicle basis. With about 2.3 million EVs registered in 2025 and a charger ratio of nearly 1 per 235 EVs in mid-2025, India remains far from the global benchmark of 1 charger per 6–20 vehicles figure 3 is indicate the value of charging points [1-2]. Compounding the raw shortfall, there are three quality problems: poor geographic distribution, low utilization that undermines maintenance economics, and a significant share of installed chargers being inoperative at any given time. One oil marketing network was reported as being 60% non-functional [3-4].

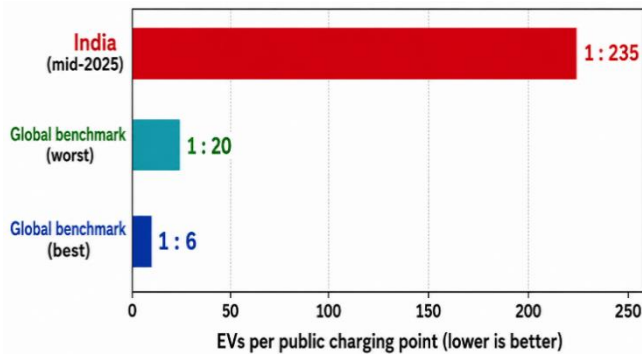


Figure 3: Charger adequacy: India vs the global benchmark

Table 1: India EV charging market snapshot (2025–26)

Indicator	Value (2025–26)
Public charging points installed (Mar 2026)	27,700
Operational share	22,800 (82%)
Growth since 2022	5,000 → 27,700 (6×)
EVs registered (2025)	2.3 million
EV share of new vehicle registrations	8%
EV-to-charger ratio (mid-2025)	1 : 235
Global benchmark ratio	1 : 6 – 1 : 20
Estimated 2030 requirement	1.3 million points
PM E-DRIVE charging outlay	₹2,000 crore / 72,300 chargers
Regulatory status of charging	De-licensed (Electricity Act, 2003)

2.2 Why commercial sites

The case for retrofits is shaped by two facts. 1. Nearly 55% of Indian EV owners reliably charge their cars at home, suggesting that a substantial minority and almost all intercity, fleet and apartment users depend on out-of-home charging [4]. 2. the longer a charging asset is in use, the more likely it is to generate revenue. Commercial buildings and parking structures have dwell time baked into them: shoppers park for an hour or two, office workers a full day, hotel guests overnight, hospital visitors for long and unpredictable periods. This fits with the physics of charging long dwell suits lower cost AC charging, short dwell suits DC fast charging allowing owners to match charger type to native visitor behaviour rather than fight it.

Regulation is consistent with retrofits. The Model Building Bye-Laws already push new and existing large complexes toward EV-readiness (Section 3), turning a compliance burden into a magnetisable amenity. Further, setting up a charging station is a de-licensed activity under the Electricity Act, 2003. A building owner can host or operate charging without a distribution licence a substantially lower barrier to entry than most infrastructure businesses [5-6].

2.3 The competitive and partnership landscape

Retrofitting owners do not enter an empty field; they enter a maturing ecosystem they can partner with. Leading networks in early 2026 included Tata Power (thousands of public and fleet points plus a very large home-charger base), the oil-marketing companies IndianOil, BPCL and HPCL (each electrifying several thousand outlets), and pure-play CPOs such as ChargeZone, Statiq, Jio-bp pulse, Ather Grid (two-wheeler focused) and Bolt. Earth (a large distributed network) [3], [7]. Consequential distribution deals HPCL's late-2025 agreement to deploy charging across its very large retail-outlet footprint, and Maruti Suzuki's unified digital platform aggregating multiple CPOs signal that host-site owners increasingly plug into national roaming and discovery networks rather than operating in isolation [1], [7]. For a building owner, this ecosystem offers a spectrum of engagement models, from fully outsourced, host-only to fully owned, self-operated CPO, as analysed in Section 6.

3. Regulatory and policy framework

Retrofitting sits at the intersection of central power-sector rules, central building norms, state EV policies and local statutory clearances. A retrofit project must satisfy all applicable layers simultaneously, provided lower layers do not conflict with higher ones.

3.1 Central power-sector guidelines

The Ministry of Power's consolidated Guidelines and Standards for EV charging (first issued 2018–2019, revised in January 2022, and further updated through 2024–2025) establish the operating spine: charging is de-licensed; any entity may set up a public charging station meeting technical

and safety norms; DISCOMs must provide connections within defined timelines (of the order of 7 days in metros, 15 days in other municipal areas and 30 days in rural areas); and the electricity tariff for public charging is a single-part tariff that should not exceed the average cost of supply, a concessional treatment extended in successive orders [5], [8]. Service charges capped by the state commission. January 2025 guidelines tighten rules for interoperability, uptime and renewable-powered charging [4].

3.2 National fiscal push: PM E-DRIVE

The PM E-DRIVE scheme earmarked ₹2,000 crores specifically for public charging, aiming at on the order of 72,300 chargers, including about 22,100 DC fast chargers for four-wheelers, some 1,800 e-bus chargers and around 48,400 two- and three-wheeler chargers, with subsidies reported at up to 80% of upstream power-infrastructure cost for qualifying sites [3][9]. One important caveat for planners is that a parliamentary reply revealed that essentially no expenditure had been incurred under the charging component as of March 2026, i.e. disbursement lags allocation [7]. So the sensible modeling approach is to build the base business case without subsidy, and treat any approved incentive as upside.

3.3 Building norms: the MBBL Clause 10.4 lever

The most relevant instrument for retrofitting is the amendment (February 2019) to the Model Building Bye-Laws, 2016, issued by the Ministry of Housing and Urban Affairs, which

includes Clause 10.4, “Electric Vehicle Charging Infrastructure.” Its core provisions [10-13]:

- **20% EV-ready parking:** buildings should provide charging infrastructure for at least 20% of total vehicle-holding / parking capacity.
- **1.25× Load augmentation:** The sanctioned load needs to be increased to accommodate simultaneous operation of all charging points, at a 1.25× safety/diversity factor on feeder capacity.
- **Universal application:** the requirement applies to all types of buildings except independent residences, and explicitly includes retrofitting of existing large complexes.

But the strength of the MBBL is only as powerful as it’s enshrined into state law. Several states have already passed it. Maharashtra is pushing new residential buildings to be 100% EV-ready and commercial buildings to be 50% EV-ready with the rest setting their own percentage of EV-ready parking [4], [14]. The forward signal is even stronger, the 2026–2030 roadmap points toward an explicit EV-ready building code notification and charger uptime/data regulations [15].

3.4 Safety, product and interoperability standards

A compliant retrofit must conform to the CEA (Safety) Regulations, 2010; BIS product standards (IS 17017 series); National Building Code fire provisions; specified connector types and open communication protocols. These are summarised in. Table 2 [6].

Table 2: Core compliance stack for a retrofit charging site (India)

Domain	Instrument	Key requirement for retrofit
Licensing	Electricity Act, 2003	Charging de-licensed; no distribution licence
Electrical safety	CEA Regulations, 2010	ELCB/interlocks, earthing, cut-off, signage
Product certification	BIS IS 17017 (Parts 1/2, 23/24, 25)	Use only BIS/ARAI-certified AC & DC EVSE
Building norm	MBBL Clause 10.4 (MoHUA)	≥20% EV-ready parking; load sizing at 1.25×
Fire	National Building Code + local NOC	Fire NOC for public/fuel-adjacent sites
Connectors	Type 2 / CCS2 / Bharat AC-001 & DC-001	Match connector to vehicle segment served
Interoperability	OCPP 1.6J/2.0.1; OCPI; UPI/RFID	Open back-end + roaming + digital payment
Tariff / service charge	MoP guidelines + State ERC orders	Single-part energy tariff; capped service charge

4. Technology Landscape for the Indian Environment

The choice of the right charging technology for the vehicle mix, the dwell profile, and the site's electrical headroom will determine whether to retrofit.

4.1 AC versus DC, and the role of dwell time

AC (“slow”/Level-2) chargers provide about 3- 22 kW and depend on the vehicle’s on-board converter. They are well-suited for long-dwell locations that require low capital investment. DC fast chargers do the AC-to-DC conversion externally and provide 30 kw to 350+ kw directly to the battery, which is good for short-dwell, high-turnover sites [3]. Most commercial retrofits will use a mix weighted by the site's native dwell time (Figure 3), as AC dominates the installed base in India, while DC is the binding gap for four-wheelers.

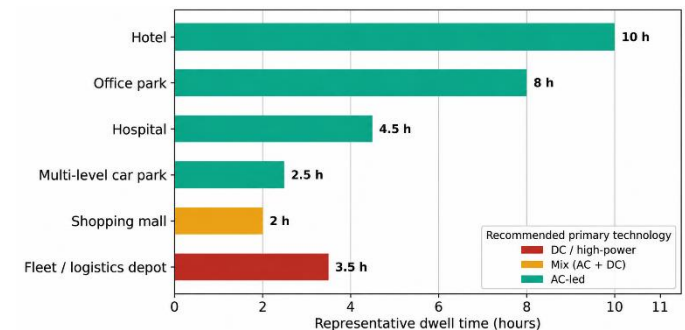


Figure 3: Matching charger technology to host site type dwell time

4.2 High-power and megawatt charging

The Indian high-power ecosystem is rapidly maturing. The development of a 1 MW-class charging solution for heavy

commercial vehicles (to be launched in late 2025 with dynamic load balancing and smart energy management) indicates a possible readiness for depot and logistics-hub electrification [1]. Underlying this are 800-volt architectures (which roughly halve resistive losses at a given power) and silicon-carbide power electronics, with liquid-cooled cables and AI-assisted load balancing to manage thermal and grid stress [16-17]. For most commercial-building are relevant mainly where fleet or bus charging is contemplated.

4.3 Battery-buffered charging and on-site storage

A pivotal enabler for retrofits with limited grid headroom is the battery-buffered charger — a DC fast charger paired with an integrated Battery Energy Storage System (BESS) that draws a modest continuous load from the grid, stores it, and discharges at high power on demand. This decouples the charger's peak output from the site's sanctioned load, enabling high-power operation without an expensive transformer upgrade. More generally, DC-coupled BESS allow for peak-shaving, backup during outages and time-shifting of cheap off-peak or solar energy to high tariff periods [1], [17]. For retrofits, storage is often the difference between a feasible and an infeasible site.

4.4 Solar plus storage and green charging

Rooftop and canopy solar over parking is a natural fit for commercial retrofits: the roof and parking canopy are already there, and generation matches daytime workplace and retail charging. Deployments pairing solar with storage have demonstrated substantial reductions in grid reliance, and green procurement generates tradeable Renewable Energy

Certificates on the Indian Energy Exchange [1], [18]. Net-metering and time-of-day tariffs that favour solar hours further improve the economics [4], [6].

4.5 Smart load management and the digital layer

Dynamic load balancing, which distributes available power across active chargers in real time, lets a retrofit site install more charge points than its raw sanctioned load would nominally support by exploiting the statistical reality that not all bays draw peak power simultaneously [17]. The digital stack complements this: an OCPP-compliant charging management system for monitoring, remote control, tariff setting and uptime; OCPI for roaming; integrated UPI/RFID/QR payments; and analytics that inform utilisation-based expansion decisions [6], [18].

4.6 Vehicle-to-grid and bidirectional charging

Bidirectional charging (V2G, V2H, V2L) is emerging rather than mainstream in India. A landmark pilot in 2024–25 led by the India Smart Grid Forum retrofitted a small fleet of Tata Nexon EVs with bidirectional chargers and demonstrated export back to the grid, using more affordable AC bidirectional charging; the Ministry of Power has directed the CEA to formulate reverse-charging guidelines [19], [20]. For large retrofit sites with fleets, V2G points toward a future revenue line demand-response and virtual-power-plant participation though standards, tariffs and hardware cost remain works in progress. Planners should treat V2G as an option to design for (adequate conduit, metering and protocol support) rather than to deploy immediately.

Table 3: Technology selection guide by host-site type

Host site	Typical dwell	Recommended primary tech	Notable add-ons
Office Park	6–10 hrs	AC (7.4–22 kW) at many bays	Solar canopy; workplace subscriptions
Shopping mall	1–3 hrs	Mix: DC 30–60 kW + AC	Advertising screens; BESS for peak shaving
Hotel	Overnight	AC at guest bays; 1–2 DC	Loyalty bundling: solar
Hospital	Variable/long	AC majority + 1 DC	Reliability/uptime SLA priority
Multi-level car park	1–4 hrs	AC majority + DC at entry	Load management to avoid upgrade
Fleet/logistics depot	Scheduled	High-power DC/megawatt	BESS; scheduling; future V2G

5. The REV-FIT Framework

The core contribution of this paper is a sequenced, six-phase framework for converting an existing commercial building or parking facility into a charging asset (Figure 4). The phases are ordered so that each gate de-risks the next; a project should not proceed to hardware procurement until Phases 1–4 are cleared. Three cross-cutting enabler layers, Energy, Digital and Governance, run through all phases.

Phase 1: Site screening and demand assessment

Establish whether the site can plausibly generate revenue before incurring engineering costs. Assess local EV fleet density and trajectory; the site's native footfall and dwell-time distribution; competing chargers; and any captive/anchor

demand. The output is a demand estimate translated into expected daily sessions and a target utilisation band the master variable of the business.

Phase 2: Electrical and grid feasibility

Audit the existing sanctioned load and spare capacity; size the incremental load at the 1.25× MBBL factor; and determine whether a transformer/feeder upgrade or a new dedicated DISCOM connection is required. This phase most often determines cost: underestimation of transformer and cabling needs is a leading cause of budget overruns and multi-month delays. Where headroom is thin, route the project toward battery-buffered chargers.

Phase 3: Regulatory and statutory compliance

MBBL/state EV-ready obligations vs Table-2 stack Check NOC and owner/RWA/Tenant approvals Obtain electrical inspector sign off prior to energizing Get fire NOC where applicable Use only BIS/ARAI certified equipment Courts have recognized that owners of shared-ownership assets cannot be arbitrarily prevented from doing so and some States require that a NOC be issued within days, but due process must still be followed regarding the cost allocation and safety [11-12].

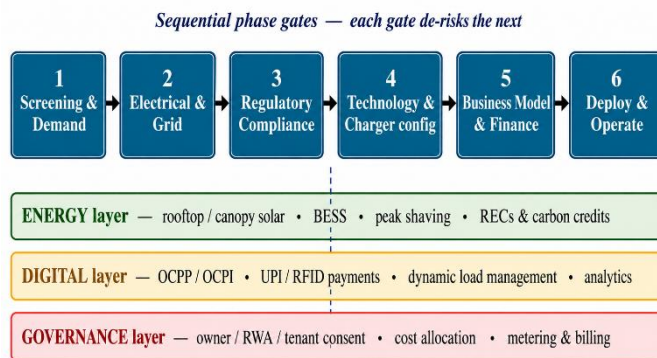


Figure 4: The REV-FIT Retrofitting framework

Phase 4: Technology and charger configuration

Select the type and number of chargers according to the logic

Table 4: The REV-FIT phase gates at a glance

Phase	Objective	Gate to pass
1. Screening & demand	Confirm revenue plausibility	Target utilisation band met in estimate
2. Electrical & grid	Establish true cost & feasibility	Load headroom or storage path confirmed
3. Compliance	Clear all statutory obligations	Consents, NOCs, certifications in hand
4. Technology	Right chargers & energy config	Spec matches dwell, segment, headroom
5. Business model	Bankable structure & tariff	Base case viable without subsidy
6. Deploy & operate	Live, reliable, discoverable asset	Commissioned; uptime SLA in place

6. Business Case and Financial Model

6.1 Cost structure

Retrofit capital cost is dominated by four items: hardware (EVSE), electrical works (transformer/feeder/cabling), civil works, and the software/network stack. Indicative 2026 hardware ranges: AC chargers from roughly ₹50,000 up to ₹2 lakhs; DC fast chargers (30–60 kW) roughly ₹10–40 lakh per unit inclusive of associated works; and ultra-fast (150 kW+) units from ₹25–50 lakh and beyond [21-23]. A commonly cited turnkey figure for a 60-kW dual-gun DC installation, including a transformer, is on the order of ₹15 lakhs [24]. Because power availability is the largest swing factor, retrofit sites with existing spare load enjoy a decisive cost advantage over greenfield, precisely the retrofitting thesis of this paper (Figure 5, Table 5) [22].

6.2 Revenue and the master variable

Charging economics rest on the spread between the

of Table-3. Vehicle segment dwell time matching. Select the energy configuration (grid-only, solar-plus-storage, or battery-buffered) in accordance with the Phase-2 headroom and tariff structure. Indicate the digital layer (OCPP CMS, OCPI roaming, UPI/RFID/QR). Design conduit and metering to be V2G and expansion ready even if not activated at launch.

Phase 5: Business model and financial structuring

Choose the commercial model on the host-to-owner scale (Table 6). Set tariff and service charge within regulatory limits. Build the revenue stack. Base case with no subsidy, layer PM E-DRIVE or state incentives as upside and stress test against the utilization scenarios in Section 6. Choose a financing solution that fits the model (self-financing, leasing, charging-as-a-service, or joint venture).

Phase 6: Deployment, commissioning and operations

Carry out civil works, install and earth equipment, connect to the back end, conduct safety testing and commissioning, set opening tariffs. Then run for uptime: preventive maintenance, remote monitoring and discovery (maps, OEM apps, roaming). With a big chunk of India's installed chargers being non-functional at any point in time, uptime discipline is a competitive advantage in itself, and a precondition for utilization.

concessional EV energy tariff a CPO pays (broadly ₹5–6.50/kWh in most states in 2026) and the price charged to users (broadly ₹12–18/kWh for public DC charging, and lower for AC and two-wheeler charging) [23, 25].

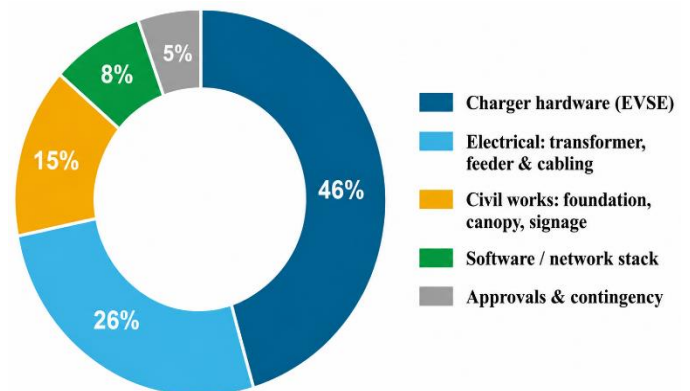


Figure 5: Indicative capex split: 60 Kw DC retrofit site (@ 15lakh turnkey)

But the decisive lever is utilisation: a station at ~25% utilisation is marginal; the same station at 40–50% is strongly profitable; and roughly 15% utilisation is the breakeven threshold for DC assets (Figure 6). This is exactly why host-site selection (Phase 1) matters more than any other single decision and why commercial buildings with captive dwell time are advantaged [25], [26].

Table 5: Indicative capex line items: 60 kW DC retrofit site ($\approx$ ₹15 lakh turnkey)

Line item	Indicative share	Notes
Charger hardware (EVSE)	46%	BIS-certified 60 kW dual-gun DC unit
Electrical: transformer, feeder, cabling	26%	Rises steeply if an upgrade is needed
Civil works: foundation, canopy, signage	15%	Trenching, lighting, parking design
Software/network stack	8%	OCPP CMS, payments, roaming
Approvals & contingency	5%	Inspector sign-off, fire NOC, buffer

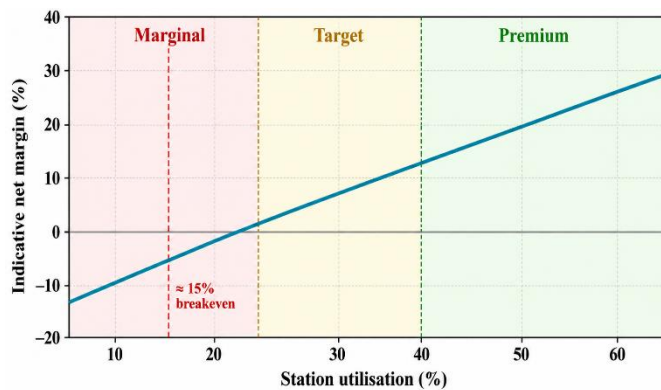


Figure 5: Utilization is the master variable illustrative

6.3 The revenue stack

Resilient operators do not rely solely on the charging tariff. The stackable streams relevant to commercial retrofits are shown in Fig. 7 [1, 21], 23]:

1. **Per-kWh / per-session charging fees:** The core line, with dynamic peak pricing adding to the effective rate.
2. **Fleet and subscription contracts:** A fixed monthly fee guaranteeing base load; widely regarded as the most effective early-stage profitability move.
3. **Advertising and digital display:** High-visibility urban sites can earn ₹5,000–50,000 per month per site from screen inventory.
4. **Co-located amenities:** Cafés, convenience retail and restrooms; dwell-aligned amenities achieve materially higher utilisation (reported 30–40%). A natural strength of malls and office parks.
5. **Grid services / V2G:** Demand-response and virtual-power-plant participation, emerging but already contractable with some progressive DISCOMs.
6. **Carbon credits and RECs:** Under India's Carbon Credit Trading Scheme and renewable-certificate markets, green charging generates tradable instruments and ESG value.

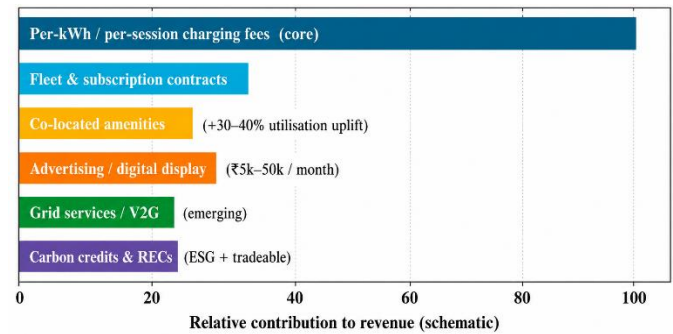


Figure 7. Stacking revenue beyond the charging tariff

6.4 Payback and models

Reported payback for well-located assets clusters around 2–4 years, tightening to roughly 18–36 months at premium high-traffic sites, and lengthening substantially where utilisation is weak [21, 22, 26]. Net margins are cited across a wide band, roughly 15–25% at well-run standard sites and 35–50% at premium locations with fleet contracts driven by the five levers of utilisation, charger type, energy buy-rate, site rent and ancillary revenue [23, 26]. The retrofit owner can occupy any point on the engagement spectrum in Table 6.

Table 6: Engagement models for a retrofit host-site owner

Model	Who owns/operates	Owner's capex	Owner's upside	Best fit
Host-only (lease / managed service)	CPO funds & operates; owner gives power	Minimal	Rent + footfall + ESG	Zero-capex entry
Charging-as-a-Service (CaaS)	Third party owns hardware; owner pays fee	Low	Retains charging margin	Mid-risk appetite
Joint venture / co-ownership	Shared capex & revenue with a CPO	Shared	Shared margin + control	Larger portfolios
Full ownership (self-operated CPO)	Owner funds, owns and operates	High	100% of margin	High footfall

7. Risk Analysis

Key risks and mitigations for a retrofit programme:

- The dominant risk. Mitigate through Phase-1 rigour, fleet/subscription anchoring, and amenity co-location.
- Cost and delay from load upgrades. Mitigate via early DISCOM engagement and battery-buffered/BESS designs that avoid upgrades.
- Non-functional chargers destroy utilisation and reputation. Mitigate with OCPP monitoring, preventive maintenance and uptime SLAs.

- Incentive disbursement lags allocation. Mitigate by modelling viability without subsidy.
- Standards evolve. Mitigate by standardising on CCS2/Bharat/Type-2, OCPP/OCPI, and expansion-ready conduit and metering.
- Disputes over consent, cost allocation and metering. Mitigate with an explicit governance structure and documented NOC/cost-sharing process.
- Service-charge caps and tariff categories can shift. Mitigate by having more revenue sources than the charging tariff.

8. Implementation Roadmap and Recommendations

The framework simplifies to a pragmatic sequence for a single asset: a two-week feasibility screen (demand plus a DISCOM load conversation) prior to committing capital; resolving consents and the compliance stack in parallel with electrical design; beginning with AC-heavy configurations that carry less capital risk and faster installation, adding DC where dwell time is short and footfall high; designing for solar/storage and V2G-readiness even if activated later; and treating uptime and discovery as first-class operational priorities.

For portfolio owners and policymakers, three recommendations follow. First, prioritise electrical-headroom mapping across the building portfolio, since spare load is the cheapest capacity in the system. Second, standardise designs, equipment SKUs and procurement across sites to compress per-site cost as the network scales. Third, a policy point accelerating the notification of an explicit EV-ready building code and firm uptime/data regulations, together with faster subsidy disbursement, would convert the large latent retrofit opportunity into deployed capacity more quickly.

9. Limitations and Future Work

This framework is a synthesis of current policy, technology and market evidence rather than an empirical evaluation; unit-cost and margin figures are indicative ranges drawn from 2025–2026 industry sources and will vary by site, state and time. State-level regulation is heterogeneous and evolving, so specific obligations must be verified locally. Future work could validate the REV-FIT phase gates against a sample of completed Indian retrofits, quantify the utilisation uplift attributable to specific site attributes, and model the financial impact of V2G once tariffs and standards mature.

10. Conclusion

India has a huge and growing gap between EV adoption and charging capacity and the fastest, most capital efficient way to close a meaningful part of it is to convert the existing stock of commercial buildings and parking facilities assets that already provide land, footfall, dwell time and partial electrical capacity. Charging is a de-licensed, policy-supported and increasingly bankable activity and the regulatory scaffolding is nudging owners into EV readiness. The REV-FIT framework proposed here sequences the retrofit task such that demand,

electrical feasibility, compliance, technology, commercial structure and operations are addressed in a de-risking order, with energy, digital and governance enablers running throughout. The evidence suggests that the main driver of viability is utilization, that the best way to address thin grid headroom is with storage rather than expensive upgrades, and that sustainable returns come from layering revenue fleet subscriptions, advertising, amenities, grid services and carbon instruments on top of the charging tariff. For building owners, CPOs and investors, retrofitting is no longer a speculative bet but an addressable, structured asset class central to India's electric-mobility transition.

References

- [1] IMARC Engineering, "How to set up EV charging infrastructure in India: Complete 2026 guide—Cost, regulations, subsidies & ROI," Feb. 6, 2026. [Online]. Available: <https://www.imarcengineering.com/blog/setting-up-ev-charging-infrastructure-in-india-a-step-by-step-guide>.
- [2] MMCM, "EV charging infrastructure in India: Status, types & 2030 targets," May 1, 2026. [Online]. Available: <https://mmcm.in/blog/ev-charging-infrastructure-in-india/>. [Accessed: Aug. 18, 2026].
- [3] Marqstats, "India EV charging station market size, share & forecast 2026–2030," Apr. 17, 2026. [Online]. Available: <https://marqstats.com/reports/india-ev-charging-station-market>.
- [4] Bolt.Earth, "The current state of EV charging in India [2026]: Public, home, and fleet networks," Feb. 9, 2026. [Online]. Available: <https://bolt.earth/blog/the-current-state-of-ev-charging-in-india-2026-public-home-and-fleet-networks>.
- [5] e-AMRIT and NITI Aayog, "EV charging infrastructure: Standards and specifications," Government of India, n.d. [Online]. Available: <https://e-amrit.niti.gov.in/infrastructure>.
- [6] Bolt.Earth, "EV charging compliance checklist for CPOs in India: 2026 guide," 2026. [Online]. Available: <https://bolt.earth/>.
- [7] ACKO Drive, "EV charging infrastructure in India: What changed in 2025 and what is in store for 2026," Dec. 2025. [Online]. Available: <https://ackodrive.com>.
- [8] V. Mittal, "What you need to set up an EV charging infrastructure in India," Avaada Group, Apr. 9, 2026. [Online]. Available: <https://www.avaada.com/blog/ev-charging-infrastructure-setup-india>.
- [9] OPG Mobility, "India's EV charging infrastructure: What's coming in 2026?" Dec. 2025. [Online]. Available: <https://opgmobility.com/indias-ev-charging-infrastructure-whats-coming-in-2026>.
- [10] Ministry of Housing and Urban Affairs, "Amendments in Model Building Bye-Laws 2016 for electric vehicle charging infrastructure," Government of India, New Delhi, India, 2019. [Online]. Available: <https://mohua.gov.in>.
- [11] Kaushal, "Do you want an EV charger in your flat? What you can and can't do," ADDA, Jul. 22, 2025. [Online]. Available: <https://blog.ind.adda.io/2025/07/install-ev-charger-in-your-apartment>.
- [12] Savekar, "Government rules for EV charging in residential societies in India," May 2026. [Online]. Available: <https://savekar.in>.
- [13] MyGate, "Implementing EV charging infrastructure: The complete guide for RWAs," Mar. 20, 2024. [Online]. Available: <https://mygate.com/blog/cooperative-housing-society/ev-charging-guide-for-rwas>.
- [14] Bolt.Earth, "Guide to EV charging in apartment complexes: Rules, costs and setup in India," Sep. 2025. [Online]. Available: <https://bolt.earth>.
- [15] DIYguru, "India's EV policy roadmap 2026–2030," Feb. 2026. [Online]. Available: <https://diyguru.org>.
- [16] EGBatt, "2026 EV charging technology trends: Megawatt charging systems, vehicle-to-grid and virtual power plants," Mar. 2026. [Online]. Available: <https://www.egbatt.com>.
- [17] Bolt.Earth, "Top five EV charging innovations of 2026," Feb. 2026. [Online]. Available: <https://bolt.earth>.
- [18] NextMSC, "Renewable energy integration in India's EV charging market," 2025. [Online]. Available: <https://www.nextmsc.com>.
- [19] Bolt.Earth, "Bidirectional charging for EVs: Is India ready for V2G technology?" Jan. 2026. [Online]. Available: <https://bolt.earth>.

- [20] DIYguru, "Vehicle-to-grid technology in India, 2025–2030," Feb. 2026. [Online]. Available: <https://diyguru.org>.
- [21] Pulse Energy, "Cost of an electric vehicle charging station in India," Apr. 2026. [Online]. Available: <https://pulseenergy.io>.
- [22] Pulse Energy, "Cost and setup process for EV charging stations in India," Apr. 2026. [Online]. Available: <https://pulseenergy.io>.
- [23] GlobalsBlog, "EV charging station business in India 2026: Complete guide," May 2026. [Online]. Available: <https://globalsblog.com>.
- [24] Urzza ChargeTech, "Financial viability of electric vehicle charging stations in India," n.d. [Online]. Available: <https://urzzachargetech.com>.
- [25] GlobalsBlog, "EV charging station profit margin in India 2026," May 2026. [Online]. Available: <https://globalsblog.com>.
- [26] Bolt.Earth, "Four proven investment strategies to maximize ROI in DC fast-charging infrastructure in India," Mar. 2026. [Online]. Available: <https://bolt.earth>.

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