Alliance for an Energy Efficient Economy

DISSECTING INDIA'S ELECTRICITY TARIFF LANDSCAPE FOR EV

A Special Review

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CONTENTS

KEY MESSAGES

- Charging infrastructure is the sine qua non for adoption of EVs and has been the most contentious issue. Charging infrastructure which closely binds mobility with the electricity sector is not only revolutionising the transport sector, it has the potential to transform the electricity distribution paradigm. The inter-linkages of electric mobility and electricity grid make the role of power distribution utilities critical.
- EV charging has dual implications for distribution utilities. One on hand, it results in additional electricity sales and on the other hand it could accentuate the peak load in the utility's service area.
- Tariff needs to be designed in a way that would allow the utility to recover the costs while making EV charging cost-effective to a user and enabling charging service a commercially viable business.
- For most of the states, EV tariffs vary from ₹ 4/kWh to ₹ 6/kWh. Uttar Pradesh is the only state with a tariff of more than ₹ 7/kWh for EV charging stations.
- Demand charge is a key instrument to tackle surge or spike in EV power demand. However, the demand charge needs to be appropriately designed to enable charging service a viable business opportunity for an investor and also, to avoid making EV adoption unattractive for a user. As of now, few states namely Gujarat, Haryana, Karnataka and Maharashtra, *etc* . have introduced demand charges.
- EV consumer category is distinct in nature compared to other consumer classes mainly due to three salient aspects – mobile source of electricity requirement, unpredictable and uneven load, and the possibility of bi-directional energy flow.
- Six areas that warrant specific deliberation while structuring EV tariff schedule are categorisation of EV charging as a consumer, the introduction of Time of Day (ToD) tariffs, the applicability of specific tariff for EV charging, the imposition of demand charge, other taxes & Power Purchase Adjustment Charges (PPAC), and socialisation of EV related grid upgradation cost.

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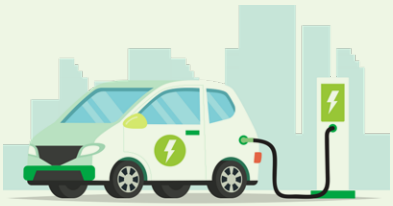
INTRODUCTION

In India, there is growing interest among policymakers to encourage adoption of Electric Vehicles (EVs) for road transport and phase out fossil fuel consuming Internal Combustion Engine (ICE) driven vehicles in view of three major imperatives – (i) to reduce petroleum imports and thus, secure the country's energy supply; (ii) to reduce the carbon footprint of road transport by leveraging higher efficiency of EVs over ICE vehicles and through effective off-take of renewable energy; and (iii) to reduce vehicular emissions of particulate matter, polluting gases and greenhouse gases.

In 2013, India released its National Electric Mobility Mission Plan (NEMMP) 2020 which aimed to promote hybrid and electric vehicles (Government of India, 2012). Followed by this, the Government of India launched Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) scheme in April 2015 (Government of India, 2015). FAME is an incentive scheme that aims to reduce the price of hybrid and electric vehicles to stimulate early adoption of these vehicles and develop a strong domestic market for such vehicle technology(ies). Recently, the Phase-II of the FAME scheme has been announced which has a budgetary provision of ₹ 100 billion (Government of India, 2019). Apart from FAME-II, the Union Budget 2019 makes a strong pitch for private ownership of electric 2-wheelers and electric 4-wheelers by allowing income tax deduction of upto ₹ 1.5 lakh on the interest paid on the loans taken to purchase EVs (Press Information Bureau, 2019). Inspite of the government's unambiguous policy signal and considerable financial support, the EV sector is finding itself on a bumpy road. Implementation of electric mobility in India is akin to solving a jigsaw puzzle. EV charging is undoubtedly a critical piece in this puzzle.

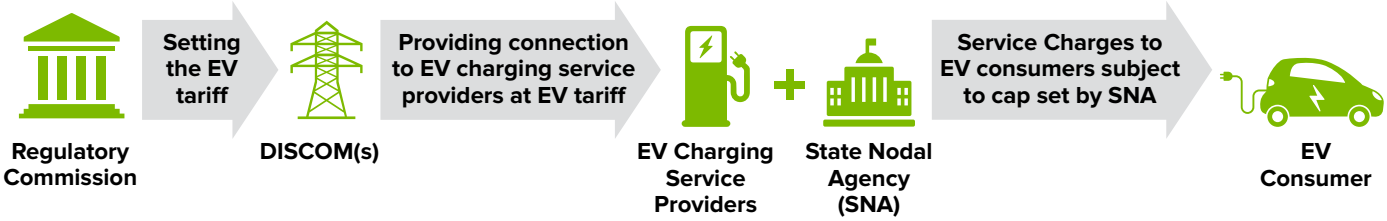
EV charging infrastructure which closely binds mobility with the electricity sector is not only revolutionising the transport sector, it has the potential to transform the electricity distribution paradigm. The inter-linkages between electric mobility and electricity grid make the role of power distribution utilities critical.

EV charging has dual implications for distribution utilities. On one hand, additional electricity sales due to EV charging would increase the revenue of a utility. On the other hand, the charging demand may accentuate the peak load in the utility's service area which has a significant bearing on its cost of power procurement and distribution network management. Tariff for EV charging becomes a critical fiscal and regulatory tool in this regard. Tariff needs to be designed in a way which would allow the utility to recover the costs while making EV charging cost-effective to a user and enabling charging service a commercially viable business.



EV charging infrastructure is the backbone of electric mobility and has been the most contentious issue.

EV Tariff Ecosystem*



* SNA/ State government/ Appropriate commission can fix the ceiling of service charges in case of public charging stations installed with government incentives.

EV TARIFF LANDSCAPE IN INDIA

Following the clarification issued on 13th April 2018 by the Ministry of Power (MoP) regarding delicensing of the EV charging activity, a handful of states such as Delhi, Haryana, Karnataka and Maharashtra announced specific tariff rates for EV charging. However, at that time, there was no specific direction or guideline with respect to tariff determination for EV charging. On 14th December 2018, MoP issued "Charging Infrastructure for Electric Vehicles – Guidelines and Standards -reg." to promote affordable EV adoption in the country (Ministry of Power, 2018). The guideline provided guidance that the tariff to be determined by the appropriate commission should not exceed the Average Cost of Supply (ACoS) by more than 15%. The guideline also clarified that captive or domestic charging stations would attract tariffs applicable for those consumer-categories. Several states including Andhra Pradesh, Telangana and Uttar Pradesh announced EV tariffs keeping the MoP guideline as the basis.

However, on 1st October 2019, MoP revised and re-issued the guideline ("Charging Infrastructure for Electric Vehicles – Revised Guidelines and Standards -reg.") (Ministry of Power, 2019). The revised guideline mentions that the appropriate commission has to fix the tariff in a state in accordance with the Electricity Act 2003. The revised guideline has done away with the capping of EV tariff at 15% of ACoS.

Guidelines issued by the Ministry of Power on 1st October 2019 states that "*the tariff to be determined by the appropriate commission in accordance with the Electricity Act 2003*".

As tariff-setting in India is a state-subject *i.e.* the State Electricity Regulatory Commission (SERC) in each state is responsible for determining tariffs for different consumer categories, the energy and demand charges for EV charging which are two parts of the tariff, are found to vary across states. However, the National Tariff Policy remains the overarching guidance for the SERCs to fix tariffs, according to which consumer tariffs should be brought within +/- 20% of the ACoS. In the context of India's cross-subsidy tariff regime, this essentially means that the subsidised consumers should not be charged less than 80% of ACoS and the tariffs for the cross-subsidising consumers should not exceed 120% of ACoS. Traditionally, domestic and agricultural consumers are the beneficiaries of subsidies, whereas commercial and industrial consumers cross-subsidise by paying more than ACoS. On the other hand, the state governments have the discretion to also offer subsidy to a class of consumers and in such cases, the governments have to make the subsidy amounts available to the distribution licensees upfront. With the addition of EVs as a new set of consumers, it would be interesting to see whether the different regulators and the state governments would offer preferential tariffs for EV charging to promote EV adoption or consider EV charging on an equal footing to commercial consumers or take a neutral stance. This warrants a close look at the EV charging tariffs applicable in different states currently.

Table 1 gives a snapshot of the state-wise energy charges and demand charges for EV charging at public charging stations. The table also provides a comparison of the EV tariffs with residential (*i.e.* subsidised category) and commercial tariffs (*i.e.* non-subsidised category) of those states.

A review of the state-wise tariffs reveals that EV tariffs vary from ₹ 4/kWh to ₹ 6/kWh in most of the states. Uttar Pradesh is the only state with a tariff of more than ₹ 7/kWh for EV charging stations. It is interesting to find that EV specific tariffs are higher than residential rates and lower than commercial tariffs. This holds true in most of the states and Union Territories (UTs).

It is also found that in most cases, EV charging tariffs have a flat energy rate (no consumption-based slab) irrespective of the type of connection (Low Tension (LT)/ High Tension (HT)). However, some states such as Andhra Pradesh, Delhi, Gujarat, Maharashtra, Uttar Pradesh *etc* . have specified separate EV tariffs for LT and HT connections.


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Table 1: State-wise EV specific tariffs and comparison with residential and commercial rates

ISSUING AGENCY	STATE	EV TARIFF		RESIDENTIAL TARIFF		COMMERCIAL TARIFF*		YEAR
		ENERGY CHARGE	DEMAND CHARGE	ENERGY CHARGE	DEMAND CHARGE	ENERGY CHARGE	DEMAND CHARGE	
APERC	Andhra Pradesh	₹ 5/kWh and ₹ 5/kVAh	Nil	₹ 1.45 to ₹ 9.05/kWh	Nil	₹ 5.4 to ₹ 10.15/ kVAh	₹ 55 to ₹ 75/kW per month	FY20
BERC	Bihar	Same tariff for EV as the respective category rate	Nil	₹ 6.15 to ₹8.60/ kWh	₹ 20 to ₹ 40/kW per month	₹ 6.4 to ₹ 7.5/ kWh	₹ 30 to ₹ 180/ kW per month	FY20
CSERC	Chhattisgarh	₹ 5/kWh	Nil	₹ 1.0 to ₹ 2.45/ kWh	₹ 2.40 to ₹ 4.85/kWh	₹ 5.40 to ₹ 7.25/ kWh	₹ 50 to ₹ 180/ kW per month	FY20
DERC	Delhi	₹ 4.5/kWh and ₹ 4.0/ kVAh	Nil	₹ 3 to ₹ 7.75/ kWh	₹ 125 to ₹ 250/kW per month	₹ 8.0/kVAh	₹ 250/kVA per month	FY20
GERC	Gujarat	₹ 4 to ₹ 4.1/ kWh	• ₹ 25 per month per installation • ₹ 25 to ₹50 per kVA per month	₹ 1.5 to ₹ 5.2/ kWh	₹ 15 to ₹ 70 per month	₹ 4.35 to ₹ 4.65/ kWh	₹ 50 to ₹ 195/ kW per month	FY20
HERC	Haryana	₹ 5.58 to ₹ 6.2/kVAh	₹ 100/kW per month	₹ 2.7 to ₹ 7.1/ kWh	Nil	₹ 6.35 to ₹ 7.05/ kVAh	₹ 160/kW per month	FY20
KERC	Karnataka	₹ 5.00/kWh	₹ 60/kW per month and ₹ 190/ kVA per month	₹ 7.02 to ₹7.80/ kWh	₹ 45 to ₹ 70/kW per month	₹ 6.40 to ₹ 9.0/ kWh	₹ 65 to ₹ 95/kW per month	FY20
MERC	Maharashtra	₹ 5.06/kWh	₹ 70/kVA/ Month	₹ 4.6/kWh	₹ 190/kVA per month	₹ 3.9 to ₹ 4.35/ kVAh	₹ 190 to ₹ 220/ kVA per month	FY20
MPERC	Madhya Pradesh	₹ 5.9 to ₹ 6.0/kWh	₹ 100 per kVA to ₹ 120 per kVA of Billing Demand	₹ 3.1 to ₹ 6.3/ kWh	₹ 35 to ₹ 90 per connection	₹ 6.1 to ₹ 8.5/kWh	₹ 55 to ₹ 260/ kW per month	FY20
OERC	Orissa	₹ 4.2 to 5.7/ kWh	Nil	₹ 2.5 to ₹ 5.7/ kWh	Nil	₹ 5.4 to ₹ 7.1/kWh	₹ 200 to ₹ 250/ kVA per month	FY20
PSERC	Punjab	₹ 6/kVAh	Nil	₹ 4.99 to ₹ 7.41/kWh	₹ 35/kW to ₹ 80/kVA per month	₹ 6.32 to ₹ 7.29/ kWh	₹ 45/kW to ₹ 110/kVA per month	FY20
TSERC	Telangana	₹ 6.00/kWh	Nil	₹ 1.45 to ₹ 9.5/ kWh	Nil	₹ 5.3 to ₹ 12.0/ kVAh	₹ 50 to ₹ 60/kW per month	FY19
UPERC	Uttar Pradesh	₹ 5.9 to ₹ 7.7/ kWh	Nil	₹ 3 to ₹ 6.5/ kWh	₹ 50 to ₹ 100/kW per month	₹ 5 to ₹ 18/kWh	₹ 95 to ₹ 430/ kW per month	FY19

Source: Tariff Orders of respective States for Year 2018-19 and 2019-20
**Commercial considered as non-domestic by various SERCs.*
***The information in the table is as on November 11, 2019.*

HIGHLIGHTS OF STATE SPECIFIC EV TARIFF FRAMEWORKS

Most of the regulatory commissions of states and UTs have already announced EV specific rates in their respective tariff orders (Figure 1). However, the considerations related to EV specific tariff are not the same across the states. Some states introduced a separate category called Public EV Charging stations (such as Goa, Punjab and UTs) which is distinct from existing consumer categories. On the other hand, some other states have considered tariffs for EV charging under the existing consumer categories such as non-domestic or non-commercial categories (such as Andhra Pradesh, Chhattisgarh and Punjab). Jharkhand is the only state which has introduced EV tariff under the commercial category. Such categorisation of EV tariffs has an implication on the commercial viability of EV charging business as electricity rates under commercial category are considerably higher than the residential or domestic category as shown in Table 1.

It is worthwhile to mention here that there is also significant variation across states in terms of tariff design. Few states have introduced demand charges which include Gujarat, Haryana, Karnataka, Maharashtra, *etc* ., while some states have notified only energy charges, such as Andhra Pradesh, Delhi, Chhattisgarh, Telangana, Uttar Pradesh, *etc*.

EV Tariff – Energy Charge

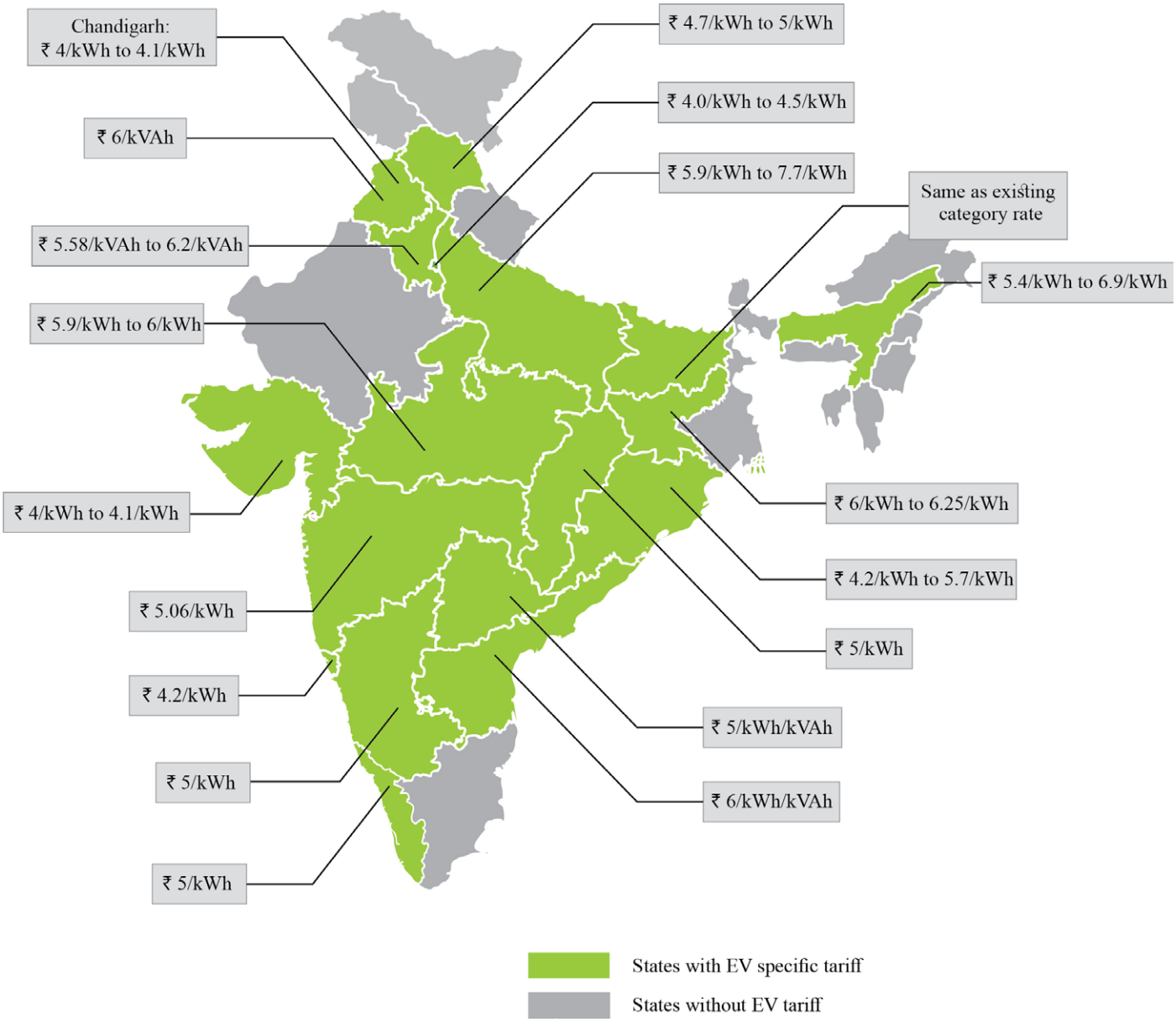
- Flat tariff rates have been introduced by regulatory commissions.
- LT energy charge varies from ₹ 4.1/kWh in Gujarat to ₹ 7.7/kWh in Uttar Pradesh.
- HT charge varies from ₹ 4/ kVAh in Gujarat to ₹ 7.3/kVAh in Uttar Pradesh.

EV Tariff – Demand Charge

- Out of 22. 15 states and UTs such as Gujarat, Haryana, Karnataka, Maharashtra *etc* . have announced demand charges for EV charging stations.
- 7 states namely Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Punjab, Telangana, and Uttar Pradesh announced no demand charge in order to boost EV adoption.

EV Tariff – ToD Charge

- Two regulatory commissions (UPERC and MERC) introduced ToD rates specifically for EV consumers.
- **Uttar Pradesh:** Surcharge and rebate of 15%
- **Maharashtra:**
  - Surcharge (₹ 0.80 / kWh for usage from 09.00 hrs to 10 hrs and INR 1.1/kWh from 18.00 hrs to 22.00 hrs)
  - Rebate (₹1.50/kWh for usage between 22.00 hrs to 06.00 hrs)
- **Delhi** –applicable for three phase consumers with load >= 10kW/kVA with surcharge and rebate at 20%.



Source: Own construction based on tariff orders of States of FY19 and FY20
**The information in the table is as on November 11, 2019.*

Figure 1: Map showing States with or without EV specific tariffs

POSSIBLE KEY CONSIDERATIONS IN SETTING EV TARIFF

In India, tariff setting is a complex subject and the tariff landscape widely varies from state to state. This is true for EV tariffs as well which is evident from the analyses presented in the previous section. EV charging is distinct from other consumer categories and distribution utilities and regulators are trying to figure out the demand characteristics of this category. It is observed that some states have already revised the EV tariff structure within a year of introducing separate tariffs for EV charging. There are three salient features of EV charging which make EV a unique consumer-class:

- **Mobile source of electricity requirement -** The EV charging demand is dynamic in nature and quite unpredictable at present. This is mainly because EVs are mobile and although their charging points are stationary, the electricity and power demands at the charging places could widely vary depending on various factors such as charging technology, EV battery capacity and C-rate, EV use, *etc* .
- **Uneven load -** EV charging loads at charging points are anticipated to be very dynamic with spikes in the demand curve. It could have a severe impact on the distribution network, especially in the distribution areas with low available hosting capacities. This is more likely to happen in the case of fast charging of EVs with large batteries.
- **Bi-directional energy flow -** EVs can also be leveraged as Distributed Energy Resource (DER) using Vehicle-to-Grid (V2G) functionality. Due to batteries, Vehicle-Grid Integration can entail bi-directional energy flow and thus, EVs can potentially act as prosumers. Appropriate metering and tariff-setting would be required to enable the application of EVs as a Virtual Power Plant (VPP).

The regulators should take these aspects into account while framing the tariff schedule for EV charging. Not to mention, tariff schedule for EV charging is an instrument which would influence the outlook of power distribution utilities, charging service providers, potential EV users and technology suppliers and would impact the future of e-mobility in a state at large.

From the detailed review of the existing EV charging tariff schedules across the states and UTs, the following six areas have been identified warranting specific deliberation to bring more clarity on the necessary tariff schedule for EV charging.

- **Categorisation of EV charging in the tariff schedule -** Presently, SERCs are found to take differing views in terms of recognising EV charging as a consumer category. EV is currently categorised as non-residential, commercial, non-industrial or bulk supply. In some cases, a separate category is also created for public charging stations. Such categorisation

Salient features of EV charging making EV a unique consumers class:

- Mobile source of electricity requirement
- Uneven load
- Bi-directional energy flow

of EV will have an implication on its tariff schedule and in turn, will impact the commercial viability of EV charging business as rates under commercial category are generally significantly higher than residential or domestic category. Also, it would be important to provide potential EV customers clear electricity price signals.

- **Application of demand charge –** The primary impact of EV charging on a DISCOM's cost of supply and its distribution network is envisaged from the power demand at a public EV charging station. Although the overall load curve of a DISCOM may remain unaltered even when there is a sizable number of EVs on road, spikes in power demand due to EV charging can be anticipated. This might drive up the power purchase cost of the DISCOM and negatively impact the stability of the distribution grid. The primary instrument available at the DISCOM's disposition to tackle surge or spike in EV power demand is the demand charge. However, the demand charge needs to be appropriately designed to enable charging service a viable business opportunity for an investor and also, to avoid making EV adoption unattractive for a user. As of now, few states namely Gujarat, Haryana, Karnataka, Maharashtra, *etc* . have imposed demand charges on EV charging.
- **Introduction of ToD tariffs –** ToD tariffs *i.e.* surcharge during peak hours and rebate during off-peak hours of 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 demand within a DISCOM's service area. Few states have already announced the ToD rates for EV, such as Delhi, Uttar Pradesh, and Maharashtra. Most of the states have not considered ToD tariffs for EV charging currently.
- **Applicability of EV charging tariffs –** As on June 12, 2019, 17 SERCs 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 not clear, for example, whether the special EV charging tariffs would be applicable for charging public electric buses or EV charging at public parking areas managed by different types of entities. The 14th December 2018 and 1st October 2019 guidelines and standards issued by MoP are also quite vague on this [(Ministry of Power, 2018); (Ministry of Power, 2019)].
- **Applicability of taxes and PPAC –** IIt is seen in many states that taxes (sometimes, cess), non-tariff surcharges and PPAC are included over and above 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. There is a lack of clarity at present to infer whether these charges will also be in case of EV charging tariff.
- **Socialising the cost of grid up-gradation due to EV charging –** There is a school of thought that the cost of grid augmentation due to EV charging should be passed through only to EV charging station operators. This would possibly drive up the tariff for EV charging. Also, it is not clear how this cost segregation can be judiciously implemented. A focussed discussion is necessary to understand the usefulness and the mechanism for such action.

> **"To shape the tariff structure of EV charging, it is highly recommended that the regulatory commissions take a 360-degree view by considering the viewpoints of the concerned stakeholders including the power distribution utilities, the EV charging service providers, the EV fleet operators and thinktanks."**

Considering the different facets of tariff schedule and their importance, it is highly recommended that to give shape to the tariff structure for EV charging in respective states, the regulatory commissions take a 360-degree view of the subject by taking into account the points of view of the concerned stakeholders including the power distribution utilities, the EV charging service providers, the EV fleet operators and thinktanks.

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ABOUT ALLIANCE FOR AN ENERGY EFFICIENT ECONOMY (AEEE)

Alliance for an Energy Efficient Economy (AEEE) is a not-for-profit thinktank acting as a policy advocacy and market enabler for responsible use of energy and transition to a climate resilient and energy secure future. It is able to curve its own niche in the energy space based on four key pillars -- Knowledge Creation, Policy Advocacy, Market Enablement and Alliance. The Power Utility & Electric Mobility research vertical at AEEE is at the forefront of carrying out incisive research on the inter-linkages between electricity grid and e-mobility *i.e.*

1. The charging infrastructure which is deemed the backbone of e-mobility and has been the most contentious issue

2. Tariffs and regulations for EV charging which impact the cost recovery of the utilities, the commercial viability of the charging service and the operational cost of EVs

3. Application of EVs as a flexible grid resource

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