POSITION BRIEF

JUNE 2023

SUPPORT BATTERY ELECTRIC TRUCKS IN THE DELHI EV POLICY 2.0

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Although medium- and heavy-duty trucks (MHDTs) in India are only 3% of the on-road vehicle fleet today, analysis using ICCT's Roadmap model shows they contribute about half of the well-to-wheel carbon dioxide (CO_2) emissions.[1] This small fleet of trucks is thus having an outsized impact on the environment and the climate. The Government of the National Capital Territory of Delhi (GNCTD) has adopted many measures to abate emissions from this segment; the ICCT's analysis supports an extension of these efforts to include incentives for truck electrification.

Delhi is the lighthouse state for electric mobility; 16.8% of vehicle registrations there in December 2022 were EVs.[2] Clearly, the Delhi Electric Vehicle (EV) Policy has been instrumental in accelerating adoption of EVs in several vehicle segments in the national capital. The policy is set to expire in August 2023. Given its success, the upcoming Delhi EV Policy 2.0 is a prime opportunity to pioneer efforts to electrify trucks. The GNCTD organized consultations to incorporate recommendations from various stakeholders in the new round of policy development in May 2023. The ICCT officially submitted recommendations related to truck electrification as part of this consultation.

The market for battery electric trucks (BETs) is emerging in India. Multiple MHDT manufacturers—from legacy companies like Tata Motors, Ashok Leyland, Volvo-Eicher Commercial Vehicles, and PMI Electro Mobility, to new entrants such as Olectra, IPLTech, Omega Seiki Mobility, and Triton EV—have announced they are developing various BET models ranging from 5 tonnes to 55 tonnes for the Indian market. A few of these models are now commercially available.

One of the guiding principles of the current Delhi EV Policy is that demand and fiscal incentives should help achieve cost parity for EVs. In line with this, the ICCT analyzed the impact of such measures on the cost-effectiveness of BETs. This brief suggests several amendments for the Delhi EV Policy 2.0 based on that analysis. While the cost assessments we present are representative of the 16-tonne category of trucks, the impact of purchase incentives would be similar for other truck categories, with some differences expected in parameters that affect upfront and operational costs like battery size and energy efficiency.

1 More information about the Roadmap model is available at https://theicct.github.io/roadmap-doc/. Medium-duty trucks have a gross vehicle weight (GVW) between 3.5 and 12 tonnes and they are in the N2 category; heavy-duty trucks are all models with GVW greater than 12 tonnes and they are in the N3 category.

2 Pankaj Jain, "Over 1.2 Lakh EVs Registered in Delhi so Far, Electric Two-Wheelers Dominate the Market," India Today, May 25, 2023, https://www.indiatoday.in/auto/latest-auto-news/story/over-12-lakh-evs-registered-in-delhi-so-far-electric-two-wheelers-dominate-the-market-2384087-2023-05-25.

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ASSESSMENT OF BATTERY ELECTRIC TRUCK UPFRONT COST AND TOTAL COST OF OWNERSHIP

Our component-based cost and weight estimates for a 16-tonne BET in India were developed using supplier quotes obtained for an ICCT-commissioned study.[3] Table 1 lists all other assumptions made for this total cost of ownership (TCO) analysis. These assumptions apply to both BETs and internal combustion engine trucks (ICETs), unless otherwise specified.

Table 1. Assumptions for the total cost of ownership of 16-tonne trucks in India

Parameter	Unit	Value
Annual trips	Number	250[a]
Financed amount	%	80% of the vehicle cost[a]
Interest rate	%	12%[a]
Repayment period	Years	5[a]
Maintenance	INR/km	3 for ICET[a] and 30% lower for BETs[b]
Annual depreciation	%	10%[a]
Insurance	%	2%[a]
Fuel economy	L/100 km or kWh/km	25 L/100 km for an ICET, 0.94 kWh/km for a BET[c]
Distance traveled per day	km	250[c]
Diesel cost	INR/L	90[d]
Electricity cost to user	INR/kWh	11.44 (consists of energy charges and overhead, including capital and operating costs of a 100 kW charging station levelized over a station life of 15 years)[e]
Road tax	INR	6,610[f]
Hardware cost of charger	INR/kW	24,500[g]
Utilization rate of chargers	%	30%[a]

[a] ICCT assumption in consultation with fleet operators.

[b] Florian Kleiner and Horst E. Friedrich, "Maintenance & Repair Cost Calculation and Assessment of Resale Value for Different Alternative Commercial Vehicle Powertrain Technologies," EVS30 Symposium, October 9-11, 2017, https://elib.dlr.de/114666/1/EVS30_Paper_Trucks_M&R_Resale_Florian%20Kleiner_uploaded_update.pdf.

[c] ICCT-commissioned virtual teardown study of electric and diesel trucks in India (forthcoming).

[d] Indian Oil Corporation Ltd., "Price Buildup of Diesel at Delhi Effective 01-May-23," April 2023, https://iocl.com/admin/img/UploadedFiles/PriceBuildup/Files/English/52ea2b771f644f788e5d49c554cb2594.pdf.

[e] Based on the methodology and assumptions discussed in Hussein Basma et al., "Total Cost of Ownership for Tractor-Trailers in Europe: Battery Electric versus Diesel," (ICCT: Washington, D.C., 2021), https://theicct.org/publication/total-cost-of-ownership-for-tractor-trailers-in-europe-battery-electric-versus-diesel/.

[f] "Tax Rate for Commercial Passenger Vehicles," Transport Department, Government of National Capital Territory of Delhi, 2023, https://transport.delhi.gov.in/transport/tax-rate-0.

[g] Nikit Abhyankar et al., "Freight Trucks in India Are Primed for Electrification," (Lawrence Berkeley National Laboratory: Berkeley, CA, 2022), https://eta-publications.lbl.gov/sites/default/files/electric_trucks_in_india_-_final_nov7.pdf.

RECOMMENDATIONS

1. PURCHASE INCENTIVE

Electric trucks in the N2 and N3 categories are substantially more expensive to purchase than ICET counterparts fueled by diesel or compressed natural gas (CNG). We estimate that the upfront cost of a 16-tonne BET with a 295 kWh battery sized

3 The ICCT commissioned a virtual teardown study of electric and diesel trucks (publication forthcoming); the work includes obtaining component cost and weight estimates for the Indian market from suppliers and assessing the cost of a virtual 16-tonne BET with performance equivalent to that of a Tata T16 Ultra.

for a 250 km range is about 3.5 to 4.5 times higher than a diesel or CNG truck, depending on the different battery chemistries; nickel manganese cobalt (NMC) and lithium iron phosphate (LFP) are two popular lithium-ion based chemistries being used for EVs. The battery is the largest individual cost and accounts for about 40% of the upfront cost.

The current Delhi EV Policy provides a purchase incentive of INR 10,000 per kWh of battery capacity, capped at INR 1.5 lakh per vehicle, for electric cars and light commercial vehicles. Figure 1 shows the impact of two incentive scenarios for BETs: (1) the same INR 10,000/kWh extended to electric trucks and (2) an INR 15,000/kWh incentive. Both are capped at 40% of the ex-showroom cost of the vehicle, and, as shown in the figure, these incentives reduce upfront costs by 22%–35%.

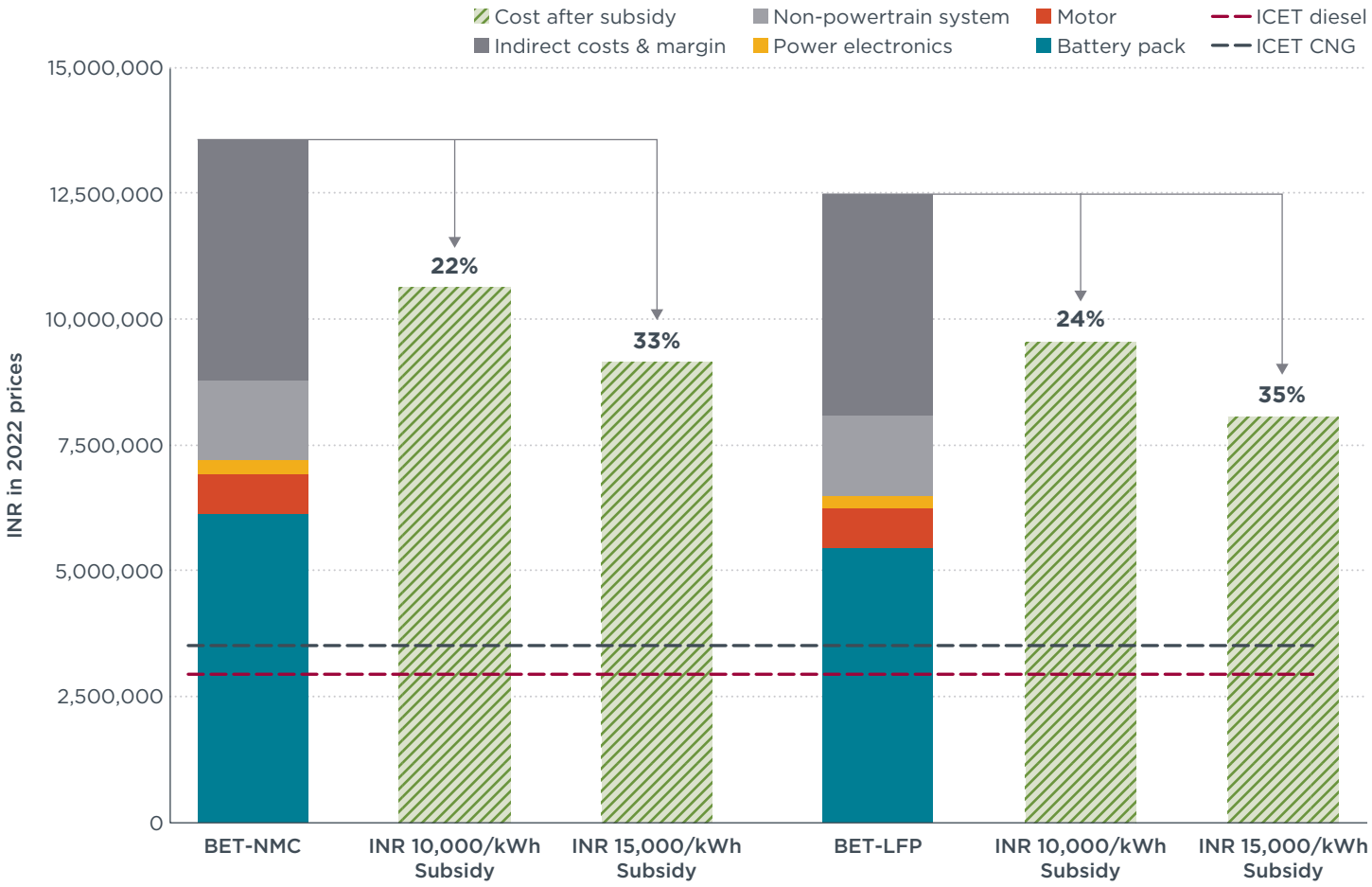

Figure 1. Upfront cost comparison of a 16-tonne truck with NMC and LFP battery chemistries.

By considering the purchase cost and operating costs over an ownership span of 5 years, we estimate the TCO of a 16-tonne BET is about 1.8 times higher than that of a diesel-equivalent truck today.[4] An INR 10,000/kWh purchase incentive would reduce the TCO of a BET by 23% and shrink the gap between the 16-tonne BET and an equivalent ICET by half (illustrated in Figure 2). An INR 15,000/kWh purchase incentive would reduce the gap by another half, and the TCO of a BET would be between 20% and 25% higher than that of an ICET.

Recommendation 1: To improve the cost competitiveness of BETs, provide purchase incentives between INR 10,000 and 15,000 per kWh of battery size, capped at 40% of ex-showroom cost.

4 The TCO is estimated in INR/tonne-km terms, and the payload penalty for BETs as a result of larger batteries is accounted for in the INR/tonne-km metric.

2. INTEREST SUBVENTION

The current Delhi EV Policy provides a 5% subvention on loans to purchase electric goods carriers in the region. Given the high financing costs in the Indian trucking sector, we estimate that adding a similar provision for electric trucks would reduce the TCO of a BET by 10%.

When combining the interest rate subvention and the INR 15,000/kWh purchase incentive with the road tax waiver offered in the current policy for all battery EVs in Delhi, the estimated TCO of a 16-tonne BET drops significantly and is brought down on par with an equivalent diesel truck.

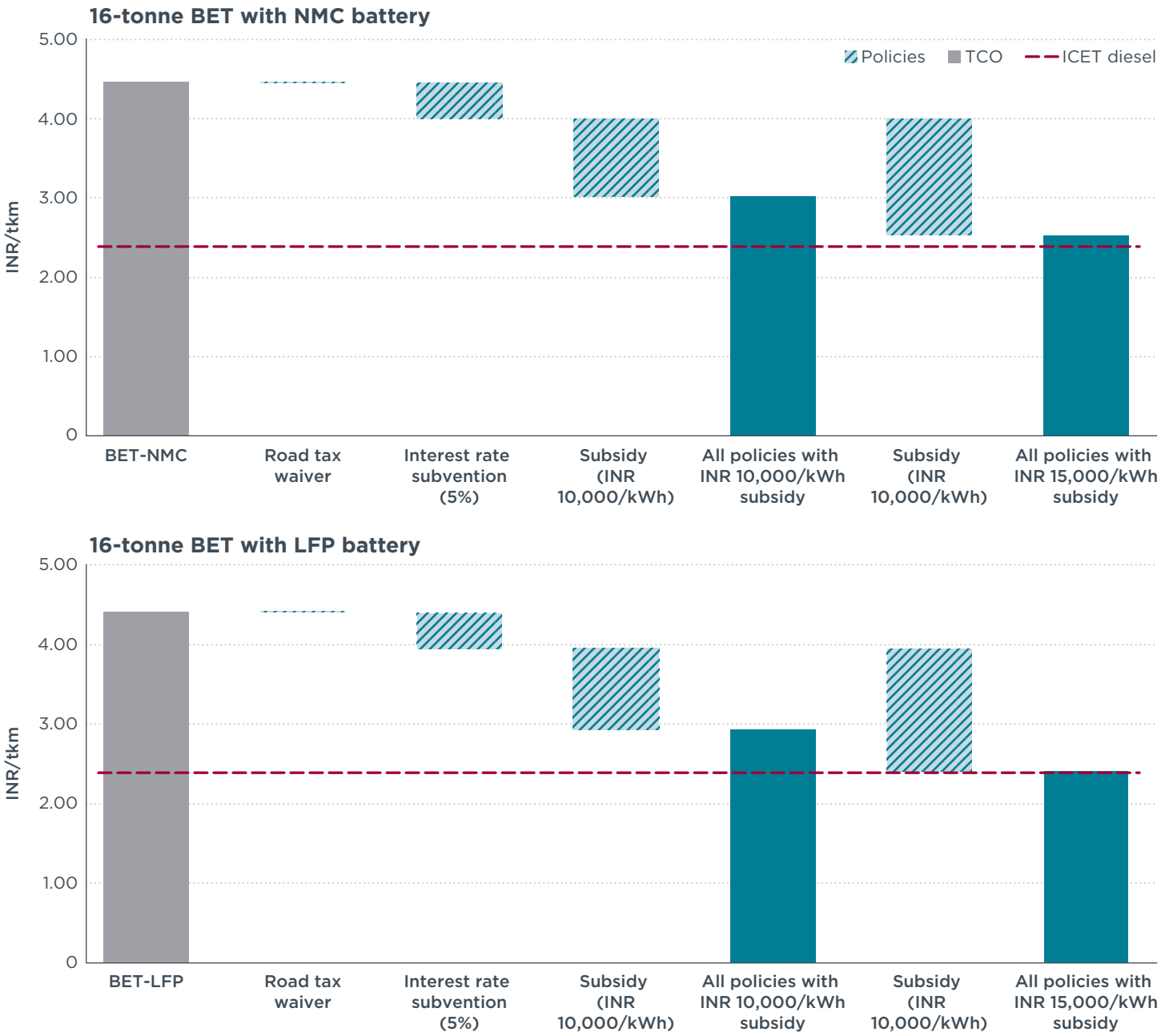

Figure 2. Impact of various incentive policies on the total cost of ownership of a 16-tonne battery-electric truck with NMC battery (top) and LFP battery (bottom).

Recommendation 2: Extend the 5% interest subvention on loans for L5N and N1 vehicles to cover the purchase of BETs. This would help make the TCO of BETs attractive compared to ICETs and help accelerate their uptake.

3. FUNDS FOR INCENTIVIZING BETS

To support national-level incentives for the BET market, the GNCTD should submit a representation to the Ministry of Heavy Industries recommending that purchase subsidies for BETs be offered in the next phase of the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme.[5] In the meantime, so as not to delay support for BETs within Delhi, which is among the regions most affected by emissions from MHDTs, consider creating an adequate corpus fund for incentivizing the uptake and operation of BETs in Delhi by increasing the Environmental Compensation Charge (ECC) or levying an additional fee on ICETs (both diesel and CNG) entering Delhi. This would generate a state BET fund that could be used exclusively for purchase incentives for BETs. While the existing ECC fund could also be directly leveraged for supporting BETs, this fund seems to be already supporting multiple projects ranging from hydrogen-blended CNG pilots to the construction of the Delhi-Meerut rapid rail corridor and this leaves little room for supporting BETs.[6]

Studies from 2015 and 2017 found that about 52,000–57,000 trucks enter Delhi on a daily basis, though recent numbers from the Transport Department say this might be as high as 70,000–80,000.[7] Conservatively assuming that 60% of the average number of trucks from the studies (i.e., 32,700) are levied this additional fee, and assuming a fee of INR 25–50 per truck, INR 2.5–5 crores could be generated monthly. This additional fee would complement the existing ECC fund, a part of which should be repurposed to support BETs.

Recommendation 3: Push for the inclusion of BETs in the next phase of the national FAME scheme. Until then, a self-sustaining fund for incentivizing BETs within Delhi could be maintained by levying a small, additional fee of INR 25–50 on diesel and CNG trucks entering Delhi.

4. APPLICATIONS THAT ARE EASIEST TO ELECTRIFY

To maximize benefits for the National Capital Territory of Delhi, prioritize electrifying intra-state trucking operations so that the incentivized electric trucks are likely to remain registered and operate in Delhi. It would demonstrate the GNCTD's leadership in tackling the issue of air pollution and send a signal regarding the expected market shift to zero-emission trucking in the future within the national capital. This shift to BETs can begin with urban trucking applications with easy-to-electrify duty cycles such as **garbage trucks**, **water tankers**, **trucks that carry construction and demolition waste**, **horticulture trucks**, **trucks that carry anti-smog guns**, **trucks carrying essentials like fruits**, **vegetables**, **and dairy**, and others that have predictable daily range requirements and no significant secondary power consumption requirements.

The ICCT's ongoing study in another major Indian city, Surat, revealed that urban trucking applications have a high percentage of idling during operation; this could be an advantage for BETs over ICETs in terms of fuel consumption. Incentivizing such applications would also maximize the air quality benefits for Delhi by ensuring that most of the miles resulting from the incentivized BETs are on Delhi roads.

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5 "About FAME II," National Automotive Board, Ministry of Heavy Industries, last updated March 28, 2022, https://fame2.heavyindustries.gov.in/.

6 Atul Mathur, "Delhi Govt Releases Second Tranche of Rs 500 Crore for RAPID," *The Times of India*, May 28, 2023, https://timesofindia.indiatimes.com/city/delhi/delhi-govt-releases-second-tranche-of-rs-500-cr-for-rapidx/articleshow/100559461.cms; Paras Singh, "₹1,298.38 Crore Collected as Green Cess from Vehicles Entering Delhi," *Hindustan Times*, March 5, 2022, https://www.hindustantimes.com/cities/delhi-news/129838-crore-collected-as-green-cess-from-vehicles-entering-delhi-101646424984985.html.

7 DownToEarth, "New CSE Survey Debunks Official Number of Trucks Entering Delhi," October 6, 2015, https://www.downtoearth.org.in/news/air/new-cse-survey-debunks-official-number-of-trucks-entering-delhi-51403; Leeza Malik and Geetam Tiwari, "Assessment of Interstate Freight Vehicle Characteristics and Impact of Future Emission and Fuel Economy Standards on Their Emissions in India,," *Energy Policy* 108 (September): 121–33, https://doi.org/10.1016/j.enpol.2017.05.053; Express News Service, "Delhi Govt Restricts Entry of Heavy, Medium Commercial Vehicles from Oct-Feb: Truckers, Traders Oppose Move, Write to CM, L-G," June 24, 2022, https://indianexpress.com/article/cities/delhi/delhi-govt-restricts-entry-heavy-medium-commercial-vehicles-oct-feb-truckers-traders-oppose-write-cm-l-g-7989401/.

The current Delhi EV Policy sets a good precedent for how to shift to EVs in government fleets. It sets a target that electric buses constitute at least 50% of all new public transport vehicles with 15 seats or more procured for the city fleet. Additionally, the current policy mandates the shift of all leased/hired cars used for the commutes of GNCTD officers to electric within a period defined in the policy. Such provisions should be leveraged for mandating electrification of vehicles in other segments that are government-owned or operated or leased, especially MHDTs.

Recommendation 4: Focus the incentives on trucking applications with favorable duty cycles and costs and on trucking operations within Delhi, as the latter would maximize the local air quality benefits.

5. CHARGING INFRASTRUCTURE

The Ministry of Power's Guidelines and Standards for EV Charging Infrastructure, dated January 14, 2022, define fast-charging standards for heavy vehicles as power level 3 (DC fast, 50 kW–250 kW) and power level 4 (DC high power, 250 kW–500 kW).[8] Such high-power charging infrastructure requires extensive capital investment from charge point operators (CPOs). To support the uptake of electric trucks and reduce TCO, the Delhi EV Policy 2.0 should focus on extending the current incentives in place for public charging points to these high-power charging stations; these can serve not just BETs but also other vehicle segments like electric buses and cars. Recall that we assessed the levelized cost of electricity for the consumer at INR 11.44 per unit for a charging station with ten 100 kW chargers; assuming a 25% capital subsidy on the hardware costs to CPOs reduces this levelized cost to the consumer by 15% and results in a 5% savings on the user's 5-year TCO.[9]

In addition, the financial burden of augmenting the distribution grid until the point of interconnection, if that is needed to accommodate the high-power requirements for public charging stations, should be borne by the electric utility, as those are the assets of the utility. Providing similar incentives to alternative public charging solutions like battery-swapping-based electric trucking operations should also be explored. Figure 3 illustrates the BET charging infrastructure ecosystem.

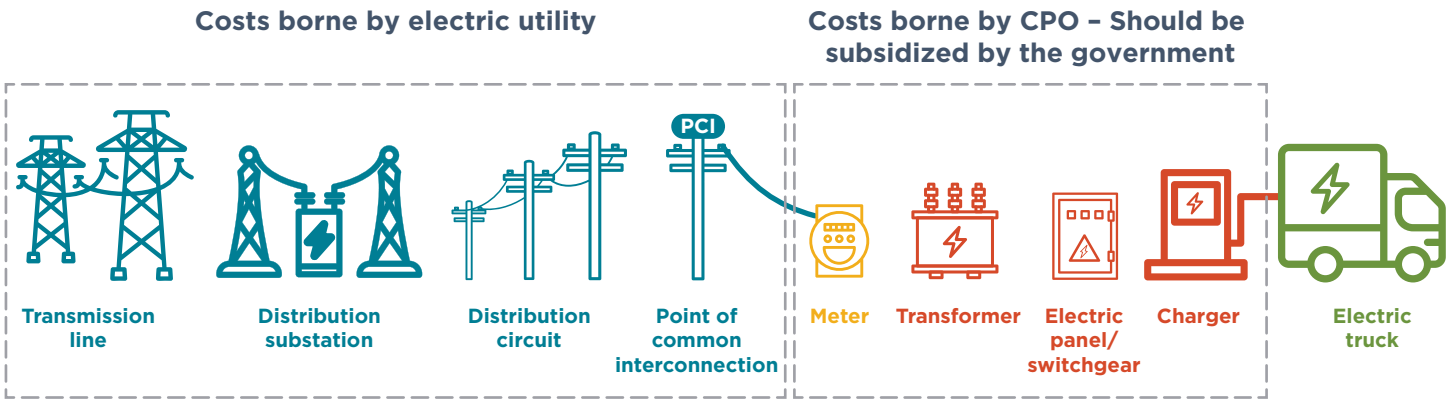

Figure 3. The BET charging infrastructure ecosystem.

Source: Hussein Basma et al., "Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-haul Trucks in the United States," (ICCT: Washington, DC, 2023), https://theicct.org/publication/tco-alt-powertrain-long-haul-trucks-us-apr23/.

8 Government of India, Ministry of Power, "Charging Infrastructure for EVs – the Revised Consolidated Guidelines and Standards," January 14, 2022, https://powermin.gov.in/sites/default/files/webform/notices/Final_Consolidated_EVCI_Guidelines_January_2022_with_ANNEXURES.pdf.

9 The levelized cost of electricity is estimated by incorporating the capital and operating costs incurred for the operation of a charging station over its life of 15 years.

The existing Delhi EV Policy states that concessional land rates are to be provided to operators setting up charging and battery-swapping stations. These concessional land plots should be made available for charging hubs that serve multiple fast-charging purposes like electric cars, buses, and trucks, as more land is required to set up charging stations, especially for trucks and buses. Analyses based on bus routes and/or freight routes could be used to design and develop a fast-charging network within Delhi.

In the early stages, the depot chargers already set up for electric buses could be used to charge BETs during hours when there is reduced need for e-bus charging.

Recommendation 5: Incentivize the deployment of DC high-power charging infrastructure to support the rapid uptake of BETs across different applications. Utilities should use their own funds to augment their upstream infrastructure where needed. Extend concessional land rates to public high-power charging stations.

6. EXEMPTION FROM PLYING AND PARKING RESTRICTIONS

To address pollution and congestion, there are restrictions on the entry and idle parking of all goods vehicles on certain Delhi roads during peak traffic hours. The current Delhi EV Policy exempts electric light commercial vehicles (e-LCVs) from these restrictions. These exemptions save private businesses that adopt e-LCVs time; measures such as these combined with other fiscal incentives in the current Delhi EV Policy have helped increase e-LCVs sales.[10]

Recommendation 6: Exempt BETs from plying and parking restrictions. This is likely to generate interest from private businesses, as was observed in the e-LCV segment.

7. EXEMPTION FROM THE ENVIRONMENTAL COMPENSATION CHARGE, TOLL TAX, AND PARKING CHARGES

While the above discussion focused on supporting the uptake of BETs in intra-state operations, simple tax exemptions can also act as market drivers for BETs used in inter-state operations. Since 2015, all MHDTs entering Delhi pay an Environmental Compensation Charge (ECC) collected by the Municipal Corporation of Delhi (MCD); proceeds go to the Transport Department of Delhi.[11] The current design of the ECC is based on the axle configuration of trucks and the fee ranges from INR 1,300 for empty trucks to INR 2,600 for filled trucks.[12]

All commercial vehicles, including MHDTs, also pay the toll tax levied by MCD, which is either an entry-per-visit charge or a monthly pass charge.[13]

All commercial vehicles in Delhi also pay a parking fee. During the consultation organized by the Delhi Transport Department for Delhi EV Policy 2.0, fleet operators mentioned that the parking charges for commercial vehicles that vary across Delhi are relatively high and lead to an increase in operational costs. e-LCVs are exempt from this parking fee in the current policy.

Recommendation 7: Exempt BETs from the ECC, MCD toll tax, and parking fees. As the number of BETs will not be significant in the next few years, the revenue impact would be small.

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10 Sidharatha Roy, "E-Vehicles in Delhi Can Ply in No-Entry Hours," *The Times of India*, November 19, 2021, https://timesofindia.indiatimes.com/city/delhi/e-vehicles-can-ply-in-no-entry-hours/articleshow/87788346.cms.

11 Government of India, Ministry of Environment, Forests and Climate Change, "Lok Sabha Unstarred Question: 3851," December 22, 2015, https://eparlib.nic.in/bitstream/123456789/674786/1/28369.pdf.

12 Paras Singh, "Delhi Civic Body to Integrate its RFID Toll Collection System with FASTag," *Hindustan Times*, February 3, 2023, https://www.hindustantimes.com/cities/delhi-news/delhi-civic-body-to-integrate-its-rfid-toll-collection-system-with-fastag-101675362989004.html.

13 South Delhi Municipal Corporation, Toll Tax Department, "Notice Invite Tender NIT No. ADC/TT/HQ/2019/D-153," February 13, 2019, http://mcdonline.gov.in/tri/sdmc_mcdportal/tendersnew/tender_1845.pdf.

ELIGIBILITY REQUIREMENTS

The current Delhi EV Policy incentivizes vehicles that are eligible for the FAME II scheme. FAME II guidelines mention the test standards and procedures for incentivizing battery electric vehicles, and these include electric buses from the heavy-duty vehicle category.[14] The performance and efficiency eligibility criteria for electric buses under FAME II were also notified separately.[15] The GNCTD should leverage these standards and guidelines for buses when incentivizing BETs to ensure that only those BETs meeting the safety and eligibility criteria are incentivized. While these criteria will apply across all GVW segments of BETs, the technical specifications in terms of battery size and range requirement should be developed for different GVW categories in intra-state trucking. This exercise is similar to how different Indian cities defined battery and range requirements based on their needs in the earlier electric bus procurement under the FAME scheme.

SUMMARY OF POLICY RECOMMENDATIONS

Table 2 summarizes the ICCT's recommendations for the Delhi EV Policy 2.0.

Table 2. Recommendations for the Delhi EV Policy 2.0

Policy	Recommendations for the Delhi EV Policy 2.0
Purchase incentive	**Recommendation 1:** To improve the cost competitiveness of BETs, provide purchase incentives between INR 10,000 and 15,000 per kWh of battery size, capped at 40% of ex-showroom cost.
Interest subvention	**Recommendation 2:** Extend the 5% interest subvention on loans for L5N and N1 vehicles to cover the purchase of BETs. This would help make the TCO of BETs attractive compared to ICETs and help accelerate their uptake.
Funds for incentivizing BETs	**Recommendation 3:** Push for the inclusion of BETs in the next phase of the national FAME scheme. Until then, a self-sustaining fund for incentivizing BETs within Delhi could be maintained by levying a small, additional fee of INR 25–50 on diesel and CNG trucks entering Delhi.
Applications that are easiest to electrify	**Recommendation 4:** Focus the incentives on trucking applications with favorable duty cycles and costs and on trucking operations within Delhi, as the latter would maximize the local air quality benefits.
Charging infrastructure	**Recommendation 5:** Incentivize the deployment of DC high-power charging infrastructure to support the rapid uptake of BETs across different applications. Utilities should use their own funds to augment their upstream infrastructure where needed. Extend concessional land rates to public high-power charging stations.
Exemption from plying and parking restrictions	**Recommendation 6:** Exempt BETs from plying and parking restrictions. This is likely to generate interest from private businesses, as was observed in the e-LCV segment.
Exemption from the Environmental Compensation Charge, toll tax, and parking charges	**Recommendation 7:** Exempt BETs from the ECC, MCD toll tax, and parking fees. As the number of BETs will not be significant in the next few years, the revenue impact would be small.

14 Government of India, Ministry of Heavy Industries & Public Enterprises, Department of Heavy Industry, "Guidelines for FAME II Eligibility Assessment Procedure," May 28, 2019, https://heavyindustries.gov.in/writereaddata/fame/famedepository/12-E__didm_WriteReadData_userfiles_Guidelines%20for%20FAME%20II%20Eligibility%20Assessment%20Procedure.pdf.

15 Government of India, Ministry of Heavy Industries & Public Enterprises, Department of Heavy Industry, "Performance & Efficiency Eligibility Criteria for Electric Bus Category Vehicle Model under FAME India Phase II," June 21, 2019, https://heavyindustries.gov.in/writereaddata/fame/famedepository/4-E__didm_WriteReadData_userfiles_DHI_8_SO2068(E%20)_21062019.pdf.