



# ITES

Part of the **UK-India** Net Zero  
Innovation Virtual Centre

# India EV Depot Calculator

Case study



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Innovate  
UK



भारतीय विज्ञान संस्थान

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# Contents

- 1 Introduction .....2
- 2 The India EV Depot Demand Calculator .....3
- 3 A Delhi EV Depot Operator Case Study .....4
  - 3.1 The Fleet .....4
  - 3.2 Scenarios .....6
  - 3.3 Analysis .....6
    - 3.3.1 Standard case .....7
    - 3.3.2 Expansion Cases .....7
    - 3.3.3 Summary ..... 10
- 4 How can you use it? ..... 11
- 5 Annex ..... 12
  - 5.1 Assumptions ..... 12
- Licence / Disclaimer ..... 13

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# 1 Introduction



India is the 2nd largest urban system with 377 million urban population. It is suggested that by 2030, the number of cities with populations of more than 1 million will grow from 42 to 68. To keep India on the move, despite high levels of congestion there is an ever-increasing need for shared transport solutions. This is a vibrant transport sector in India, from trains and buses to ride sharing services across the country. The challenge comes when we look to the future and how to create a transport eco-system that aligns with India's, and the global, decarbonisation goals.

The market trends for electric vehicle (EV) fleet operations in India are highly positive. The ride-sharing market is expected to reach USD 93.72 million by 2028, with a compound annual growth rate (CAGR) of 5.05% from 2024 to 2028. With the surge in income, expanding exports, thriving e-commerce, and projected gross domestic product (GDP) growth of 7-8% over the next five years, the demand for goods movement is anticipated to escalate at a 7% CAGR, reaching 15.6 trillion tonne-kilometres by 2050. Additionally, the online grocery market in India, which stood at \$4.45 billion in 2023, is expected to grow at a CAGR of 34.1% from 2025 to 2029. The food delivery market has also expanded significantly, with giants like Swiggy and Zomato leading the way, and is estimated to reach \$29.33 billion by 2028<sup>i</sup>.

Regulatory frameworks are also driving the adoption of electric vehicles in India. The Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme, 2023, mandates that all delivery service providers transition to electric vehicles: 10% of two- and three-wheelers and 5% of four-wheelers within the first six months after notification of the scheme, 25% of three-wheelers and 15% of four-wheelers within one year, and complete electrification of two- and three-wheelers within four years and all four-wheelers within five years. The Ministry of Road Transport and Highways has further set a target of EV30@2030, aiming for 30% of newly registered private cars, 40% of buses, 70% of commercial cars, and 80% of two-wheelers and three-wheelers to be electric by 2030<sup>i</sup>.

The uptake of electric vehicles will need to go hand in hand with the rollout of suitable charging and electricity network infrastructure to support operations. EV Fleet Operators will need to develop an understanding of the potential future energy demands and the need for and costs of charging infrastructure. To explore how this might be achieved the ITES program has developed an India EV Depot Calculator.

This case study will explore its use through an illustrative example of a Delhi based EV Depot Operator.

## 2 The India EV Depot Demand Calculator

The India EV Depot calculator is an Excel-based tool designed to assess the potential future daily charging demand, charging infrastructure requirements and costs for a fleet of depot charging-based vehicles in India. Figure 1 below shows a high-level summary of the tool’s inputs, processes and outputs. The tool uses existing data which is gathered from public and private resources with additional information that can be provided and configured by the user. Outputs are calculated from the present day until 2030. These datasets include:

- Vehicle performance & specifications
- Vehicle charge point performance
- Charging Infrastructure costs
- Seasonal environmental data

Based on the inputs selected and the scenario configured the calculator is then able to answer questions the user may have like:

- What is the impact of fleet electrification on charging demand and infrastructure requirements?
- What does the charge demand of a fully electrified fleet look like during weekdays and weekends?
- What are the costs to the charging infrastructure which are involved to support operations?

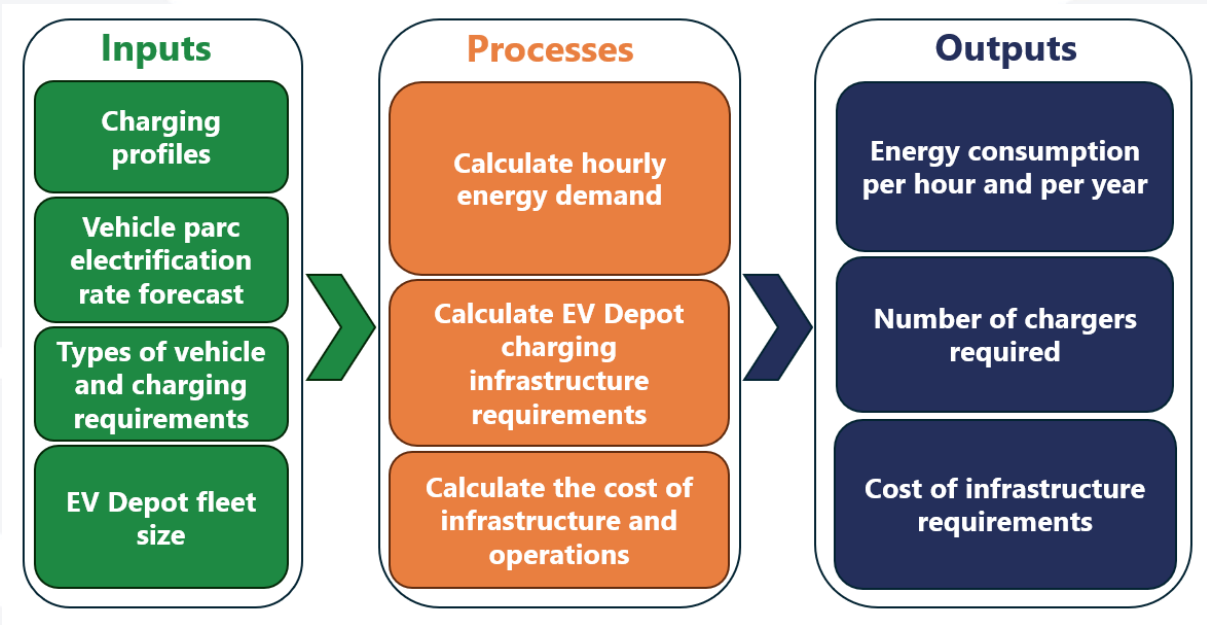


Figure 1 India EV Depot Calculator Input & Output

## 3 A Delhi EV Depot Operator Case Study



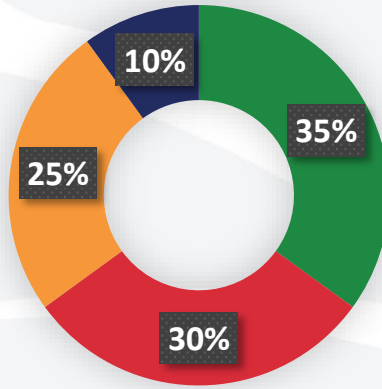
### 3.1 The Fleet

This case study is built around strategic decisions of an illustrative fleet of an EV Depot Operator in Delhi, such as Zevo, and will highlight how the India EV Depot Calculator can be used to explore future fleet energy demands and infrastructure requirements. Delhi was selected based on the current momentum that the city is putting behind accelerating the adoption of electric mobility.

To configure the calculator several assumptions were made as outlined below in Table 1, to build a picture of a representative EV Depot operating in Delhi. While the overall fleet size of Zevo lies somewhere around 1000 vehicles<sup>i</sup>, and the analysed vehicle types are all within their fleet<sup>ii</sup>, the actual vehicle spread and annual mileage are assumptions.

<b>Fleet Attribute</b>	<b>Assumption</b>
<b>Overall fleet size</b>	1000 vehicles
<b>Vehicle types and quantity</b>	<ul style="list-style-type: none"><li>• 350 e2-wheelers</li><li>• 300 Cargo e3-wheelers</li><li>• 250 B1 Van</li><li>• 100 B2 Van</li></ul>
<b>Average annual mileage</b>	<ul style="list-style-type: none"><li>• e2-wheelers = 6,000 miles</li><li>• Cargo e3-wheelers = 9,000 miles</li><li>• B1 Van = 10,000 miles</li><li>• B2 Van = 12,000 miles</li></ul>
<b>Operations</b>	Most vehicles arrive back at the depot at 1800. Some arrive at lunchtime (1200), some at midnight.
<b>Electrification target</b>	Zevo already has a fully electric fleet, therefore 100%
<b>Charging power</b>	2/3 wheelers – 7kW charging 4 wheelers – 50kW charging

Table 1 EV Depot fleet calculator configuration



■ e2-Wheelers ■ Cargo e3-Wheelers ■ B1 Van ■ B2 Van

Figure 2 Illustrative EV fleet distribution across vehicle types

Another important configuration that the user must provide is the operational information about the percentage of the fleet returning to the depots each hour. This information is crucial as it forms the basis for determining when a vehicle could reasonably begin a charging session. For these scenarios most vehicles typically arrive back at the depot at 18:00, with some arriving at lunchtime (12:00) and others at midnight. The calculator assigns appropriately powered chargers based on the vehicle type, though this can be overwritten by the user if needed.

The India EV Depot calculator then combines the information provided by the user with the background embedded input data, as laid out above. From this it can build a picture of the likely energy consumption and frequency of charging.

## 3.2 Scenarios

To demonstrate how the India EV Depot Calculator can be utilised to explore different strategic business decisions that a fleet operator could undertake regarding the future expansion of their operations, this case study examines three distinct scenarios:

- **Standard Case:** In the base case scenario, the fleet maintains its current operational model without significant changes to its fleet size or structure. The focus remains on the ongoing electrification of the existing vehicles as previously planned. This scenario serves as the benchmark, against which the impacts of the other scenarios can be compared.
- **2/3-Wheeler Expansion – Groceries and Food Delivery:** In this scenario, the fleet operator considers the strategic decision to expand its fleet to tap into the rapidly growing groceries and food delivery market in India. To capitalise on the rapidly growing food delivery market opportunities, the fleet operator plans to purchase 100 new electric two-wheelers (e2-wheelers) and 100 new electric three-wheelers (Cargo e3-wheelers) to cater to the growing demand in these sectors.
- **4-Wheeler Expansion – Goods Movement:** In this final scenario the fleet operator chooses to further enhance its goods movement capabilities by expanding its fleet of four-wheelers. To capitalise on the growth in goods movement in India, the fleet operator plans to acquire 100 new electric vans, equally divided by the two size categories, and increase the annual mileage of these vans by 25%. This expansion aims to strengthen the fleet operator's position in the logistics and transportation sector, ensuring they are well-equipped to meet the escalating demand for efficient goods movement.

## 3.3 Analysis

Once the calculator is configured there are a variety of outputs calculated. These include:

- Energy demand profiles
- Number of chargepoints required
- Chargepoint costs

The user of the India EV Depot calculator will have the ability to evaluate the effects of their scenarios. Here we discuss the results from the scenarios outlined above.



### **3.3.1 Standard case**

In the Standard Case scenario, the fleet operator maintains its current fleet size and structure, continuing with the planned electrification of existing vehicles. This scenario provides a baseline for evaluating the impact of more ambitious expansion plans.

Figure 3 shows, when the entire fleet is electrified, the peak energy demand will be around 3.5 MW at 19:00, as most vehicles return to the depot in the evening. The energy demand is consistently low during the morning hours, reflecting the lower number of electrified vehicles on charge.

Charging most of the vehicles simultaneously creates this 19:00 peak demand, which likely aligns with other high demands on the Delhi network. This could add significant strain to the grid, potentially necessitating network reinforcement to maintain grid stability.

As illustrated in Figure 4, the calculator suggests that around 144 charge points (104 x 7 kW and 40 x 50 kW) to support a 100% electrified fleet. The overall infrastructure costs that provide the energy to the vehicles is expected to have a total capital expenditure of 273.9 crore INR (£25.9 million).

### **3.3.2 Expansion Cases**

The other two scenarios were carried out using the India EV Depot Calculator to demonstrate the effect of strategic responses to business opportunities. The impact on the charging profile, and therefore on the peak demand, is illustrated in Figure 3. In the 2/3-wheeler expansion scenario, despite acquiring more overall vehicles, there is only a slight increase in the demand peak, due to the smaller batteries and lower energy consumption of the 2/3 wheel vehicles.

In contrast, the 4-wheeler expansion scenario results in a significant increase in peak demand, which rises to over 5 MWh at 19:00. It is to be noted that this charging



might occur over multiple depot locations of the fleet.

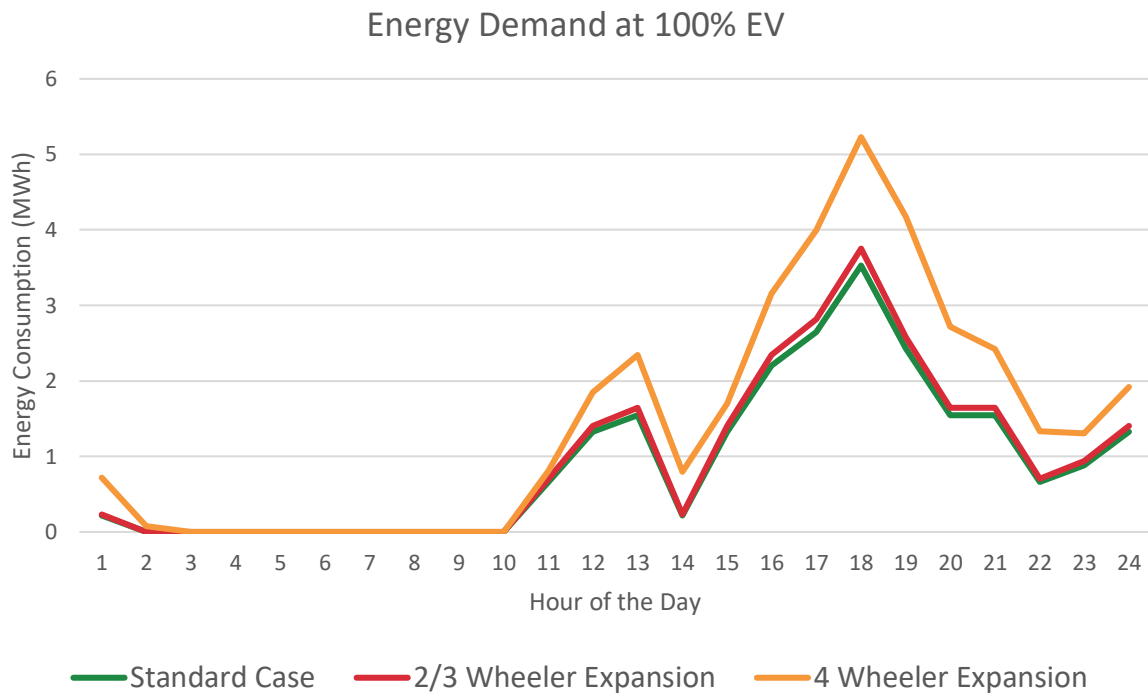


Figure 3. Energy demand profiles at full electrification

The number of chargepoints in use during peak hours increases with both expansion scenarios. In the 2/3-wheeler expansion, an additional 32 new 7 kW chargers are required compared to the Standard Case. This is necessary to accommodate the increased number of two and three-wheelers that need to charge during peak hours.

In the 4-wheeler expansion scenario, an additional 8 new 50 kW chargers are required compared to the Standard Case. This increase reflects the higher energy demands and longer charging times of the expanded four-wheeler fleet. Figure 4 illustrates the distribution and increase in the number of chargepoints required under both expansion scenarios.

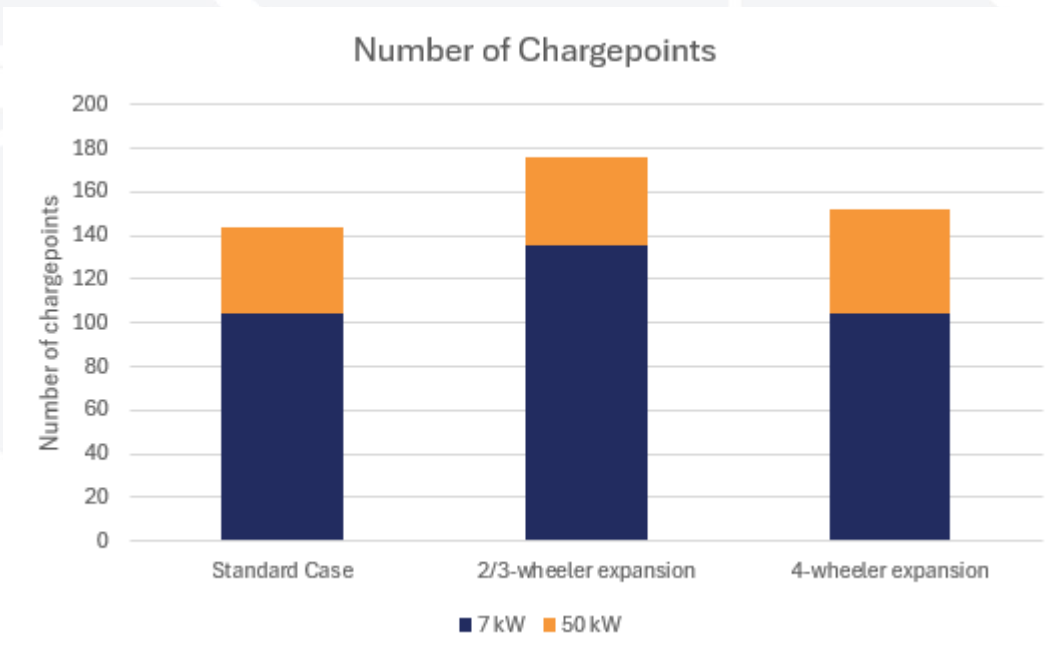


Figure 4. Number of chargepoints

The effect on the total capital expenditure (CAPEX) for the charging infrastructure, focusing solely on chargepoint costs, is shown in Figure 5. In the 2/3-wheeler expansion, the CAPEX for charging points amounts to 290.8 crore INR (£27.5 million GBP).

In the 4-wheeler expansion scenario, the CAPEX for charging points increases to 317.2 crore INR (£30.0 million GBP). This higher expenditure reflects the greater cost associated with installing more powerful 50 kW chargers required to support the additional four-wheelers in the fleet.

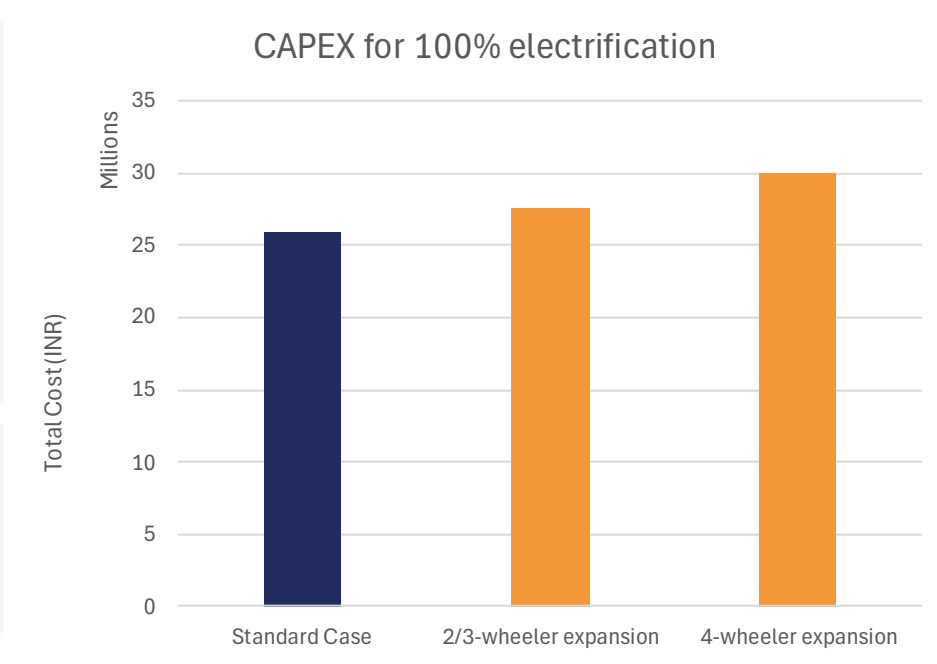


Figure 5. Total CAPEX for infrastructure to support full fleet electrification

### 3.3.3 Summary

These analyses highlight the varying impacts of different expansion strategies on , the fleet operator 's energy demand, charging infrastructure, and capital costs. The 2/3-wheeler expansion, while increasing the number of vehicles, has a more moderate impact on peak demand and infrastructure costs. In contrast, the 4-wheeler expansion significantly increases peak demand and requires substantial investment in high-power charging infrastructure. These insights provide a better understanding of the trade-offs involved in each strategic decision, enabling , the fleet operator to make informed choices about future expansions.

## 4 How can you use it?



This case study serves to demonstrate the use of the India Depot EV Calculator for the scenarios explored here. However, the potential use cases that can be explored through this calculator are wider ranging.

The calculator is a tool to help stakeholders make key decisions as we approach target years for emissions reductions and for fleet operators to have a better vision of how to operate more sustainably. Beyond what has been demonstrated here, this tool could be used to explore the sensitivity of:

- Chargepoint power specifications
- Chargepoint costs
- Fleet vehicle types and sizes
- Fleet vehicle performance
- Fleet operation profiles
- Seasonal climate variation
- Impacts of auxiliary loads
- Fleet electrification rates

The calculator offers a canvas which can be configured by a variety of depot fleet operators to reflect their operations and future strategies and support their decision making and planning. If you are interested in understanding more please do get in touch with the Innovating for Transport and Energy Systems programme.

## 5 Annex



### 5.1 Assumptions

There are several underlying assumptions that support the operation of the India Depot EV Calculator. They include:

- All new electrified fleet vehicles are BEV
- Fleet vehicles charge once a day and complete one full charge during that session
- Duration of charge is rounded up to the nearest hour
- There are 14 possible vehicle types
- There is an even distribution of mileage across the days of the year
- Battery capacities are assumed to be sufficient to meet daily charging demand
- Usable battery capacity is assumed to be 85% of total battery capacity
- Infrastructure cost estimates are for the chargepoints only

For further detail get in touch with the ITES programme.

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<sup>i</sup> Market Research Report\_ITES\_EV Fleet Operators

<sup>ii</sup> Zevo India Vehicles

<https://zevoindia.in/vehicles>

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