Workplace Charging Guidebook

A guidebook for employers on planning, installing, and managing electric vehicle charging at the workplace in Delhi

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2W: two-wheeler
3W: three-wheeler
4W: four-wheeler
AC: Alternate current
Amp: Ampere (base unit of electric current)
AMC: Annual maintenance contract
BEVC: Bharat electric vehicle charger
BIS: Bureau of Indian Standards
BRPL: BSES Rajdhani Power Limited
BYPL: BSES Yamuna Power Limited
CCS: Combined Charging System
CSMS: Charging station management system
DC: Direct current
DDC: Dialogue and Development Commission of Delhi
DERC: Delhi Electricity Regulatory Commission
DISCOM: Distribution companies
EV: Electric vehicle
EVSE: Electric vehicle supply equipment
GNCTD: The Government of National Capital Territory of Delhi
GST: Goods and service tax
HT: High tension
ICE: Internal combustion engine
IEC: International Electrotechnical Council
IESA: India Energy Storage Alliance
INR: Indian national currency
KW: Kilowatt
LEV: Light electric vehicle
LT: Low tension
OCPP: Open Charge Point Protocol
SLD: Service line development
TPDDL: Tata Power Delhi Distribution Limited
V: Volt (unit of potential difference, voltage, and electromotive force)

1 Introduction

Image credit: Sophie Jonas/Unsplash

Image credit: Mohd Aram/Unsplash

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[1] in the city. The Policy aims to improve Delhi's air quality by driving rapid adoption of electric vehicles with the goal of reaching 25% of all new vehicle sales by 2024. The GNCTD has undertaken various initiatives and progressive steps to move towards this vision. One such innovative and first in the country step is Delhi Government's recent launch of single-window facility for installation of charging points for electric vehicles in private and semi-public spaces in the city.

Through this guidebook, GNCTD seeks to encourage corporates, based out of Delhi, to join hands with the Delhi Government in promoting electric vehicles by adopting workplace charging for electric vehicles. Various research shows that many corporate employees are willing to switch to EVs if there is a sound charging infrastructure[2] at their workplace[3]. According to various estimates, about 90% of the electric vehicle charging happens at home or at workplace. Typically, the vehicles used by employees, to get to and from the workplace, sit idle in the parking lot of the workplace. This time can be utilized by the employees to charge their vehicles. In March 2021, Delhi Government directed all commercial establishments and institutions having a parking capacity of 100 vehicles or more to reserve 5%[4] of their parking space for electric vehicles.

This document guides corporates in assessing the scope for workplace charging, details the processes involved for effective decision-making and sets out the way forward for the planning and implementation of EV charging stations at workplaces.

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.

2. Charging infrastructure, otherwise known as Electric Vehicle Supply Equipment (EVSE), provide a power source for electric vehicles to recharge their batteries.

3. [Workplace Charging | Department of Energy]

4. As per the amended Unified Building Byelaw (UBBL), 20% of all parking capacity of new constructions must provide charging infrastructure for EVs. Existing buildings which have a parking capacity of more than 100 vehicles are also directed to set aside 5% of the capacity for EVs.

2 Need for workplace charging program

Image credit: Michael Fousert/Unsplash

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. Electric vehicles are the future, and corporates must anticipate and prepare in advance to be a part of this growing market. Here are the reasons why corporates should focus on workplace EV charging facilities:

- Workplace charging will become a necessity in the future and employees will expect charging solutions. This trend can already be seen in many EV-rich countries.
- The availability of workplace charging can increase the visibility of an organization's commitment to sustainability and position the employer as a green and clean energy user.
- Workplace charging can improve employee retention. EVs can increase monthly savings for employees as the maintenance cost of an EV is lower as compared to an ICE vehicle. Also, provision of charging facility at the workplace can serve as an additional perk/ benefit for employees.

Benefit for employees:

- Workplace charging can help reduce the issue of range anxiety – i.e., the fear that a vehicle battery will discharge before the destination is reached with no scope for charging en route. Offering charging at the workplace can potentially double the driving range.
- Workplace charging can provide charging to employees who may not have residential charging access.
- Workplace charging may encourage employees to shift to EVs and avail the cost savings in the form of lower maintenance cost of the vehicle.

Social benefits:

- Workplace charging may help in the greater adoption of EVs and benefit society by contributing to cleaner air.

3 Steps to create an action plan to bring EV charging to your workplace

1. Create awareness among employees
2. Assess the need for charging
3. Select the right EV charger
4. Determine quantity of chargers
5. Identify optimal site
6. Budgeting & installing
7. Devise usage policies
8. Ongoing maintenance

3.1 Create awareness among employees

Lack of awareness is one of the major barriers to EV adoption. To make workplace charging program a success, employers must first and foremost create awareness among employees about the benefits of switching to electric vehicles. Employers can organize a staff meeting or a webinar to discuss the environmental benefits of adopting electric vehicles, total cost of ownership etc. The following tools/information may also come handy for creating awareness among employees:

- Total Cost of Ownership Evaluator to compare ownership cost of electric vehicle against an ICE vehicle
- Incentives provided by the government on purchase of EVs (see Appendix-A)
- Employees need to be made aware of the existing public charging infrastructure in Delhi
- Employers can also encourage employees to take the Switch Delhi Pledge

3.2 Assess the need for EV charging at your company

It is important to evaluate and gauge potential employee demand for workplace charging. One way to evaluate demand is through an employee survey (see Appendix-B), which can give a clearer picture on how many employees already have an EV, or plan to buy an EV, and thus would potentially utilize workplace chargers. Once the survey is done, it should be evaluated to determine necessary details, such as:

- Number of EVs that need to be served
- Vehicle models that need to be served and their charging requirements
- Potential future demand for EV charging

Moreover, employers should also add the EV charging requirements of their own EV fleet (if any), potential external EVs (official visitors/clients etc.), and any EVs that they plan to buy in the future.

Even in the cases where the current demand for workplace charging in the organization is low, we encourage employers to adopt workplace charging to support transition of 25% of the employees to EVs in future.

3.3 Select the right EV chargers

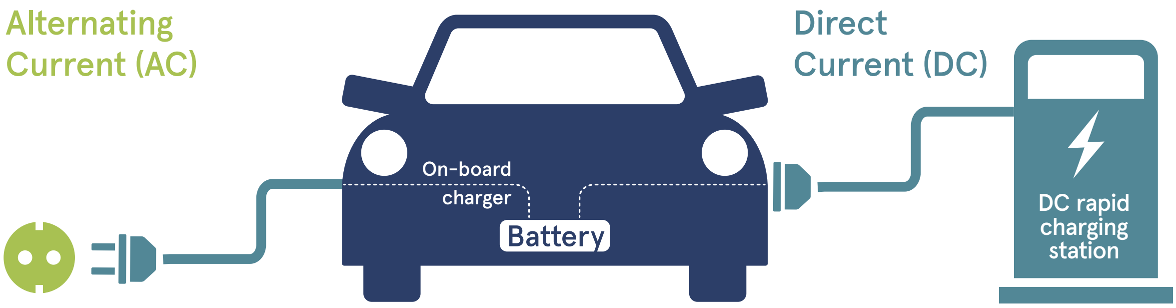
The next important step in the process of adopting workplace charging is selecting a charging level. There are various factors that should be considered while selecting a charging level:

- **Demand for charging:** If the number of employees showing interest in using EV charging stations is low, then AC charging should typically be adopted.
- **EV models:** Different EV models and segments have different charging requirements. Employers should carefully assess the existing EV models used by their employees and new models that they may need to cater to in future. Employers are recommended to have a good mix of charger types that can cater to existing and future demand.
- **Cost:** AC chargers are less expensive and a cost-effective method for a trial-run, whereas DC chargers are expensive and should be considered if there is high demand and fast charging is required. Please see section 3.6 for details on cost components.
- **Commuting distance of the employees:** Fast chargers should be considered if the EV fleet used by the employer is operational throughout the day or the employees commute long distance. Otherwise, AC chargers are sufficient for EVs that are parked throughout the workday. However, to serve a given number of EVs at the workplace, number of slow chargers required would be higher compared to fast chargers.
- **Sanctioned electricity load:** In most cases, AC chargers can be accommodated in the existing sanctioned power load. DC chargers may require an increase in the sanctioned power load, for which employers are advised to check the feasibility from DISCOM before taking the decision.

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.

AC Chargers: All batteries require DC power to charge. AC charger provides AC power from the grid to EV's onboard charger, 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 employers are advised to check the feasibility from DISCOM before taking the decision.

Image 2: AC and DC charging process



Putting AC chargers is a low-cost strategy which can be used as a trial-run to gauge employee interest. It is an ideal strategy to provide an EV charging facility to employees when there is low demand, and the commuting distance of the employees is less. AC chargers can provide sufficient charging for most EVs that are parked throughout the workday. The main types of AC chargers in India are:

1. **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.

2. **LEV AC chargers**
   These are low-cost AC chargers that can be installed with a 230 V AC, single-phase electricity connection as well. These are single phase chargers that cost lower compared to AC 001 chargers.

3. **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 4Ws (such as Mahindra e2s and Tata Tigor). A Bharat AC 001 charger costs ~INR 50,000.

4. **Fast AC charging**
   Most upgraded and high-capacity EV models available in India have on board chargers with higher power ratings which enables AC charging at a faster rate with AC Type 2 charger (7.7 kw to 22 kw). These chargers can cost about INR 1,25,000.

DC Chargers: Unlike AC chargers, DC chargers have an AC to DC power converter inside the electric vehicle supply equipment (EVSE) itself, which directly feeds DC power to the EV's battery. DC chargers are high-capacity chargers which are utilized for fast charging of the vehicle. DC fast chargers can serve multiple vehicles throughout the day. However, a DC charger is a freestanding unit which is costly and requires more space. The major categories of DC chargers in India are:

1. **Low voltage DC charging**
   Bureau of Indian Standards (BIS) has recently adopted an International Electrotechnical Council (IEC) standard for low voltage DC charging. The standard provides the requirements for the control and the communication between DC EV supply equipment for a Light EV to supply up to 120 V DC and current up to 100A DC. Low voltage DC chargers are not very popular yet, however, they are expected to become a popular low-cost DC charging solution in future.

2. **Level 1 DC Chargers**
   These chargers have an output voltage of 48V/60V/72V and come with power outputs of 10kW/15kW 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.

3. **Level 2 DC Chargers**
   These chargers have an output voltage up to 1000V and come with power outputs of 25kW to 150kW. CCS and CHAdeMO are the most popular Level 2 DC Chargers. CHAdeMO is used by Japanese 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.

Below are the details of the popular AC and DC chargers available in India:

***Table 1:** AC and DC chargers and their features*

EV charger name	Output type	Power output	Input voltage	No. of output guns	Connector type	Compatible with EV
LEV AC	AC charger	3.3 KW	230 V AC, Single Phase, 50 Hz	1	EC 60309-1:2002	2W, 3W, legacy/first era 4W (Tata Tigor, Mahindra e-Verito, Mahindra e20) and advanced 4W models (using portable charger provided by OEMs)
Bharat AC001	AC charger	3*3.3 KW	415V, three phase AC	3	IEC 60309	2W, 3W, legacy/first era 4W and advanced 4W models (using portable charger provided by OEMs)
Type 2 AC	AC charger	7.4 and 22KW	7.4 KW - 230V, single phase AC 22 KW - 415V, three phase AC	1	IEC 62196	2W[1], 3W and 4W Capable of charging legacy 4W as well as most of the existing and future EV models 7.4KW charger is enough for all existing and upcoming car models 22KW charger is not compatible with car types currently available in Indian market[3]. However, these chargers may be useful when cars with higher on-board capacity are available in India in future
Bharat DC 001	DC charger	10KW/15KW	415V, three phase AC	1 or 2	GB/T 20234	Tata e-Tigor & Mahindra e-Verito Small buses and vans
CCS[2]	DC charger	25-150KW	415V, three phase AC	1	CCS connector	Tata Nexon, Hyundai Kona, MG ZS EV Manufacturers use these charges on their new models that include Hyundai, Kia, BMW, Audi, Mercedes, MG, Jaguar, Mini, Peugeot, Vauxhall/Opel, Citroen, Nissan, and VW Vehicles with CCS2 connectors can be charged using Type 2 AC connectors as well
CHAdeMO2	DC charger	25-150KW	415V, three phase AC	1	CHAdeMO connector	Used by Japanese manufacturers Vehicles with CHAdeMO sockets, always have another charging socket next to it, which mostly is Type 2 AC Presently there are no car models in India that are compatible with CHAdeMO

1. Type-2 AC is capable of charging e-2W/3W with the provision of an adapter.

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 2: Electric vehicle segments and their charging time

Vehicle segment	Battery capacity	Battery voltage	Approx. charging time
E-2W	1.2-3.3 kWh	48-72V	Fast charge: ~1 hour (not applicable for all 2W) Slow charge: ~5 hours
E-3W	3.6-8 kWh	48-60 V	4-5 hours
E-Cars (1st generation)	11 - 21 kWh	72 V	Fast charge: 1- 2 hours Slow charge: 5 – 8 hours
E-Cars (2nd generation)	30-80 kWh	350-500 V	Fast charge: 1 hour Slow charge: 6-8 hours

3.4 Determine quantity of EV chargers

Determining the quantity of charging stations is another important step. Installing too many chargers will inflate the cost, and installing fewer chargers will create scheduling and access issues and discourage EV use. The number of installed EV charging stations should aim to serve existing EVs and provide for some additional demand in the future. Through the survey conducted in step-2, employers can gauge the interest of employees to purchase EVs in future.

Several researches suggest that fast charging a vehicle's battery on continuous basis depletes the battery life. Employers are suggested to keep this factor in mind and choose a combination of AC and DC chargers to maximise the life of the battery of the vehicles. As per industry experts, a vehicle should not be fast charged more than 30% of the time.

Are there any restrictions on number and type of chargers that can be selected for workplace EV charging stations?

For workplace EV charging, there is no restriction on number and type of chargers that can be selected.

3.5 Identify optimal site for charging stations

The charging station location plays a major role in determining the costs and user policy. The following points should be taken into consideration before selecting a space to set up an EV charging station:

- Minimizing the distance from the EVSE to the existing electrical service panel will reduce installation costs.
- EV charging space must be safe and easily accessible to all drivers. EV drivers require additional space for manoeuvring around a parking space to connect and disconnect from the charger.
- It is recommended to have designated space for EVs. Clear signages and green paint may be used to communicating the spaces designated for EVs.
- Placing the charging station in a prime location near their entrance may bolster a company's green image and encourage EV uptake.
- To accommodate growing demand, employers may need to upgrade the facility's electrical service, and pre-wire their parking lot to plan for future expansion. The power capacity of the wiring would depend on the type of chargers that the employer plans to install in the future. Employers are recommended to calculate expected future demand based on an employee survey and consult their EVSE installation company for pre-wiring.

Please refer Appendix – C for sample floor plan of an EV charging station. You may customize the floor plan to suit your requirement.

Image credit: Michael Fousert/Unsplash

3.6 Budgeting and installing EVSE

Employers should consult a professional EV installation company who can first assess the site and then help the employer with cost estimation and installation.

Major cost components to be considered:

- **EVSE unit:** The cost of AC chargers can vary between INR 4,000 to INR 1,50,000 per charger, depending on the brand, capacity, and features. The cost of a DC charger can vary between INR 2,50,000 to INR 15,00,000. Delhi Government has launched a single-window process for hassle-free purchase and installation of EV chargers in private and semi-public spaces. This single window process allows people to apply online to get an EV charger installed, net of Delhi Government subsidy. The GNCTD provides a grant of 100% for the purchase of charging equipment up to INR 6000 per charging point for the first 30,000 charging points. Please see section 5 of the document for details on purchase and installation of EV chargers through Delhi Government's single window process. EV chargers can also be purchased directly from manufacturers and online marketplaces.

- **Electricity connection:** Some of the major cost components are:

  1. **New electricity connection:** Employers must assess the existing electrical demand on the premises and whether the extra EV load can be accommodated in the existing system. If the increase in electricity demand is more than the contracted power limit, then the employer must contact the grid operator to check for the available capacity and apply for a new connection or connection augmentation. A security deposit of INR 2,500 per KW needs to be paid for new connection/ connection augmentation. In most cases, putting AC chargers or a low-capacity DC charger, may not require an increase in electricity load. Employers can also opt for pre-paid connection (up to 44 KW) which is available with a fixed security deposit of INR 3,000 per connection.

  2. **Transformer:** If the electricity demand exceeds 100 KW, installation of a separate transformer may be required.

  3. **Meter, cabling and MCB boxes:** It is recommended to have a separate meter for EV chargers to avail the tariff concession from the Delhi Government. The cost of cabling will largely depend on the distance of EVSE from the existing electrical service panel. Under Delhi Government's single window process, cabling cost of 5 meters is covered in the EVSE cost. Employers should also install a main switch (MCB) & safety device for each charger.

4 **Electricity cost:** To encourage adoption of EVs, GNCTD is providing special tariffs for EV charging in FY 2020-21 – 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 kVAh 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 2020-21.

5 **Other charges:** The employer would also need to pay road restoration charges, and service line and development (SLD) charges. Please see this document for more details.

- Civil work: Cost of civil work varies depending upon the site and type of civil work. The major components of civil work are:

1 **Concrete foundation for DC chargers:** While AC chargers are wall-mounted, DC chargers are free-standing units that require a concrete foundation base.

2 **Shed:** Employers are advised to install a shed to protect their EVSE in case of open parking.

3 Other expenses such as painting, signboards etc.

- EVSE management software: It is recommended that employers also put EVSE management software for communication between vehicle and charging stations. It will also help in collecting user data and making the system safer. Some vendors provide Charging Station Management System (CSMS) with the EVSE. Below are the communication features of some major chargers:

1 AC001 can only communicate with the CSMS but cannot communicate with EV

2 Type 2 AC chargers can communicate with CSMS and EVs

3 All DC chargers can communicate with CSMS and EVs

Image 3: Illustration of functioning of open communication protocol

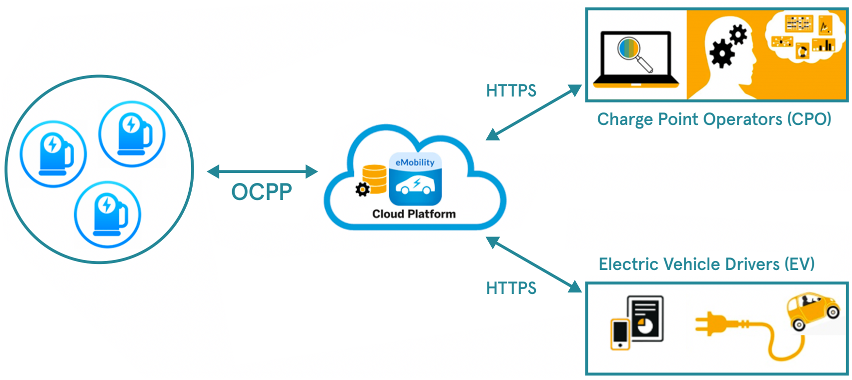


Image credit: Chargeangels.fr

Image notes:.

OCPP is an open communication protocol that allows the EV charging stations and the Charging Station Management System (CSMS) to communicate with each other. CSMS is a cloud-based backend system managed by the charging station operator. Some of the operations supported through OCPP are smart charging, authorizing the EV user to start charging, EVSE fault diagnosis, Reservation of charging time slot etc

Given below are a few scenarios that employers operate in and how cost will be impacted given these scenarios:

Table 3: EV charging station cost impact in different scenarios

Scenario	How will it impact the cost
Owned space	No impact on the overall cost of installing EV chargers
Leased space	If the employer operates on leased/rented space, it will not impact the cost of installing EV chargers. However, the employer should have an agreement with the property owner to install EV chargers. It is preferred to have a long-term agreement (~10 years) as the life of EV chargers is about 10 years. Employers can also consider entering a cost and revenue sharing model with the property owner
Shared parking space	In case of shared parking space, employers (who share the space) can appoint a common charging point operator and agree to share the cost of installing EV chargers, devise a clear usage policy, and revenue model

How can the cost of the Electric Vehicle Supply Equipment (EVSE) be optimized?

It is easy to optimize the cost of EVSE if the following points are kept in mind:

1. Choose the EVSE unit with the minimum level of features needed. Additional features may add to the cost
2. Go for AC chargers (unless DC charging is absolutely required), they are a lot cheaper than DC chargers
3. AC chargers also minimize the cost of installation and maintenance

3.7 Devise usage policies

Employers must create clear policies and procedures to ensure optimal and fair charging without the company incurring unnecessary costs to install additional stations.

- **Parking usage etiquette:** Employers should reserve parking for electric vehicles. These parking spaces should be demarcated by using colour codes and signboards. Penalties for non-EVs being parked in EV parking space may be considered.

- **Access priority:** Access priority should be clearly defined. Various methods can be used such as first-come, first served, reservation system, priority for EVs with low charging level etc. Employers may also use a mobile application to manage charging station access.

- **Moving charged vehicles:** The employer should set up clear policies around charging time limits (e.g., number of hours), moving and parking of fully charged vehicles. Employers can consider implementing time-based penalty once the vehicle battery is charged to 80%[1] of its total capacity.

- **Charging etiquette:** Establishing protocols will help users understand when is it appropriate to disconnect an EV so another EV owner can use the charging station. Procedures or consequences should be devised and enforced when conventional vehicles are parked in charging station spaces.

- **Payment options for using charging stations:** Employers may choose to provide free EV charging as part of their employee benefits or charge their employees for EV charging. In case of free charging, clear policies must be laid down to avoid misuse of the facility. Employers may choose from various payment options – Pay for time, pay for energy consumed or on a membership basis. Most EV chargers come with integrated payment solutions using RFID cards, mobile wallets etc. Some chargers can easily connect to external payment applications to facilitate payment. Employers can choose from various payment settlement options such as prepaid cards, credit/debit cards, cell phone credits, cash option, mobile wallets, reward points etc.

Page notes:.

1. In most cases, once a battery charge reaches 80%, charging of remaining 20% of the battery takes a lot of time. This is because of the constant voltage phase (CV phase). CV phase often starts when the battery is 80% charged, however, it can vary slightly depending on the electric components, the battery, and other factors.

3.8 Ongoing maintenance of EVSE

Employers can choose to maintain and operate their chargers themselves or avail a maintenance contract from their vendor. Most EVSE vendors provide ongoing maintenance contracts for the EVSEs installed by them. Given below are some of the points that should be kept in mind before selecting EVSE maintenance contract:

- 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. Employers are advised to work with their vendors to establish a warranty and service plan that fits their goals.

- A networked charging station provides notifications of system faults or issues that should be promptly addressed, while non-networked stations must be manually inspected regularly to ensure they are working properly.

- DC fast charger units require more maintenance because they have cooling systems, filters, and other components. Hence maintenance cost of DC chargers is usually more than AC chargers.

Image credit: Andrew Roberts/Unsplash

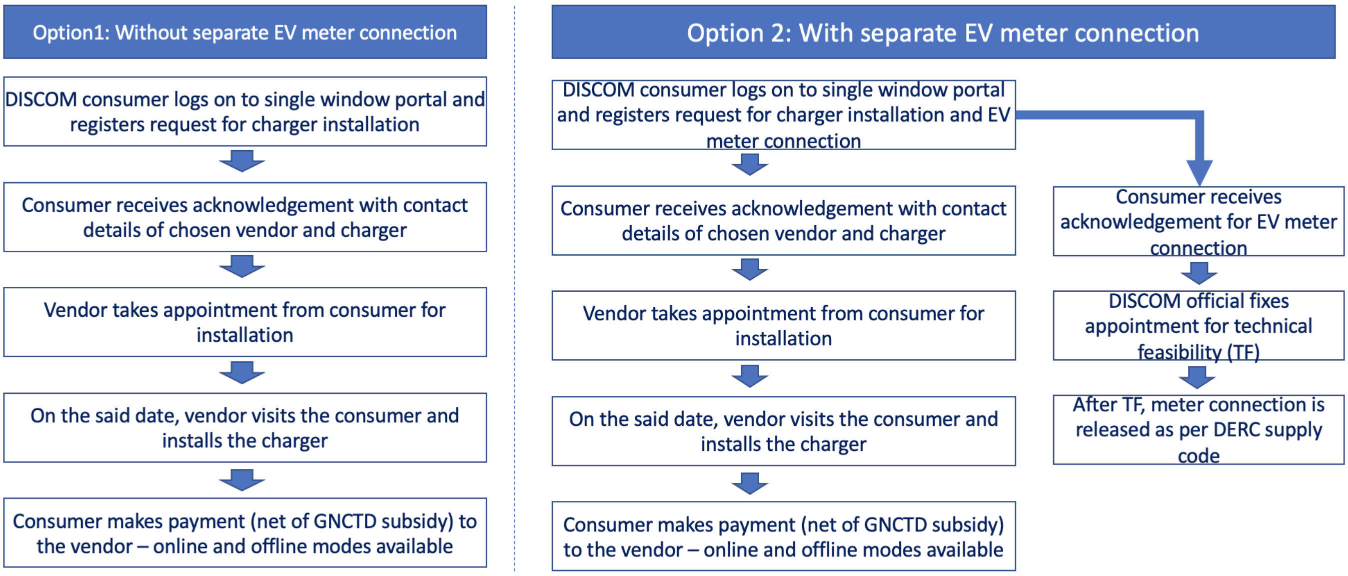
4 Purchase and installation of EV chargers through Delhi Government's single window process

Image credit: Tommy Krombacher/Unsplash

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, a consumer can submit request for new electricity connection (if required) and EV charger installation on its DISCOM's portal. After receiving the request, DISCOM assesses if there is load availability on the premise. If the load is available, both the request for the charger and the request for the new connection gets approved. If not, the consumer is informed that load enhancement is required, and the tentative cost of load enhancement is shared with the consumer. Consumer shall make the payment for EV charger once the request is approved. Post payment, DISCOM will install EV connection and EV meter at consumer's premises and EV charger vendor will install the EV charger(s).

Image 4: *Process flow for installation of chargers through single window portal*



Note: 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.

- The single window process will be available for installation of Type 1 AC 001, LEV AC and DC 001 chargers.

- For the first 30,000 charging points, a 100% subsidy of up to INR 6,000 will be provided on installation of Type 1 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 number of EV 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 cost of charger (net of subsidy and inclusive of GST), charger installation cost (including 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.

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

Table 4: EV charger prices under Capex Model

S. No	Type of charger	Charger price (INR)	Subsidy as per EV policy (INR)	Final Cost to consumers with three year warranty (INR)
1	LEVAC	8,495 to 10,530	6,000	2,495 to 4,530
2	AC001	50,530 to 62,107	18,000	32,530 to 44,107
3	DC001	2,32,184 to 2,89,030	0	2,32,184 to 2,89,030

Table 5: Table 4: EV charger prices under Subscription Model

S. No	Type of charger	Subscription price per month after subsidy (INR)
1	LEVAC	132 to 337
2	AC001	1,180 to 4,200
3	DC001	7,472 to 14,680

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/

5 Solar-powered charging station for electric vehicles

Image credit: Kindel Media/Pexels

Employers may choose to meet the energy requirements of their workplace charging station partly or fully through renewable energy sources (typically solar). If the on-site electricity generation through renewable energy source can meet the power demand only partly, the employer should arrange for a secondary electricity supply source. However, the feasibility of this option needs to be assessed on a case-by-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 that could be stored in a battery and subsequently be supplied to the grid during peak hours for load shaving. This benefit can be achieved through net-metering.
- 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 feasibility and profitability of installing solar panels at that site. Employers 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 plant beyond this capacity, he/she needs to pay the additional SLD charges as per DERC Guidelines. About 10 square meter area is required to set up 1 kWp grid connected rooftop solar system. The average cost of grid connected rooftop solar systems is about INR 55 per watt. For detailed regulations on installation and safety of solar panels, please visit DERC (Supply Code and Performance Standards) Regulations, 2017. Once the solar panels are installed, employers 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 can help lower the employer's electricity bill. The employer 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, 2019 and Delhi Electricity Regulatory Commission's (DERC) website for details.

Image 5: *Illustration of functioning of net metering*

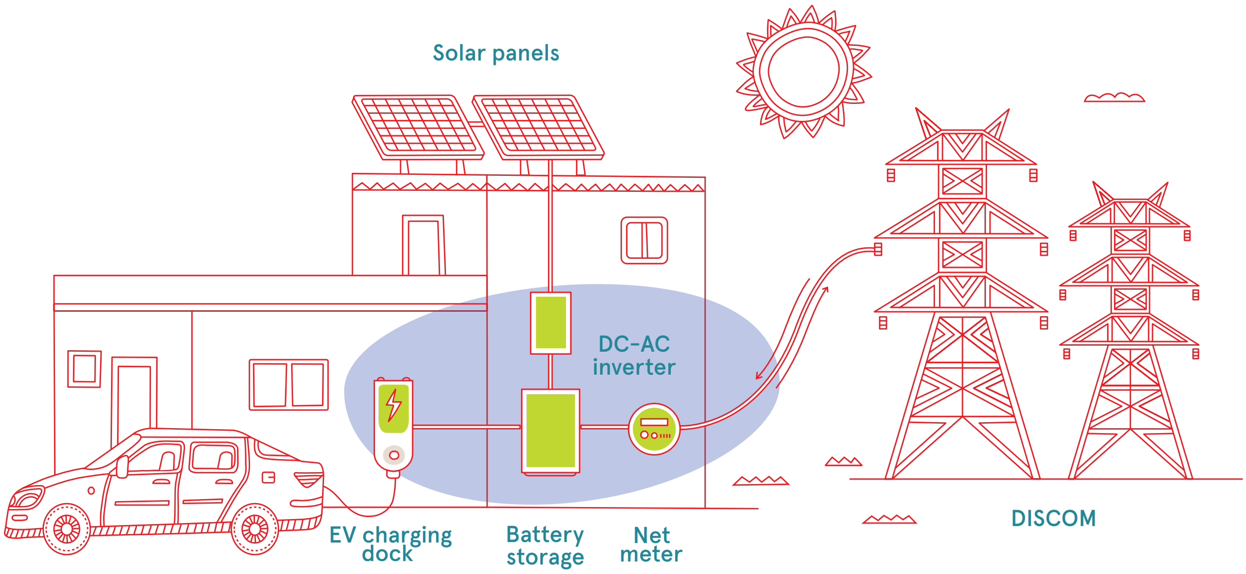


Image credit: Handbook of electric vehicle chasrging infrastructure implementation

A

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 vehicles
  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 e-autos/e-carts/e-carriers.
- **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 Type 1 AC 001 chargers and LEV AC chargers through Delhi Government.
- **Special electricity tariff:**
  Special tariff concession is available to all Private Charging Points that are BEVC-AC001 compliant and are connected to the Central Management System (CMS) of the relevant DISCOM.

  All the subsidies provided by GNCTD shall be in addition to the incentives provided under FAME- II policy

Additionally, in July 2019, GST Council slashed GST on EVs to 5% from 12%. It also reduced the GST on EV chargers from 18% to 5%.

B

Appendix B - Sample Employee Survey for Workplace Charging Planning

1. How do you typically commute to work?

a. Walk
b. Bus
c. Carpool
d. Bike/scooter
e. Car
f. Metro/train
g. Three-wheeler
h. Taxi

2. If you drive to work, approximately how far is your trip (one-way)?

a. Less than 10 kms
b. 10-25 kms
c. 26-50 kms
d. More than 50 kms

3. Throughout the workday, what is your usual travel pattern?

a. I stay at the worksite and do not move my vehicle
b. I leave the worksite and move my vehicle once per day
c. I leave the worksite and move my vehicle more than once per day

4. Do you own an electric vehicle that you use to commute to work? If yes, share the details.

a. Yes
b. No

Make: _____________ Model: ____________ Battery Range: ________

5. Do you own or are you considering purchasing an electric vehicle?

a. Yes, I'm considering purchasing in the next 6 months
b. Yes, I'm considering purchasing in 12-24 months
c. Yes, I'm considering purchasing but I'm not sure when
d. No

6. Do you have a charging station at your residence?

a. Yes
b. No

7. Do you think we should install electric vehicle charging stations for employees?

a. Yes
b. No

8. If an EV charging station is installed at your workplace, would you use it?

a. Yes
b. No

9. Would having access to an electric vehicle charging station at the workplace increase the probability that you would purchase an electric vehicle in the future?

a. Yes
b. No

C

Appendix C – Sample floor plan for an EV charging station

Charging station layout for off-street perpendicular parking – floor mounted sockets

Image 6: Charging station layout for off-street perpendicular parking – floor mounted sockets

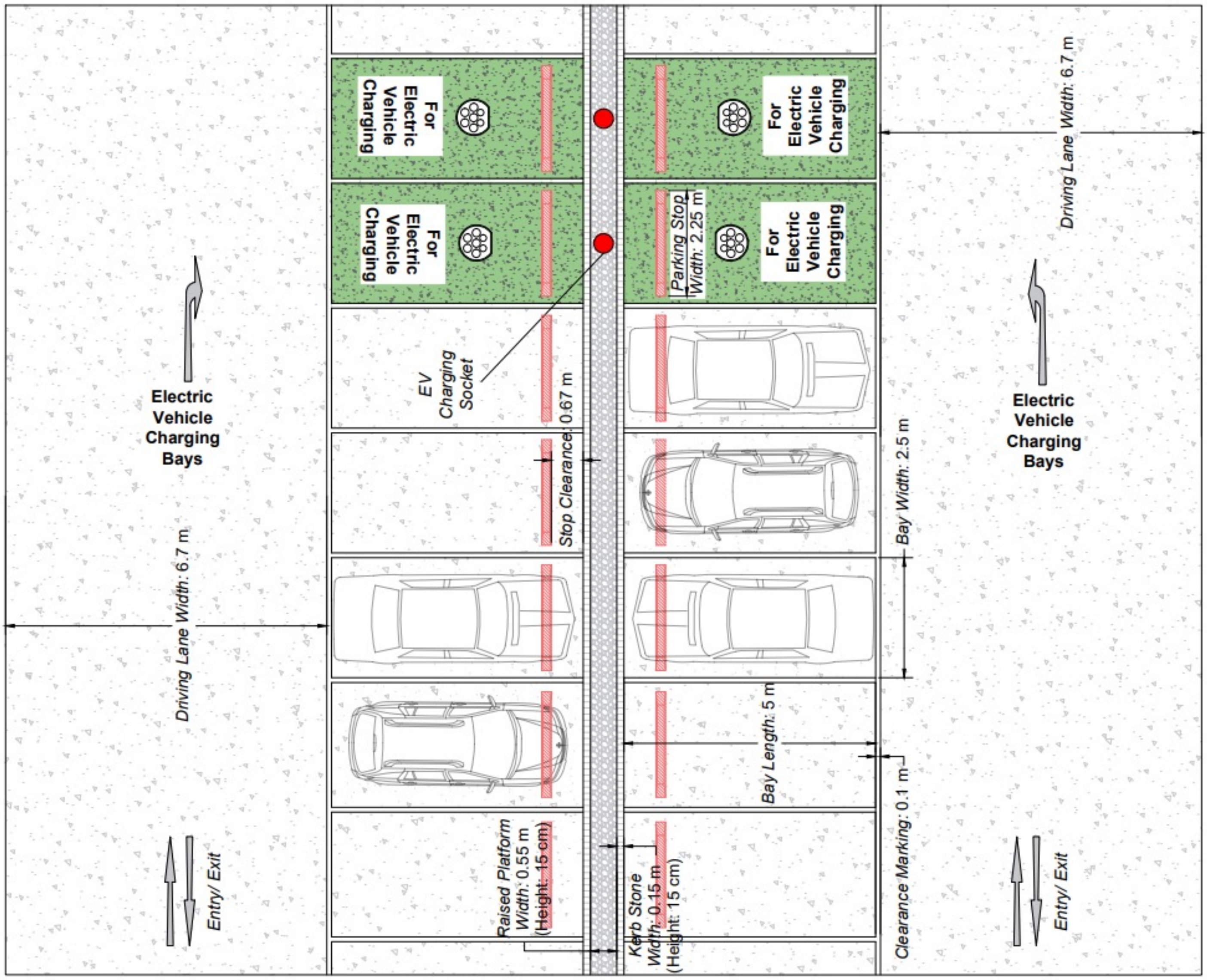


Image credit: Chaitanya Kanuri, WRI India

Charging station layout for off-street perpendicular parking – wall mounted sockets

Image 7: Charging station layout for off-street perpendicular parking – wall mounted sockets

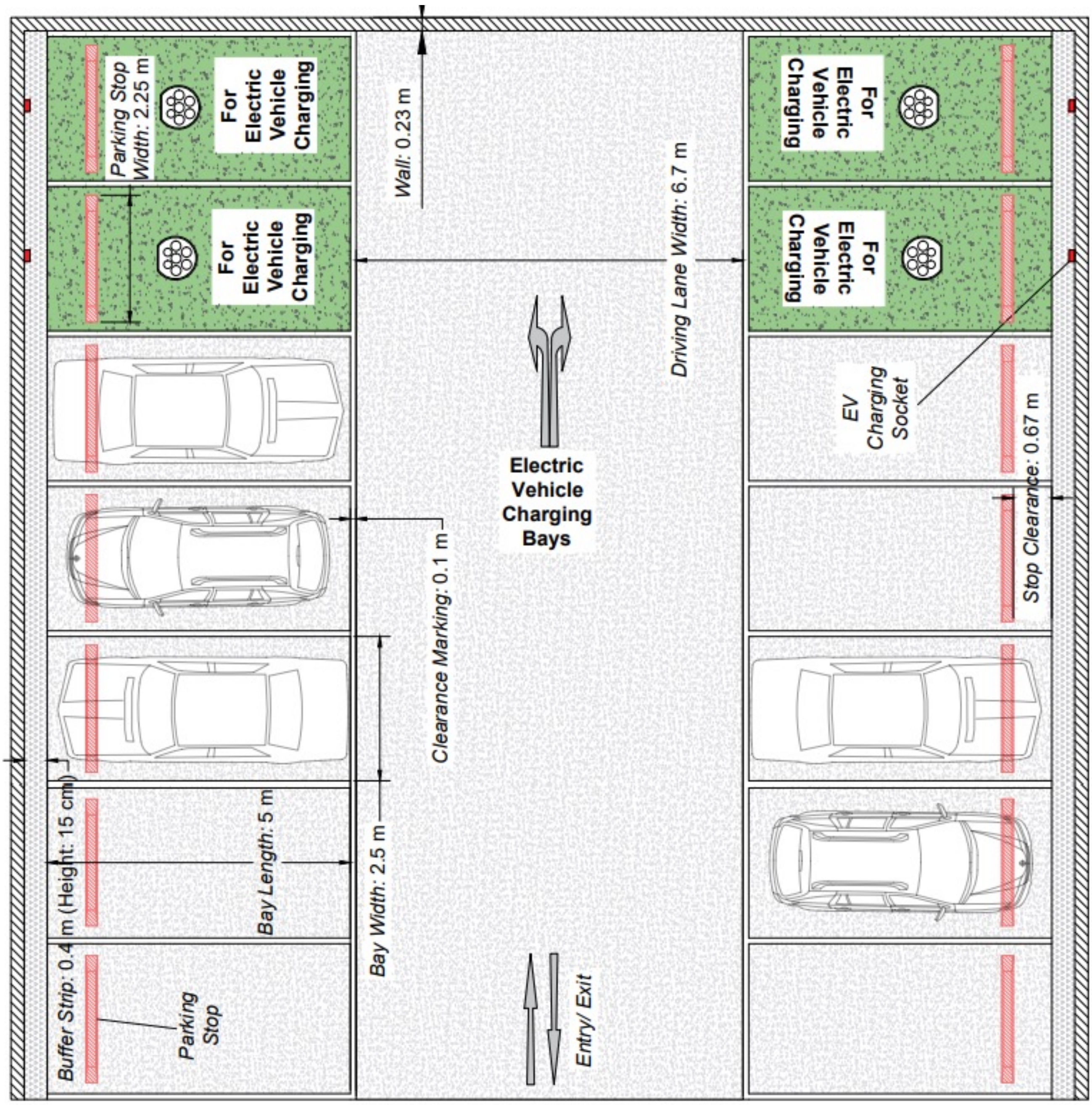


Image credit: Chaitanya Kanuri, WRI India

D Appendix D – Best Practices for Minimising Charging Station Costs

EVSE Unit

- Carefully evaluate EVSE financial incentives offered by utilities and GNCTD.
- 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 minimises drilling of holes through building structures for routing of electrical conduit and wiring.
- Choose a dual/multi-gun EVSE to minimise installation costs per charge port.
- Smart charging approach can allow installation of more EVSE without need for connection/contract load upgradation. Coordinated charging of EVs will allow accommodating more EVs to be charged by a given number of EVSE.

Location

- Place the EVSE close to the electrical service to minimise the need for trenching/boring and the costs of potential electrical upgrades.
- Choose a location that already has space on the electrical panel with a dedicated circuit.

Long Term Plannning

- Contact the site's utility early in the planning stages to discuss electricity consumption and demand charges as well as electrical service needs.
- Plan for existing quantity and location of EVSE, keeping in mind the expansion plan over the next few years.
- When upgrading existing facility for electrical service, also provide infrastructure for future EVSE installations. This will minimise the cost of installing future units.
- If building a new facility, consider the future requirement of electricity infrastructure (panels and conduit) during initial construction than modifying the site later.


electric
drive
240V~
110V~

Workplace Charging Guidebook