

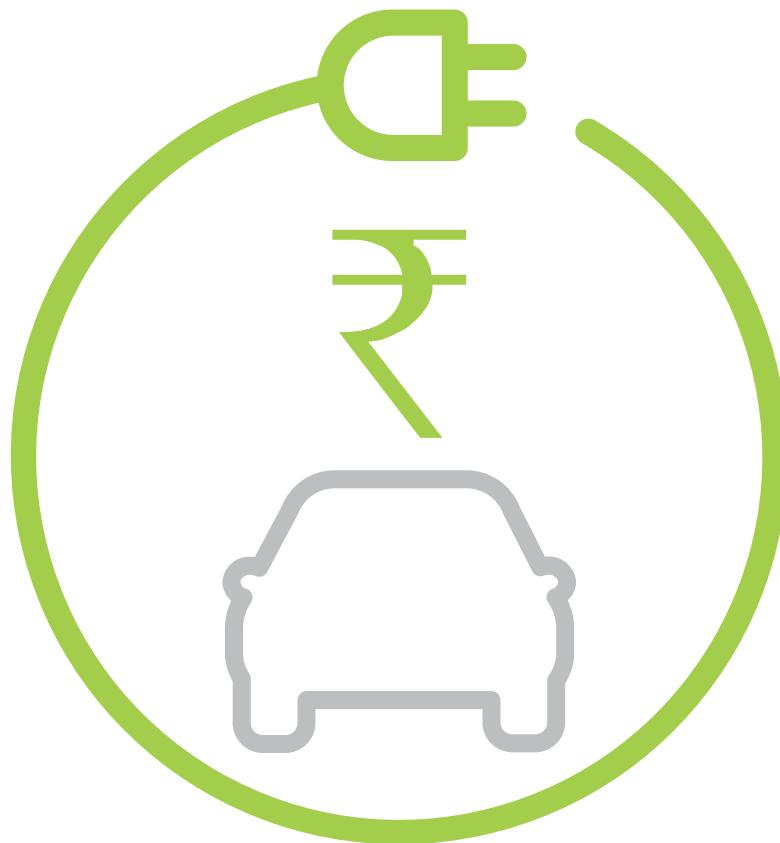
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EV

A New Entrant to India's Electricity Consumer-basket

Impact on Utility Cost of Supply and the Need
for a New Approach for Tariff-Setting



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Executive Summary: EV – A New Entrant To India’s Electricity Consumer-Basket

Impact on Utility Cost of Supply and the Need for a New Approach for Tariff-Setting

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EV

A New and Unique Electricity Consumer Category

Electrification of vehicles is regarded as an important intervention to decarbonise the economy in the fight against climate change. India, a signatory of the Paris Agreement on climate change, is pushing hard to promote Electric Vehicle (EV) adoption in the country. As vehicles start running with electric drivetrains fueled by lithium-ion batteries which require recharging, EV is now a new entrant to India's electricity consumer-basket. The non-EV categories have been there for a long time, and their energy consumption and demand patterns are fairly well understood and have already been accounted for to a certain extent in the tariff framework. However, EV charging as a consumer category is distinct from other categories in three major ways:

- First,** EVs are a mobile source of electricity requirement. As a result, the possible energy requirement and power demand at the charging points could be hard to predict during the initial phase.
- Second,** the EV charging load is anticipated to be intermittent, with spikes in the demand curve. This could have a significant impact on the local distribution network, especially in distribution areas with limited available hosting capacity.¹
- Third,** EVs can potentially act as prosumer due to possibility of bi-directional energy flow. They are a potential distributed energy resource and could be leveraged to feed electricity back into grid using Vehicle-to-Grid (V2G) functionality.

Regulators have to take these factors into account when framing the EV tariff schedule.

EV Charging Tariffs

A Critical Fiscal and Regulatory Tool

The availability of charging infrastructure is a major requirement to increase EV adoption. It is the backbone of electric mobility and has been the most difficult issue to address. Charging infrastructure closely binds mobility to the electricity sector and has the potential to bring about major transformations in electricity distribution. The interlinkage of mobility and the electricity grid presents an opportunity as well as a challenge for power distribution companies (DISCOMs).

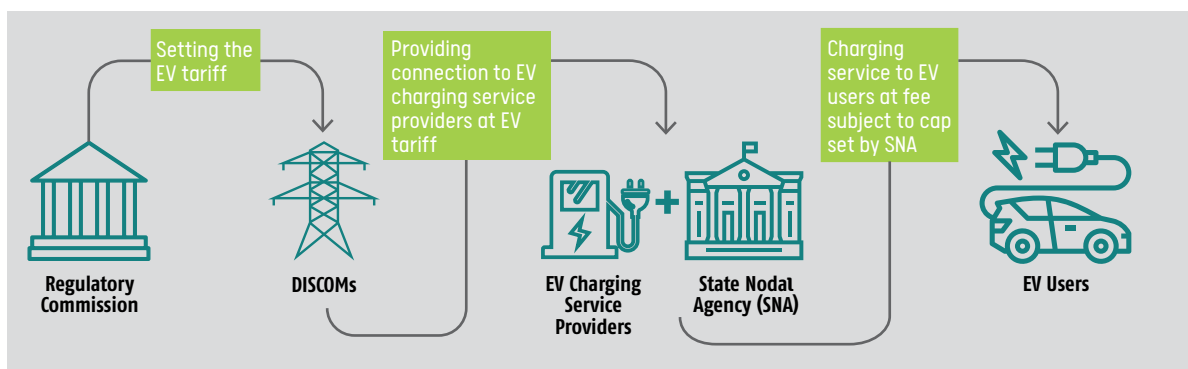
EV charging has two major implications for DISCOMs. While additional electricity sales due to EV charging would help increase a DISCOM's revenue, the charging demand may increase the peak load in the DISCOM's service area, which could have a significant impact on its cost of power procurement and network management. Hence, the DISCOM has to factor in future EV charging demand in its resource and investment planning. This makes the understanding of when, where, and how much EV charging would add demand to the grid very crucial. EV charging tariffs become a critical fiscal and regulatory tool in this regard. The tariffs need to be designed in a way that

¹ Hosting capacity is defined as the amount of new power generation or consumption sources that can be connected to the grid without adversely impacting the reliability or power quality for other customers.

would allow the DISCOM to recover its costs, while making EV charging cost-effective for users and provision of EV charging services a commercially viable business.

How EV Tariffs are Linked to EV Users

In the electricity sector, “tariff” can be defined as the cost or charge incurred by a consumer class to avail of electricity for its use. In India, consumer electricity tariff is a state-subject i.e. it is set by an appropriate commission at the state level called the State Electricity Regulatory Commission (SERC). The process of tariff-setting is based on the provisions contained in the Electricity Act 2003 and the Tariff Policy notified by the Government of India (GoI) from time to time. EV charging is a new consumer category, recently added to the existing list, for which the tariffs have to be fixed by the commission of the respective state or Union Territory (UT).



ES 1: TARIFF LINKAGE WITH EV USERS

Source: AEEE Analysis

Figure ES 1 shows how electricity tariffs are linked to EV users. The process followed in notifying tariffs for EV charging is the same as for the rest of the consumer categories in a state or UT. For an EV charging service provider, the cost of electricity is a major operating expense. However, they also incur considerable infrastructure-related costs in establishing the charging station. Therefore, to recover both variable and fixed costs, the EV charging service provider charges EV users a fee, commonly known as the “EV charging service fee”. This is what EV users pay when they charge their vehicles at EV charging stations. To ensure that the service charge is not too high, the designated State Nodal Agency/State Government/appropriate commission has the discretion to fix a ceiling for the service charge, which is applicable for the public charging stations (PCS) set up with government incentives, financial or otherwise. As per the latest guidelines (dated 8th June 2020), the tariff shall not be more than the average cost of supply (ACoS) plus 15 percent.

How EV Charging can Potentially Impact DISCOM's Cost of Supply

A DISCOM's Cost of Supply (CoS) is the fundamental basis for the setting of electricity consumption tariffs by a regulator. The CoS is computed by dividing the aggregate revenue requirement (ARR) estimated by the regulator by the total energy sales for the year. ARR comprises power purchase cost, operation and maintenance (O&M) expenses, administrative expenses, return on capital employed (RoCE), depreciation, and income tax. With EVs getting added to the consumer basket of a DISCOM, requiring additional electricity to be supplied, the DISCOM needs to procure more electricity. This may lead to an increase in the power purchase cost of the DISCOM. The magnitude of the increase in cost will primarily depend on the time of day at which there is substantial demand for EV charging. This will also have implications on the distribution and transmission losses. Other components of ARR that will be impacted are O&M expenses, depreciation, RoCE, and income tax. The increase in O&M expenses will be directly proportional to the network augmentation and upgradation required to cater to the additional demand from the EV charging facilities. However, it is not possible to generalise the percentage of increase based on an average network augmentation cost, as it depends on the loading pattern of the existing network and the spare capacity available at the distribution transformer or feeder level. If there is an addition of distribution infrastructure, depreciation costs will also increase. As it is difficult to project the need for infrastructural expansion due to EV charging, a change in depreciation cost for the DISCOM is a hard thing to assess. Furthermore, there will be no impact on RoCE unless the share of equity increases due to additional capital expenditure. There will be no change in income tax if RoCE remains constant.

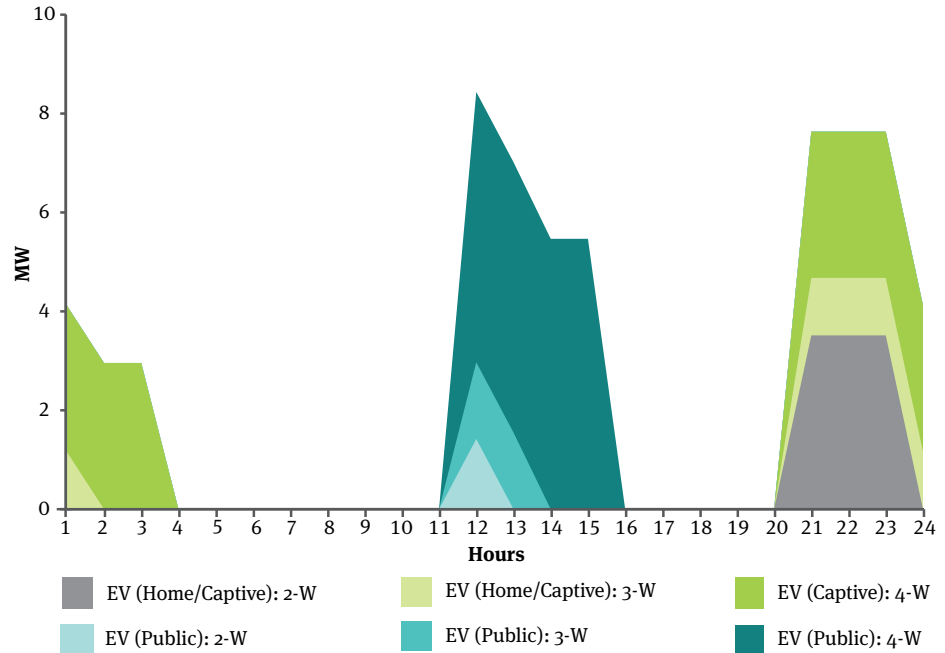
Apart from the possible increase in the cost, EV charging creates an opportunity for a DISCOM to increase its energy sales. Thus, the actual impact on CoS per unit of electricity sales will depend on whether the magnitude of the increase in ARR is higher or lower than the increase in revenue from higher energy sales.

Impact of EV Charging on DISCOM's Peak Power Demand and Energy Requirement – Delhi Case Study

EV charging can potentially lead to a significant addition to load and energy requirement at the distribution level compared to the grid level. A modelling exercise taking into account charging of 10,100 EVs (out of which 100 are e-buses) in the service area of each DISCOM in Delhi² throws some interesting results. Apart from the number of vehicles, another critical factor in peak power demand assessment is the coincidence in charging of EVs. The analysis considers two scenarios for EV charging patterns – Scenario I where all EVs start charging at the same time, and Scenario II where 50% of EVs start charging at the same time.

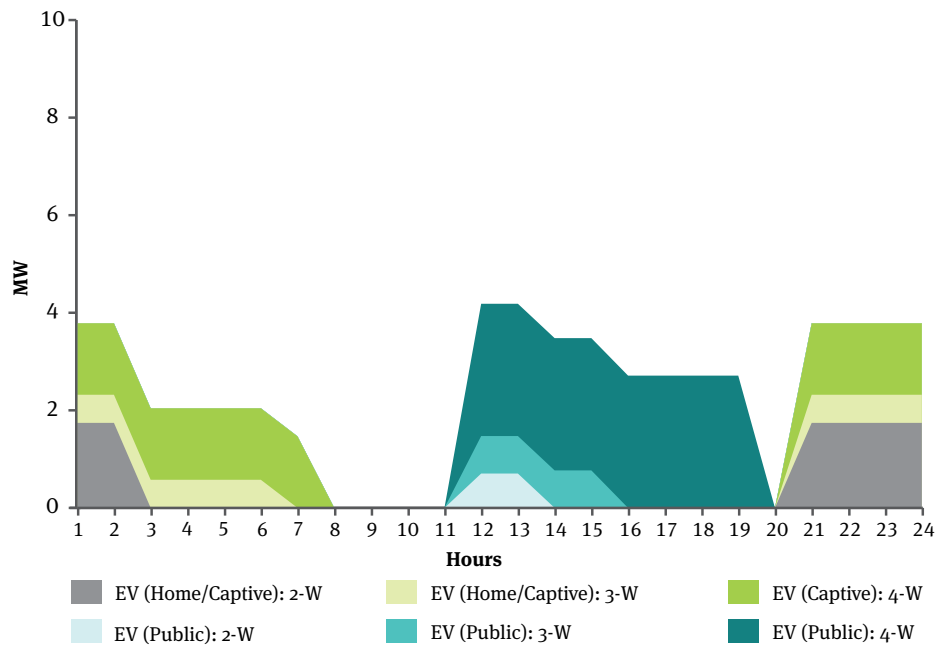
² This cumulatively accounts for 40,400 EVs in the entire Delhi area, including 400 e-buses.

Figure ES 2 and Figure ES 3 show the projected EV charging load curve of 10,000 EVs (excluding e-buses) with different charging options (public, home, and captive) in Scenario I and II, respectively. The projection indicates that the increase in the charging power and energy requirement is greatest at night in both scenarios. However, peak power demand is expected to be highest at noon in Scenario I.



ES 2: PROJECTED EV CHARGING LOAD CURVE FOR 10,000 EVs IN SCENARIO I

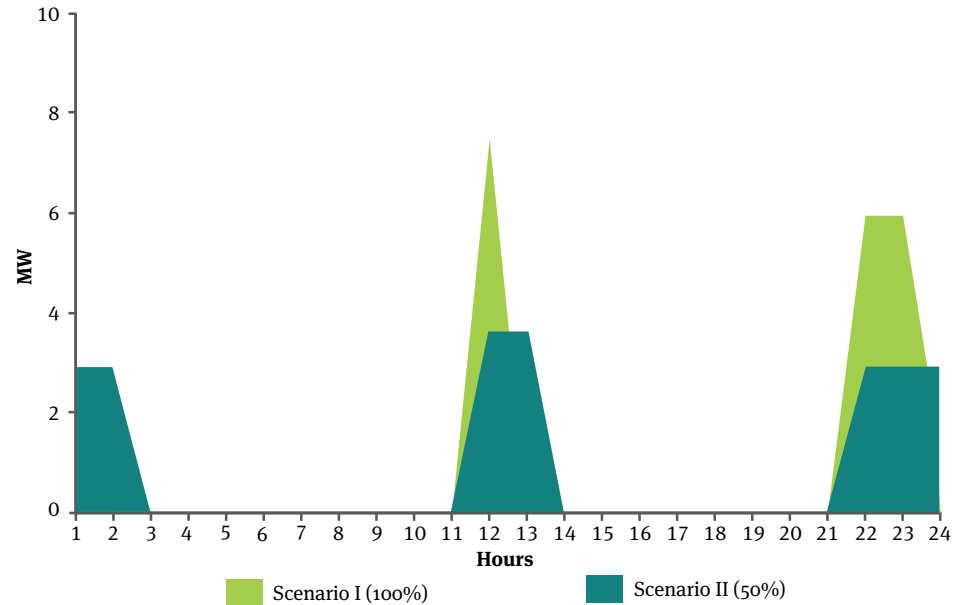
Source: AEEE analysis



ES 3: PROJECTED EV CHARGING LOAD CURVE FOR 10,000 EVs IN SCENARIO II

Source: AEEE analysis

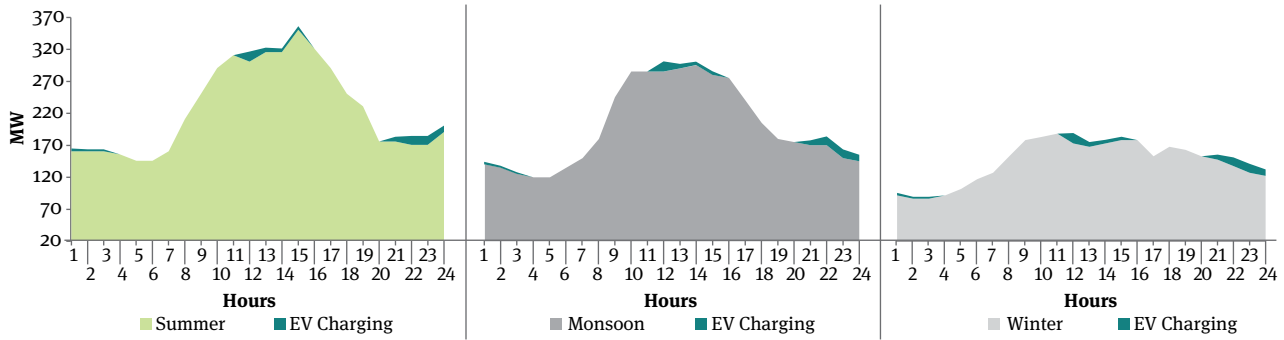
Unlike other vehicle categories, e-buses have much higher battery capacities, and, hence, their charging is studied separately. Figure ES 4 shows that the bus charging causes a sudden increase in the energy requirement and power demand at night, with maximum impact if all buses charge at the same time. However, peak power demand is highest at noon in Scenario I.



ES 4: PROJECTED EV CHARGING LOAD CURVE FOR 100 E-BUSES USING FAST CHARGERS

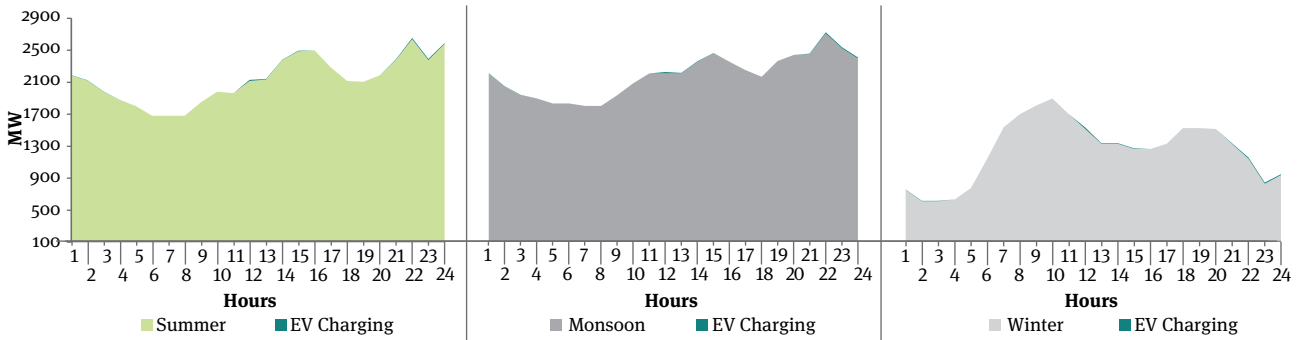
Source: AEEE analysis

The impact on energy demand from EV charging at the state level is expectedly marginal. However, EVs may represent a significant addition to the load and energy requirement at the distribution level. To present the results, the names of the DISCOMs have been kept anonymous. Henceforth, the four DISCOMs in Delhi are referred to as DISCOM-I, DISCOM-II, DISCOM-III, and DISCOM-IV. The impact of EV charging on the peak power demand and energy requirement due to the adoption of 10,000 EVs (which include 2-Ws, 3-Ws, and 4-Ws) and 100 e-buses is presented in Figure ES 5, Figure ES 6, Figure ES 7, and Figure ES 8. The projection shows that the impact of EV adoption is more significant in DISCOM-I than in other DISCOMs. This is primarily due to two reasons. First, DISCOM-I witnesses a mid-day peak, unlike the other DISCOMs; therefore, EV charging at PCS accentuates the peak during the day. Second, the amount of energy requirement in DISCOM-I is significantly lower than that in other DISCOMs. As a result, EV charging, even at a low adoption rate, could have a more significant impact on DISCOM-I. In the case of the other DISCOMs, the EV charging contribution at this EV adoption level constitutes only a marginal fraction of the total demand, and, thus, it is not visible in their load curves. The impact is marginal in all three seasons. However, it is important to note that as the EV adoption rate increases, EV charging could potentially add to the evening and night peaks experienced by all the DISCOMs (except DISCOM-I).



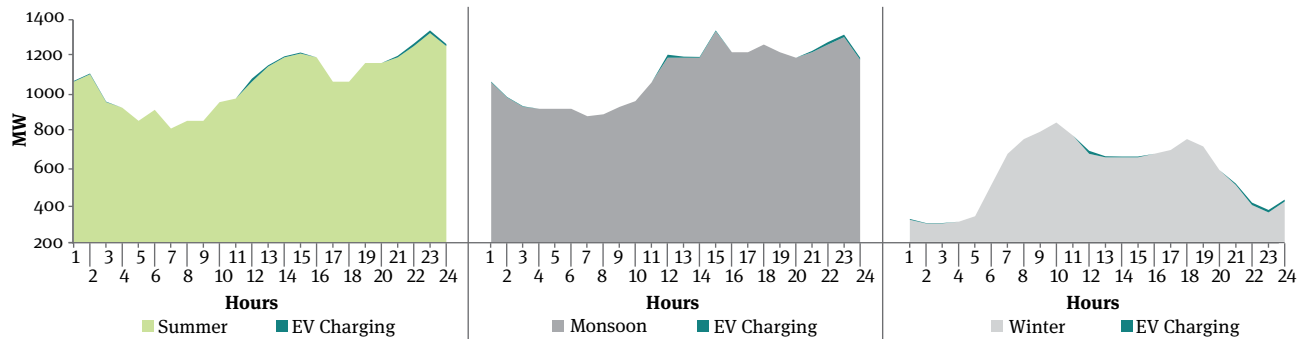
ES 5: IMPACT OF EV CHARGING ON AVERAGE DAILY LOAD CURVE OF DISCOM-I

Source: SLDC Delhi and AEEE analysis



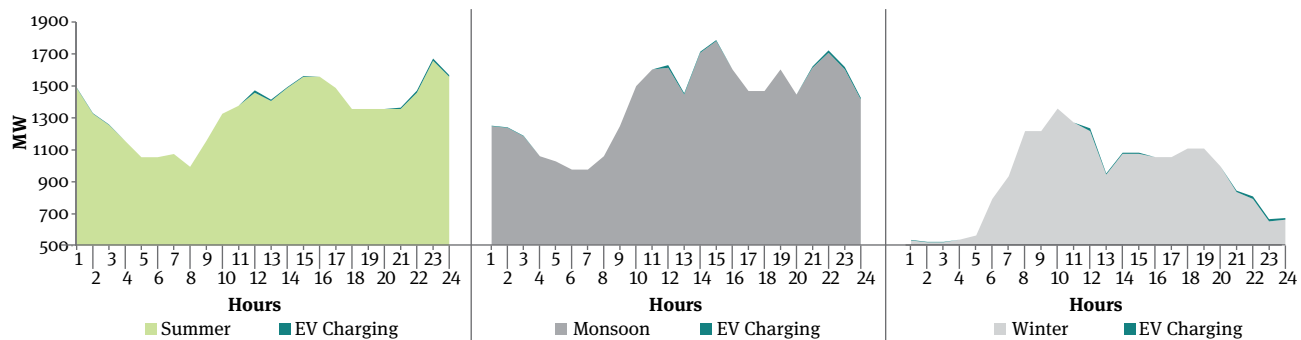
ES 6: IMPACT OF EV CHARGING ON AVERAGE DAILY LOAD CURVE OF DISCOM-II

Source: SLDC Delhi and AEEE analysis



ES 7: IMPACT OF EV CHARGING ON AVERAGE DAILY LOAD CURVE OF DISCOM-III

Source: SLDC Delhi and AEEE analysis



ES 8: IMPACT OF EV CHARGING ON AVERAGE DAILY LOAD CURVE OF DISCOM-IV

Source: SLDC Delhi and AEEE analysis

Impact on DISCOM Cost of Supply in Delhi

The impact of EV charging on the CoS of a DISCOM depends on the increase in the cost of power procurement vis-à-vis the increase in revenue from higher energy sales. The impact on the cost of power procurement will be contingent on the price at which additional energy is procured.

Table ES 9 presents the impact on the CoS over 5 years due to EV adoption. The study evaluates the year-on-year (y-o-y) percentage change in CoS in comparison with post-EV adoption values of the preceding year. The results presented in the table are based on the assumption of a 15% y-o-y increase in EV energy sales. The investigation finds that for all the DISCOMs (except DISCOM-III), the CoS decreases marginally in Year 1 of the analysis period. In this initial year, the percentage increase in ARR is found to be less than the increase in energy sales, which results in a decrease in CoS. This is primarily due to the availability of surplus contracted power in Delhi DISCOMs, aided by an increase in revenue due to additional energy sales. Furthermore, EV charging is found to help fill valleys in the load curves of the DISCOMs in certain scenarios, thus improving the economics of electricity provision. It is interesting to note that among the DISCOMs, the decrease in CoS is the highest for DISCOM-I. This is primarily because the proportion of additional energy requirement from EVs is higher for DISCOM-I than for other DISCOMs, as shown in the earlier analysis.

The analysis indicates that from Year 2 onwards, CoS starts increasing in the case of DISCOM-II and DISCOM-IV while, for DISCOM-III, the CoS starts increasing from the first year onwards. For DISCOM-I, the percentage change in CoS remains negative, but the margin decreases over the years. The percentage increase in ARR is found to be higher than the increase in energy sales, primarily because the CAGR of O&M is significantly higher in the case of DISCOM-II, DISCOM-III, and DISCOM-IV, compared to DISCOM-I. Furthermore, the proportionate contribution of EV charging to energy sales is greater in the case of DISCOM-I compared to other DISCOMs. It is notable that even if energy sales increase by 10% or 20%, there is no significant impact on the DISCOMs' CoS.

ES 9: IMPACT OF EV ADOPTION ON COST OF SUPPLY OVER 5 YEARS

DISCOM	Year 1	Year 2	Year 3	Year 4	Year 5
DISCOM-I	-1.84%	-1.57%	-1.26%	-0.89%	-0.47%
DISCOM-II	-0.52%	0.31%	1.26%	2.32%	3.48%
DISCOM-III	0.19%	1.87%	3.74%	5.75%	7.84%
DISCOM-IV	-0.18%	0.19%	0.60%	1.04%	1.51%

Source: AEEE analysis

It should be noted that the results from the analysis of Delhi DISCOMs cannot be generalised for all DISCOMs across India. Hence, one should not conclude that CoS will always decrease in the case of other states or DISCOMs. EV impact on CoS is contingent on a number of varying DISCOM- and context-specific factors, including the availability of surplus power, rate of EV adoption, EV mix, and price at which additional power is procured by a DISCOM.

How Many EVs Would be Required to Cause a 10% Increase in the CoS of a Delhi DISCOM?

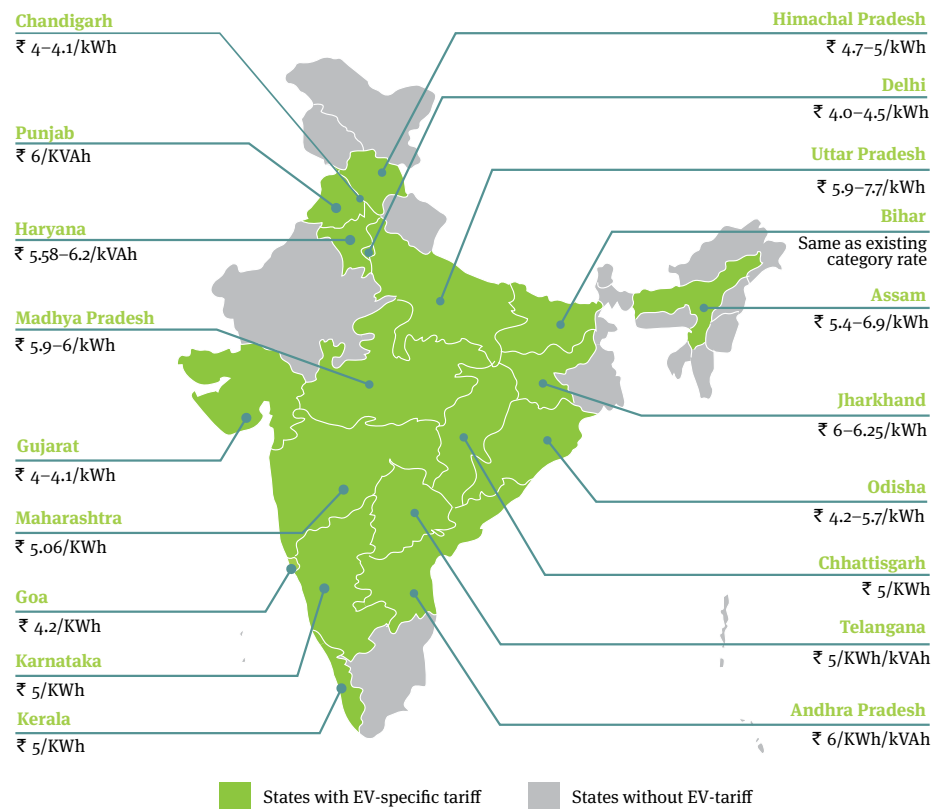
Although the study finds that there could be a decrease or minor increase in the CoS of Delhi DISCOMs in a moderate EV penetration scenario, this does not imply that the impact would remain at this level if EV adoption accelerated in the city. Table ES 10 shows the results in terms of total number of EVs and the vehicle mix for each DISCOM. The number of EVs corresponding to 10% increase in CoS would range from 0.10 million (in the case of DISCOM I) to 1.13 million (in case of DISCOM II). In terms of vehicle mix, the analysis indicates that 2-Ws would constitute the largest share in such a scenario. For example, the 2-W population could be as high as 0.79 million in case of DISCOM II. This resonates with the overall trend of 2-Ws and 3-Ws dominating in the EV sector in India.

ES 10: EV NUMBER CAUSING 10% INCREASE IN DELHI DISCOM CoS (IN MILLIONS)

DISCOM	2-W	3-W	4-W	e-bus	Total
DISCOM-I	0.07	0.02	0.01	0.0009	0.10
DISCOM-II	0.79	0.17	0.15	0.01	1.13
DISCOM-III	0.41	0.09	0.08	0.006	0.58
DISCOM-IV	0.37	0.08	0.07	0.005	0.53

Source: AEEE analysis

EV Tariff Landscape in India



ES 11: MAP OF STATES WITH AND WITHOUT EV-SPECIFIC ENERGY CHARGE³

Source: AEEE analysis, based on state and UT tariff orders from FY19 & FY20

3 Information as on November 11, 2019

Electricity regulators in eighteen states and five UTs have stipulated specific rates for EV charging in their respective tariff orders through November 11, 2019 (Figure ES 11). However, the recognition of EVs as a consumer category in tariff orders varies from state to state. Also, the two-part electricity tariffs (Fixed/ Demand Charge and Variable/ Energy Charge) are found to differ structurally as well as in terms of value.

The salient features of the tariff structures observed across Indian states and UTs are summarised below:

Energy Charge

- Flat tariff rates have been introduced by regulatory commissions of the states and UTs.
- Energy charges vary between LT and HT connections.
 - ▶ LT energy charge vary from ₹ 4.1/kWh (in Gujarat) to ₹ 7.7/kWh (in Uttar Pradesh).
 - ▶ HT energy charge vary from ₹ 4/kVAh (in Gujarat) to ₹ 7.3/kVAh (in Uttar Pradesh)
- In case of Bihar, unlike other states, the respective tariff-category would be applicable for the electricity consumed for EV charging.
- Jharkhand has introduced separate tariffs for rural and urban consumers under the commercial category.
- Maharashtra is the only state which has specified wheeling charges for EV charging (₹ 0.94/kWh for both LT and HT).

Demand Charge

- A few states and UTs have announced demand charges for EV charging stations.
 - ▶ **Andaman and Nicobar Islands, Chandigarh, Daman and Diu, and Lakshadweep** (₹ 100/kW/month)
 - ▶ **Goa** (₹ 100/kW/month)
 - ▶ **Gujarat** (for LT ₹ 25 per installation and HT consumers from ₹ 25-50/kVA/month)
 - ▶ **Haryana** (₹ 160/kW/month or 160/kVA/month)
 - ▶ **Karnataka** (for LT consumers ₹ 60/kW/month and HT consumers ₹ 190/kVA/month)
 - ▶ **Madhya Pradesh** (for LV ₹ 100/kVA/month and HV ₹ 120/kVA/month)
 - ▶ **Maharashtra** (₹ 70/kVA/month)
 - ▶ **Puducherry** (₹ 200/kW/month)
- States such as Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Punjab, Telangana, and Uttar Pradesh have not introduced demand charge.

EV-specific ToD/ ToU rates

- Three regulatory commissions (UPERC, MERC, and KSERC) introduced ToD rates specifically for EV consumers.
 - ▶ **Uttar Pradesh:** Surcharge and rebate of 15%
 - ▶ **Maharashtra:**
 - Surcharge (₹ 0.80/ kWh for usage from 9 AM to 10 AM and ₹ 1.1/kWh from 6 PM to 10 PM)
 - Rebate (₹ 1.50/kWh for usage between 10 PM and 6 AM)

- ▶ **Kerala:**
 - Surcharge (50% for usage from 6 PM to 10 PM)
 - Rebate (25% for usage from 10 PM to 6 AM)
- ▶ There are a few SERCs where ToD rates are applicable by default for EV consumers.
- ▶ In **Delhi**, ToD rates are applicable for consumers with load $\geq 10\text{kW}/\text{kVA}$, with surcharge and rebate at 20%.
- ▶ **Telangana**- ToD applicable to HT consumers, with surcharge and rebate at ₹ 1/kWh
- ▶ **Chhattisgarh**- ToD applicable to HV consumers, with 20% surcharge and 25% rebate
- APERC introduced ToD rates in FY19 tariff order but subsequently discontinued. In FY20 tariff order, the state has introduced single-part flat tariff for both HT and LT consumers.

Key Considerations for EV Tariff Framework

There are five key areas that warrant special consideration and require regulators and policymakers to provide more clarity, which would help potential investors in the EV charging space in decision-making.

- 1. Categorisation of EV charging in the tariff schedule** – Presently, the SERCs have differing views on recognising EV charging as a consumer category. It is currently categorised as non-residential, commercial, non-industrial, or bulk supply. In some states or UTs, a separate category has been created for PCS. Against this backdrop, key questions arise: Will the differing nomenclatures create confusion for EV owners and charging service providers? Should there be a uniform categorisation of EV charging as a consumer category? Such categorisation of EV charging has an implication on its tariff schedule and, in turn, impacts the commercial viability of EV charging businesses since rates under the commercial category are generally significantly higher than in the residential or domestic category. It is therefore important to provide potential EV customers clear electricity price signals.
- 2. Applicability of EV charging tariffs⁴** – As on 11th November 2019, eighteen states and five UTs have introduced separate tariffs for EV charging. However, the applicability of these tariffs is not clear. Tariff orders in different states have used different nomenclatures to refer to EV charging, which is not well defined. It is unclear, for example, whether the special EV charging tariffs would be applicable for charging public e-buses or charging EVs in public parking areas managed by different types of entities. The guidelines and standards issued by MoP, both on 14th December 2018 and 1st October 2019, are also quite vague about this.
- 3. Application of demand charge** – The primary impact of EV charging on a DISCOM's CoS and its distribution network comes from the power demand at a public EV charging station. Although the overall load curve

⁴ Another critical factor is the long-term certainty of tariff design for EV charging, i.e. whether SERCs are determining year-to-year tariffs or tariffs for the entire control period (3 years or 5 years). This knowledge could offer great stability/regulatory certainty to investors and EV charging service providers and aid them in their decision-making. However, the report has not explored this issue, as most states recently introduced tariffs for EV charging, but this could be investigated in future studies.

of a DISCOM may remain unaltered even when there is a sizeable number of EVs on the road, spikes in power demand due to EV charging can be expected, which may have the following ramifications:

- Creation of momentary gaps between actual power demand and the contracted power of the DISCOM: To meet this power demand, the DISCOM may have to purchase power on the spot market, which could be expensive. This would drive up the power purchase cost of the DISCOM. The other apprehension is that the DISCOM may resort to load shedding, which is not a rare occurrence in India.
- Surge in EV power demand exceeding the system capacity of a feeder: This would have a serious negative effect on the stability of the distribution grid and could cause power cuts at the local level, requiring the DISCOM to make a significant investment in grid augmentation beyond periodic capacity improvement.

The primary instrument at the DISCOM's disposal to tackle surges in EV power demand is the demand charge. However, the demand charge needs to be appropriately designed to make charging service provision a viable business opportunity for investors and avoid making EV adoption unattractive for potential EV users.

4. Introduction of ToD tariffs – ToD tariffs, i.e. a surcharge during peak hours and rebate during off-peak hours throughout the day, are an effective tool for a DISCOM to flatten the load curve. Depending on the time-pattern of EV charging, the charging load can potentially accentuate the peak power demand within a DISCOM's service area. As seen in the existing tariff framework, ToD tariffs are applicable for industrial and commercial consumers during certain months in most states, to shift the load to off-peak hours. As EV charging demand is anticipated to rise, it is important to consider the need to introduce, as well as how to design, ToD tariffs for EV charging. Understanding the EV charging patterns is critical for this, but it is challenging at present, in the absence of discernible charging demand in a DISCOM's licence area.

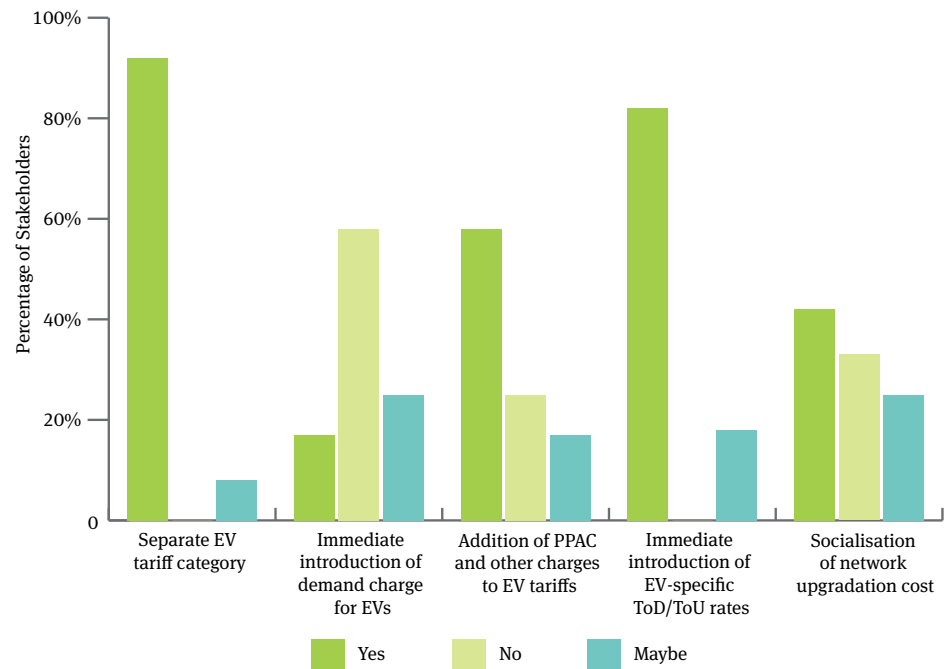
5. Applicability of taxes and PPAC⁵ – In many states, taxes (sometimes cess), non-tariff surcharges, and PPAC are included on top of the tariff amount in the final billable amount to an electricity consumer. Following similar bill structure, taxes and other charges are expected to be applicable for EV charging connections; however, there is currently a lack of clarity regarding their applicability to EV charging tariffs.

Stakeholder Perspectives

EV tariffs have different implications for different stakeholders in the e-mobility ecosystem. While appropriately designed EV tariffs can enhance the revenue of DISCOMs and help them flatten the load curve in their distribution areas, this also can potentially impact the commercial viability of the charging service business and the total cost of EV ownership. Hence, depending on the stakeholders' interests, their viewpoints will differ and sometimes be in opposition. Thus, the question of how to design a tariff framework that supports the different players' interests and enables India's EV ecosystem to mature and thrive arises.

⁵ Apart from tariff design, the setting of "Service Connection Charges" is another important topic to explore. This aspect is governed by the Supply Code provisions of respective states and has not been studied in this report.

Figure ES 12 depicts the results of a questionnaire-based survey conducted with a range of stakeholders. It is evident that they strongly support the separate categorisation of EV tariffs and the introduction of EV-specific ToD/ ToU rates.



ES 12: SURVEY RESULTS ON CRITICAL ASPECTS OF EV CHARGING TARIFF FRAMEWORK

Source: AEEE analysis

The key outcomes from the stakeholder consultation and survey results are summarised as follows:

- There should be a separate tariff category for EV charging. Initially, it may not be required for 2-W charging.
- Application of demand charges can be avoided in the current scenario. However, in the future, when EVs are a sizeable fraction of the vehicle population, demand charges will be needed to manage the EV charging load and recover the cost of network upgradation.
- Electricity duty/ tax is not in the purview of the regulatory commissions, but, rather, the state governments. Approximately 60% of participants agreed that other charges and taxes, which are usually included in the electricity bill for most consumers, should also be applicable to EV charging.
- More than 80% of participants agreed that ToD tariffs for EVs should be introduced now. They also recommended starting ToD metering for EV connections. ToD rates (with no demand charge) are important to avoid increases in the peak load and the need for network upgradation, as well as to enable better utilisation of underutilised capacity.
- There are mixed views concerning the socialisation of network upgradation costs. Some stakeholders felt that the need for network upgradation costs could be avoided with ToD/ ToU rates for EV charging.
- Stakeholders emphasised that the transaction cost of getting a new connection needs to be reduced and the process to be simplified.

Recommendations on Key Elements of the EV Tariff Framework

It is highly recommended that the regulators take a 360-degree view of the subject, taking into account the viewpoints of all concerned stakeholders, including the DISCOMs, EV charging service providers, EV fleet operators, and think-tanks. Table ES 13 provides a summary of recommendations on key considerations for the EV tariff framework.

ES 13: SUMMARY OF RECOMMENDATIONS ON KEY CONSIDERATIONS FOR EV TARIFF FRAMEWORK

Key Elements	Recommendations
Energy Charge	<ul style="list-style-type: none"> State regulators can offer promotional EV tariffs (less than ACoS) to encourage EV adoption during the initial phase.
Demand Charge	<p>Different alternatives could be adopted to reduce the burden of demand charge on charging service providers, while allowing DISCOMs to recover their costs:</p> <ul style="list-style-type: none"> Waiving off the demand charge during the initial phase and introducing it later on, as EV adoption rate increases Levying demand charges based on the maximum power demand recorded in a given billing period Adopting a subscription-based model for demand charge
ToD/ToU Tariffs	<ul style="list-style-type: none"> Use of ToD/ ToU tariffs would enable DISCOMs to make use of time flexibility to avoid network upgradation and reduce technical losses. Application of ToD/ ToU tariffs would be beneficial to various stakeholders: <ul style="list-style-type: none"> DISCOMs: Flexibility to adjust daily load curve without the immediate requirement for network upgradation EV Charging Service Providers: Avoiding the cost burden of network upgradation in the immediate future EV Consumers: Affordable charging cost, increasing the economic attractiveness of EV adoption ToD rates could be used to coincide EV charging with renewable energy generation, thereby enabling higher offtake of RE for EV charging and helping avoid “cross-subsidisation” in EV tariffs and the need for network upgradation. In future, dynamic rates need to be introduced. In a scenario of high EV penetration, ToD/ ToU rates may not be effective.
Other Charges and Taxes	<ul style="list-style-type: none"> The state government determines electricity duty, tax, and cess, while other surcharges, PPAC, etc. are fixed by state regulators. To promote EV adoption, the government could either reduce the duty/ cess or provide an exemption for EV charging. PPAC charges can be applicable to all categories, including EV charging, whereas a regulatory surcharge should not be levied on EV charging.

Key Elements	Recommendations
Socialisation of Network Upgradation Cost	<ul style="list-style-type: none"> ■ ToD/ ToU rates should be introduced for EV charging, along with smart chargers and exemption from demand charge, to avoid network upgradation requirement while there is a low EV adoption rate. ■ As EV adoption increases, charging demand needs to be a consideration in the network upgradation plan, and regulators need to take a call on the cost recovery plan.
EV Charging Categorisation	<ul style="list-style-type: none"> ■ Recognising PCS as a new consumer class provides clear price signals to charging station operators and EV users and allows the government to offer “EV-only” incentives to boost EV adoption. ■ Standardisation of EV charging as a consumer category across the country may simplify the understanding of the EV charging tariff regime and improve the ease of doing business in the e-mobility sector.

