Residential EV Charging Guidebook

A guidebook for planning, installing and managing electric vehicle charging, in all types of residential areas, in Delhi

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A report by Dialogue and Development Commission of Delhi (DDC) and WRI India
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This document is a broad guideline for residential societies interested in installing EV charging stations in their society. For a detailed understanding of EV charging stations and customized solutions, expert advice from charging solution providers may be required.
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### List of Abbreviations

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<tr>
<td>2W</td>
<td>Two-wheeler</td>
</tr>
<tr>
<td>3W</td>
<td>Three-wheeler</td>
</tr>
<tr>
<td>4W</td>
<td>Four-wheeler</td>
</tr>
<tr>
<td>AC</td>
<td>Alternate current</td>
</tr>
<tr>
<td>Amp</td>
<td>Ampere (base unit of electric current)</td>
</tr>
<tr>
<td>AMC</td>
<td>Annual maintenance contract</td>
</tr>
<tr>
<td>BEVC</td>
<td>Bharat electric vehicle charger</td>
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<tr>
<td>BIS</td>
<td>Bureau of Indian Standards</td>
</tr>
<tr>
<td>CCS</td>
<td>Combined Charging System</td>
</tr>
<tr>
<td>CPO</td>
<td>Charge Point Operator</td>
</tr>
<tr>
<td>CSMS</td>
<td>Charging station management system</td>
</tr>
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<td>DC</td>
<td>Direct current</td>
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<td>DDA</td>
<td>Delhi Development Authority</td>
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<tr>
<td>DERC</td>
<td>Delhi Electricity Regulatory Commission</td>
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<tr>
<td>DISCOM</td>
<td>Distribution companies</td>
</tr>
<tr>
<td>EV</td>
<td>Electric vehicle</td>
</tr>
<tr>
<td>EVSE</td>
<td>Electric vehicle supply equipment</td>
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<tr>
<td>GNCTD</td>
<td>The Government of National Capital Territory of Delhi</td>
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<tr>
<td>GST</td>
<td>Goods and service tax</td>
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<tr>
<td>HT</td>
<td>High tension</td>
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<tr>
<td>ICE</td>
<td>Internal combustion engine</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Council</td>
</tr>
<tr>
<td>IESA</td>
<td>India Energy Storage Alliance</td>
</tr>
<tr>
<td>INR</td>
<td>Indian national currency</td>
</tr>
<tr>
<td>KW</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>LEV</td>
<td>Light electric vehicle</td>
</tr>
<tr>
<td>LT</td>
<td>Low tension</td>
</tr>
<tr>
<td>OCPP</td>
<td>Open Charge Point Protocol</td>
</tr>
<tr>
<td>OEM</td>
<td>Original equipment manufacturer or manufacturer</td>
</tr>
<tr>
<td>SLD</td>
<td>Service line development</td>
</tr>
<tr>
<td>V</td>
<td>Volt (unit of potential difference, voltage, and electromotive force)</td>
</tr>
</tbody>
</table>
Introduction
The Government of the National Capital Territory of Delhi (GNCTD) announced the Delhi Electric Vehicle Policy in 2020, with a vision to promote the adoption of electric vehicles (EVs) in the city. The Policy aims to improve Delhi’s air quality by driving rapid adoption of EVs with the goal of reaching 25% of all new vehicle sales by 2024.

Through this guidebook, GNCTD seeks to encourage all residential societies (Old neighbourhood areas, planned colonies, DDA flats, Cooperative Group Housing Societies, Government housing societies, employer housing etc.) based out of Delhi, to join hands with the Delhi Government in promoting electric vehicles (EVs) by adopting EV charging in their residential societies.

We urge all residential societies to promote EVs by:

- Adopting community EV charging facility which can be used by all the EV owners in a society. These charging points will especially provide shared access to EV charging for residents.
- Encouraging their residents to adopt electric vehicles.
- Supporting residents (by providing necessary permissions) in the installation of private charging points within their premises.

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1. EV is a vehicle that runs fully or partially on electricity. Unlike conventional vehicles that use fossil fuels, EVs use an electric motor that is powered by a fuel cell or batteries.
As per Delhi Development Authority’s amended Unified Building Bye Laws (2016), 20%² of all parking capacity in buildings must be provided with charging infrastructure for EVs. In March 2021, the Delhi Government also directed all commercial and residential institutions having a parking capacity of 100 or more vehicles to reserve 5%³ of their parking space for electric vehicles with suitable EV chargers with a minimum output of 3.3KW.

The GNCTD is committed to provide all the support needed to simplify the EV adoption process for residential societies in Delhi. GNCTD shall provide a grant of 100% for the purchase of charging equipment up to INR 6000/- per charging point for the first 30,000 charging points as well as a special EV tariff for EV charging. BSES Rajdhani Power Limited (BRPL), BSES Yamuna Power Limited (BYPL) and Tata Power-DDL (TPDDL) consumers can get a private EV charging point installed through an online single-window portal at their homes, group housing societies, multi-storey apartment complexes, RWA offices etc. For more details, please refer to section 6 of the document.

Through this document, we aim to guide residential societies in understanding the importance of EV charging, support effective decision-making and set out the way forward for the planning and implementation of EV charging stations in the parking space of the societies. The document also aims to address some of the challenges (such as lack of space, capital investment, power load management etc.) residential societies might face while implementing EV charging.

3. Existing buildings which have a parking capacity of more than 100 vehicles are also directed to set aside 5% of the capacity for EVs. More details in Appendix B.
2

Need for EV charging facility in residential societies
According to India Energy Storage Alliance (IESA), the EV market is expected to grow at a CAGR of 44% between 2020–2027 and is expected to hit 6.34 million-unit annual sales by 2027. Delhi, the national capital, is witnessing a rapid transition to electric vehicles. In 2021, EVs accounted for 5.6% of the vehicle sales in Delhi, highest in India, while the national average was 1.9%.

Charging EVs at home or within a residential complex is generally cheaper and more convenient for residents. Various studies show that a majority (around 80%) of all EV charging happens at home and hence residential charging will be central to the future charging ecosystem. As per a survey conducted in Delhi’s gated communities, EV charging infrastructure is gaining traction and 45% of the communities are keen to invest in EV charging infrastructure over the next 12 months.

As indicated by the recent changes in building bye laws and the increased adoption of EVs in Delhi, providing EV charging as a service/amenity to the residents will soon become inevitable. At the same time, providing this amenity upfront will also encourage residents to transition to EVs as lack of charging options is one of the biggest impediments to accelerated adoption to EVs.

Reasons why residential societies should focus on EV charging facilities:

**Benefits to builders and property owners:**

- **Availability of EV charging facility can lead to higher property value in the future.** An EV charging point is like any other amenity that adds value and provides a ‘green’ image to the property. Data from countries with higher EV adoption shows that buyers are willing to pay more for homes with EV charging stations. Also, properties with a higher number of EV charging stations in the vicinity have a high selling price (1.5-2.6 times more) than the conventional properties.

- **As EVs go mainstream in coming years, potential property buyers will want EV charging as an inbuilt amenity.** Preparing and installing EV chargers at the time of construction will spare builders from the future hassle and high cost of retrofitting EV chargers in their property.

- **As young and educated citizens are more likely to buy electric vehicles, putting EV chargers may help attract potential clients.**

- **Availability of EV charging facility will help attract and retain property owners and tenants.**

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5. Source - Vahan
6. [https://www.livingetc.com/advice/electric-car-charging-at-home](https://www.livingetc.com/advice/electric-car-charging-at-home)
Benefits to resident welfare associations (RWAs)/societies:

- Several societies are taking green initiatives such as rainwater harvesting and installing solar panels. Therefore, installing EV chargers can boost the green image of society.
- Installation of EV chargers in the society premises can prepare our next generation to be more responsive towards the environment and climate change.

Benefits to residents:

- Availability of EV chargers within the premises of the residential complex can help EV users start their day with a fully charged vehicle and hence address range anxiety.
- The actual usage of personal cars in most Indian cities is less than 35 km a day\(^9\), availability of EV charging facility in the residential premises can take care of most of the charging needs.
- Residential EV charging is mostly cheaper than public EV charging stations.
- Availability of EV chargers can boost the confidence of residents planning to buy an EV in the future.
- Operational and maintenance cost of EVs is lower. Residents shifting to EVs will be able to avail these benefits.

Social benefits:

- The wide availability of EV charging facilities will accelerate the adoption of EVs in Delhi and benefit society by contributing to cleaner air and better health.

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Steps to bring EV charging to residential societies

The residential societies should plan their EV charging roadmap from the initial stage — by encouraging their residents to adopt EVs. Once a society has 5-6 EVs, it can install common charging points in the spare or visitor parking lots. Installing community chargers will encourage more residents to make the switch to EVs. All RWAs should encourage residents to shift to EVs and cooperate with the residents willing to install EV chargers for their personal use. EV owners staying in residential societies can use their existing individual power connections to set up charging points. Residential societies who want to set up common charging points could take a planned approach as described in this section.

1. Create awareness
2. Demand estimation
3. EV charger planning
4. Infrastructural planning
5. Space planning and charger deployment
6. Charger usage guideline and maintenance
3.1 Create awareness

Lack of awareness is one of the most critical barriers to EV adoption. As the first step, RWAs must create awareness among their residents about the benefits of switching to electric vehicles. We urge RWAs to organize meetings and awareness activities in their society to push for EV adoption.

The following tools/information may come in handy for creating awareness:

- **EV savings** calculator to compare ownership cost of EVs against an ICE vehicle
- Incentives provided by the government on the purchase of EVs (see Appendix-A)
- Awareness about existing public charging infrastructure in Delhi
- Encourage residents to take the Switch Delhi Pledge

3.2 Demand estimation

As the next step, we recommend RWAs to evaluate and gauge existing and potential demand for EV charging in society. One way to evaluate this demand is through a survey (see Appendix-C) which could include questions inquiring about whether a resident owns or is considering the purchase of an EV, along with the make or model to establish charging needs. The survey could also inquire demand expected from visitors as well as additional questions aimed at better understanding overall attitudes towards EVs, driving habits, preferences for where charging infrastructure should be installed (e.g. in a private or shared space) and how costs are allocated.

It is to be noted that in the RWAs of Delhi, the vehicles owned by the residents are mostly 4W (cars) or 2W. Once the RWA has a fair estimate of the number and type of EVs that need to be served, they can refer to the guidelines provided in the DDA Unified Building Bye Laws for Delhi, 2016. The norms in the bye-laws suggest the number of charging stations that could be installed at a specific location considering the charging technology, available EV types, and location to ensure the charging requirements are fulfilled. We recommend RWAs to provide EV charging infrastructures in at least 20% of the parking space provided in their area. The guidelines provided by DDA on the number of EV chargers to be installed in the group housing societies are are listed in the following table.

---

10. [https://dda.gov.in/sites/default/files/tender/COMPENDIUM%20OF%20UBBL%20201605082020_0.pdf](https://dda.gov.in/sites/default/files/tender/COMPENDIUM%20OF%20UBBL%20201605082020_0.pdf)
In India, all types of EV chargers can be categorized broadly into two categories – AC chargers and DC chargers. AC and DC chargers differ in the amount of power they require, installation infrastructure, cost, and time they take to charge the vehicle.

EV chargers can use either AC or DC power to charge the EV from EVSEs\(^\text{11}\). All batteries require DC power to charge. AC charger provides AC power from the grid to the on-board charger of the vehicle, which converts it to DC power and then feeds it into the EV battery. AC chargers are generally slow compared to DC chargers because their capacity is limited by the power rating of onboard chargers. However, in DC chargers, the converters are part of EVSE and directly supply the DC power to the EV battery bypassing the on-board charger and hence charge at a faster rate.

### Table 1: Number of chargers required per vehicle

<table>
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<tr>
<th>EV segment</th>
<th>Slow Charger (SC)</th>
<th>Fast Charger (FC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - wheeler</td>
<td>1 SC for every 2 EVs</td>
<td>-</td>
</tr>
<tr>
<td>3 - wheeler</td>
<td>1 SC for every 2 EVs</td>
<td>-</td>
</tr>
<tr>
<td>4 - wheeler</td>
<td>1 SC for every 3 EVs</td>
<td>1 FC for every 10 EVs</td>
</tr>
</tbody>
</table>

11. Charging infrastructure, otherwise known as Electric Vehicle Supply Equipment (EVSE), provide a power source for electric vehicles to recharge their batteries.
The main types of AC chargers in India are:

- **Normal AC charging**: The simplest type of AC charging is a simple three-pin connector with a 15 Amp plug. This, however, is not recommended as it is not the safest way of charging, does not collect user data, and does not enable smart billing and payment. It is advisable to use a wallbox charger (such as LEV AC or AC001 or Type 2 AC charger) instead of directly charging from a 15 A domestic socket.

- **LEV AC chargers**: These are low-cost 3.3 KW AC chargers that can be installed with a 230 V AC, single-phase electricity connection. LEV AC charger can cost as low as INR2,500 when purchased under Delhi Government’s single window process.

- **Bharat AC chargers**: The most common AC charger in India is Bharat AC 001 which has three charging guns (3x3.3 kW), complies to Bharat EV standards, and is supported by FAME-II scheme as well. These chargers are typically used to charge 2W (by using a separate adapter) and some entry level 4Ws (such as Mahindra e2s and Tata Tigor). However, these chargers can also be used to charge many upgraded/high capacity 4Ws. A Bharat AC 001 charger costs ~INR 40,000.

- **Fast AC charging**: EV models that have on board chargers with higher power ratings enable AC charging at a faster rate with AC Type 2 charger (7 kw to 22 kw). These chargers can cost about INR 65,000.

LEV AC and AC001 requires a suitable adapter with a connector to charge e-2W, e-3W and e-4W. The EV manufacturers provide suitable connectors along with the EVs during the time of purchase for EV charging.

The major categories of DC chargers in India are:

- **Low voltage DC charging**: Bureau of Indian Standards (BIS) has recently adopted an International Electrotechnical Council (IEC) standard for low voltage DC charging. Low voltage DC chargers are not very popular yet, however, they are expected to become a popular low-cost DC charging solution in future.

- **Level 1 DC Chargers**: These chargers have an output voltage of 48V / 60V/72V and come with power outputs of 10 kW / 15 kW with maximum current of up to 200A. Bharat DC 001 is the most popular type of level 1 DC charger in India. However, this charger can cater to only a few e-Cars such as Tata e-Tigor and Mahindra e-Verito. Most other e-cars (including the upcoming models) are compatible with CCS chargers. These chargers typically cost about INR 2,50,000.

- **Level 2 DC Chargers**: These chargers have an output voltage up to 1000V and come with power outputs of 25kW to 150 kW. CCS and CHAdeMO are the most popular Level 2 DC Chargers. CHAdeMO is used by Japanese car manufacturers, and this charger is phasing out everywhere except in Japan. In July 2020, Nissan announced its decision to switch from CHAdeMO to CCS in US and Europe. CCS charger, on the other hand, is gaining popularity globally. Level 2 DC chargers can cost more than INR 10,00,000 depending upon the brand and type of charger.
For details on various EV chargers and typical charging time for different segments of vehicles, please refer to Appendix D.

Residential societies may not require DC chargers in the beginning when the demand is low. In most cases, LEV AC, AC001 and Type 2 AC can suffice the demand. These chargers are affordable in terms of cost, require less space (wall mounted) and less electricity load. AC charging remains the best option for residential vehicles that remain parked overnight in the residential premises. RWAs should choose the type of charger based on estimated demand (section 3.2), overall budget and sanctioned electricity load.

Below are the few important points that RWAs should keep in mind while selecting the type of EV charger:

- Charging an EV from a 15 A socket is not recommended as it is not the safest way of charging. It is recommended that RWA’s install the appropriate chargers described in this guidebook.

- Different EV models and segments have different charging requirements. RWAs should carefully assess the existing EV models used by the residents and new models that they plan to buy in future. We recommend having good mix of charger types that can cater to existing and future demand.

- Since vehicle dwell times in residential areas is high, we recommend setting up slow chargers which are also better from a cost efficiency and electricity load management perspective.

- RWAs can consider putting pre-paid meters (for load requirement up to 45 kW) to save security deposit costs associated with new EV connection. Please see section 3.4 for details.

- DC 001 chargers under the single window process will be installed in only those premises which have a sanctioned load of more than 15kW.
3.4 Infrastructure planning

While planning the infrastructure for EV chargers, electrical infrastructure and safety planning plays a key role. The electrical infrastructure should be planned in consultation with the DISCOM and the Charge Point Operators (CPO)\textsuperscript{12}. The safety of the EV chargers is the responsibility of the CPO and the RWA should ensure that the safety measures are adhered to during the installation, operation, and maintenance of the chargers.

3.4.1 Electrical Infrastructure

Under Delhi Electricity Regulatory Commission (DERC’s) supply code and performance regulations\textsuperscript{13}, following are the voltage levels of the power supply provided to group housing societies (GHS):

- **Low Tension (LT)**
  - 1. Single Phase: 230 volts between phase and neutral
  - 2. Three Phase: 415 volts between phases

- **High Tension (HT)**
  - 1. Three phase: 11 kV between phases

The electric power supply to residential areas is provided under 2 broad categories as given below:

- **Single point supply**: The DISCOM shall provide a single point supply to GHS at the HT voltage of 11 kV or LT voltage of 415 V. If it is an HT connection then, the developer/RWA should bear the expenses of installation of the Distribution Transformer to step down the voltage from 11 kV to 415 V. It is the responsibility of developer/RWA to provide power supply to each residential unit of the GHS and for the common amenities in the society. The developer/RWA collects the electricity charges from each residential unit and remits the charges for the entire electricity availed at the single point of supply as per the electricity bill to the DISCOM. This system is most preferred in societies with high-rise apartments.

- **Individual Connection**: The DISCOM shall provide individual power supply connection to each house with respective individual meters. It is the responsibility of each member of the society to pay the electricity bill directly to DISCOM as per the applicable tariff. As per DERC regulations, if more than 2/3rd of the members of the society opt for individual connection, then the entire society will be converted for taking direct supply.

\textsuperscript{12} Charge point operators (CPOs) purchase EV chargers from EVSE vendors and ensure optimal ongoing EV charging operations. They provide the charging network infrastructure, managing the backend technologies as well the connection between the chargers, to deliver reliable and consistent EV charging.

But if the number of members of the society opting for direct supply is less than 2/3rd of the total number of members in the society, then partial conversion is allowed. The system of individual connection is preferred mostly in government colonies and low-rise residential buildings (for e.g. Ground + 2 floors or Ground + 3 floors). Under this electrical layout, the electricity for the common amenities in the society would be provided under separate wiring and metering arrangement. The RWA would be billed under commercial tariff for power consumed by the common amenities.

While undertaking electrical infrastructure planning, it is important to understand the different metering arrangements provided by the DISCOMs. The metering arrangements, provided in Delhi for EV charging, are briefly explained below:

1. **Existing meter**: The consumers can charge their EVs from the existing sanctioned load and electrical connection provided that the power capacity of the charger does not exceed the sanctioned load along with comfortably catering to the already existing energy consumption needs of the consumer. The RWA can allow EV charging through the existing electricity connection and the electricity consumed will be billed as per the applicable tariff (domestic or commercial) depending on where the EV charger is installed in the society.

2. **Minus Metering**: In this metering system, a separate meter (with EV tariff) is provided for EV charging in addition to the existing meter which records the energy consumption of the society. The facility of minus metering for EV load is provided only for those GHS/RWAs that have availed single point supply at HT voltage of 11 kV. The electricity bill is calculated as given below.

<table>
<thead>
<tr>
<th>Description</th>
<th>Formula</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-EV energy consumed by the society (A)</td>
<td>(Total units recorded in main meter) - (No. of units recorded in EV meter)</td>
<td></td>
</tr>
<tr>
<td>Electricity charges for non-EV energy consumed (B)</td>
<td>(A × existing tariff rates) + Fixed charges</td>
<td></td>
</tr>
<tr>
<td>Electricity charges for EV load (C)</td>
<td>(No. of units recorded in EV meter) × EV tariff</td>
<td></td>
</tr>
<tr>
<td>Total electricity bill</td>
<td>= B + C</td>
<td></td>
</tr>
</tbody>
</table>

3. **EV meter**: According to DERC, the GHS/RWA or individual house owner can have separate connection and meter for EV charging. Through this arrangement, the EV tariff of INR 4.5/kWh can be availed. Presently, there are no fixed charges on the enhanced EV load.
The electricity prices for different metering arrangements are summarized in the table given below.

Table 3: Summary of electricity charges for different metering arrangements

<table>
<thead>
<tr>
<th>Metering arrangement</th>
<th>Fixed Charges (on enhanced load) (In INR)</th>
<th>Energy charges (In INR)**</th>
<th>SLD charges (In INR)**</th>
<th>Security Deposit (In INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing meter</td>
<td>Existing rates</td>
<td>Existing rates</td>
<td></td>
<td>Existing rates</td>
</tr>
<tr>
<td>Minus metering (for single point supply only)</td>
<td>Existing rates</td>
<td>4.5/kWh*</td>
<td>3000 (up to 5 kW)</td>
<td>2500/kW</td>
</tr>
<tr>
<td>EV meter</td>
<td>Nil</td>
<td>4.5/kWh</td>
<td>3000 + 500/kW above 5 KW***</td>
<td>2500/kW</td>
</tr>
<tr>
<td>Prepaid meter (Recharge as per the usage – No upper or lower limit)</td>
<td>Nil</td>
<td>4.5/kWh</td>
<td>Maximum charge – 15,000</td>
<td>3000 (up to 45 kW)</td>
</tr>
</tbody>
</table>

Source: BRPL
* 1 kWh = 1 unit of electricity
**Additional taxes, as applicable
*** Example – If the load requirement is 12kW, then SLD chargers will be 3000 + 500 * (12-5) = Rs 6500

While planning the electrical infrastructure, the RWAs should consider certain key points as mentioned below:

- GHS/RWAs are advised to use the maximum demand indicator (MDI) to decide whether EV charging can be accommodated in the existing sanctioned electricity load. MDI measures the maximum amount of electrical energy required by a specific consumer during a given period of time. MDI can be used to calculate the buffer load (if any) that can be utilised for EV charging. For example, if an RWA has a sanctioned load of 1000KW and the average MDI for last 4 months has been 900 KW, the buffer load of 100KW can be utilized to add EV chargers. The MDI value is mentioned in the electricity bill, please refer Appendix E for details.

- If the average MDI for last 4 consecutive months is almost close to the sanctioned load, then enhancement of the load and the entailing grid upgradation may be required for installation of EV chargers. Consumers can simply reach out to their DISCOM for load feasibility – more details in section 6 of the document.

- If the GHS/RWA has availed LT connection, then the cost of grid augmentation will be borne by the DISCOM.

- If the additional load required for EV charging is less than 100 kW, then 3-phase LT connection would be provided to the society and the cost of grid upgradation will be borne by the DISCOM. The RWA would have to pay the enhanced security deposit and SLD charges.

- If the additional load required for EV charging is between 100 kW and 200 kW, then the RWA can avail either LT connection or HT connection, but the distribution transformer will be mandatorily upgraded for the HT connection.

- If the additional load required for EV charging is more than 200 kW, then upgradation of the distribution transformer would be required at the HT level.
3.4.2 Safety Planning

EV chargers are high power loads that need special attention in terms of safety planning and precautions against fire and non-fire hazards. Fire risk and hazard associated with high energy density Li-ion batteries have become an important safety concern for EVs.

To protect the consumers, EVs and the electrical grid infrastructure from fire and non-fire hazards, the following measures should be undertaken.

- The DISCOM and the consumer should comply with the provisions of the Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2010, as amended from time to time. The “Safety Provisions for Electric Vehicle Charging Stations” have also been provided in the Central Electricity Authority (Measures relating to Safety and Electric Supply) (Amendment) Regulations, 2019\(^\text{14}\). This regulation should be particularly adhered to for the safe installation, operation, and maintenance of the charging points.

- All EV charging points should have a socket-outlet of supply at least 2.6 feet above the finished ground level.

- During the testing of installation of the meter or providing a separate electrical connection for EV charging, if the DISCOM’s representative finds a defect in the consumer’s wiring, the DISCOM shall serve a written notice to the consumer to make modifications that are necessary to render the installation safe. The connection shall be energized only on removal of the defects.

- The EV users should ensure that the compatible adapters and connectors are used for the EV models that would avail the EV charging service. If the stations are manned with personnel, then the RWA should ensure that the personnel are trained to safely operate the EV chargers.

- The RWA should ensure that there are boards/notices clearly displayed at each charge point which would mention the specifications of those charge points. Information on the EV models compatible with the charge points could also be provided through mobile applications in addition to the display boards/notices.

- A cord extension set or a second supply lead should not be used in addition to the connector used by the EV to connect to the EVSE. The EV parking place shall be such that the connection on the EV when parked for charging shall be within five meters from the EV charging point.

- Fire detection, alarm and control system should be provided as per relevant Indian Standards.

- All consumers/RWAs, irrespective of the sanctioned load, should install a suitable device for earth leakage protection within the time as may be notified by the DERC. Also, no new connection shall be energized, unless a suitable earth leakage protection device has been installed.

3.5 Space planning and charger deployment

For planning the space required for EV chargers, it is important to know the dimensions of different types of chargers and the minimum parking space required for different EV segments. The table below summarizes the dimensions and ways of mounting/installing these EV chargers.

Table 4: Types of EV chargers and their approximate dimensions

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Type of Charger</th>
<th>Mounting / Installation</th>
<th>Approx. Dimension in feet (Height x Length x Breadth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>LEV AC</td>
<td>Wall Mounted</td>
<td>1.15 x 1 x 0.5</td>
</tr>
<tr>
<td>2.</td>
<td>AC001</td>
<td>Wall Mounted</td>
<td>2.25 x 1.5 x 0.5</td>
</tr>
<tr>
<td>3.</td>
<td>Type 2 AC (7.4 kW)</td>
<td>Wall Mounted</td>
<td>1.15 x 1.05 x 0.5</td>
</tr>
<tr>
<td>4.</td>
<td>DC001</td>
<td>Plinth Mounted (On ground)</td>
<td>5.25 x 1.6 x 1.15</td>
</tr>
<tr>
<td>5.</td>
<td>CCS / CHAdeMO</td>
<td>Plinth Mounted (On ground)</td>
<td>6 x 2.1 x 1.6</td>
</tr>
</tbody>
</table>

The table below summarizes the average parking space required for different EV segments.

Table 5: EV segments and approximate parking space required

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>EV Segment</th>
<th>Approx. Average parking space required (in sq. feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2-wheeler</td>
<td>6.6 x 3.3</td>
</tr>
<tr>
<td>2.</td>
<td>3-wheeler</td>
<td>9.8 x 6.6</td>
</tr>
<tr>
<td>3.</td>
<td>4-wheeler (Cars only)</td>
<td>16.5 x 8.2</td>
</tr>
</tbody>
</table>
Based on the demand estimation exercise, the RWA could arrive at the appropriate mix of EV chargers and allot the required space. The RWA may consider allotting space for EV chargers in the spare parking area, visitor’s parking area or common facility areas within the society. Below are some of the important points to be kept in mind while finalizing the location:

- The location should preferably be close to the main electrical panel, this will reduce the wiring/cabling costs.
- The parking should either be covered or should preferably not be exposed to direct heat. Excessive heat is not good for charging infrastructure and the vehicle’s battery.
- EV charging space should be easily accessible to residents and visitors.
- If the EV chargers are put in a high-visibility area, it may boost the confidence of the residents and encourage EV uptake.

### 3.6 Charger usage guidelines and maintenance

RWAs may contact their DISCOM for the installation of chargers under the Delhi Government’s single window process *(More details in section 6)*. RWAs may also contact an experienced OEMs or CPOs directly for the installation of the chargers. Once the chargers are installed, RWAs must create clear policies and procedures to ensure optimal usage of the chargers:

- **Demarcation of EV parking**: EV parking should be clearly demarcated by using colour codes and signboards. Penalties for non-EVs being parked in EV parking space may be considered.

- **Access planning**: A well-planned access and usage of EV chargers can play a big role in improving the overall EV charging experience of the residents. In consultation with residents, RWAs can use various methods such as first-come-first-serve, reservation system, priority for EVs with low charging levels etc. EV owners should be able to make a reservation for charging in the parking space through the mobile app. The app should provide information on the availability of chargers, type of charger and the option to reserve the chargers. In the case of gated societies, some EV charging apps can also be integrated with the community management app that the society may be using.

- **Charging etiquette**: RWA should clearly define the charging etiquette and consequences if any damage to the property (charging gun or EVSE) happens. It is a good idea to have an attendant to guide the residents, especially those who are new to EV charging.
- **Moving charged vehicles:** During the night, RWAs may allow the residents to park their vehicle for charging overnight. However, during the daytime, RWAs should set up clear policies around charging time limits (number of hours) and moving the fully charged vehicles.

- **Payment for using EV charger:** Most EV chargers come with integrated payment solutions using RFID cards, mobile wallets etc. These chargers allow tracking the charger usage per user, automatic billing, and bill generation. Some chargers can easily connect to external payment applications to facilitate payment. For the convenience of the users, various payment settlement options such as credit/debit cards, cash options, mobile wallets etc. can be considered.

Along with the optimal usage of chargers, regular maintenance of the EV chargers is equally important. RWAs are recommended to avail a maintenance contract from their EVSE vendor. Most EVSE vendors provide ongoing maintenance contracts for the EVSEs installed by them. EV chargers purchased and installed through Delhi Government’s single window process cover annual maintenance costs for 3 years. If an EV charger is purchased from any other channel, the terms of the maintenance contract may vary depending upon the charger brand, charger type and vendor. RWAs are advised to work with their vendors to establish a warranty and service plan that fits their goals.
Common concerns and their solution
As RWAs proceed to making their societies EV charging friendly, they are likely to encounter some of the below challenges or doubts. Most of these challenges can be resolved through careful planning, cooperation and change in mindset.

Low demand

In India, adoption of EVs is at a nascent stage. This implies that the segment of the population buying electric vehicles is comparatively less. In such a situation, RWAs are usually faced with the question of whether to provide an EV charging facility for a small number of EV users. We urge RWAs not to base their decision on the current number of EVs in society, but also focus on future growth. In the coming years, EVs will mainstream and EV chargers will become a basic amenity. RWAs should not only cater to a set of early adopters but also encourage more residents to adopt EVs to improve the utilization of EV chargers.

Approval of personal EV charging point in single-point connection societies

Societies with single-point electricity connections may be faced with the question of whether to approve the installation of EV chargers meant for personal use. Such RWAs may not be able to provide limitless connectivity to EV owners. RWAs in such societies can resort to installing community chargers which can draw electricity from electricity load meant for society’s common usage. Society may also approve personal EV chargers if the electricity consumption (including EV charger) remains under the sanctioned load of the house. In the future, when the demand grows and cannot be managed within the sanctioned load, RWAs may need to upgrade their electrical infrastructure and charge expenditure as common society expenditure.

Lack of space for community chargers

Identification of the right spots for installing EV chargers is crucial. Several residential societies face the challenge of lack of space for installing EV chargers. Residential societies can initially dedicate a smaller space for charging EVs. Such spaces can be carved out from spare parking lots, visitor’s parking space or space allocated for common usage (gathering, sports etc.). EV chargers are most likely to be used during the night and utilizing a common usage area for EV charging during the night should not be a challenge. All AC chargers are wall mounted, and hence, can be accommodated in very less space.

Capital cost and operating cost allocation

Since most societies currently have a small number of EVs, they may face the dilemma of whether to charge the EV project cost from current EV users or the entire society. RWAs must see EV charger project cost as society’s environmental responsibility and not as an expense to be borne by any individual or group of users. The cost of the project when allocated among all the residential houses (likely to be 200-500) may not be very high. To reduce the financial burden, medium and large size RWAs can try to outsource the installation of EV chargers to CPOs who offer chargers on an ‘energy as a service’ basis. Please refer section 5 for some of the best practices to reduce the overall project cost. For an overview of the cost components, please refer to page 17 of the Delhi Government’s Corporate Charging Guidebook.
Managing the power load

A planned charging approach can allow the installation of more EVSE without the need for connection/sanctioned load upgradation. RWAs should carefully plan the EV charger usage and other common electricity usages so that the total usage is always within the sanctioned limit. Please refer section 3.3.1 for electricity infrastructure planning.

Payment of power cost

It is important that EV users are charged for their respective electricity consumption for EV charging using the community chargers. LEVAC Charger generates a receipt after each charging session and hence can be used to charge the user in post-paid mode. AC001 and DC001 enable you to opt for a prepaid facility before any charging session through a mobile application. Please refer section 3.6 for details on payment solutions.
5 Best practices for RWAs
Usage of electric vehicles and installation of EV chargers is currently at a nascent stage but will mainstream in the coming years. Proper planning at initial stages and adopting some of the best practices can reduce the project cost and improve the overall experience of EV charger usage. We recommend some of the best practices that are listed below:

Safety and Asset Longevity

- EV parking and charging space should be planned in such a way that it minimizes any exposure to extremely high temperatures when the vehicle is parked.
- Many residents may not be aware of the usage of EV chargers. An awareness session with interested residents can help in better handling of the charging equipment. DISCOMs in Delhi are undertaking these awareness exercises and we urge RWAs to coordinate with DISCOMS for the same.
- RWAs can consider deploying CCTV cameras in the EV charging zone to ensure the safety of the asset.
- EV charging area should preferably be away from the children’s play areas. Children should not be allowed in the charging area.

Electric Vehicle Supply Equipment (EVSE) Unit

- Carefully evaluate EVSE financial incentives offered by GNCTD (details in Appendix A).
- Choose the EVSE unit with the minimum level of features needed. Additional features that are not required may just add to the upfront and maintenance cost.
- A wall mounted EVSE minimizes drilling of holes through building structures for routing of electrical conduit and wiring.
- Choose a dual/multi-gun EVSE to minimize installation costs per charge port.
- A planned charging approach can allow the installation of more EVSE without the need for connection/sanctioned load upgradation. RWAs should carefully plan the EV charger usage and other common electricity usages so that the total usage is always within the sanctioned limit.
- RWAs should carefully assess the EV usage and charging habits of the residents. Coordinated charging of EVs will allow accommodating more EVs to be charged by a given number of EVSE.
- RWAs should carefully assess the charging requirements of their residents and select an optimal mix of AC and DC chargers to optimize the overall cost of the project.

Electric Infrastructure

- In the beginning, RWAs should try to accommodate the EV chargers in the existing sanctioned load. Additional power load or a new connection can increase the project cost.
- It is critical to apply for a separate EV meter to avail subsidized tariff for EV charging. Operating on residential/commercial tariffs increases the charging cost.
Long Term Planning

- Residential buildings that are under construction should account for EV charging requirements at the time of construction and apply for electric connection accordingly.
- Also, attention should be paid to future requirement of electricity infrastructure (panels and conduit) during initial construction rather than modifying the structure later.
- Plan for existing quantity and location of EVSE, keeping in mind expansion plan over the next few years.
- When upgrading existing facility for electrical service, also provide infrastructure for future EVSE installations. This will minimize the cost of installing future units.
Purchase and installation of EV chargers through Delhi Government’s single window process
Delhi Government has taken an important and progressive step to create a single-window process for the installation of slow and fast EV chargers in the city. Various private and semi-public spaces, including corporate offices, can use this single-window facility for a hassle-free installation of EV chargers on their premises.

Under the single window process, the Delhi government has authorised the DISCOMs in Delhi, i.e. BRPL, BYPL and TPDDL, to empanel vendors with ARAI certified EV chargers for LEVAC, AC001, and DC001 models. To avail this facility, a consumer can submit a request for EV charger installation and also for a new EV meter connection (if required) directly on its DISCOM’s web portal. After receiving the request, DISCOM arranges a site inspection to assess the feasibility of EV charger deployment at the premise by the EV charger vendor selected by the consumer. This includes parameters such as the distance between the electricity panel and the site, the need for civil work (if any), the availability of a mobile network in the case of a sim-based EV charger, and a few others. If the site is feasible, the request is approved and the consumer is informed about the load enhancement (if required) and the tentative cost of load enhancement (if applicable). Once the request is approved, the vendor deploys the EV charger on the mutually agreed installation date and the consumer makes the payment for the EV charger (net of subsidy). The EV connection request, if any, is taken care of by the DISCOM parallely. The installation and operationalization of these EV chargers is completed within seven working days of submitting the request.

**Image 3: Detailed process flow for installation of chargers through single window portal**

**Option 1: Without separate EV meter connection**

- DISCOM consumer logs on to single window portal and registers request for charger installation
- Consumer receives acknowledgement with contact details of chosen vendor and charger
- Vendor takes appointment from consumer for installation
- On the said date, vendor visits the consumer and installs the charger
- Consumer makes payment (net of GNCTD subsidy) to the vendor – online and offline modes available

**Option 2: With separate EV meter connection**

- DISCOM consumer logs on to single window portal and registers request for charger installation and EV meter connection
- Consumer receives acknowledgement with contact details of chosen vendor and charger
- Vendor takes appointment from consumer for installation
- On the said date, vendor visits the consumer and installs the charger
- Consumer makes payment (net of GNCTD subsidy) to the vendor – online and offline modes available

Installation of EV charger is done within 7 days of registration, subject to appointment confirmation. Meter connection will be done in 7-15 days as per site condition.
Key highlights and benefits provided under the single window process for installation of EV chargers:

- The single window process will be available for installation of AC 001, LEV AC and DC 001 chargers.
- The consumers can get an LEV AC charger for as low as INR 2,500. For the first 30,000 charging points, a 100% subsidy of up to INR 6,000 will be provided on installation of AC 001 and LEV AC chargers. The consumer will pay the charger price after adjusting the subsidy and vendor of the charger will receive the subsidy amount from Delhi Government.
- The subsidy shall be restricted to a maximum of 20 EV charging points or 20% of total parking slots whichever is lesser. If a consumer plans to install more chargers than the given limit, the consumer will have to pay the full price for the additional chargers.
- Consumers would have two payment options to choose from:

  1. **Capex model**: In this model, the consumer makes the complete payment upfront to the EV charger vendor. The payment would include the cost of the charger (net of subsidy and inclusive of GST), charger installation cost (including the cost of wiring up to 5 meters), and annual maintenance contract (AMC) for 3 years.

  2. **Subscription model**: In this model, the total cost to the vendor would be paid by the consumer as equal monthly installments (subscription fee) over 3 years. The payment made to the vendor would include the cost of the EV charger (net of subsidy and charges), installation cost (including cost of wiring up to 5 meters), operational cost and maintenance cost for 3 years. After the full payment of monthly installments, the ownership of the charger will transfer to the customer. Subscription model facility is available only for consumers deploying 10 or more charging points.

Below are the EV charger prices under the two payment models:

**Table 6: EV charger prices under Capex Model**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of charger</th>
<th>Charger price (INR)</th>
<th>Subsidy as per EV policy (INR)</th>
<th>Final Cost to consumers with three-year warranty (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LEVAC</td>
<td>8,375 to 10,480</td>
<td>6,000</td>
<td>2,375 to 4,480</td>
</tr>
<tr>
<td>2</td>
<td>AC001</td>
<td>50,530 to 62,107</td>
<td>18,000</td>
<td>32,530 to 44,107</td>
</tr>
<tr>
<td>3</td>
<td>DC001</td>
<td>2,32,184 to 2,89,030</td>
<td>0</td>
<td>2,32,184 to 2,89,030</td>
</tr>
</tbody>
</table>

**Table 7: EV charger prices under Subscription Model**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of charger</th>
<th>Charger price (INR)</th>
<th>Subscription price per month after subsidy (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LEVAC</td>
<td>8,375 to 10,480</td>
<td>132 to 337</td>
</tr>
<tr>
<td>2</td>
<td>AC001</td>
<td>50,530 to 62,107</td>
<td>1,180 to 4,200</td>
</tr>
<tr>
<td>3</td>
<td>DC001</td>
<td>2,32,184 to 2,89,030</td>
<td>7,472 to 14,680</td>
</tr>
</tbody>
</table>
A consumer can avail the single window facility by either going to the respective DISCOM’s portal or calling the following numbers: 7011931880 or 19123 (option 9) for BRPL; 19124 (option 9) for TPDDL; and 01135999808 for BYPL. Below are the links to DISCOM’s portals.

BRPL: http://bsesbrpl.com/SwitchDelhi/
TPDDL: http://www.tatapower-ddl.com/switchdelhi/
BYPL: https://byplws1.bsesdelhi.com/switchdelhi
Permits, documents and clearances to be submitted by RWAs to DISCOMs
The applicants are required to provide two self-attested documents i.e. ID proof and land ownership proof to apply for EV Charger from the DISCOM’s portal.

Any of the following documents shall be accepted as proof of identity:
- Electoral identity card;
- Passport;
- Driving license;
- Ration card having photograph;
- Aadhar card;
- PAN card;
- Photo identity card issued by any Government agency;
- If the applicant is an organization, certificate of incorporation/ registration issued by the Registrar and proof of authorization /resolution of Board for authorizing the person.

Any of the following documents shall be accepted as the proof of ownership or occupancy of premises:
- Certified copy of title deed;
- Certified copy of registered conveyance deed;
- General Power of Attorney (GPA);
- Allotment letter/possession letter;
- Valid lease agreement along with undertaking that the lease agreement has been signed by the owner or his authorized representative
Solar-powered charging station for electric vehicles
Several residential societies in Delhi have already installed rooftop solar panels and use the electricity generated from solar panels for lighting up the common area in the society. According to BSES, a 5KW solar plant can bring annual savings of INR 46,300\(^{15}\). RWAs may choose to meet the energy requirements of their EV charging station partly or fully through renewable energy sources (typically solar). If the on-site electricity generation through renewable energy sources can meet the power demand only partly, RWAs should arrange for a secondary electricity supply source. However, the feasibility of this option needs to be assessed on a case-to-case basis.

**Advantages of solar-powered charging stations**

- Integration of renewable energy can result in greening the entire EV usage cycle to a large extent
- Solar-powered charging stations reduces the burden on the power utility grid
- A solar-powered charging station acts as a power generating station that could supply energy to a power utility grid. They generate electricity, store in a battery, and can be supplied to the grid during peak hours for load shaving. This benefit can be achieved through net-metering (described below)
- Integration of renewable energy sources can also help in achieving better financial viability

Before installing solar panels, it is crucial to do a pre-installation evaluation to check the feasibility and profitability of installing solar panels at that site. RWAs can consult a solar EPC Company that can manage everything from site survey, financing, solar installation, and service support. As per the DERC guidelines, maximum solar plant capacity should be the Sanctioned Load of the connection. If a consumer wants to install a plant beyond this capacity, he/she needs to pay the additional service line development (SLD) charges as per DERC Guidelines. About 10 square meter area is required to set up a 1 kW grid connected rooftop solar system. The average cost of grid connected rooftop solar systems is about INR 55 per watt\(^1\). For detailed regulations on the installation and safety of solar panels, please visit DERC (Supply Code and Performance Standards) Regulations, 2017. Once the solar panels are installed, RWAs can apply for net metering.

Net metering or net billing enables the deduction of electricity produced on-site using renewable energy from the total electricity consumed in a billing period. This helps lower the society’s electricity bill. The residential society would either need to pay for the difference in units or would get paid by DISCOM for extra units at the end of the billing cycle.

For detailed regulations on net metering connection, please visit Guidelines under DERC (Net Metering for Renewable Energy) Regulations, 2014 and Delhi Electricity Regulatory Commission’s (DERC) website for details. For detailed information on other consumer queries, please visit this link.

Image 3: Illustration of functioning of net metering

Solar panels

EV charging dock

Battery storage

Net meter

DC-AC inverter

DISCOM

Image credit: Handbook of electric vehicle charging infrastructure implementation
Appendix A - Incentives on electric vehicles and EVSE

Below are the highlights of the various incentives provided by GNCTD under Delhi EV Policy. For details, please visit Delhi EV Policy.

- **Purchase incentives:**
  1. 2W – INR 5,000 per kWh of battery capacity per vehicle subject to a maximum of INR 30,000 per vehicle
  2. E-carriers– A purchase Incentive of INR 30,000 to the first 10,000 e-Carriers
  3. E-auto/e-carts – A purchase Incentive of INR 30,000 per vehicle

- **Scrapping incentive** of up to INR 5,000 and INR 7,500 shall be provided to registered owners of electric 2W and e-carriers/e-autos respectively.

- **Road Tax and registration fees** shall be waived for all Battery Electric Vehicles (BEVs) during the period of this policy.

- **Interest rate subvention:** GNCTD shall provide an interest rate subvention of 5% on loans for the purchase of selected categories of Electric Vehicles (EVs) in Delhi.

- **Incentives provided by Delhi Government on charging equipment:**
  GNCTD shall provide a grant of 100% for the purchase of charging equipment up to INR 6000 per charging point for the first 30,000 charging points. Grants shall be available on purchasing AC 001 chargers and LEV AC chargers through the Delhi government.

- **Special electricity tariff:** To encourage adoption of EVs, GNCTD is providing special tariffs for EV charging i.e., INR 4.50 per kWh for Low tension (LT) current and INR 4.00 per KWh for High tension (HT) current (compared to INR 7.75 per kWh for industrial consumption). The government is committed to keeping the electricity tariffs low during the policy period. Click this link to check electricity tariff schedule for FY 2021-22.

- **Lower GST:** In July 2019, GST Council slashed GST on electric vehicles (EVs) to 5% from 12%. It also reduced the GST on EV chargers from 18% to 5%.

All the subsidies provided by GNCTD shall be in addition to the incentives provided under FAME-II policy.
Appendix B – Unified building bye-Laws: Charging infrastructure for electric vehicles

Subject: Regarding providing of Charging Infrastructures for Electric Vehicles as per Unified Building Bye-Laws (UBBL), 2016

Sir,

Please refer to the minutes of the meeting dated 22.01.2021 (copy enclosed) on the subject cited above, which was held on 21.01.2021 under the Chairmanship of the Hon’ble Minister (Power), vide which the following directions as are relevant to the ULBs/DMCs for setting up of Infrastructure for EV Charging relating to all ULBs/DMCs have been issued by the Hon’ble Minister.

i) In terms of UBBL for Delhi, 2016, in all the new constructions, charging infrastructure shall be provided for Electric Vehicles in 20% of all vehicles holding capacity/parking capacity at the premises covered under UBBL.

ii) Semi-public spaces like existing commercial and institutional buildings including malls, shopping complexes, cinema halls/multiplexes, office spaces, hotels, restaurants, hospitals etc., having a parking capacity of more than 100 vehicles be mandated to set aside at least 5% of the total vehicle capacity for EVs fitted with suitable EV chargers at the minimum slow chargers with 3.3 KW output.

In view of the above, directions are issued to all ULBs/DMCs for implementation of the decisions taken in the minutes of the meeting.

This may be accorded TOP PRIORITY Please.

Yours faithfully,

Encl: As above

Appu Kumar
Dy. Director (LB-I)
Appendix C – Sample survey questionnaire

1. Do you own an electric vehicle? If yes, share the details.
   a. Yes     b. No
   Make: _____________   Model: ____________ Battery Range: ________

2. Are you considering to purchase an electric vehicle?
   a. Yes, I’m considering to purchase in the next 6 months
   b. Yes, I’m considering to purchase in 12-24 months
   c. Yes, I’m considering to purchase but I’m not sure when
   d. No

3. Please share the details of EV that you plan to buy in the next 6-12 months
   Vehicle type:    2W              4W
   Make: _____________   Model: ____________   Battery Range: ________

4. How long are your daily trips (one-way)?
   a. Less than 10 kms   c. 26-50 kms
   b. 10-25 kms   d. More than 50 kms

5. What is your vehicle charging pattern?
   a. I will charge my vehicle daily and only during the night
   b. I can charge my vehicle during the day
   c. I need to charge my vehicle once in 2-3 days
   d. If any other, please describe_______________

6. Do you think we should install community EV charging stations in our society?
   a. Yes     b. No

7. If an EV charging station is installed in the society, would you use it?
   a. Yes     b. No

8. Do you have any regular visitor who owns an EV and may use the EV charger installed in the society? If yes, share the details.
   Vehicle type:    2W              4W
   a. Yes     b. No
   Make: _____________   Model: ____________ Battery Range: ________

9. Would having access to an EV charging station in the society increase the probability that you would purchase an EV in the future?
   a. Yes     b. No
## Appendix D - Types of chargers and charging time

### Table 8: AC and DC chargers and their features

<table>
<thead>
<tr>
<th>EV charger name</th>
<th>Output type</th>
<th>Power output</th>
<th>Input voltage</th>
<th>No. of guns</th>
<th>Socket type</th>
<th>Compatible with EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEV AC</td>
<td>AC charger</td>
<td>3.3 KW</td>
<td>230 V AC, Single Phase, 50 Hz</td>
<td>1</td>
<td>IS-60309</td>
<td>2W, 3W, legacy/first era 4W (Tata Tigor, Mahindra e-Verito, Mahindra e20) and advanced 4W models using portable charger provided by OEMs</td>
</tr>
<tr>
<td>Bharat AC001</td>
<td>AC charger</td>
<td>3*3.3 KW</td>
<td>415V, three phase AC</td>
<td>3</td>
<td>IS-60309</td>
<td>2W, 3W, legacy/first era 4W and advanced 4W models (using portable charger provided by OEMs)</td>
</tr>
<tr>
<td>Type 2 AC</td>
<td>AC charger</td>
<td>7.4 and 22KW</td>
<td>7.4 KW – 230V, single phase AC</td>
<td>1</td>
<td>IS-17017-2-2</td>
<td>Capable of charging legacy 4W as well as most of the existing and future EV models</td>
</tr>
<tr>
<td>Bharat DC 001</td>
<td>DC charger</td>
<td>10KW/15KW</td>
<td>415V, three phase AC</td>
<td>1 or 2</td>
<td>GB/T 20234.3</td>
<td>Capable of charging Tata Tigor EV, Mahindra e-Verito, small buses and vans</td>
</tr>
<tr>
<td>CCS</td>
<td>DC charger</td>
<td>25-150KW</td>
<td>415V, three phase AC</td>
<td>1</td>
<td>IS-17017-2-3, Configuration FF</td>
<td>Tata Nexon, Hyundai Kona, MG ZS EV</td>
</tr>
<tr>
<td>CHAdeMO^1</td>
<td>DC charger</td>
<td>25-150KW</td>
<td>415V, three phase AC</td>
<td>1</td>
<td>IS-17017-2-3, Configuration AA</td>
<td>Used by several manufacturers – Hyundai, Kia, BMW, Audi, Mercedes, MG, Jaguar, Mini, Peugeot, Vauxhall / Opel, Citroen, Nissan, and VW</td>
</tr>
</tbody>
</table>

**Page notes:**

2. CCS and CHAdeMO are available as individual machines as well as in combination. Some manufacturers also customize the chargers as per the requirement of the charging station operations.

3. Most EVs have an on-board charger that converts AC current to DC current as all batteries require DC power to charge. None of the existing and upcoming models in India have an on-board charger that has capacity to utilize a 22 KW AC charging.
Below are the details of vehicles segments and typical charging time required.

Table 9: Electric vehicle segment and their charging time

<table>
<thead>
<tr>
<th>Vehicle segment</th>
<th>Battery capacity</th>
<th>Battery voltage</th>
<th>Approx. charging time</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-2W (Onboard charger &lt; 3 kW)</td>
<td>1.2- 4.0 kWh</td>
<td>48-72V</td>
<td>Fast charge: ~1 hour (not applicable for all 2W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slow charge: ~5 hours</td>
</tr>
<tr>
<td>E-3W (Onboard charger &lt; 3 kW)</td>
<td>3.6-8 kWh</td>
<td>48-60 V</td>
<td>4-5 hours</td>
</tr>
<tr>
<td>E-Cars (1st generation) (Onboard charger &lt; 3 kW)</td>
<td>11 - 21 kWh</td>
<td>48-72 V</td>
<td>Fast charging: 1- 2 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slow charging: 5 – 8 hours</td>
</tr>
<tr>
<td>E-Cars (2nd generation) (Onboard charger 3 – 11 kW)</td>
<td>30-80 kWh</td>
<td>350-500 V</td>
<td>Fast charging: 1 hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slow charge: 6-8 hours</td>
</tr>
</tbody>
</table>
Appendix E – Sample electricity bill

[Image of an electricity bill]
Residential EV Charging Guidebook