Title

Designing Electric Truck Incentives for India

Authors

Ramji, Aditya
Das, Anannya
Ladha, Rijhul
et al.

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Prepared by:

Aditya Ramji, Anannya Das, Rijhul Ladha, Ridhi Palia

Institute of Transportation Studies, University of California, Davis

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UCDAVIS
India ZEV Research Centre
Institute of Transportation Studies

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Executive Summary

Direct purchase incentives for electric vehicles have been a key policy tool that India has relied on. The Government of India announced the PM E-DRIVE Scheme in September 2024, with an outlay of INR 10,900 crore (~USD 1.3 billion), effective from 1st October 2024 to 31st March 2026. The scheme has notably added an incentive allocation of INR 500 crore (~USD 60 million) for battery electric trucks for the first time in India.

The design of the incentive program for e-trucks will be critical in setting the foundation for India's ZET market development. Since the incentive for e-trucks will precede the implementation of fuel efficiency regulations for trucks (under development), the impact of the program on e-truck deployment and model availability in India will likely have an impact on the fuel efficiency compliance pathways that major truck manufacturers adopt.

Principles of incentive design based on global lessons

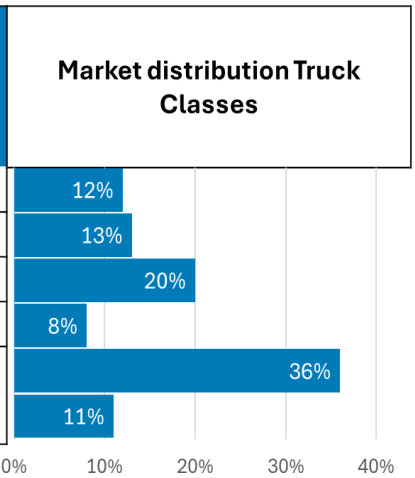
Global lessons from the US and EU clearly show that the subsidy support is higher for N3 trucks (GVW > 12T) as compared to N2 (GVW 3.5 – 12T). While designing purchase incentives, few aspects that need due consideration include:

a. Price differential between a Battery Electric and ICE truck
b. Quantum of the purchase incentive as a function of the price differential
c. First Come, First Serve incentive disbursement
d. Decoupling incentives from market (use cases) and ownership (public vs private)
e. Encourage flexibility in incentive utilization
f. Streamline compliance requirements with limited complexity for early market creation

India's truck market and estimated battery electric truck prices

Figure ES-1: India's e-truck cost estimates

MHDV Categories	Gross Vehicle Weight (GVW)	Battery Size (kWh)	2024 ex-factory price (INR)		BET / ICE Price Ratio
			ICE truck	E-truck	
N2A	3.5 - 7.5 T	90	12,37,358	23,62,500	1.91
N2B	7.5 - 12 T	120	17,34,555	34,65,000	2.00
N3A	12 - 18.5 T	200	20,00,000	57,75,000	2.90
N3B	18.5 - 28 T	275	23,41,539	79,40,625	3.35
N3C	28 - 49 T	350	39,37,872	1,26,32,813	3.2-3.5
N3D (Tractor)	30 – 55 T	350	35,00,000	1,12,28,106	



Proposed Incentive Structure for India

Figure ES-2: E-truck incentive structure for India

MHDV category	Truck Classes by GVW	Incentive	Battery Size	E-Truck Price Threshold	Max Subsidy amount as a % of ex-factory price	
	Tonnes	INR/kWh	kWh	INR	INR	%
N2 (503 e-trucks)	3.5 - 7.5 T	10,000	90	23,62,500	5,00,000	20%
	7.5 - 12 T	10,000	120	34,65,000	7,00,000	
N3 (1495 e-trucks)	12 - 18.5 T	15,000	200	57,75,000	17,50,000	30%
	18.5 - 28 T	15,000	275	79,40,625	24,00,000	
	28 - 49 T	15,000	350	1,26,32,813	40,00,000	
	30 – 55 T	15,000	350	1,12,28,106	34,00,000	

N3
Volume : higher % incentives
Price : 70% of truck market is N3 trucks
VKT : 3-3.5% higher than ICE variant
Emission : More clean kilometers
: Eliminate more emission

Variable Structure
Differentiated for N2 and N3

Maximum battery size & price ratio in the category is considered
- PM E-DRIVE can incentivize more e-trucks as price competitive models are launched

Fund utilization roadmap

		N2	N3	Total
Subsidy Allocation (INR crore)	Year 1	10	140	150
	Year 2	20	330	350
e-truck incentivized (sales)	Year 1	161	446	607
	Year 2	342	1049	1391

1 Introduction

The global transition to medium and heavy-duty trucks (MHDT) to zero emission is still in early stages. In 2023, about 54,000 zero-emission trucks (ZETs), nearly all battery-electric trucks (BETs), were sold globally (International Energy Agency, 2024). Most of these sales (~70%) were in China, followed by Europe and the United States. In India, efforts such as the Electric Freight Accelerator for Sustainable Transport (e-FAST India) led by NITI Aayog, have provided a strong platform to signal market demand for over 7,500 electric trucks by major manufacturers and logistics companies.

The role of policy in enabling this transition will be critical. The combination and extent of regulatory and policy actions that governments can implement include sales targets, adopting GHG emissions standards and efficiency measures that promote ZETs, setting purchase incentives, preferential financing, and so on (Xie, Dallman, & Muncrief, 2022). The right combination of policies can increase model availability and lower the cost of ZETs, in turn accelerating technology and market development. In the US and EU, zero emission truck purchase incentives are combined with GHG or fuel efficiency regulations to create a strong market signal (US EPA, 2024) (European Union, 2024) (IRS, 2024) (ACEA, 2024).

In India, there are ongoing efforts to develop fuel efficiency regulations for medium and heavy-duty trucks but are only expected to be announced in late 2025 and effective from 2027 onwards. Direct purchase incentives for electric vehicles have been a key policy tool that India has relied on since the FAME Scheme was announced in 2015. The focus of the incentive programs has been primarily at two and three wheelers, cars and public buses. After two phases of the FAME Scheme between 2015 - 2024, the Government of India announced the PM E-DRIVE scheme in September 2024, with an outlay of INR 10,900 crore (~USD 1.3 billion), effective from 1st October 2024 to 31st March 2026 (Ministry of Heavy Industries, 2024). The PM E-DRIVE Scheme while continuing the incentives for other vehicle segments, has notably added an incentive allocation of INR 500 crore (~USD 60 million) for e-trucks for the first time, with 30% to be spent in the first year and the balance in the second year.

The design of the incentive program for e-trucks will be critical in setting the foundation for India's ZET market development. Since the incentive for e-trucks will precede the implementation of fuel efficiency regulations for trucks, the impact of the program on e-truck deployment and model availability in India will have an impact on the fuel efficiency compliance pathways that major manufacturers adopt. If the incentive program can show proof of deployment and early market signals, manufacturers are more likely to rely on fuel efficiency compliance pathways with higher ZET shares as opposed to improvements in ICE powertrains.

1.1 Scope of the technical analysis

This technical paper presents a potential purchase incentive design framework for India for e-trucks under the PM E-DRIVE Scheme. It draws on global experiences of e-truck incentives in the US and EU, including both national and sub-national programs. Further, the analysis also includes an assessment of the market potential for e-trucks through the implementation of the purchase incentive program.

For the purposes of this analysis, the focus is on medium and heavy-duty trucks, as defined in Table 1 (ARAI, 2020) (European Parliament, 2007) (US Department of Transportation, 2015).

Table 1: Truck classification by weight across key markets

Gross Vehicle Weight (GVW)	India	EU	US
3.5 - 7.5 tonnes	N2A	N2	Class 2b-4
7.5 - 12 tonnes	N2B	N2	Class 5-6
12 - 18.5 tonnes	N3A (2-Axle Rigid)	N3	Class 7-8
18.5 - 28 tonnes	N3B (Multi-Axle Rigid)	N3	Class 8
28 - 49 tonnes	N3C (Multi-Axle Rigid)	N3	Class 8
30 – 55 tonnes	N3D (Tractor Trailer)	N3	Class 8

Note: The analysis considers >25T for the N3C category instead of 28T, due to data availability and sales reporting. Further, due to data issues, the N3C and N3D category are combined for this analysis in specific cases.

2 Lessons from global practices on incentive mechanisms

Even with fuel efficiency standards, end consumers still need to purchase zero emission vehicles, and thus, incentives are widely seen as essential to support the transition (Ramji, 2024). In case of zero emission trucks, major markets such as the US and the EU are providing purchase incentives based on truck classes. While designing purchase incentives, few aspects that need due consideration include:

a. **Price differential between a Battery Electric and ICE truck.** Provides a better understanding of the viability gap between different powertrains. Further, it enables an assessment of the role of upfront price subsidies in relative terms to other incentives such as lower energy costs, toll and tax waivers, and interest rate subventions, among others.
b. **Quantum of the purchase incentive as a function of the price differential.** Typically, incentives cover up to 80% of the viability gap, with purchase incentives covering about half, and the remaining coming from other operating cost incentives and technology innovations from manufacturers. A very high upfront purchase incentive can lead to market price distortion, limit technology innovation, impacting market scale and model availability.
c. **First Come, First Serve** is the most effective incentive implementation process, especially in early market transformation. It benefits both OEMs and end-users by incentivizing them to transition faster and drives overall market demand.
d. **Incentives should be decoupled from market and ownership parameters**, i.e. they should not be restricted to use cases or public or private fleets. In early market conditions, with lack of clarity on viability of e-trucks and the financial risk appetite of fleets to adopt such vehicles, incentives should support the development of e-trucks in different segments allowing for private and public market stakeholders to make decisions for deployment and scale.
e. **Encourage flexibility in incentive utilization.** Incentive utilization criteria should not be restricted to specific truck categories or fleet application or to highway corridors only, as in

early market conditions, there will be many emerging niche applications that will likely deploy e-trucks including the private sector. The incentive program should also be flexible in responding to emerging market trends and model availability.

f. **Streamline compliance requirements with limited complexity for early market creation.** While eligibility criteria for incentive disbursement are important, the processes and ability to access these incentives should be made relatively simple, as high complexity in incentive eligibility requirements can impact the market negatively.

In the US, states such as California, New Jersey and Massachusetts provide an upfront purchase subsidy for electric trucks through a voucher-based mechanism ranging from USD 7,500 - 20,000 for Class 2b (3.8 – 4.5 T GVW) to USD 90,000 -175,000 for Class 8 (GVW > 15 T) trucks (California Air Resources Board, 2024; New Jersey Economic Development Authority, 2024; Massachusetts Department of Energy Resources, 2024). In the State of New York, the incentives are provided for 95% of the additional cost of an e-truck compared to a similar ICE truck with a maximum subsidy cap of USD 100,000 - 215,000, depending on the truck class (for Classes 4-8, i.e., GVW > 6.5 T) (New York State Energy Research and Development Authority, 2024).

In the EU, more than 10 countries including Austria, Belgium, Finland, France, Poland, Italy, and the Netherlands provide a maximum subsidy ranging from USD 4,914 - 100,000 for the N2 segment (3.5 – 12 T GVW) and USD 4,900 - 187,500 for the N3 segment (GVW > 12 T) (ACEA, 2024) .

The maximum cap on the subsidy is higher for N3 category (GVW > 12 T) than the N2 category (GVW 3.5 – 12 T) in both the EU and the US. The subsidy cap for N3 is about twice in the EU (except France and Sweden) and 60% higher in the US than the N2 segment, respectively (Figure 1). The subsidy cap threshold as a percentage of the e-truck price is also lower for N2 than N3, averaging 25% and 30% of the capital cost, across both the EU and US markets.

Annexure-I provides a detailed description of incentive programs for zero emission trucks in the US and the EU, and Annexure-II provides the merits and demerits of a purchase incentive program.

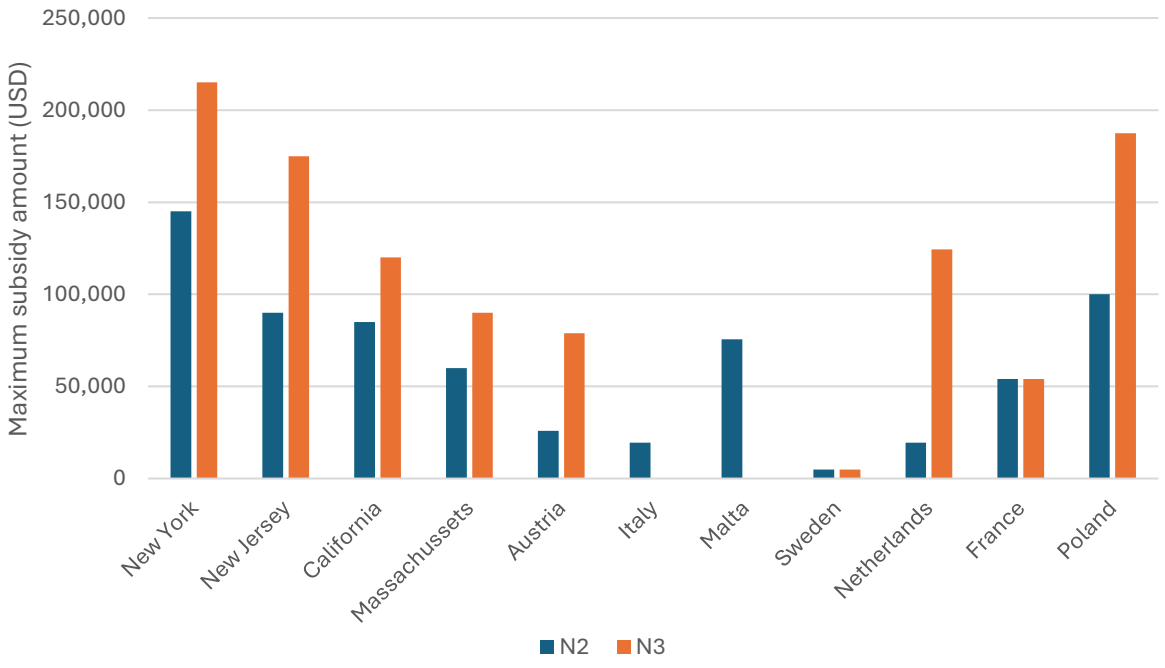


Figure 1: Subsidy cap for N2 and N3 segments across EU and US (USD) Source: UC Davis (2024) Authors analysis of data collated from multiple vehicle aggregator websites

3 Designing a purchase incentive for e-trucks in India

3.1 India's e-truck market potential

India's MHDT market has grown at a CAGR of 8.2% from FY2014 to FY2024. It recorded sales of about 4 lakh trucks in FY2024, of which about 80% were in the N3 category and 20% in the N2 category (Ministry of Road Transport and Highways, 2024). Within these, the N3C (GVW>25T) sub-category contributed about 50% of the sales in the past 3 years (Figure 2) (Society of Indian Automobile Manufacturers, 2024). The MHDT market is expected to grow at 1.7 – 2% CAGR between FY2024 – FY2030, having reached 2019 peak sales in FY2024 (Figure 3).

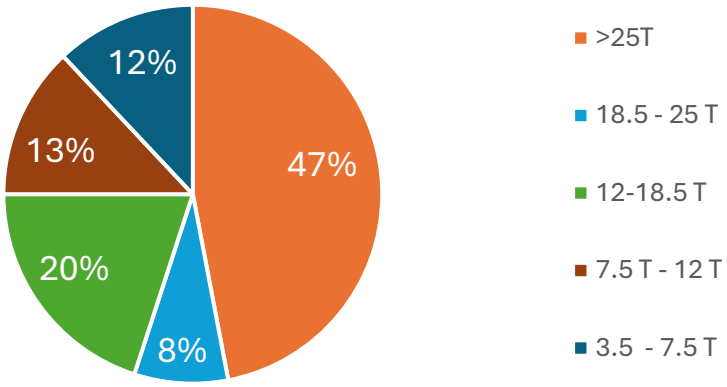


Figure 2: Category-wise market share of MHDTs in India between FY22 – FY24
Source: UC Davis (2024); Author analysis based on sales data from SIAM

As per government data, there were 140 and 240 e-trucks sold in the N2 and N3 categories respectively, representing 0.1% of the total sales in FY2024 (Ministry of Road Transport and Highways, 2024). As per UC Davis estimates, that consider policy measures such as purchase incentives, total cost of ownership (TCO), OEM launch announcements and commitments from shippers, about 4,500 e-truck sales are projected between FY2025 – FY2027 (Figure 4). Most of these sales are expected to occur in the N3 category given its overall market share in MHDT sales as well as expected e-truck model availability.

Within the N3 category, the N3B (18.5-28T) and N3C (>28T) are estimated to see the highest e-truck sales. There are 4 e-truck models available in these sub-categories in the market, provided by Ashok Leyland, IPLTech and Olectra (Ashok Leyland, 2024; IPLTECH Electric, 2024; Olectra Greentech Ltd, 2024). The number of models is expected to increase to more than 7 with product launches expected from OEMs including Tata Motors, Volvo Eicher Commercial Vehicles (VECV), Propel and Tresa Motors within the next 2 years. Moreover, e-trucks in these sub-categories are undergoing pilots with the cement and steel industry under the e-FAST program of NITI Aayog. This presents an opportunity to scale deployment in these sub-categories for efficient utilization of the allocated incentives under the PM E-DRIVE scheme.

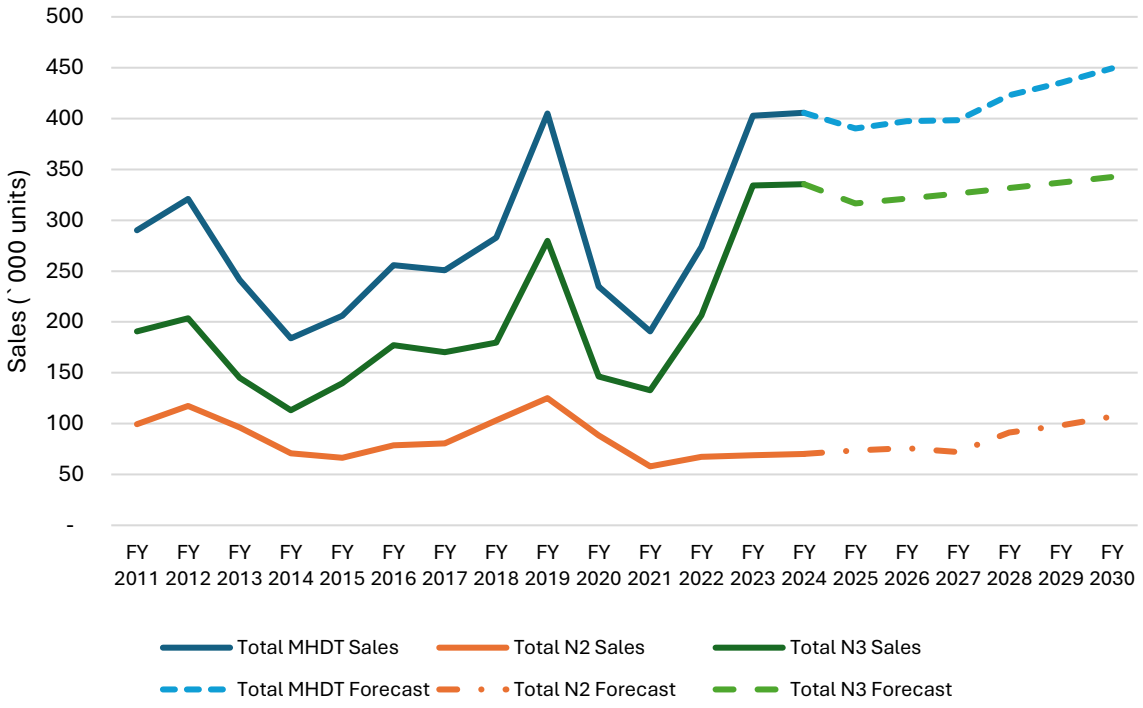


Figure 3: MHDT forecasts for India
Source: SIAM (2024), MoRTH (2024), UC Davis (2024)

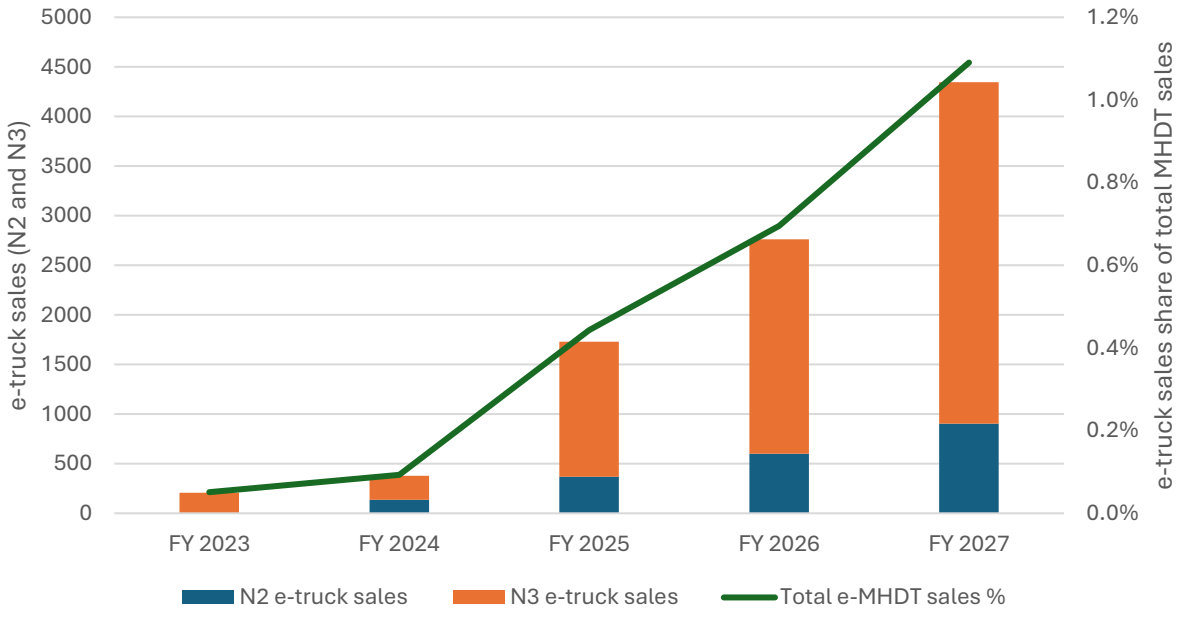


Figure 4: Electric MHDT market potential for India
Source: UC Davis (2024)

3.2 Understanding e-truck costs for incentive design

Based on market surveys and cost estimations, the existing price of e-trucks is about 2 - 3.5 times across segments compared to that of equivalent ICE models (Figure 5). The high upfront cost is a significant barrier in scaling up e-truck adoption. Though the battery size in India is about 25-40% lower than equivalent models in the EU and US markets, the battery cost still forms 40-50% of the cost of an e-truck in India.

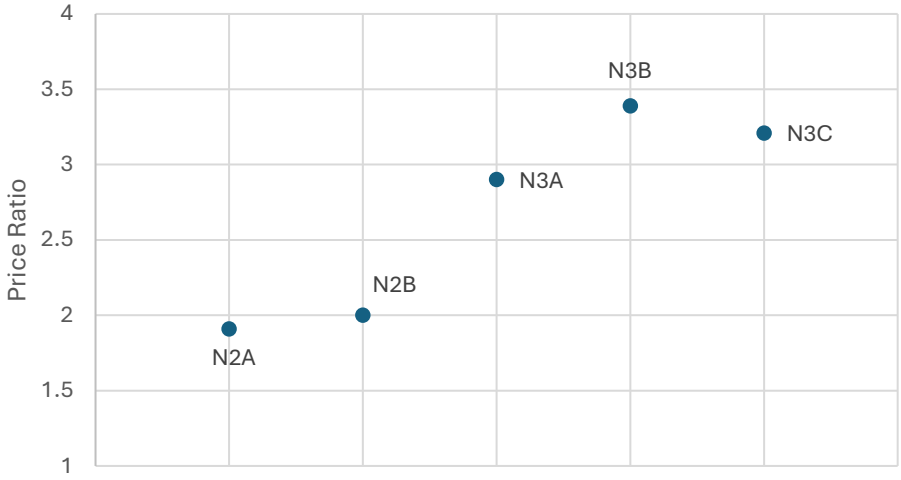


Figure 5: E-truck and ICE truck upfront price ratio
Source**:** UC Davis (2024)

Given India's approach to purchase incentives for EVs using battery sizes as the base criteria, along with overall price caps, we estimate the battery sizes for the different truck segments for India, based on market trends in the US and EU. The battery sizes are then used to estimate the prices of e-trucks in each segment. Table 2 provides the battery sizes for the US, EU and India markets and estimated range (EV Volumes, 2024)

Table 2. Battery sizes for e-trucks across segments and countries

Segment	Battery Size (kWh)			Estimated range (kms)		
	US	EU	India	US	EU	India
N2A	190	124	90	247	257	152
N2B	100	168	120	177	270	203
N3A	413	332	200	405	312	192
N3B	400	293	275	392	299	275
N3C & N3D	402	382	350	370	359	326

It should be noted that while the current and announced e-truck models in India have relatively lower battery sizes, the higher end of potential battery sizes are considered to ensure that the segment-wise price caps used for incentive eligibility are comprehensive across the possible range within each segment.

3.3 E-truck incentive design

We evaluate four incentive design scenarios which account for two key parameters:

a. Battery size of e-trucks (kWh)
b. Ex-factory price of Battery Electric Trucks (INR),

such that, the total incentive based on battery size is capped by a share of the ex-factory price.

Based on the evaluation of each scenario, we present Scenarios 2 and 4 in detail, with Scenario 4 being the suggested approach for the e-truck incentive program, adjusting for drawbacks of a flat incentive across truck segments (as in Scenarios 1 – 3).

Table 3. Incentive scenarios for e-trucks

Incentive Scenario	Battery size Incentive (INR/kWh)	Ex-factory price cap
Scenario 1	10,000 (N2 and N3)	20% (N2 and N3)
Scenario 2	10,000 (N2 and N3)	25% (N2 and N3)
Scenario 3	10,000 (N2 and N3)	30% (N2 and N3)
Scenario 4	10,000 for N2 and 15,000 for N3	20% for N2 and 30% for N3

Note: Incentive = Battery size incentive or ex-factory price cap, whichever is lesser

3.3.1 Scenario 2: Incentive of INR 10,000 / kWh and 25% ex-factory price cap

The incentive amount considered is INR 10,000/kWh with a subsidy cap of 25% of the e-truck ex-factory price, whichever is lesser, for both N2 and N3 categories. Table 4 provides the segment-wise incentive available under this scenario. In this scenario, the purchase incentive amounts to about 25% of the e-truck ex-factory price for N2A, N2B, N3A and N3B segments.

Table 4. Incentive available based on price cap and battery size for Scenario 2

Vehicle category	Battery size (kWh)	E-truck price (INR lakh)	Incentive Cap @25% (INR lakh)	Incentive @ 10,000/kWh (INR)	Incentive available (INR)
N2A	90	23.63	5.91	9,00,000	5,91,000
N2B	120	34.65	8.66	12,00,000	8,66,000
N3A	200	57.75	14.44	20,00,000	14,44,000
N3B	275	79.41	19.85	27,50,000	19,85,000
N3C	350	126.33	31.58	35,00,000	31,58,000
N3D	350	112.28	28.07	35,00,000	28,07,000

However, under this scenario, the purchase incentive supports about half (50%) of the price difference between an ICE and BET for the N2 category, whereas it only covers over one-third (37%) of the price difference for the N3 category, which results in an unequitable distribution of the incentive across the two categories. Given the higher tonnage of the N3 segment, which would require higher battery sizes and would witness greater payload constraints for range optimization, a higher incentive coverage for the N3 category is essential. This would require a reconsideration of the incentive criteria.

3.3.2 Scenario 4: Variable incentive and price caps for N2 and N3 segments

In this scenario, the incentive amount is INR 10,000/kWh for the N2 category with a cap of 20% e-truck ex-factory price and INR 15,000/kWh for the N3 category with a cap of 30% e-truck ex-factory price, whichever is lesser (Table 5).

Table 5. Incentive available based on price cap and battery size for Scenario 4

Vehicle category	Battery size (kWh)	E-truck price (INR lakh)	Ex-factory price cap (INR lakh)	Battery-size based incentive (INR)	Incentive available (INR)
N2A	90	23.63	4.73	9,00,000	4,73,000
N2B	120	34.65	6.93	12,00,000	6,93,000
N3A	200	57.75	17.33	20,00,000	17,33,000
N3B	275	79.41	23.82	27,50,000	23,82,000
N3C	350	126.33	37.90	35,00,000	35,00,000
N3D (Tractor)	350	112.28	33.68	35,00,000	33,68,000

This incentive design lowers the subsidy for N2 by 20% and increases the subsidy for N3 by 20% from the previous scenario. Since the upfront price of e-trucks in this sub-category is also 3-3.5 times higher than their ICE equivalent (Figure 6), a higher subsidy is expected drive higher adoption in this category.

As highlighted earlier, the incentive amount is varied across the two truck segments, to ensure equitable coverage (Figure 6). With the variable incentive for the N2 and N3 categories, it supports 41% of the price differential in the N2 category and about 44% of the price differential in the N3 category. Compared to the previous scenario, this offers a more rational distribution of the purchase incentive program, supporting a marginally higher amount for the higher weight classes (N3).

Further, the varied incentive amount aligns with the existing market structure of trucks in India, where the N3 segment contributes more than 75% of ICE sales and is expected to be over 60% of e-trucks sales, given e-truck model availability and OEM announcements.

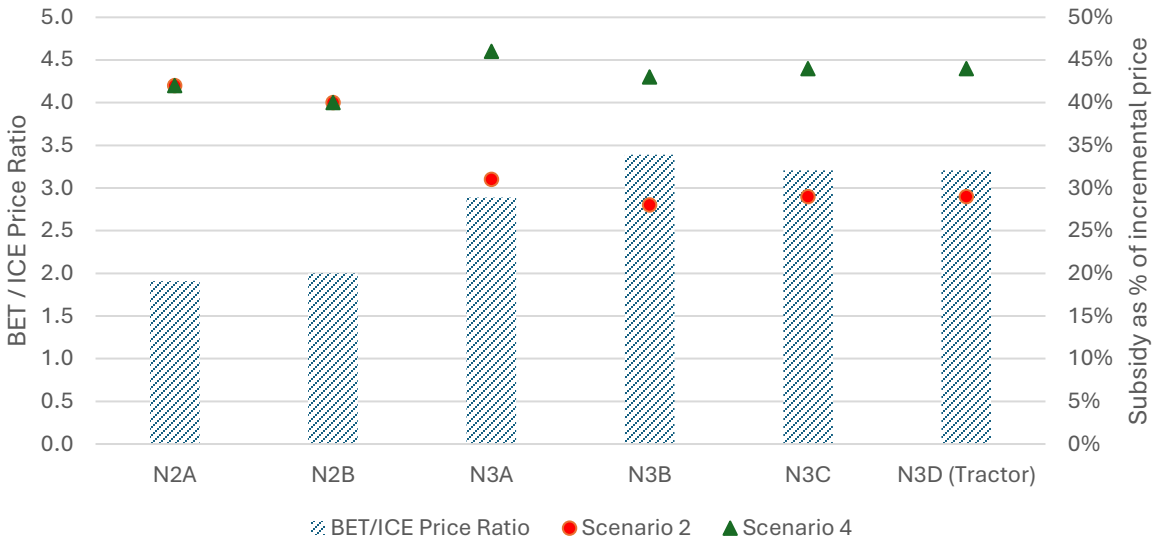


Figure 6: Subsidy incentive as a share of viability gap under scenarios
Source: UC Davis (2024)

Figure 7 provides a comparative summary of the incentive designs across all the scenarios, with a focus on Scenarios 2 and 4 presented above. As can be seen, Scenario 4 provides a higher incentive for the N3 category, which is projected to have the highest e-truck sales growth. This is expected to create a strong multiplier effect across all truck segments, bringing down technology costs faster by targeting the hard-to-abate segments in trucking and resulting in greater emission savings from replacing heavier trucks as zero emission, thus creating maximum impact of the PM E-DRIVE scheme in terms of market transformation and emission reduction.

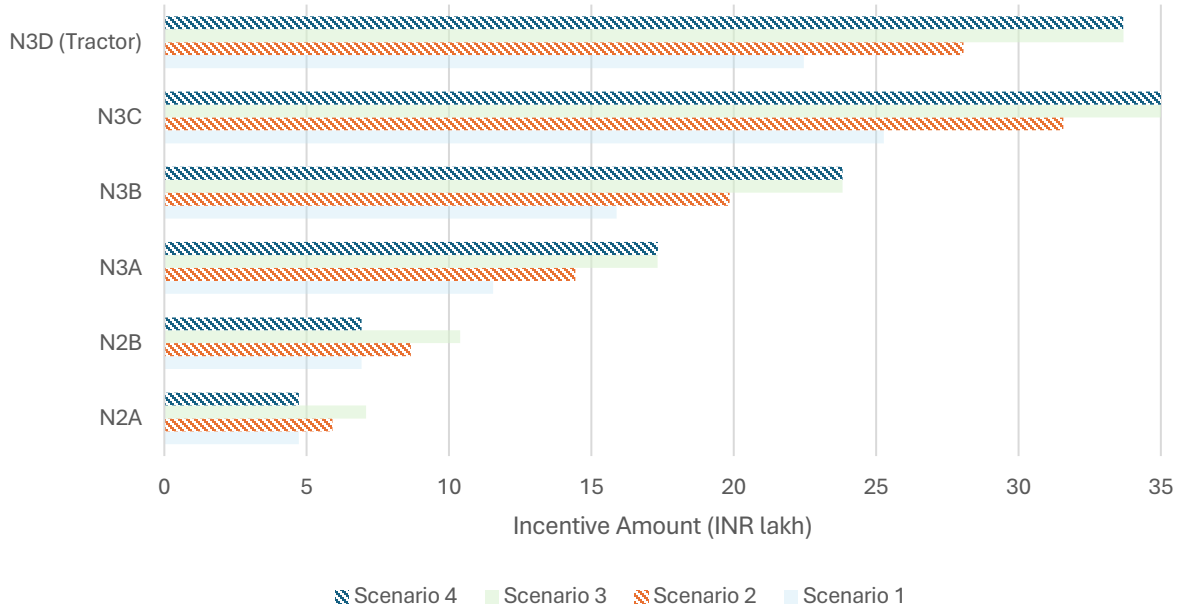


Figure 7: Comparative assessment of the incentive amount (INR lakh) under scenarios
Source: UC Davis (2024)

4 Maximizing impact of the INR 500 crore e-truck incentive allocation

The PM E-DRIVE scheme has allocated INR 500 crores (~USD 59.25 million) over two years, between FY25 – FY27 for incentivizing e-trucks. The program specifically focuses on battery electric trucks in the weight categories greater than 3.5T GVW. The scheme has allocated 30% (INR 150 crore) of budget to be spent in Year 1, and the balance (INR 350 crore) in Year 2.

We evaluate the four scenarios (Annexure-III and Annexure-IV) to estimate the number of e-trucks that could be incentivized based on the funds allocated for disbursement. The scenarios are assessed based on two key factors:

a. Distribution of incentivized e-trucks reflects the current overall MHDT market structure across various weight categories,
b. Fund utilization must be maximized in Year 1 with an outlay of INR 150 crore and Year 2 with an outlay of INR 350 crore.

Based on the incentive design under Scenario 4, the analysis estimates that about 2,000 e-trucks can be supported through the scheme over the two years, with 24% of these being N2 and 76% being N3 category e-trucks respectively. Table 6 provides a further breakdown within each category of the estimated e-truck volumes that can maximize fund utilization. While this is indicative, it is suggested that the incentive allocation be bifurcated across N2 and N3 categories but kept flexible across sub-categories to enable a dynamic and responsive incentive program for the electric truck market.

As stated in Section 3.1, the market potential for e-trucks is estimated to be about 4,500 trucks between FY25 – FY27 for India. With the suggested approach for the incentive design under the PM E-DRIVE scheme, the program can support about 45% of e-truck new sales estimated.

Table 6. Distribution of funds across e-truck categories with variable incentive structure

Truck Segment	E-trucks incentivized in Scenario 4	Govt. Expenditure on incentives (INR cr)	Total allocation of incentives
N2A	243	12.15	N2 (3.5 – 12 T) INR 30 crore for 503 e-trucks
N2B	260	18.20	
N3A	398	69.65	N3 (> 12T) INR 470 crore for 1495 e-trucks
N3B	160	38.40	
N3C	717	286.80	
N3D (Tractor)	220	74.80	
TOTAL	1998	500.00	INR 500 crore for 1998 e-trucks

5 Conclusion

The PM E-DRIVE scheme's inclusion of e-truck incentives is a pivotal moment in India's pathway to transport decarbonization. The complex market structure of the trucking industry and its operating conditions make it a hard to abate segment, with upfront costs being a significant barrier for adoption.

As seen in the analysis presented in this paper, the INR 500 crore incentive program can incentivize 2000 – 3000 electric trucks over a two-year period. With the market potential estimated at about 4500 trucks in the same period, the incentive program could support 45 – 65% of the market potential. At the same time, it is important to consider key parameters of incentive design to ensure an equitable program while avoiding market distortion and enabling early market development for e-trucks. This led to the development of a variable incentive program with higher incentives for higher weight classes, i.e. the N3 category, as well as differential price caps. Under this scenario, about 2000 e-trucks can be incentivized over the program period using the INR 500 crore allocation.

In addition to these, there are other design considerations that the e-truck incentive program could include:

a. **Definition of battery electric trucks:** The current program while focusing on battery electric trucks, could define thresholds for plug-in hybrid electric trucks, that could enable deployment of lower emission trucks in long haul and on-demand applications.
b. **Expanding the scope to zero emission truck incentives:** The program could be expanded in its next phase to include a wider definition of zero emission trucks, allowing for a technology agnostic approach that could include fuel cell hydrogen trucks and other emerging technologies as well.
c. **Energy efficiency requirements:** The incentive program for other vehicle segments in India already defines minimum efficiency (kWh/km) requirements for electric vehicles. The same could be defined for electric trucks for each segment, ensuring minimum technology benchmarks and driving innovation.
d. **Investment in infrastructure:** The PM E-DRIVE scheme allocates INR 2000 crore (~USD 238 million) for public charging infrastructure. Of this, while it aims to establish infrastructure for two and three wheelers, as well as cars and other four-wheelers, there is no mention of infrastructure incentives for e-trucks. While the scheme sets a goal of 1,800 public e-bus chargers, under certain conditions, these could be used by e-trucks as well. But with no specific allocation for e-truck chargers, there could be lower uptake in specific market conditions, resulting in limited market scale and deployment.
e. **Localization:** India's incentive program requires e-trucks to meet the component localization requirements as already set out in the Phased Manufacturing Program (PMP). A targeted approach to understand the current level of localization of electric truck components can support cost reduction for other overall EV industry. The deployment of e-trucks with larger battery sizes is also expected to provide a boost to the domestic cell manufacturing ecosystem.

f. **Scrappage policy:** The PM E-DRIVE scheme links incentives for e-trucks to scrappage certificates, i.e., to avail the purchase incentive, the buyer of an electric truck must have either a certificate of scrappage or certificate of deposit (COD) as proof that an ICE truck has been retired from the stock. India implemented a Voluntary Vehicle Modernization Program (Scrappage Policy) in 2022, with MHDVs requiring annual fitness tests after 8 years upto 15 years, after which the costs of compliance increase significantly. New electric truck buyers will have to either obtain CODs by retiring existing vehicles they own or can trade CODs from other fleet owners. The market will determine the clearing price for these CODs. This could potentially constrain the growth of new all-electric truck fleets, who may not have access to older vehicles to scrap or be able to procure enough CODs in the market at a viable price. The linking of incentives to scrappage is still expected to have net positive benefits, by way of replacing older polluting trucks from the stock, leading to both emission reduction and economic benefits.

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Annexure – I

Summary of zero emission truck incentives in the US and EU

United States
○ **Commercial Clean Vehicle Credit program**[1]: A federal program under the Inflation Reduction Act (IRA) which offers tax credits up to $40,000 for the purchase of Class 4-8 (GVW > 6.5 tonnes) electric trucks and up to $7,500 for purchase of Class 2b-3 (3.8 tonnes< GVW <6.4 tonnes) electric trucks. ○ **California Heavy Vehicle Incentive Program (HVIP)**[2]: It offers incentives between $7,500-$150,000 for Class 2b-8 (GVW> 3.8 tonnes) electric trucks and going up to $300,000 for fuel cell electric trucks. Both public and private fleet operators are eligible. Higher incentives for small fleet operators (operating less than 20 trucks) in California. ○ **Massachusetts Offers Rebates for EVs (MOR-EV)**[3]: It incentivizes purchase and lease of battery electric and fuel-cell electric MHDTs by $15,000-$90,000 for Class 3-8 (GVW> 5 tonnes) for individuals and fleets. The rebate decreases by 15% after every 200 vouchers have been claimed under the program. The maximum vehicle price cap to avail rebate is $2 million. Eligible applicants include residents, private businesses, non-profits, educational institutions and non-federal government departments. ○ **New York City Clean Trucks Program**[4]: Purchase incentives for replacing Class 4-8 (GVW> 6.5 tonnes) diesel vehicles with battery electric vehicles up to either 75% of BET sales invoice or a cap of $100,000-$215,000 depending on truck class. Funding is available for replacement of one Class 4-8 diesel vehicle (MY 1992-2009) for each zero-emission replacement truck.

[1] https://www.irs.gov/credits-deductions/commercial-clean-vehicle-credit

[2] https://californiahvip.org/

[3] https://mor-ev.org/trucks-3-8#rebate-lev

[4] https://www.nycctp.com/available-funding/

European Union
○ Emissionsfreie Nutzfahrzeuge und Infrastruktur – Austria[5]: provides €24,000 per N2 vehicle and €73,000 per N3 vehicle ○ **Flanders – Belgium [6]**: 40% of additional cost of up to €400,000/vehicle for per N2 and N3 BEV and 22.5% of additional cost of up to €350,000/vehicle N2 and N3 FCEV ○ **Program sufinanciranja elektricnih vozila 2022 – Croatia[7]:** For both N2/N3- Maximum €53,089 per company for BEVs, PHEVs, or FCEVs up to 40% of funds per vehicle. The maximum amount depends on the category. ○ **Poland[8]:** Purchase Subsidy upto 30% of eligible costs (large enterprises), up to 50% (medium-sized enterprises) and up to 60% (small enterprises) with max of 400,000 PLN (category N2) and 750,000 PLN (category N3). ○ **MOVES MITMA[9]**: Total Allocation - €400 million; N2/N3- Incentives from €15,000-190,000, depending on the vehicle type and the company size. ○ **The AanZET (Aanschafsubsidie Zero-Emissie Trucks) Scheme for fleet adoption[10]:** Budget €22,228,000. This scheme subsidises a small enterprise with a higher proportion of subsidies in comparison to a medium and large enterprise.

[5] https://www.umweltfoerderung.at/

[6] https://www.vlaio.be/en/subsidies/ecology-premium-plus/amount-ecology-premium-plus

[7] https://www.acea.auto/files/Electric_commercial_vehicles_Tax_benefits-and_purchase_incentives_2023.pdf

[8] https://interreg-baltic.eu/project-posts/polish-government-presented-new-funding-scheme-for-bev-and-fcev-trucks/

[9] https://www.transportes.gob.es/el-ministerio/sala-de-prensa/noticias/mar-16112021-1646

[10] https://www.rvo.nl/subsidies-financiering/aanzet

Annexure – II

Role of purchase incentives

Purchase cost incentives on upfront cost of the vehicle, typically based on the EV battery capacity, and capped up to 40% of vehicle cost

Objective: Early market development and accelerating EV adoption

Strengths	Challenges	Risks	Opportunities
Direct benefits • **Immediate financial relief at the time of purchase:** Direct incentives on the purchase price reduces the upfront cost of vehicle making it more affordable. • **Encourages adoption during the policy period:** Direct incentives boost consumer interest, especially among early adopters and increase demand. Indirect benefits • **Achieve economies of scale if implemented over a longer period:** Increased demand will help in achieving economies of scale and eventually reduce technology costs. • **Ease of Implementation:** Purchase incentives are relatively straightforward to administer, managed by a single department.	• **Market barrier:** Limited market impact in medium to long term without strong regulatory framework such as fuel efficiency norms or sales targets. • **Fiscal constraints:** Long term sustainability of direct incentives are not fiscally viable, and thus, cannot be used as a long term market signal. • **Manufacturing scale:** Will have limited impact on unlocking investments in manufacturing scale, given medium to long term uncertainty in budgetary allocations. • **Misuse of funds:** Lack of monitoring of eligibility criteria (such as localization requirements or scrappage certificate) and guidelines for implementation can lead to misuse of funds.	• **Market collapse:** Heavy reliance on direct purchase incentives can create an unsustainable e-truck market. A sudden reduction or elimination of these incentives can lead to market collapse with significant decline in sales. • **Imbalance in supply and demand**: A temporary spike in demand and supply in market following the incentive period can make it challenging for manufacturers to plan production and investment, ultimately eroding market stability. • **Complex eligibility criteria** for incentives can dilute the objectives of the scheme impacting industry and consumers alike.	• **Regulation-linked incentives** can meet the twin objectives of fiscal efficiency and market development (regulations include fuel efficiency norms, sales credit mechanisms, taxation reforms, etc.) • Explore **innovative financing** opportunities • Allow regulators to strengthen market through **periodic changes** to incentive design parameters.

Annexure - III

Evaluating fund utilization across the four subsidy scenarios

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Incentive structure (INR / kWh)	10,000	10,000	10,000	Variable structure (INR 10,000 for N2 / INR 15,000 for N3)
Price cap as % of ex-factory price	20%	25%	30%	N2 – 20% N3 – 30%
Number of e-trucks that can be subsidised	2980	2462	1945	1998
E-truck subsidy as % of incremental cost	N2 - > 40% N3 - < 30%	N2 - > 50% N3 - < 40%	N2 - > 60% N3 - < 45%	N2 = 40% N3 = 40%
Amount utilised (INR crore)	499.95	499.81	499.71	500.00
Estimated E-truck market in FY 25 - FY 27	4490; N2 (970), N3 (3519)			
E-trucks incentivised (Ratio N2:N3)	25:75	26:74	23:77	25:75
No. of e-trucks subsidized as % of estimated e-truck market	N2 (75%) N3 (64%)	N2 (67%) N3 (51%)	N2 (46%) N3 (43%)	N2 (49%) N3 (43%) (45% of all e-trucks)

Annexure - IV

Maximizing fund outlay and market transformation across the four subsidy scenarios

<table>
<tr><th>Truck Classes by GVW</th><th colspan="2">E-trucks that can be supported in Scenario 1</th><th colspan="2">E-trucks that can be supported in Scenario 2</th><th colspan="2">E-trucks that can be supported in Scenario 3</th><th colspan="2">E-trucks that can be supported in Scenario 4</th></tr>
<tr><td>N2A (3.5 - 7.5 T)</td><td>352 (12%)</td><td rowspan="2">732 (25%)</td><td>320 (12%)</td><td rowspan="2">650 (26%)</td><td>200 (10%)</td><td rowspan="2">442 (23%)</td><td>243 (12%)</td><td rowspan="2">503 (25%)</td></tr>
<tr><td>N2B (7.5 - 12 T)</td><td>380 (13%)</td><td>330 (13%)</td><td>242 (12%)</td><td>260 (13%)</td></tr>
<tr><td>N3A (12 - 18.5 T)</td><td>397 (13%)</td><td rowspan="3">2247 (75%)</td><td>345 (14%)</td><td rowspan="3">1812 (74%)</td><td>236 (12%)</td><td rowspan="3">1503 (77%)</td><td>398 (20%)</td><td rowspan="3">1495 (75%)</td></tr>
<tr><td>N3B (18.5 - 25 T)</td><td>450 (15%)</td><td>400 (16%)</td><td>320 (16%)</td><td>160 (8%)</td></tr>
<tr><td>N3C and N3D (>25 T)</td><td>1400 (47%)</td><td>1067 (43%)</td><td>947 (49%)</td><td>937 (47%)</td></tr>
<tr><td>Total</td><td colspan="2">2979</td><td colspan="2">2462</td><td colspan="2">1945</td><td colspan="2">1998</td></tr>
</table>