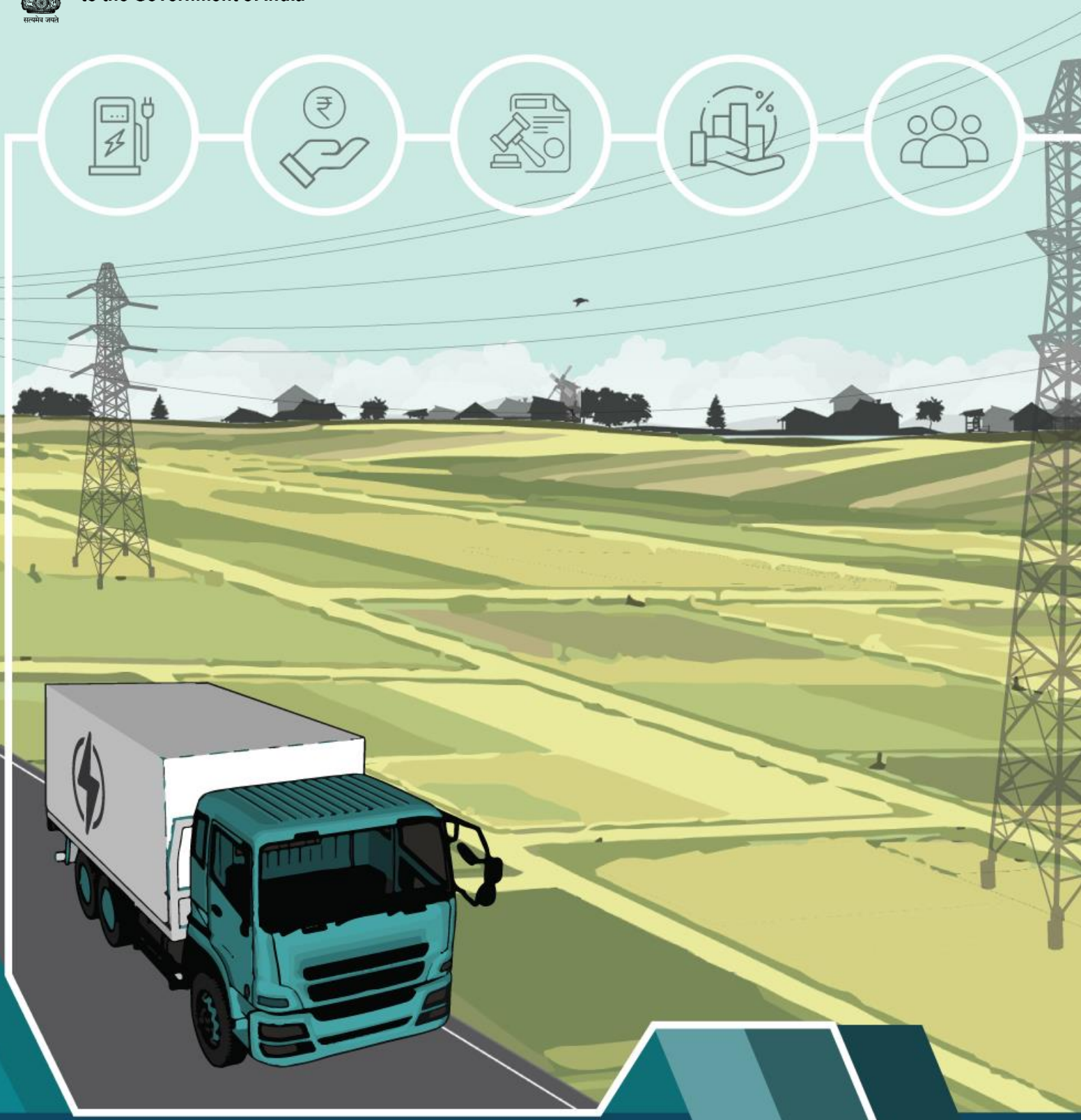
Office of the Principal Scientific Adviser
to the Government of India



Bharat Zero Emission Trucking (ZET) Policy Advisory

August 2024

अजय के. सूद
भारत सरकार के प्रमुख वैज्ञानिक सलाहकार
Ajay K. Sood
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FOREWORD

India's rapidly growing economy, coupled with urbanization and industrialization, has heightened the need for cleaner transportation solutions. With the transportation sector being a significant contributor to greenhouse gas emissions, the transition to zero-emission trucks (ZET) represents a crucial step in our Net Zero 2070 commitment.

ZET adoption is not only essential from decarbonization perspective but significant from energy security decision standpoint. The induction and wider adoption of ZET requires technical prowess and systematic policy interventions to create enabling techno-socio-economic ecosystem in India.

The "Bharat Zero Emission Trucking Policy Advisory "aims to create a roadmap for creating such policies. This advisory includes a comprehensive set of 30 policy interventions across five key areas aimed at benefiting stakeholders across the entire supply chain of ZET deployment, including incentivization, regulation, infrastructure, business and financing, and stakeholder-centric policies. These policy areas have been identified based on learning from successful national and international models, and are assessed and rigorously evaluated by set of experts.

I am hopeful that this advisory will pave the way for wider consultations and policy formulations at central and state governments level. I am deeply appreciative of the efforts of the Policy Advisory Panel and all expert contributors who have dedicated their expertise and time to crafting this document.

Ajay K Sood

(Ajay K. Sood)

Dated: 13th August, 2024

सत्यमेव जयते

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MESSAGE

As India progresses toward becoming a global leader in sustainable development, the imperative to address transportation emissions becomes more evident. To address transport sector emissions importance of zero-emission trucking (ZET) is well understood not only for aligning with our net zero goals but also for enhancing energy security and saving foreign exchange on petroleum imports. In the long term, ZETs can also contribute to reducing logistics costs for the country.

In August 2022, the PSA office established the Consultative Group on eMobility (CGeM), comprising experts from industry, academia, and other techno-commercial entities. This group identified the need for an R&D roadmap in surface transportation and e-mobility, which led to the creation of the Technical Roadmap for Zero Emission Trucking in India. However, recognizing that technological advancements alone are insufficient, the policy roadmap aims to shape demand, supply, and charging infrastructure for ZETs in addition to the technical roadmap.

The "Bharat Zero Emission Trucking Policy Advisory," outlines essential interventions to support the industry's transition to ZETs. By providing a clear policy roadmap, the industry gains clarity on product cycle development and sets targets that align efforts with national decarbonization pathways. Together, these roadmaps ensure a comprehensive and synergistic approach to ZET deployment.

I am hopeful that this advisory will serve as a cornerstone for a sustainable and prosperous future in India's road freight sector. I extend appreciation to all members of Policy Advisory Panel for their valuable input and suggestions. My deep appreciation for Dr. Preeti Banzal, Adviser/Scientist 'G', O/o PSA, Prof. Karthick Athmanathan, PSA Fellow , and COEZET , IIT Madras (appointed as Project Management Unit) for their exceptional contributions in drafting this Policy Advisory.

I am sure that the "Bharat Zero Emission Trucking Policy Advisory" will support formulation of many policies inherently required for induction and proliferation of zero emission trucking in India.

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Dated: 13th Aug, 2024

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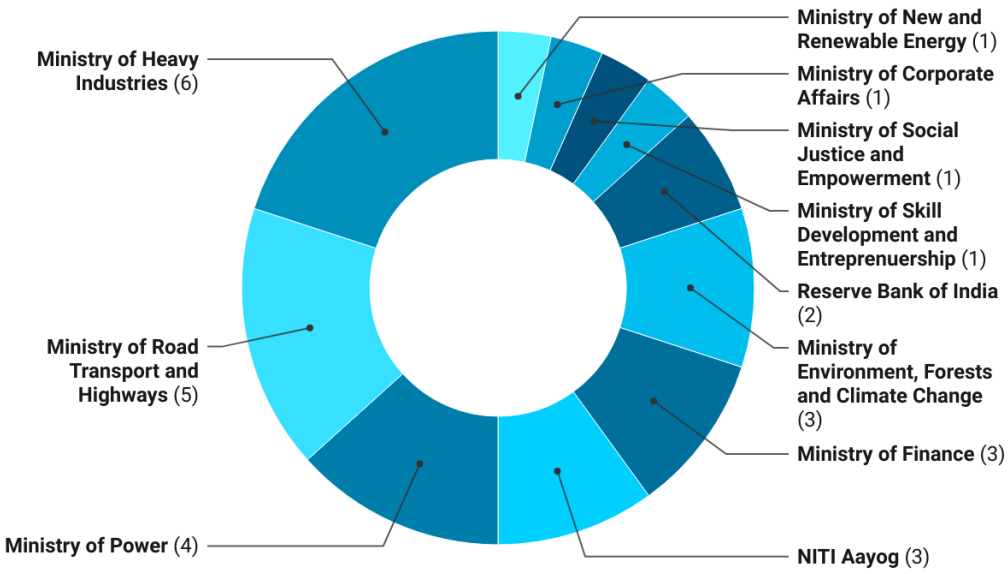
EXECUTIVE SUMMARY

Over the next 25 years, India is projected to become a ₹2200 trillion economy[1], leading to significant growth in road-based freight transportation. This growth, however, poses a serious threat to the environment. By 2050, an estimated 17 million trucks[2] could be on Indian roads, contributing to air pollution, an increased reliance on fuel imports, and rising logistics costs, which already account for 14%[3] of the country's GDP. To achieve India's ambitious Net Zero 2070 target, it is essential to complete a transition to zero-emission trucks (ZETs) by 2050, by pushing ZET sales penetration to 100%[4]. ZETs offer several benefits: enhancing energy security, reducing foreign expenditure on fuel, and lowering overall logistics costs. However, this transition requires coordinated action from both industry and policymakers.

The Office of the Principal Scientific Adviser recognizes the need for a comprehensive policy roadmap, in addition to individual schemes, to achieve this goal. The Consultative Group on eMobility (CGeM) from the Office of the Principal Scientific Adviser (O/o PSA) to the Government of India had published the 'Technical Roadmap for Deployment of Zero-Emission Trucking in India'[5] in March 2023 to identify the urgent technical actions required for accelerating ZET penetration in India. As a next step to facilitate ZETs in India, the Office of the PSA has established a Project Management Unit at the Centre of Excellence for Zero Emission Trucking (CoEZET), IIT-Madras to prepare a ZET Policy Advisory in close interaction with industry stakeholders to ensure enabling policies are notified by the Government of India. In this regard, a Policy Advisory Panel (PAP) has been constituted, with approval from the Office of the PSA.

To support the ZET transition, a comprehensive set of 30 policy interventions have been identified and rigorously analysed by experts. These interventions cover various areas and have been assessed for both ease of implementation (time and resources) and their potential impact on ZET adoption (volume of trucks affected, sector visibility, ecosystem dependence). An initial assessment by the PAP and the CoEZET is included for every intervention. This advisory, including the assessment by PAP, is intended to stimulate further discussion and analysis, rather than provide a rigid set of actions. The O/o PSA is interdisciplinary and cross-cutting. Both the O/o PSA and CoEZET at IIT Madras are prepared to assist identified ministries throughout the policymaking process. This support will include background briefings, research, stakeholder engagement, communication, and organizing key stakeholder discussions.

The policy advisory has been envisioned with a technology-agnostic approach, focusing on shaping demand, supply, and developing a robust refuelling infrastructure. Learning from successful national and international models, the roadmap emphasizes the importance of a cohesive approach that utilizes both incentives and regulations. Incentives can help make ZETs financially viable for potential buyers in the initial years, while regulations can signal market maturity and guide industry investments. The advisory outlines policy interventions across five key areas aimed at benefiting stakeholders across the entire supply chain of ZET deployment, including incentivization, regulation, infrastructure, business and financing, and stakeholder-centric policies. Some policies will target early market development, while others will focus on long-term provisions. A ministry-wise distribution of policy interventions is given in Figure 1.



Note: The labels represent ministries and the number of interventions that belong to each ministry.

Figure 1: MINISTRY-WISE DISTRIBUTION OF 30 POLICY INTERVENTIONS

By implementing this roadmap, the government aims to instil confidence in all stakeholders involved in the road freight ecosystem. This includes vehicle manufacturers, truck operators, financial institutions, charge point operators and other key players. Clarity on policies provides industries with the direction needed for product development and aligns efforts with national decarbonisation goals. In essence, the technical and policy roadmaps work in tandem to ensure a comprehensive and coordinated approach to deploying ZETs, paving the way for a more sustainable future for India's freight transportation sector.

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LIST OF ABBREVIATIONS

2W	2-Wheeler Vehicle
3W	3-Wheeler Vehicle
4W	4-Wheeler Vehicle
AIS	Automotive Industry Standards
AISC	Automotive Industry Standards Committee
ARAI	The Automotive Research Association of India
Auto-PLI	Automotive Production Linked Incentive Scheme
BET	Battery Electric Truck
BHEL	Bharat Heavy Electricals Limited
BIS	Bureau of Indian Standards
BMS	Battery Management System
CaaS	Charging as a Service
CAPEX	Capital Expenditure
CMVR	Central Motor Vehicle Rules
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CPO	Charge Point Operator
DISCOM	Electricity Distribution Company
e-MaaS	Electric Mobility as a Service
EU	European Union
EV	Electric Vehicles
FAME	Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India
FCET	Fuel Cell Electric Truck
FCEV	Fuel Cell Electric Vehicle
GVW	Gross Vehicle Weight
H2ICE	Hydrogen Internal Combustion Engine
HDV	Heavy Duty Vehicle
ICAT	International Centre for Automotive Technology
ICE	Internal Combustion Engine

IITM	Indian Institute of Technology Madras
ISO	International Organization for Standardisation
LCV	Light Commercial Vehicle
LSP	Logistics Service Provider
MDV	Medium Duty Vehicle
MHI	Ministry of Heavy Industries
MMLP	Multi Modal Logistics Park
MoCI	Ministry of Commerce and Industry
MOEFCC	Ministry of Environment, Forest, and Climate Change
MoF	Ministry of Finance
MoRTH	Ministry of Road Transport and Highways
MSME	Micro, Small and Medium Enterprises
NBFC	Non-Banking Financial Company
NHAI	National Highways Authority of India
NITI Aayog	National Institution for Transforming India
NOx	Nitrogen Oxides
NTPC	National Thermal Power Corporation
OEM	Original Equipment Manufacturer
OPEX	Operational Expenditure
PMP	Phased Manufacturing Program
PPP	Public Private Partnership
PSU	Public Sector Undertaking
SAIL	Steel Authority of India Limited
SFO	Small Fleet Owners
SIAM	Society of Indian Automobile Manufacturers
SOP	Standard Operating Procedure
TCO	Total Cost of Ownership
VGF	Viability Gap Funding
ZET	Zero-Emission Truck/Zero-Emission Trucking
ZEV	Zero Emission Vehicles

1. INTRODUCTION

1.1 BACKGROUND

India boasts the world's 4th largest[2] trucking industry, with trucks accounting for a significant portion of the country's transportation sector. Despite comprising only 3%[2] of all vehicles, trucks are responsible for more than one-third of transport-related carbon dioxide (CO2) emissions. This is particularly concerning given that road transportation accounts for a staggering 71%[2] of overall freight movement in India.

Fuelled by population growth and rapid urbanization, demand for logistics is expected to rise exponentially. Forecasts predict road freight movement to reach a staggering 9.6 trillion[2] tonne-km by 2050. This growth trajectory not only increases environmental concerns but also presents a significant economic challenge. Road freight currently accounts for over 25% of India's annual oil import expenditures, reaching a cost of ₹3.3 lakh crores[2] in FY 2022-23 alone.

Transport emissions go beyond CO2. They also include hazardous pollutants, such as nitrogen oxides (NOx) and carbon monoxide (CO). These pollutants contribute to ground-level ozone formation, which in turn increases the risk of cardiovascular and respiratory diseases.

Transitioning to zero-emission technologies is essential to achieve India's ambitious climate goals, including Net Zero 2070. Electrifying road transport offers dual benefits: reducing dependence on foreign oil and lowering overall logistics costs. Studies by NITI Aayog suggest that widespread adoption of zero-emission trucks (ZETs), including battery-electric trucks (BETs) and fuel-cell-electric trucks (FCETs), could avoid a staggering 838 billion[6] litres of diesel consumption by 2050, translating to savings of over ₹108 lakh crores[6] in oil expenditures.

1.2 ZET STATUS AND GOVERNMENT INITIATIVES

The Government of India has introduced several initiatives to promote the adoption of ZETs, focusing on electric and hydrogen-based fuel technologies.

Recognizing the importance of electric vehicles (EVs) in India's future, the Ministry of Heavy Industries was designated as the nodal ministry to promote and facilitate EV adoption in 2023. This ministry is spearheading multiple initiatives specifically targeted towards e-trucks, including potential incentives under the upcoming FAME III[7] program.

The Office of the Principal Scientific Adviser constituted a Consultative Group on eMobility (CGeM) a selective group of experts from academia, industry and other stakeholder entities. This group identified need, among others, to create a Technical Roadmap for Zero Emission Trucking in India. Accordingly, the 'Technical Roadmap for Deployment of Zero-Emission Trucking in India' was published in March 2023 to identify the urgent technical actions required for wider ZET adoption and acceleration of ZET penetration in India.

Furthermore, India's first freight electrification platform, the Electric Freight Accelerator for Sustainable Transport (e-FAST)[8], launched by NITI Aayog, has facilitated crucial conversations and collaborations regarding ZETs. This platform serves a vital role in fostering cross-industry partnerships, identifying pilot strategies, enabling financing solutions, enhancing the business viability of ZETs, and informing the development of supportive policies.

The Ministry of New and Renewable Energy[9] has launched pilot projects to use green hydrogen under the National Green Hydrogen Mission for the long-haul transportation. The program aims to support hydrogen deployment based on fuel cell-based propulsion and internal combustion engine-based propulsion technologies for trucks and buses in a phased manner. The scheme also focuses on supporting infrastructure development, such as hydrogen refuelling stations. It will also explore blending green hydrogen-based ethanol, methanol, and other synthetic fuels, to run automobiles.

1.3 POLICY ADVISORY PANEL FOR ZETS

The Office of the Principal Scientific Adviser (O/o PSA) recognizes the need for a comprehensive and targeted policy roadmap to facilitate ZET adoption in India. Building on this understanding, the Consultative Group on eMobility (CGeM) within O/o PSA released the "Technical Roadmap for Deployment of Zero-Emission Trucking in India"[5] in March 2023. This roadmap identified urgent technical actions to accelerate ZET penetration.

As a critical next step, the O/o PSA established a Project Management Unit at the Centre of Excellence for Zero Emission Trucking (CoEZET) at IIT-Madras. This unit is tasked with preparing ZET policy advisory recommendations to ensure the introduction of enabling policies by the Government of India. With the approval of the O/o PSA, a Policy Advisory Panel (PAP) was constituted to guide this process.

The Bharat ZET Policy Advisory is conceived as a live document- identifying a list of interventions to accelerate ZET adoption in India. It covers five crucial categories, benefiting stakeholders throughout the ZET deployment supply chain: incentives, regulations, infrastructure, business and financing, and stakeholder-centric interventions. While a few policies will be directed towards early market development such as fee waivers for limited periods and pilot incentives, few others will be long-term provisions.

1.4 METHODOLOGY AND APPROACH

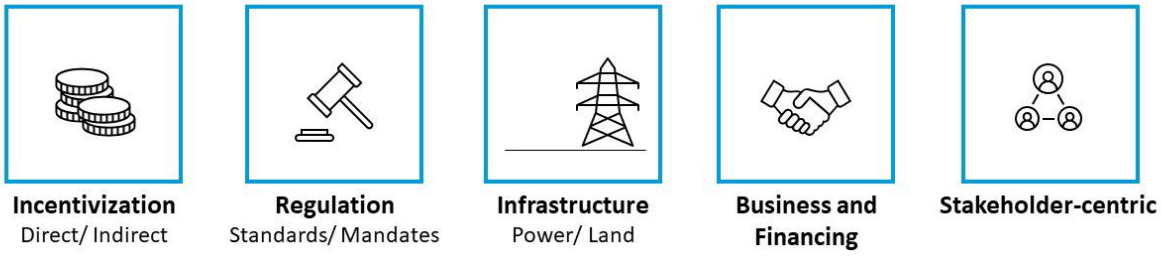
The Bharat ZET Policy Advisory adopted a systems-thinking approach to develop comprehensive policy interventions for ZET deployment in India. This approach involved several key steps:

1. **Understand the ZET Ecosystem:** A thorough analysis of the ZET ecosystem was conducted to identify key stakeholders, including industry players and government agencies, who will be both impacted by and can influence ZET adoption.
2. **Stakeholder Sensitivity:** Critical stakeholders were identified using a dual lens: considering their potential impact on ZET adoption and ensuring all stakeholders benefit from the implemented policies.
3. **Policy Identification:** Based on the systems thinking approach, thirty policy interventions have been formulated in collaboration with CoEZET. These interventions aim to accelerate ZET adoption across the entire ecosystem.
4. **Review and Consultation:** The initial policy roadmap will be extensively debated by the PAP and published. It will also be circulated to relevant ministries and NITI Aayog for further deliberation with stakeholders involved in the e-FAST platform.
5. **Living Document:** This roadmap is conceived as a living document, and it will be periodically updated and refined as the ZET ecosystem evolves and feedback is incorporated from stakeholders.

This approach ensures that the policy interventions are well-coordinated, consider the entire ZET ecosystem, and ultimately foster a smooth transition to zero-emission trucking in India.

1.5 THE KEY ELEMENTS OF POLICY INTERVENTIONS

The policy advisory categorizes policy interventions across five crucial areas to benefit stakeholders throughout the ZET deployment supply chain.



1. **Incentivization Schemes:** Financial support through direct and indirect financing will make ZETs more attractive to buyers.
2. **Regulatory Framework:** Amending existing regulations and introducing new ones will provide clarity and signal market readiness for ZETs.
3. **Zero-Emission Refuelling Infrastructure:** Tax credits and innovative service models are essential for establishing a reliable network of ZET charging and refuelling stations.
4. **Financing Solutions:** Lowering interest rates, facilitating attractive loans, and diversifying financing streams will improve cost parity for ZET adoption.
5. **Stakeholder-Centric:** Increasing awareness and upskilling stakeholders across the freight ecosystem will foster trust and transparency in the transition.

To ensure a holistic approach, the policy advisory will undergo a 360-degree impact assessment. Once feedback is gathered from various stakeholders, comments will be carefully considered and incorporated before the final Bharat ZET Policy Roadmap is published. Individual policy interventions will then be forwarded to the identified ministries for policy development and implementation.

The O/o PSA is ready to provide support and additional inputs to individual ministries throughout the policy development and implementation process. In close collaboration with O/o PSA and NITI Aayog, CoEZET will provide the necessary resources and support to ensure a smooth transition to ZETs in India.

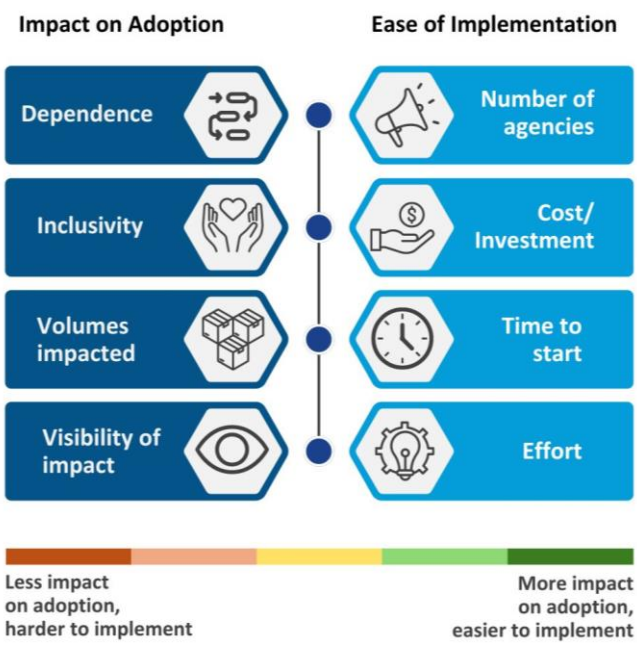
1.6 DELIVERABLES OF THE PANEL AS PART OF THIS ADVISORY

The need for a targeted policy roadmap has been clearly recognized, with designated nodal agencies identified for policy development. The following are the deliverables identified as part of the roadmap:

1. Identifying a list of areas for policy interventions that are to be implemented to support adoption of ZETs in India.
2. Benchmarking policy interventions to draw insights from successful implementations and address challenges effectively.
3. Creating a master plan for each of the above policy interventions with timelines.
4. Preparing a short and clear roadmap for each policy intervention that will define the following:
    a. The objective and justification for the activity
    b. The projected impact on adoption and ease of implementation
    c. The recommended nodal agency responsible for policy development and Implementation
    d. The recommended methodology for the intervention
    e. The stakeholders impacted by or impacting the interventions
    f. An approximate timeline for the activity displaying various tasks
    g. The outcome/ likely legislation affected for policy implementation
5. Developing a list of annexures that illustrate ZET policies that are either under development, implementation, or are already implemented.

1.7 HOW IS THIS DOCUMENT TO BE USED?

1. At the outset, it is to be noted that this Policy Advisory is, as the name suggests, "Advisory" in nature and is intended to facilitate further debate and deliberations for ensuring well-evaluated decisions on policymaking.
2. Given the constant and rapid changes in the market, technology, supply chain, costs, and policies, this document is to be treated as a living document.
3. The Bharat ZET Policy Advisory has identified various policy interventions required for the successful implementation of ZETs in India. The document has thirty identified policy interventions along with a recommended nodal agency for each policy intervention. Each intervention will be further refined through extensive stakeholder consultations, including detailed cost-benefit and impact analysis by concerned policy formulating ministry/department/institution. The O/o PSA can provide requisite knowledge support to individual ministries throughout the policy development and implementation process.
4. Each policy intervention can be read independently.
5. Each of the policy interventions were subjectively assessed by the PAP members for its Ease of Implementation as well as for its Impact on Adoption of ZET. This assessment, made by the different PAP members were then subsequently debated and normalised in CoEZET, along with different experts and industry players who have had direct and hands-on experience in trucking as well as sufficient knowledge in Batter Electric Trucks. This normalisation and calibration were done with the following 4 + 4 sub-criteria for Impact and Ease respectively:



6. The scores indicated for impact on adoption and ease of implementation in the advisory are to be treated as indicative and qualitative and essentially debate-initiating figures for a larger community of stakeholders to assess in the next phase of this document.
7. This is an advisory document and not a project plan or proposal. The experts have limited their suggestions to a broad level so that policymakers can take this up for further action.
8. This policy advisory should ideally undergo broader consultations with stakeholders through MHI as well as on the e-FAST India[8] platform, led by NITI Aayog[10]. The outcome of such consultations can be incorporated into the ZET Policy roadmap document. The roadmap indicates staggered start timelines, interdependencies of various policy interventions, and a policy prioritization.

9. For each identified policy intervention, suggestions for an implementation methodology have been given. The estimated active working time required for policy development is also indicated, which respective nodal agencies can refine further. The outcome section outlines potential legislative changes or required notifications as indicative guidance.
10. The recommended methodology is suggestive and high-level, intended for further refinement and detailed development by the respective nodal agency during implementation.
11. The timelines specified for each policy intervention reflect the active timeline (in months) of policy development from the commencement of implementation by the relevant ministries.
12. The policy interventions which are already under development or under implementation are excluded for this document and have been added to annexures to avoid duplicating efforts and side-tracking from core actions that are clearly within ZET's scope.

1.8 STAKEHOLDER IDENTIFICATION

The identification of interventions has been conducted through a thorough assessment of the needs of various stakeholders, including government, industry, and research organizations. Each policy intervention designates a nodal agency and outlines a list of stakeholders who will play a crucial role in the formulation or implementation of the policies.

LIST OF STAKEHOLDERS IDENTIFIED

CENTRAL MINISTRIES

Ministry of Heavy Industries
Ministry of Road Transport and Highways
Ministry of Finance
Ministry of Power
Ministry of Environment, Forests and Climate Change
Ministry of New and Renewable Energy
Ministry of Petroleum and Natural Gas
Ministry of Commerce and Industry
Ministry of Ports, Shipping & Waterways
Ministry of Housing & Urban Affairs
Ministry of Skill Development & Entrepreneurship
Ministry of Steel
Ministry of Mines
Ministry of Civil Aviation
Ministry of Education

PRIVATE COMPANIES

Shipper companies
Logistics Service Providers Small fleet owners and truck drivers
Original Equipment Manufacturers
Refuelling station operators (Charge point operators/hydrogen)
Distribution Companies
Battery manufacturers
Roads and bridges engineers
Toll-road operators
Battery component manufacturers (cell manufacturer, battery assembler)
Battery Management System (BMS) service providers
Battery recyclers
Hydrogen production companies
Corporate organizations

CENTRAL/STATE AGENCIES/DEPARTMENTS

Government Departments
NITI Aayog
State Government – Transport depts
Regional Transport Office (RTO)
Central Electricity Regulatory Authority & State Electricity Regulatory authorities
NHAI and State Public Works departments, State development authorities such as MSRDC
Income Tax Department
GST Council
Department of Public Enterprises

Associations
Confederation of Indian Industry (CII)
Federation of Indian Chambers of Commerce & Industry (FICCI) Associated Chambers of Commerce & Industry of India (ASSOCHAM)
Cement Manufacturers Association
Automotive Component Manufacturers Association of India (ACMA)
Society of Indian Automobile Manufacturers (SIAM)

Public Sector Enterprises
National Investment & Infrastructure Fund (NIIF)
Indian Highway Management Company Ltd (IHMCL)
Airport Authority of India
Dedicated Freight Corridor Corporation of India Limited (DFCCIL)
Other Public Sector Undertakings

Skill Development
National Council for Vocational Education and Training (NCVET)
National Skill Development Council
Automotive Skill Development Council
Sector Skill Councils
Capacity Building Commission

Standard Setting Organization
Central Motor Vehicles Rules -Technical Standing Committee (CMVR-TSC)
Automotive Industry Standards Committee (AISC)
Bureau of Indian Standards (BIS)

Testing Agencies
International Centre for Automotive Technology (ICAT),
Automotive Research Association of India (ARAI)

FINANCIERS

International Finance Corporation
International banks
Public sector banks
Private sector banks
Reserve Bank of India
Climate financiers
Financing institutions
Non-Banking Financing Company (NBFC)
Fintech companies
Investment Facilitation Agencies
Insurance companies
Indian Bank Association (IBA)

RESEARCH ORGS/ THINK TANKS

Testing & research organizations
Think tanks
Academia/Researchers
The Energy & Resources Institute
Invest India
Public & private academic/training institutions

LABOUR UNIONS

All India Transporter's Welfare Association (AITWA) / All India Motor Transport Congress (AIMTC)
Indian Battery Manufacturers Association (IBMA), India Energy Storage Alliance (IESA) & other such associations

1.9 BENCHMARKING ZET POLICIES

Globally, in 2023, the sales of electric trucks have surged[10] by 35% compared to 2022, with approx. 54000 units sold. China, a dominant market, comprises of 70% of the global sales, followed by Europe at 1.5% and United States at 0.1% of the global e-truck sales.

The rapid increase in e-truck adoption has been largely propelled by proactive policy support, encouraging industry uptake. Some countries have utilized purchase incentives to promote the adoption of ZETs, while others have implemented supply-side regulations to drive this transition. Furthermore, this growth has been supported by measures for infrastructure development, credit-based mechanisms, and R&D initiatives.

	National Decarbonization Targets	Incentivization	Regulation, Standardisation & Mandates
USA	Net Zero 2050 30% ZEV share of HDV sales by 2030 and 100% by 2050	US Inflation Reduction Act Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) Truck Loan Assistance Program for small-biz fleet owners	California Advanced Clean Trucks Advanced Clean Fleets US EPA proposed the next round of GHG emission standards (Phase III) for heavy-duty trucks for model year 2027 & beyond.
United Kingdom	Net Zero 2050 100% ZEV share of HDT sales by 2040 and MDT sales by 2035	Plug-in truck grants (PITrG)	Ultra Low Emission Zone (ULEZ)
European Union	Net Zero 2050 Norway - 100% sales of ZETs or biogas trucks by 2030 Austria – 100% sales of ZETs below 18T by 2030 and above 18T by 2035	Purchase incentives by France and Germany	Proposed revision to EU CO2 Regulations EU Directive 96/53/EC has been amended
China	Net Zero 2060 Fully electrify public sector vehicles by 2035 under New Energy Vehicle Industry Development Plan	Revised subsidies policy for promoting sales of both commercial & passenger class NEVs including trucks	Implementation Plan for Synergistic Reduction of Pollution and Carbon Emissions
India	Net Zero 2070	Purchase incentives for e-tractors by Haryana	Production Linked Incentives CAFE Norms 4 states committed to phase out commercial fossil fuel vehicles by 2030

	Business & Financing Mechanism	Infrastructure	Stakeholder-centric
USA		Inflation Reduction Act Low Carbon Fuel Standard (LCFS) Infrastructure Investment and Jobs Act 2021	Department of Energy (DoE) Clean Cities Program
United Kingdom			Vocational training programs for EV transition by skill development agencies/ associations
European Union	Loan Guarantee Instrument for Trans-European Transport Network Infrastructure	Alternative Fuel Infrastructure (AFIR Regulations)	Skills4Electrification project
China		Implementation opinions on further improving service guarantee capacity of EV charging infra.	Vocational training programs for EV transition by skill development agencies/ associations
India	Demand Aggregation for e-buses under 'The Grand Challenge'	Incentives for charging infrastructure under Faster Adoption and Manufacturing of Electric and Hybrid Vehicles (FAME)	Vocational training programs for EV transition by skill development agencies/ associations

2. MASTER PLAN FOR POLICY ROADMAP

The document lists 30 policy interventions for ZET adoption, each assigned to a recommended nodal agency. The interventions are sequenced according to ministries and do not indicate any prioritization of policies.

MASTER PLAN & BUDGET FOR INDIA ZET POLICY ADVISORY

Sl. No.	Activity	Nodal Agency	Plan Duration in Months				
			5	10	15	20	25
1	Demand Incentive	Ministry of Heavy Industries					
2	Early Adopters Pilot Program						
3	Demand Aggregation for ZETs						
4	eMaaS Enablement for PSUs						
5	Phased Localization Mandate						
6	Interoperable Standards for BET Batteries						
7	Comprehensive Powertrain Roadmap						
8	Zero Emission Technology Definition	Ministry of Road Transport and Highways					
9	Additional Gross Vehicle Weight (GVW) and Max Axle Weight Allowance for ZETs						
10	ZET Toll Waiver for Limited Period						
11	CAFE Norms Tightening and ZEV Credits						
12	Quality and Quantity of Power Supply	Ministry of Power					
13	Refuelling Infrastructure Deployment Criteria by Road Classification						
14	Demand Charge Waiver for Charging Infrastructure						
15	Phased Supply Side Sales Mandates	Ministry of Environment, Forest, and Climate Change					
16	Phased Demand Side Mandate						
17	Credit Guarantees	Ministry of Finance					
18	Accelerated Depreciation for ZETs and Charging Infrastructure						
19	Tax Credits for ZETs and Re-fuelling Infrastructure						
20	Concessional Land for ZET Refuelling Infrastructure						
21	Interest Subvention						
22	Priority Sector Lending						
23	Hydrogen Corridor Incentive	Ministry of New and Renewable Energy					
24	Entry Time Waiver for Limited Period	Ministry of Housing and Urban Affairs					
25	Entry Fee Waiver for a Limited Period	NITI Aayog					
26	Stakeholder Engagement and Awareness						
27	Residue Value Framework for BETs						
28	CSR Support for ZET Adoption	Ministry of Corporate Affairs					
29	Special Pilot Incentive Program for Small Fleet Owners and Drivers	Ministry of Social Justice and Empowerment					
30	Skill Development Programs	Ministry of Skill Development and Entrepreneurship					
	Total						

3. ROADMAP

The PAP has prepared this policy advisory document for the following topics/areas after due deliberation and diligence.

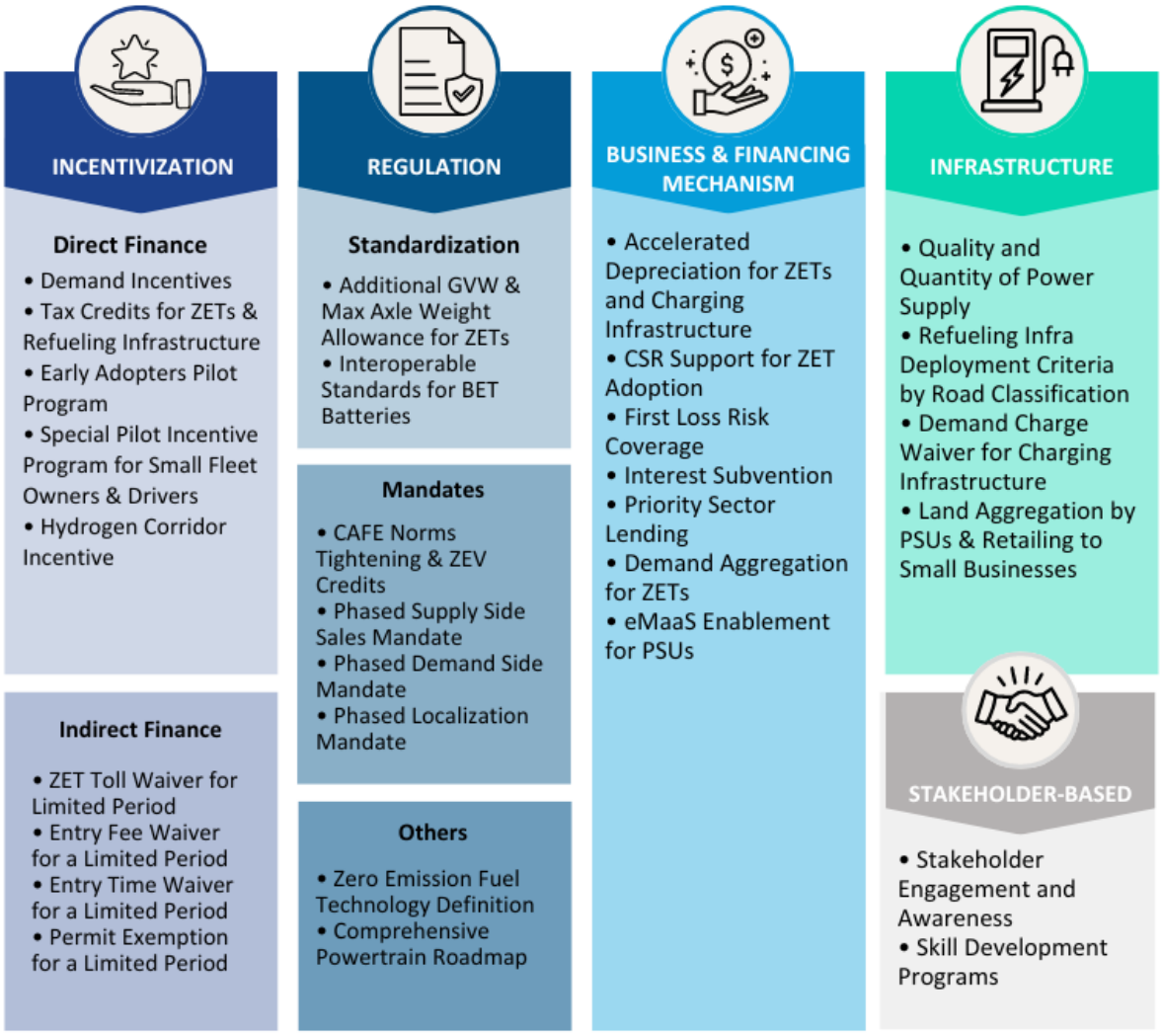


FIGURE 2: CLASSIFICATION OF POLICY PRIORITY AREAS FOR THE DEPLOYMENT OF ZET

Each policy intervention in the advisory includes key aspects, such as:

1. Objective
2. Projected impact on adoption and ease of implementation
3. Recommended nodal agency
4. Recommended methodology
5. Stakeholders
6. Suggested timeline for policy development
7. Outcome/likely legislation affected

The thirty identified policy interventions are detailed in the following sections.

3.1 DEMAND INCENTIVE

OBJECTIVE

ZETs come with a substantial upfront cost, often 2.5-3.5 times higher than their internal combustion engine (ICE) counterparts. This cost disparity presents a significant hurdle for potential buyers and fleet operators looking to adopt ZETs. Policies such as FAME I, FAME II, and PLI schemes have notably catalysed the EV landscape in India. By focussing on two, three, and four-wheelers, it has fostered financial viability and innovation, leading to almost 30 lakhs[11] registered EVs on Indian roads by the end of 2023.

To address the challenges of high upfront costs for ZETs, global point-of-sale incentives have made ZETs financially appealing and competitive compared to ICE trucks. For instance, California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)[12] provides incentives that account for 21%[12] of average savings per vehicle. Other countries, such as the EU and China, are providing sales incentives to bridge the high-cost differences between ICE and its clean transportation counterparts. This helps ease adoption for stakeholders. These incentives would be available to buyers of ZETs, partly bridging the price gap between ZETs and their ICE counterparts.

ZET demand incentives can be designed in various formats to suit market requirements. For example, implementing incentives with performance-based parameters such as battery capacity, range, and energy consumption can enhance product quality for efficient market development. Incentives can also be routed through public sector undertakings (PSUs), specific for government controlled/ owned fleets, based on identified qualifying parameters. This can help in leveraging their capacity to aggregate assets like trucks, land, and charging infrastructure. These combined resources can then be provided to stakeholders at favourable rates, helping to mitigate risks related to technology, infrastructure, and other factors. Going forward, a careful phasing out of incentives should be planned to not disrupt the demand-supply cycle.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Conduct a holistic study of global ZET demand incentives examples.
2. Develop a comprehensive understanding of ZET vehicle costs compared to ICE truck costs across vehicle segments.
3. Conduct cost gap estimations for each segment to identify the design criteria for demand incentives for each segment.
4. Identify criteria for incentives – ₹/kWh of subsidy, energy efficiency criteria, capping budgetary allocation, reducing per unit incentive year-on-year based on technology cost reduction, qualifying criteria for receivers, etc.
5. Assess the impact of demand incentives on the total cost of ownership (TCO), required budgetary allocation of ZETs.
6. Create a framework of incentive programs.
7. Identify avenues for disbursing funds – either directly to stakeholders or via PSUs.
8. Consult stakeholders for feedback on the draft framework and refine it.
9. Devise a withdrawal strategy for demand incentives.
10. Roll out demand incentives.

STAKEHOLDERS

1. Ministry of Finance
2. Ministry of Road Transport and Highways
3. Original Equipment Manufacturers
4. Logistics Service Providers
5. Small fleet owners and truck drivers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 3 : TIMELINES TO ROLL OUT DEMAND INCENTIVES

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATION AFFECTED

Creation of a demand incentive program, similar to FAME.

ADDITIONAL READING LINKS

1. Electric Vehicle Incentives in 15 Leading Electric Vehicle Markets (https://escholarship.org/content/qt0tn2p4x6/qt0tn2p4x6.pdf)
2. Principles for Effective Electric Vehicle Incentive Design (https://theicct.org/sites/default/files/publications/ICCT_IZEV-incentives-comp_201606.pdf)
3. Providing the Spark: Impact of Financial Incentives on Battery Electric Vehicle Adoption (https://ceepr.mit.edu/wp-content/uploads/2021/09/2019-015.pdf)
4. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (https://californiahvip.org/)

3.2 EARLY ADOPTERS PILOT PROGRAM

OBJECTIVE

Pilot programs serve as essential testing grounds, fostering innovation in technology, operational strategies, and financial models to overcome challenges in adopting ZETs. A successful, scalable pilot initiative can significantly expedite ZET adoption by identifying viable applications, mapping product requirements to specific routes, and funding constraints faced by truck operators.

The early adopters pilot program can create a cohort of first movers. The program can be designed for a specified number of trucks or amount or both, across defined sectors and segments to boost the cohort's confidence. Support can be provided in terms of streamlined/ fast-track approvals, additional pilot vouchers/ incentives, land provision for public charging infrastructure setup, viability gap funding (VGF), etc. The program can be carried out by PSUs for better project monitoring and operationalization.

Several cities and states across the US have launched pilot initiatives aimed at electrifying specific segments of trucks. For example, Seattle's Heavy Duty Vehicle Electrification Incentive Pilot[13] targets drayage trucks, offering point-of-sale rebates covering up to 40% of the total truck cost, with a total funding pool of ₹14 crores. In India, National Thermal Power Corporation (NTPC) has trialled hydrogen buses and hydrogen refuelling stations in Ladakh[14].

The program can be administered through an application process, where candidates will be evaluated based on predefined parameters. These parameters should consider factors such as minimum fleet size, the viability of use cases, operational capacity, and the pilot deployment plan.

The program should be valid for a specified duration, during which the feasibility of pilot initiatives for the given zero emission fuel will be assessed. Co-funding mechanisms may be employed to enhance support, and a public-private partnership (PPP) model can facilitate program implementation. The tangible benefits of this initiative will be clearly outlined to encourage participation and uptake.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Study national and international examples to identify the type of support given for pilot deployment.
2. Consult stakeholders to understand challenges in ZET adoption and required support.
3. Determine key parameters for assessment that include:
    - Use cases
    - Corridors
    - Vehicle class
    - Timelines for an implementation plan
    - Charging infrastructure deployment
    - Solution design
    - Commercial analysis
    - Sectoral/geographical coupling
4. Establish sources for funding the program, identify risk sharing mechanisms and determine financing framework.
5. Set up evaluation experts from government, PSUs, academic institutions, or research organizations to assess feasibility of projects.
6. Devise a strategy for operationalization of the program and disburse funds.
7. Oversee timelines for implementation.
8. Notify early pilot incentive program to gather applications.
9. Assess pilot project feasibility, business, financing, environmental and technical aspects for received applications.
10. Determine the success of pilot implementation based on success metrics such as lowest viability gap, match funding from private sector, scale of deployment, potential for replication and market transformation, etc.
11. Grant early pilot incentive for the shortlisted applications.
12. Establish a monitoring, evaluation, and learning (MEL) structure for the project and assess success of the program.

STAKEHOLDERS

1. Ministry of Road Transport and Highways
2. State Government – Transport departments
3. Logistics Service Providers
4. Shippers
5. Original Equipment Manufacturers
6. Distribution Companies
7. Financial institutions
8. Insurance companies
9. Refuelling station operators (Charge point operators/hydrogen)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 4 : TIMELINES TO ROLL OUT EARLY ADOPTERS PILOT PROGRAM

ACTIVITY	PERIOD (Months)								
	2	4	6	8	10	12	14	16	18
Background research and analysis									
Stakeholder consultation									
Program development									
Program roll-out									
Administration and pilot deployment									

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An official notification and Standard Operating Procedure (SOP) released by government specifying the number of trucks, funds allocated, assessment criteria, for the Early Adopters Pilot Program.

ADDITIONAL READING LINKS

1. City of Seattle's Electric Trucks Incentive Pilot - Environment (https://www.seattle.gov/environment/climate-change/transportation-/transportation-electrification/heavy-duty-truck-electrification)
2. Innovative Small e-Fleet Pilot Program, California Air Resources Board (https://ww2.arb.ca.gov/resources/fact-sheets/innovative-small-e-fleet-pilot-program)
3. Zero-Emission Truck Pilot Project (https://www.sdapcd.org/content/sdapcd/grants/grants-equipment/heavy-duty-trucks/zero-emission-truck-pilot-project.html)
4. Implementation Manual For HVIP (https://californiahvip.org/wp-content/uploads/2023/08/HVIP-FY22-23-Implementation-Manual.pdf)

3.3 DEMAND AGGREGATION FOR ZET

OBJECTIVE

The primary goal of this intervention is to facilitate the price discovery process for ZETs by aggregating demand from buyers and fleet operators. This can potentially create a clear and sustained market signal for OEMs. This process would help achieve economies of scale, leading to lower prices for ZETs and make TCO attractive –which will help spur demand further.

Demand aggregation can optimize manufacturing processes, enhance investment opportunities, and increase operational efficiency. Increased competition will stimulate innovations and expand the scope for standardisation. This aggregated demand will also ensure efficient utilization of infrastructure. With the increase in pilots-at-scale, areas of policy intervention can be identified, leading to targeted incentivization, both fiscal and non-fiscal, driving the ecosystem towards faster adoption of ZET. Overall, demand aggregation has the potential to create a virtuous cycle, where increased demand leads to cost reductions, which in turn stimulates further demand.

In a successful example of demand aggregation, Convergence Energy Solution Limited (CESL) in May 2022, under the mandate of MHI, concluded 'The Grand Challenge'[15] for e-bus procurement. India's biggest e-bus tender was to deploy 5,450 e-buses across five cities – Delhi, Hyderabad, Bengaluru, Surat, and Kolkata. The procurement was through Gross Cost Contract (GCC) model reducing the financial burden on agencies. The bulk aggregation and procurement led to the discovery of lowest prices for e-buses – Rs 43.49/km for 12m buses and Rs 39.21/km for 9m bus.

The success can be attributed to CESL playing pivotal role in the e-bus tendering process. Comparable systems and organizational frameworks should be identified for ZETs that lack governing or administrative authorities. This can be explored separately for government owned fleet (garbage, port operations, etc.) and private players (cement, FMCG, etc.). The exercise can run parallel to the e-MaaS model implementation program [refer to the section 3.5 below]. The two will complement each other's efforts in identifying pathways to ZET adoption.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Public sector undertaking (PSU) such as CESL, appointed by Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Study case of e-bus Grand Challenge – identification of key driving parameters, challenges, and stakeholders consulted.
2. Study and analyse national and international demand aggregation mechanisms for ZETs.
3. Assess potential for demand aggregation across private and public fleets.
4. Identify geographies/ corridors and sectors for aggregation.
5. Identify business models that are suited to be employed for demand aggregation.
6. Identify key stakeholders to gauge interest and participation in demand aggregation.
7. Consult identified stakeholders to gather insights.
8. Identify an agency/ PSU for implementation.
9. Formulate demand aggregation strategy and create legal, contractual framework.
10. Standardise use cases and vehicle categories in ZETs to be aggregated.
11. Notify the identified agency for demand aggregation based on MHI's mandate.

12. Create a Request for Proposals (RFP) or other aggregating mechanisms to solicit bids from electric truck manufacturers or dealers.
13. Conduct stakeholder workshops on demand aggregation for detailed solution design.
14. Negotiate favourable terms and conditions with selected suppliers based on aggregated demand, including pricing, delivery schedules and warranty terms.
15. Aggregate demand at national level and release of Letter of Intents from respective agencies to OEMs.

STAKEHOLDERS

1. PSU identified for implementation
2. NITI Aayog
3. Confederation of Indian Industry (CII), Federation of Indian Chambers of Commerce & Industry (FICCI), Associated Chambers of Commerce and Industry of India (ASSOCHAM), Cement Manufacturers Association (CMA) and other such organizations
4. All India Transporter's Welfare Association (AITWA) / All India Motor Transport Congress (AIMTC)
5. Logistic Service Providers
6. Original Equipment Manufacturers
7. Ministry of Road Transport and Highways
8. Ministry of Power / Distribution Companies
9. Dedicated Freight Corridor Corporation of India Limited (DFCCIL)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 5: TIMELINES TO ROLL OUT OF DEMAND AGGREGATION FOR ZET

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Study and analysis												
Stakeholder consultation												
Mandate from MHI												
Standardisation and tendering process												
Start of implementation												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by MHI mandating the selected nodal agency to aggregate demand for ZETs at a national level.

ADDITIONAL READING LINKS

1. Grand Challenge Case Study (https://www.convergence.co.in/public/images/electric_bus/grand-challenge-case-study-final-web-version.pdf)
2. The Grand Challenge: An Aggregated Approach to E-Bus Procurement in India (https://transformative-mobility.org/the-grand-challenge-an-aggregated-approach-to-e-bus-procurement-in-india/)
3. Development of the India Zero Emission Bus Market Investor's Guide (https://transformative-mobility.org/wp-content/uploads/2023/04/C40-India-ZE-Bus-Investor-guide.pdf)

3.4 E-MAAS ENABLEMENT FOR PSUS

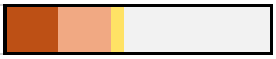
OBJECTIVE

The substantial capex associated with ZETs compared with regular trucks stands as a significant impediment to their widespread adoption.

A potential solution to bridge this gap involves making ZETs available to Logistics Service Providers (LSPs) through electric-Mobility-as-a-Service (e-MaaS)[16] that includes Vehicle-as-a-Service (VaaS) and Battery-as-a-Service (BaaS). This approach can address challenges by incorporating specific conditions, including long-term commitments from shipper/end-user companies, operational excellence demonstrated by LSPs, long term service commitments by OEMs and availability of charging infrastructure tailored to identified use cases. By facilitating leasing arrangements, these conditions can collectively contribute to overcoming the financial and operational barriers that hinder the adoption of ZETs in the logistics sector.

The implementation of the eMaaS model can be effectively facilitated through Public Sector Undertakings (PSUs) such as Bharat Heavy Electricals Limited (BHEL), National Thermal Power Corporation (NTPC), Steel Authority of India Limited (SAIL), etc. Government incentives can be channelled through these established holding companies, providing a structured framework for enhanced fund monitoring and accountability.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Study national and international examples implementing eMaaS as a solution for MHDVs.
2. Benchmark the eMaaS model implemented for buses and lessons from the process.
3. Identify PSUs which can take up eMaaS for ZETs.
4. Assess a methodology to create holding company under PSUs through government order, etc.
5. Establish a platform and rules for financial management and transparency.
6. Identify detailed qualifying criteria for participants, use cases and routes.
7. Assess impact and trade-off – investment vs. emission saving, opportunities for carbon trading, etc.
8. Develop a Model Concession Agreement for eMaaS, if required.
9. Create an operationalization framework that includes a risk-sharing mechanism.

STAKEHOLDERS

1. Ministry of Power
2. Public Sector Undertakings
3. Ministry of Petroleum and Natural Gas
4. Ministry of Heavy Industries
5. Ministry of Steel
6. Original Equipment Manufacturers
7. Shipper companies
8. Logistic Service Providers
9. Charge Point Operators

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 6: TIMELINES TO ROLL OUT e-MAAS ENABLEMENT FOR PSUs

ACTIVITY	PERIOD (Months)								
	2	4	6	8	10	12	14	16	18
Research, analysis and benchmarking									
Stakeholder consultation									
Establishing regulatory framework									
Policy roll-out									

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order creating a mandate for PSUs to develop eMaaS.

ADDITIONAL READING LINKS

1. Grand Challenge Case Study (https://www.convergence.co.in/public/images/electric_bus/grand-challenge-case-study-final-web-version.pdf)
2. India EV Landscape – eMaaS Revolutionizing the Mobility Space (https://www.avendus.com/upload/misc/india-ev-landscape-emaas-revolutionizing-the-mobility-space.pdf)
3. Billion Electric Introduces Revolutionary E-Mobility Platform for Airport Buses & Trucks, Raises $10M in Seed Funding (https://emobilityplus.com/2023/06/27/billionelectric-introduces-revolutionary-e-mobility-platform-for-airport-buses-trucks-raises-10m-in-seed-funding/)

3.5 PHASED LOCALIZATION MANDATE

OBJECTIVE

India has the third largest automotive market in the world, with new vehicle sales totalling 4.25 million[17] in 2022. Traditional ICE has localised production, while current EV production depends on international supply chains. To maintain India's leadership in the automotive market, it becomes essential to solve the critical challenges of the zero-emission vehicle supply chain. This includes battery and allied systems, fuel-cells, motors, drivetrains, and other critical aggregates of ZETs. The overarching goal is to reduce EV prices, lower repair costs, and generate employment opportunities. Studies suggest that localization could reduce prices significantly - crucial for ZETs, which have high upfront costs.

The European Union established EBA 250[18] in 2017 to promote localising the entire battery manufacturing value chain. It offers capital funding in the form of grants through IPCEI (Important Projects of Common European Interest) initiatives. Under IPCEI 2019, ₹28,591 crores were allocated across seventeen projects by seven member states, while IPCEI 2021 saw ₹25,917 crores allocated across forty-six projects by twelve member states. Additionally, financing support is accessible through institutions such as the European Investment Bank and the European Bank for Reconstruction and Development.

GOI has introduced the Phased Manufacturing Program (PMP)[19] for electric vehicles, which promotes localised manufacturing of electric vehicles. This helps drive down EV costs, and compliance with PMP is a condition to avail FAME subsidies[20]. This focus on local production for electric vehicles, specifically electric buses, has created a strong foundation for building electric trucks in India. There is a need to extend support beyond current PLI timelines for effective localization of ZET production. A comprehensive phased strategy can help OEMs optimise logistics costs and promote control over quality-cost-delivery (QCD) for ZETs.

To further encourage ZET development, the mandate can consider:

- Incentives for acquiring and processing raw materials for zero emission technology such as battery and hydrogen, remaining ZET components.
- Partnerships and research collaborations to advance ZET technology.
- Financial support for building ZETs and their components in India.
- Policies to minimize disruptions in the ZET supply chain.
- Strategic timelines for phasing local manufacturing, considering the current maturity of the e-bus manufacturing market.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Benchmark localization practices in India for electric vehicles and other automotive sectors.
2. Study and analyse challenges and opportunities localizing ZET manufacturing as part of the larger EV ecosystem in India.
3. Study and assess existing import dependency for various EV / EV components in India. Consult stakeholders - industry, research organizations, and global alliances on critical areas to be addressed.
4. Devise a framework for policy incentives to be introduced to promote localization.
5. Identify funding mechanisms to promote localization.

6. Identify timelines for localization.
7. Devise a phased localization strategy and anti-dumping mechanisms for ZETs.
8. Devise compliance mechanisms and penalties.
9. Create an implementation and monitoring plan.
10. Roll out mandate for phased localization for ZETs.

STAKEHOLDERS

1. Original Equipment Manufacturers
2. Component manufacturers
3. Testing and research organizations
4. Think tanks
5. Financing institutions

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 7: TIMELINES TO ROLL OUT PHASED LOCALIZATION MANDATE

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Research and analysis	■	■	■									
Stakeholder consultations				■	■	■						
Localization strategy and anti-dumping mechanism framework							■	■	■	■		
Implementation and monitoring											■	■

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A mandate for directing manufacturers of ZETs, outlining timelines and targets for ZETs and component manufacturing.

ADDITIONAL READING LINKS

1. Designing Policy, Regulation, and Incentives for a ZEV transition | India Centre for Energy and Transportation (https://indiazev.ucdavis.edu/designing-policy-regulation-and-incentives-zev-transition)
2. Localisation: An Impetus for the Indian EV Industry (https://www.linkedin.com/pulse/localisation-impetus-indian-ev-industry-ev-plugs/)

3.6 INTEROPERABLE STANDARDS FOR BET BATTERIES

OBJECTIVE

Given the dynamic nature of the battery ecosystem, various battery and automotive manufacturers in India presently employ distinct designs and assembly methods for battery packs. Interoperable standards for BET batteries are essential as it gives BET owners with different battery systems the ability to use the same charging infrastructure network. Standardisation also holds the potential to enhance charging infrastructure utilization, as its software stack can automatically identify the speed of charging when a vehicle plugs-in. Standardisation promotes increased market competition, fostering a conducive environment for reducing battery prices. As the technology and ecosystem matures, standardization of batteries can also pave the way for efficient battery swapping in ZETs.

Standardisation for interoperability entails establishing uniformity in connectors, and communication protocols, across EV and energy storage applications. For this, BIS Standard IS 17855:2022[21] for electric vehicle batteries would need to be updated in accordance with ISO 12405:2018. This standard encompasses test procedures for basic characteristics, performance, reliability, and electrical functionality of battery packs and systems, whether for high power or high energy applications. Battery standards can cover product dimensions and performance, safety, testing, and safe application, independent of type, application, or configuration (hybrid, standalone, and module).

The North American Charging Standard (NACS)[22], developed by Tesla, provides guidelines and specifications to standardize EV charging across North America, aiming to make charging infrastructure as universal as possible. In contrast, the European Union selected the CCS[23] standard as the official DC fast charging standard, commonly used in Volkswagen and BMW electric cars.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Conduct a comprehensive evaluation of existing battery standards, technologies available and upcoming technologies, encompassing both quantitative and qualitative aspects.
2. Assess global standards to identify best practices for benchmarking.
3. Conduct research and analysis of battery technologies for different segments of e-trucks.
4. Consult stakeholders to gather suggestions, address potential bottlenecks and challenges in current battery configuration.
5. Analyse communication protocol, safety protocols, testing procedures, and safe applications to inform the development of robust standards.
6. Update BIS standards - IS 17855:2022 - to include specifications such as communication protocol and connectors.
7. Release a government order (mandate or enabling the interoperability standards).

STAKEHOLDERS

1. Bureau of Indian Standards - Ministry of Consumer Affairs, Food and Public Distribution
2. Automotive Industry Standards – Ministry of Road Transport and Highways
3. Ministry of Power – Central Electricity Authority
4. Ministry of Mines

5. Distribution companies
6. Indian Battery Manufacturers Association, India Energy Storage Alliance, and other such associations
7. Battery component manufacturers (Cell Manufacturer, Battery Assembler)
8. Battery management system service providers
9. Original Equipment Manufacturers
10. Battery recyclers
11. Academia/ Researchers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 8: TIMELINES TO ROLL OUT INTEROPERABLE STANDARDS FOR BET BATTERIES

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Research, analysis and benchmarking												
Stakeholder consultation												
Establishing new standards and enforcement												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

The BIS Standard IS 17855:2022 for electric vehicle batteries would be updated in accordance with ISO 12405:2018.

ADDITIONAL READING LINKS

1. IS 17855:2022, Bureau of Indian Standards (https://standardsbis.bsbedge.com/bis_searchstandard.aspx?standard_number=is%2017855&id=35894)
2. Battery standardisation for circular economy, Clean Mobility Shift (https://cleanmobilityshift.com/products-technology/battery-standardisation-for-circular-economy/)
3. Guide to Battery Safety Standards in India, compiled by ARAI (https://evreporter.com/battery-safety-standards-in-india-by-arai/)

3.7 COMPREHENSIVE POWERTRAIN ROADMAP

OBJECTIVE

While strides have been made in improving fuel efficiency norms and electrifying trucks, the policy landscape surrounding alternative fuels remains in flux. Discussions often centre around various options such as petrol, diesel, bioethanol, biodiesel, battery electric, H2 ICE, and Hydrogen Fuel Cell. While diversification is beneficial to avoid dependence on a single technology, it can also complicate resource allocation and utilization.

Clarity on alternative fuels, their applications, and the regulatory landscape is crucial to streamline OEMs' R&D efforts, attract investment for technology deployment, and facilitate infrastructure creation. An alternative powertrain roadmap is essential from two key national perspectives: ensuring energy security by reducing reliance on oil imports and mitigating emissions from the transport sector. A comprehensive powertrain roadmap aligns the automobile sector's efforts and investments with national objectives. It can consist of incremental steps to create a feedback loop for necessary course corrections.

In the trucking sector, which is commercially driven by shippers, LSPs, and OEMs, having a clear roadmap for alternative drivetrains is vital for planning transitions and investments. This clarity allows stakeholders to make informed decisions and navigate the transition toward more sustainable transportation solutions.

Under the European Commission's Transport Research and Innovation Monitoring and Information System (TRIMIS) program, a low-emission alternative energy for transport (ALT)[24] roadmap along with a transport electrification (ELT)[25] roadmap was developed to provide clarity to stakeholders.

The US released "The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation,"[26] a joint document of Department of Energy, Transport, U.S. Environmental Protection Agency and U.S. Department of Housing and Urban Development. The memorandum of understanding aims to create comprehensive strategy for decarbonizing the transportation sector that will help guide future policy decisions, as well as research, development, demonstration, and deployment in the public and private sectors. Strategies like these are strategic for the nation to develop clarity on the future pathways.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	Ease of implementation

RECOMMENDED NODAL AGENCY

Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Research growth projections for freight market and its share from growth of road freight sector including fuel usage pattern, emission levels, regulatory framework and technological capabilities and its mapping with India Net Zero 2070 goals.
2. Engage with key stakeholders, such as vehicle and component manufacturers and respective industry associations, government agencies, fuel suppliers, shippers, and logistics companies to identify challenges, gather insights and garner support.
3. Evaluate available alternative fuel technologies suitable for the trucking sector, considering factors like fuel availability, infrastructure requirements, vehicle compatibility, cost-effectiveness, and environmental impact.
4. Assess market demand, consumer preferences, pricing dynamics, and supply chain considerations for alternative fuels. Identify potential barriers to market penetration and strategies to overcome them.

5. Evaluate the infrastructure requirements for alternative fuel distribution, including fuelling stations, storage facilities, refuelling infrastructure along trucking routes, and grid connectivity for electric vehicles.
6. Develop financial models to assess the economic viability and cost implications of transitioning to alternative fuels for trucking operators, considering factors like fuel costs, vehicle prices, operating expenses, and return on investment.
7. Design a comprehensive alternative powertrain roadmap with critical stakeholder consent,
8. Create a feedback, review, and update mechanism at regular intervention points.

STAKEHOLDERS

1. Ministry of Environment, Forest, and Climate Change
2. Ministry of Power
3. Ministry of Road Transport and Highways
4. Ministry of Petroleum and Natural Gas
5. Ministry of New and Renewable Energy
6. Original Equipment Manufacturers
7. Component Manufacturers
8. Society of Indian Automobile Manufacturers and ACMA
9. Shippers
10. Logistics Service Providers
11. Refuelling station operators (Petrol pumps/ Charge point operators/ Hydrogen)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 9: TIMELINES TO ROLL OUT COMPREHENSIVE POWERTRAIN ROADMAP

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Alternative powertrain roadmap development												
Alternative powertrain roadmap roll-out with an update mechanism												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An alternative powertrain roadmap for trucking is published as joint document by all relevant ministries.

ADDITIONAL READING LINKS

1. Low Emission Alternative Energy Transport (https://trimis.ec.europa.eu/roadmaps/low-emission-alternative-energy-transport-alt)
2. US National Clean Hydrogen Strategy Roadmap (https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf?Status=Master)
3. White Paper for Alternative Fuels for Vehicles (https://www.siam.in/uploads/filemanager/159siamwhitepaperonalternativefuelsforvehicles.pdf)

3.8 ZERO EMISSION TECHNOLOGY DEFINITION

OBJECTIVE

The transportation sector's emissions are on a relentless upward trajectory. To address this crisis, a clear, government-led definition for “zero-emission technology" is essential. A standardized definition eliminates ambiguity, fosters innovation in clean fuels, streamlines investments, empowers informed consumer choices, and guides effective policy development, accelerating the transition to a cleaner transportation landscape.

The Environmental Protection Agency (EPA) and the European Commission recognize H2ICE as a zero-emission technology[27]. While H2-ICE is a zero-carbon fuel, its NOx and particulate matter (PM) emissions are nearly zero, falling well below the current Euro VII standards. This clarity promotes investment in accessible, affordable hydrogen infrastructure, fostering adoption of fuel cell electric vehicles (FCEVs) with a developed ecosystem. Alternative fuel vehicles, such as H2ICE, possess the potential to serve as transitional alternatives until more affordable zero-emission fuels are widespread.

As per California Health and Safety Code 44258[28], *"(d), a “zero-emission vehicle” means a vehicle that produces no emissions of criteria pollutants, toxic air contaminants, and greenhouse gases when stationary or operating, as determined by the state board.”* Various existing zero-emission fuel technologies like BET, H2ICE, and FCEV for trucks require categorisation, notification, and formalisation for specific applications. This formalization process will aid the industry in building crucial infrastructure and supply chains. This, coupled with incentivization and mandates for identified fuel trucks, can gradually help the sector transition to zero-emission fuels.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Benchmark definitions & available technologies for near-zero & zero-emission trucks.
2. Evaluate the emissions portfolio of near zero emission technologies including both GHG and non-GHG emissions.
3. Conduct an analysis to estimate greenhouse gases (GHG), NOx, and particulate matter (PM) emissions resulting from the identified technologies.
4. Engage in stakeholder consultations to determine applications based on geographic considerations, infrastructure availability, climatic conditions, etc.
5. Draft definitions for near-zero and zero emission vehicles.
6. Convene formal consensus-building with a Central Motor Vehicle Rules (CMVR) committee (MoRTH) for the notification and formalization process.
7. Release the official notification.

STAKEHOLDERS

1. Ministry of Environment, Forest and Climate Change
2. Ministry of Heavy Industries
3. Testing agencies such as International Centre for Automotive Technology, Automotive Research Association of India
4. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 10: TIMELINES TO ROLL OUT ZERO-EMISSION TECHNOLOGY DEFINITION

ACTIVITY	PERIOD (Months)							
	1	2	3	4	5	6	7	8
Background research and analysis								
Stakeholder consultation and analysis								
Notification								

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A notification defining zero-emission fuel, as specified in CMVR.

ADDITIONAL READING LINKS

1. EU Type Approval for Hydrogen Powered Vehicles (https://www.tuvsud.com/en/resource-centre/case-studies/eu-type-approval-hydrogen-vehicles)
2. Hydrogen Internal Combustion Engines, Cummins Inc. (https://www.cummins.com/news/2023/09/08/hydrogen-internal-combustion-engines-trending-topics-hydrogen-engine-live)
3. How Hydrogen Combustion Engines Can Contribute to Zero Emissions, McKinsey (https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/how-hydrogen-combustion-engines-can-contribute-to-zero-emissions)
4. Alternative Fuels Data Centre, Establishment of Zero Emission Vehicle (ZEV) and Near-ZEV Component Rebates (https://afdc.energy.gov/laws/12112)

3.9 ADDITIONAL GROSS VEHICLE WEIGHT (GVW), MAX AXLE WEIGHT ALLOWANCE AND INCREASED OVERALL DIMENSIONS FOR ZETS

OBJECTIVE

Battery electric trucks and hydrogen-powered trucks have a reduced payload capacity due to the additional weight of their batteries, or a hydrogen truck's cylinder manifold. The objective of this intervention is to allow additional payloads for ZETs, which will indirectly incentivize truck operators to switch to cleaner transportation technologies.

Sub-section (1) of section 58 of the Motor Vehicles Act, 1988[29], empowers the central government to specify the gross vehicle weight of the truck and the max safe axle weights for each axle through a notification. To reduce the payload penalties for ZETs, the gross vehicle weight and max safe axle weights will have to be updated and notified, allowing for a higher weight tolerance per axle that is suitable for ZETs.

Directive 96/53/EC[30] sets out the maximum authorised weights and dimensions for HDVs that move on EU roads and carry goods or passengers. To incentivise the transition to cleaner vehicles, the proposal allows for 4 tonnes of additional weight on vehicles using zero-emission technologies, ensuring that no payload will be lost to accommodate batteries/other zero-emission components. As technology advances and results in lighter ZETs and battery packs, periodic reviews should be conducted to assess the need for relaxing weight norms.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Study the increase in GVW and max safe axle weights per load class for ZETs (Battery, FCEV, and H2ICE).
2. Study the methodology for determining GVW and max safe axle weight and dimensions, including length, width, height, and axle loads for trucks in India.
3. Study international standards and examples for determining safe axle weight for ZETs.
4. Study the impact on the weight capacity of roads/ bridges due to additional battery weight as per Indian Roads Congress (IRC) standards along with global examples.
5. Consult stakeholders, such as OEMs and LSPs, to identify parameters for redefining weight class followed by CMVR amendment protocol.
6. Notify updated GVW and max safe axle weight guidelines for ZETs based on suggestions.

STAKEHOLDERS

1. Central Motor Vehicles Rules -Technical Standing Committee / Automotive Industry Standards Committee
2. Testing and Homologation Agencies
3. Regional Transport Office
4. Original Equipment Manufacturers
5. Roads and bridges engineers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 11: TIMELINES TO ROLL OUT ADDITIONAL GROSS VEHICLE WEIGHT (GVW) AND MAX AXLE WEIGHT ALLOWANCE FOR ZETs

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A notification of the revised GVW and max safe axle weight guidelines for ZETs, through section 58 of the Motor Vehicles Act, 1988.

ADDITIONAL READING LINKS

1. Revision of the Weights and Dimensions Directive (https://www.europarl.europa.eu/regdata/etudes/brie/2023/754595/eprs_bri(2023)754595_en.pdf)
2. Maximum authorised weights and dimensions for certain road vehicles (https://www.europarl.europa.eu/regdata/etudes/brie/2023/753177/eprs_bri(2023)753177_en.pdf)
3. New EU weight limits mean electric trucking is here for the long haul (https://www.transportenvironment.org/discover/new-eu-weight-limits-mean-zero-emission-trucking-is-here-for-the-long-haul/)
4. Effects of Increased Weights of Alternative Fuel Trucks on Pavement and Bridges (https://escholarship.org/content/qt4z94w3xr/qt4z94w3xr.pdf?t=qo95b9)
5. The Road Vehicles (Authorised Weight) (Amendment) Regulations 2023 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1132243/draft-statutory-instrument-the-road-vehicles-authorised-weight-amendment-regulations-2023.pdf)
6. Revision of Safe Axle Weights/ GVW of Heavy Motor Vehicles | Odisha State Transport (https://odishatransport.gov.in/application/uploaddocuments/notification/rules_1537859753.pdf)

3.10 ZET TOLL WAIVER FOR A LIMITED PERIOD

OBJECTIVE

Toll costs represent a significant portion of the operational expenses (OPEX) incurred by trucking companies, ranking as the third-highest contributor. Incentivizing LSPs through toll exemption for ZETs can promote them to use more electric trucks. This section details the roadmap for updating the fee levied for trucks on highways. The current National Highways Authority of India (NHAI) regulation, Rule 11 of the National Highways Fee[31] (Determination of Rates and Collection) Rules, 2008, which grants vehicles exemption from toll charges on highways under the "exempted from paying user fee" category, requires modification.

In 2022, as part of the Eurovignette directive[32], toll charges for environmentally friendly trucks were lowered in the EU, while those for diesel trucks with higher emissions were raised. Each member state has introduced its own adjustments following this directive. For instance, Germany raised toll charges for diesel trucks compared to zero-emission trucks, resulting in annual savings of approximately 44,500 EUR until 2025 for the truck operators.

Toll fee/charge waivers for ZETs can incentivise a higher uptick of e-trucks, thereby reducing carbon emissions and improving health of the residents along the highways. Maximized benefits can be derived from increased operation of ZETs through the implementation of a green toll system. Additionally, recommendations regarding the withdrawal of toll waivers once momentum is established in the ecosystem need to be considered.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Assess the impact of toll waivers on operational costs of ZETs.
2. Study the impact of toll waivers on toll collection, toll operators and LSPs.
3. Analyse the financial burden on the government due to the adoption of green toll.
4. Identify financing avenues for the government to fund toll operators.
5. Develop a framework for incentivization and compensation for toll booth operators.
6. Update National Highways Fee Rules, 2008.
7. Strategize on the operationalization of withdrawal of toll waiver.
8. Develop and implement a tech-enabled system to create a ZET-based toll along with IBA.

STAKEHOLDERS

1. Indian Highway Management Company Ltd
2. Ministry of Finance - Revenue Department
3. Indian Bank Association
4. Toll road operators
5. State Road Transport Authorities
6. Logistic Service Providers
7. Small fleet owners and truck drivers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 12: TIMELINES TO ROLL OUT ZET TOLL WAIVER FOR A LIMITED PERIOD

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment in Rule 11 of National Highways Fee (Determination of Rates and Collection) Rules, 2008 under the category "exempted from paying user fee" with Green Toll withdrawal framework.

ADDITIONAL READING LINKS

1. Green trucking: EU adopts new tolling rules (https://www.transportenvironment.org/discover/watershed-moment-for-green-trucking-as-eu-adopts-new-tolling-rules/)
2. EU Parliament Approves Road Tolls Reform to Favour Zero-Emission Trucks | Power Integrations (https://www.power.com/community/green-room/blog/eu-parliament-approves-road-tolls-reform-to-favor-zero-emission-trucks)

3.11 CAFE NORMS TIGHTENING AND ZEV CREDITS

OBJECTIVE

The transport sector is responsible for 73.6% of fuel consumed in the country, one-third of which is attributed to trucks. Corporate Average Fuel Economy (CAFE)[33] norms set minimum fuel efficiency requirements for new vehicles thus lowering CO2 emissions, oil dependency, strengthening energy efficiency, and driving technological innovation. As per the norms, every vehicle manufacturer is required to comply with the fuel consumption value (in litres/100 km) obtained by an equation corresponding to the vehicle GVW in the notification. Fuel efficiency norms were notified[34] for passenger cars in 2017-18 and light commercial vehicles (LCVs) and medium-duty vehicles (MDV) (M2, M3 and N2 categories) in 2019 by the Ministry of Power. Phase I norms were further modified after the implementation of BS-VI emissions standards in 2020 and were notified for implementation in April 2023. Phases II and III, which are under development, are aimed at introducing software testing instead of track testing and defining g/t-km to enhance efficiency of standards.

The objective is to establish progressive and technology-agnostic CAFE standards for heavy-duty vehicles. The challenges to overcome will include non-availability of any reported fuel economy data for trucks and buses, either by manufacturers or government bodies. Other parameters will include fleet weight, normalization factor, a credit system for emission savings, an excess emission premium on manufacturers, etc.

To reduce the trucking industry's carbon emissions, a strategic framework can aid the shift to zero-emission technologies. The most important aspect will be baselining emissions and timelines for the periodic review of targets should be established. This section aims to promote ambitious yet achievable fuel efficiency targets to drive innovation, stimulate research and development, and accelerate ZET market penetration. An increase in standards stringency in a phased manner can aid ZET's environmental feasibility.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	Ease of implementation

RECOMMENDED NODAL AGENCY

Bureau of Energy Efficiency (BEE) and Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Study national and global standards for a phased implementation of fuel efficiency norms, frameworks adopted for HDVs and its impact on ZET production by OEMs.
2. Collect data and assess baseline for CO2 emissions by MHDV segments.
3. Assess methodologies for setting fuel efficiency standards along with multipliers for ZET sales and other alternative technologies.
4. Consult stakeholders to identify parameters for fuel efficiency calculation.
5. Formulate phase 2 and phase 3 fuel efficiency standards for MHDVs and respective timelines.
6. Develop a framework for monitoring, timelines for testing and certification.
7. Align recommendations with specific departments and needed/required amendments.
8. Create a compliance, monitoring and penalty system with periodic reviewing to assess impact and effectiveness of standards.

STAKEHOLDERS

1. Ministry of Heavy Industries
2. Ministry of Petroleum and Natural Gas
3. Society of Indian Automobile Manufacturers

4. Original Equipment Manufacturers
5. Automotive Research Association of India, International Centre for Automotive Technology
6. The Energy and Resources Institute (TERI)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 13: TIMELINES TO ROLL OUT TIGHTENING CAFE NORMS AND ZEV CREDITS

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Research, analysis, and benchmarking												
Stakeholder consultation												
Establishing new standards												
Notification and roll-out of tracking-penalty mechanism												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A notification by Bureau of Energy Efficiency, Ministry of Power specifying the constant speed fuel consumption standard for MHDVs, amending Rule 115 of the Central Motor Vehicle Rules, 1989. This can be done as per the powers conferred by the clauses (a) and (b) of section 14 of the Energy Conservation Act, 2001 (52 of 2001).

ADDITIONAL READING LINKS

1. Central Motor Vehicle Rules Amendment (https://static.pib.gov.in/writereaddata/specificdocs/documents/2022/jul/doc20227669301.pdf)
2. Notification issued to include compliance with Fuel Consumption Standards (FCS), for light, medium and heavy duty motor vehicles of various categories, manufactured in, or imported by, India (https://pib.gov.in/pressreleasepage.aspx?prid=1839570)
3. Constant speed fuel consumption standard for Light and Medium commercial vehicles (https://beeindia.gov.in/sites/default/files/so 2540(e).pdf)
4. Fuel Efficiency Norms for Heavy Duty Vehicles Presentation (http://www.ecmaindia.in/uploads/image/83imguf_mr.sumantkumar(formerdirectorpcra).pdf)
5. India's Fuel Economy Benchmarks, Shakti foundation (https://shaktifoundation.in/wp-content/uploads/2021/09/indias-fuel-economy-benchmarks.pdf)
6. Analysis of Fuel Economy and GHG emission Reduction Measures from Heavy Duty Vehicles in other countries and of options for the EU (https://climate.ec.europa.eu/system/files/2018-09/analysis_fuel_economy_hdv_en.pdf)
7. Energy Conservation and Efficiency (https://mowr.nic.in/previous-site/presentations/energy conservation and efficiency.pdf)
8. The European Union Automotive Fuel Economy Policy (https://www.globalfueleconomy.org/transport/gfei/autotool/case_studies/europe/eu case study.pdf)
9. CO2 emissions and fuel consumption standards for heavy-duty vehicles in the European Union (https://theicct.org/sites/default/files/publications/efficiency_standards_hdvs_eu_briefing_051618.pdf)
10. EU CO2 emission standards for passenger cars and light-commercial vehicles (https://theicct.org/sites/default/files/publications/icctupdate_eu-95gram_jan2014.pdf)

11. Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks (https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-07/cafe-2027-2032-hdpuv-2030-2035-nprm-web-version.pdf)
12. Setting CO2 Emission Performance Standards For New Passenger Cars And For New Light Commercial Vehicles, And Repealing Regulations (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02019R0631-20210301)

3.12 QUALITY AND QUANTITY OF POWER SUPPLY[i]

OBJECTIVE

A high-quality, reliable, abundant, and affordable source of power is vital to ensure uninterrupted e-logistics operations, which serves as the backbone of the country's economy. This can include ensuring quality by reducing Aggregate Technical and Commercial (AT&C) losses, bridging the gap between Aggregate Cost of Supply (ACS), and Average Revenue Realized (ARR), establishing a smart-grid infrastructure. Additionally, strengthening feeder networks, enhancing distribution infrastructure, and capacity building for Distribution Companies (DISCOMs) are essential for quality assurance.

The Ministry of Power has initiated the RDSS scheme[35] to address AT&C losses nationwide, with the aim of reducing losses to 12-15% and eliminating the ACS-ARR gap by 2024-25. While the scheme primarily focuses on deploying smart meters to address billing issues and identify theft, there is a need to expand its focus on smart grid integration. This expansion should enable flexible generation, efficient load management, and the establishment of priority charging corridors for MHDVs.

Indian Railways, with the 4th largest railway network globally, is 94% electrified[36]. To ensure quality and quantity of power supply, they have a dedicated high voltage AC traction system, which reduces disruptions and provides a steadier electricity supply. They also have a robust backup infrastructure, such as duplicate feeders and multiple traction power transformers, to ensure power backup in case of failures. Similar systems can be looked at to ensure efficient operations of electric trucks.

The intervention also emphasizes the importance of providing regulators with reliable statistics for efficient planning and tariff determination. Access to such data is crucial for designing innovative initiatives like demand response, storage, Time of Day (ToD), and Time of Use (ToU) tariffs. Aspects related to additional generation of electricity and transmission capacity are not covered under the scope of the intervention.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Power Finance Corporation (PFC) and Rural Electrification Corporation (REC) - MoP

RECOMMENDED METHODOLOGY

1. Assess the impact of truck electrification on power consumption and grid loading patterns, focusing on peak usage times along major freight corridors.
2. Estimate electricity demand for MHDVs and align it with DISCOMs' supply capabilities.
3. Evaluate plans for expanding the electrical supply network including direct RE-based power supply for large scale charging stations on highways or corridors.
4. Conduct a gap analysis between the required strengthening of electrical infrastructure for trucking electrification growth and existing supply network expansion plans.

[i] This intervention is specific to battery electric trucks, but a similar approach needs to be adopted for hydrogen refuelling infra when the technology is ready.

5. Determine the fiscal provisions needed to strengthen electrical infrastructure to the required level and evaluate the impact of existing schemes on losses, gap analysis, and smart grid infrastructure promotion.
6. Improve feeder system integration and eligibility criteria for DISCOMs to access central funding and state-level fiscal provisions.
7. Establish performance metrics and monitoring mechanisms to ensure effective quality and quantity outcomes, with periodic evaluations and adjustments.

STAKEHOLDERS

1. Ministry of Power
2. Central Electricity Regulatory Authority and State Electricity Regulatory authorities
3. State owned DISCOMs
4. Private DISCOMs
5. Charge Point Operators
6. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 14: TIMELINES TO ROLL OUT QUALITY AND QUANTITY OF POWER SUPPLY

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Stakeholder consultation												
Amendment in RDSS												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment in the RDSS scheme or a launch of a new scheme to include feeder segregation and strengthening for MHDV charging lines on priority.

ADDITIONAL READING LINKS

1. RDSS Smart Metering Key Risks and a Lost opportunity for the Smart Grid (https://www.linkedin.com/pulse/rdss-smart-metering-key-risks-lost-opportunity-smart-pardeep-verma-ccvgf/)
2. Integrated Power Development Scheme (https://www.ipds.gov.in/rdss_docs/letter_faq_rdss_17082021.pdf)
3. Government of India launches Revamped Distribution Sector Scheme (RDSS) to reduce the Aggregate Technical & Commercial (AT&C) losses to pan-India (https://pib.gov.in/pressreleaseiframepage.aspx?prid=1897764)
4. Revamped Distribution Sector Scheme Guidelines (https://powermin.gov.in/sites/default/files/uploads/final_revamped_scheme_guidelines.pdf)

3.13 REFUELLING INFRASTRUCTURE DEPLOYMENT CRITERIA BY ROAD CLASSIFICATION[ii]

OBJECTIVE

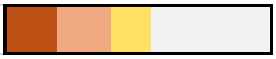
Establishing a reliable charging/refuelling infrastructure is crucial to address range anxiety and successfully integrate zero emission MHDVs. Thorough assessments of demand and supply can help identify specific infrastructure requirements, acknowledging diverse freight movement scenarios. Given the variety of applications, use cases, and supply-demand dynamics, deploying a uniform infrastructure for all ZETs might not be viable and is not suggested. Given the current maturity of Battery Electric Trucks (BETs), the intervention focuses on charging infrastructure deployment criteria. With advancement in technologies this should be amended to accommodate other zero emission fuels such as hydrogen.

For BETs, the framework could be tailored to suggest density and intensity of charging infrastructure along different road categories i.e., the minimum distance between public charging stations could be at specified intervals, with certain combination of charging stations. This can also be phased-in systematically at key freight centres like urban node peripheries, rural centres, distribution hubs, MMLPs, ports, etc. It is imperative to also define the quantity and types of fast and normal chargers. Collaboration with diverse stakeholders and nodal agencies for each road category is essential to create a comprehensive framework.

EU has adopted guidelines for deploying recharging stations under alternative fuels infrastructure regulation (AFIR). Article 4 of the directive 2014/94/EU [37] outlines recharging stations' output requirements and frequency along identified transport corridors per vehicle segment. The AFIR mandates the installation of charging stations for e-trucks every 60km along the core TEN-T (Trans-European Transport Network) and at every 100km along the TEN-T comprehensive road network. It includes specifications on power output, recharging points as per defined timelines.

Charging Infrastructure for Electric Vehicles – Guidelines and Standards [38] by India's Ministry of Power delineates the frequency of charge parks needed for long-range EVs. Currently, one charge park needs to be present at every 100km on each side of the highway, with at least two chargers of 100kW output. To enhance these standards, amendments should be introduced, incorporating guidelines that consider factors like road category and volume of freight movement. The guidelines should also include timelines for refuelling infrastructure deployment along highways, indicating percentages of road lengths to be covered against each year. The accelerated deployment of these amendments can be achieved by deploying refuelling infrastructure under PM Gati Shakti by Department for Promotion of Industry and Internal Trade (DPIIT).

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Guidelines by Ministry of Power and implementation by DPIIT.

RECOMMENDED METHODOLOGY

1. Study national and global examples for deployment of charging infrastructure along highways.
2. Identify types of charging and road categories for infrastructure assessment.
3. Assess demand and supply for BET infrastructure.

[ii] Given the currently maturity of Battery Electric Trucks (BETs), the intervention focuses on charging infrastructure deployment criteria. With advancement in technologies this should be amended to accommodate other zero emission fuels such as hydrogen.

4. Form a working group with all representatives from central and state agencies building road and power infrastructure.
5. Consult stakeholders to understand infrastructure requirements per road category.
6. Define the frequency of charge parks for BETs through analysis.
7. Devise a framework of infrastructure deployment for each road category.
8. Identify timelines to phase-in charging infrastructure along highways for BETs.
9. Amend electric vehicle charging standards clause 5(ii) – frequency of charging infrastructure for long range EVs.
10. Frame a government order to DPIIT for staggered implementation.
11. Establish implementation and monitoring frameworks by DPIIT.

STAKEHOLDERS

1. NHAI and State Public Works departments, State development authorities such as MSRDC
2. Indian Highway Management Company Limited
3. Distribution Companies
4. Charge Point Operators
5. Original Equipment Manufacturers
6. Logistic Service Providers
7. Shippers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 15: TIMELINES TO ROLL OUT REFUELLING INFRASTRUCTURE DEPLOYMENT CRITERIA BY ROAD CLASSIFICATION

ACTIVITY	Period (Months)								
	2	4	6	8	10	12	14	16	18
Background research and analysis									
Framework for charging infrastructure deployment/ road category									
Stakeholder consultation									
Amendment in EVCS									
Start of implementation by DPIIT									

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment to clause 5 (ii) of the "Charging Infrastructure for Electric Vehicles – Guidelines and Standards" defining the frequency, power output, and quantity of recharging points for ZETs mentioned against designated timelines. Subsequently, a government order is to be released to enable DPIIT to implement charging infrastructure deployment.

ADDITIONAL READING LINKS

1. Regulation on deployment of Alternative Fuels Infrastructure (https://data.consilium.europa.eu/doc/document/pe-25-2023-init/en/pdf)
2. Where to Charge Electric Trucks in Europe & M Dash Modelling a Charging Infrastructure Network (https://www.mdpi.com/2032-6653/13/9/162)

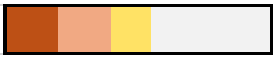
3. Final_Consolidated_EVCI_Guidelines_January_2022_with Annexures (https://powermin.gov.in/sites/default/files/final_consolidated_evci_guidelines_january_2022_with_annexures.pdf)
4. Infrastructure Deployment MHDV (https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf)
5. Perspectives on Charging Medium-and Heavy-Duty Electric Vehicles (https://iea.blob.core.windows.net/assets/f9038101-deb5-4fe0-813f-e45190928d65/matteomuratori_nrel_perspectivesonchargingmedium-andheavy-dutyelectricvehicles.pdf)
6. Technology Assessment of ZETs on the Delhi Jaipur Highway (https://psa.gov.in/cms/web/sites/default/files/psa_custom_files/delhi Jaipur highway_311023_without blank %282%29.pdf)

3.14 DEMAND CHARGE WAIVER FOR CHARGING INFRASTRUCTURE

OBJECTIVE

Establishing charging infrastructure for MHDVs entails significant costs, including land prices, setup, electricity charges, and operational expenses. Additionally, Charge Point Operators (CPOs) must pay fixed monthly demand charges to utility companies, irrespective of infrastructure utilization. These factors escalate the overall costs of setting up such infrastructure. Temporarily waiving demand charges can alleviate operational expenses for CPOs until infrastructure utilization reaches desired levels, especially for charging ZETs with high-power requirements. Implementing an initial exemption of demand charges for ZET charging connections can enhance the economic viability of establishing charging points, fostering ZET adoption. However, it is crucial to mitigate potential financial strains on Distribution Companies (DISCOMs) by devising a compensation mechanism that balances infrastructure growth with DISCOM sustainability.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

The Central Electricity Regulatory Authority and State Regulatory Commissions

RECOMMENDED METHODOLOGY

1. Study national and global examples for demand charge exemptions.
2. Assess the impact of demand charge waiver on operational costs and hence business viability for Charge Point Operators.
3. Analyse the financial burden on DISCOMs due to required infrastructure strengthening but not recovering through demand charges
4. Evaluate timelines for EV adoption to reach required utilization levels
5. Identify financing avenues for funding DISCOMs.
6. Develop framework for implementation and withdrawal of demand charge waiver.
7. Create a notification by Central Electricity Regulatory Authority to forum of regulators for establishing demand charge waiver guidelines for State Electricity Regulatory authorities.

STAKEHOLDERS

1. Ministry of Power
2. Central Electricity Regulatory Authority and State Electricity Regulatory authorities
3. Distribution companies
4. Private DISCOMs
5. Charge Point Operators

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 16: TIMELINES TO ROLL OUT DEMAND CHARGE WAIVER FOR CHARGING INFRASTRUCTURE

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Background research and analysis												
Consultations with identified stakeholders												
Impact assessment (for CPOs and DISCOMs)												
Legal pathways to establish framework												
Policy roll-out (Central level)												
Policy roll-out (State level)												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A notification by Central Electricity Regulatory Authority to forum of regulators for establishing demand charge waiver guidelines and implementation by individual states.

ADDITIONAL READING LINKS

1. Electricity Cost for Charging, NITI (https://e-amrit.niti.gov.in/electricity-cost-for-charging)
2. Notice Medium Heavy Duty Charging Infrastructure (https://www.nj.gov/bpu/pdf/publicnotice/notice_mediumheavydutystraw_dec2022v2.pdf)

3.15 PHASED SUPPLY SIDE SALES MANDATES

OBJECTIVE

Three OEMs in India collectively have a share of 75% in the truck manufacturing market. Additionally, two of these, have declared their net-zero targets for commercial vehicles. This signifies a positive market trend towards decarbonisation.

Given the established net-zero goals, it is crucial to delineate intermediate milestones to phase out ICE trucks. Phased introduction of supply mandates, in conjunction with appropriate incentive programs, can accelerate industry-wide efforts to adopt ZETs. The mandates would require OEMs to sell a percentage of zero-emission trucks each year. Supply mandates have the potential to provide a structured pathway for emission reduction aligned with national and international decarbonisation targets. To avoid overworking OEMs, it is crucial to thoroughly evaluate the nation's resources, including its energy, economy, and manufacturing capabilities. Incentivization and creating of credit systems can encourage stakeholders to transition to green energy.

Notably, in 2020, the California Air Resources Board (CARB) mandated a certain percentage of ZEV trucks in sales through its Advanced Clean Trucks Policy[39]. California's robust ZEV ecosystem has positioned the state at the forefront of ZET deployment, representing approximately 47% of ZET sales in the U.S. between 2017 and 2022.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Environment, Forest, and Climate Change, Ministry of Road Transport and Highways and Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Study national and international examples of supply-side mandates.
2. Study likely legislations and ministries which can enforce the demand side mandate.
3. Consult OEMs to understand their decarbonisation roadmap, strategies, and supply-chain challenges.
4. Assess and prioritize specific truck segments for transitioning.
5. Develop growth projections, demand assessment, technology, and market maturity.
6. Design supply side mandates with intermediate year-wise timelines for a phased transition.
7. Identify compliance parameters and credit mechanisms and assess its impact on market transformation.
8. Establish performance target monitoring and non-compliance measures to support the transition.

STAKEHOLDERS

1. Ministry of Heavy Industries
2. Original Equipment Manufacturers
3. Ministry of Power
4. Ministry of Road Transport and Highways

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 17: TIMELINES TO ROLL OUT PHASED SUPPLY-SIDE SALES MANDATES

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government directive by MOEFCC/MHI mandating OEMs to sell a certain percentage of zero-emission trucks.

ADDITIONAL READING LINKS

1. Advanced Clean Trucks, California Air Resources Board (https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks)
2. Advanced Clean Trucks Fact Sheet, California Air Resources Board (https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet)
3. Regulatory Mandates and Electric Vehicle Product Variety (https://www.frankpinter.com/pinter_jmp.pdf)
4. Zero Emission Vehicle (ZEV) Mandate Policy Report (https://www.cseindia.org/zero-emission-vehicle-zev-mandate-policy-report-11813)
5. UK Trucks Use Cases Summary Report (https://www.transportenvironment.org/wp-content/uploads/2023/01/2022_12_uk_trucks_use_cases_summary_report.pdf)
6. Towards a Zero Emissions Policy, Shakti Foundation (https://shaktifoundation.in/wp-content/uploads/2022/08/towards-a-zero-emissions-policy.pdf)
7. Breaking Down CA's Advanced Clean Trucks & Fleets Rules, Breakthrough (https://www.breakthroughfuel.com/blog/breaking-down-californias-advanced-clean-trucks-and-advanced-clean-fleets/)

3.16 PHASED DEMAND SIDE MANDATE

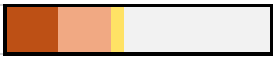
OBJECTIVE

This ZET mandate for shippers aims to earmark a percentage of their fleet for conversion to zero-emission technologies, aligning industry decarbonisation with national goals pertaining to India's Nationally Determined Contributions (NDC).

The intent is to stimulate demand and supply growth towards ZETs, through strategizing measures such as California's Advanced Clean Trucks[39] and Advanced Clean Fleet Act[40]. The initial market development can be guided by incentives for truck owners and infrastructure establishment, followed by implementing of sales targets for OEMs. After this, phased targets for shippers and logistics service providers can be introduced. Initially this can be applicable for specific/ controlled operations such as postal services, garbage collection, ports, fleets owned by state agencies or PSUs, and other identified specific goods.

In 2022, Delhi became the first state to adopt an EV demand mandate through the Delhi Motor Vehicle Aggregator Scheme[41]. The scheme sets segment-wise percentage targets for new EV fleet additions over the next 3-4 years, particularly focusing on fleet aggregators in both passenger and commercial segments, with an emphasis on last-mile delivery services. Considering the fragmented trucking market, the intervention stresses a robust scheme by the nodal agency for sustainable freight operations in India.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Environment, Forest, and Climate Change or Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Study national and international examples of demand-side mandates.
2. Study legal pathways which can enforce the demand side mandate/ ministry.
3. Study and analyse the market maturity of ZET adoption.
4. Consult large shippers, logistics service providers (LSPs) to understand their decarbonisation roadmap, strategies, and operational challenges.
5. Assess and prioritize use cases/ vehicle segments for deploying ZETs.
6. Develop growth projections for technology advancement, supply assessment and market maturity.
7. Design demand-side mandates for a structured transition.
8. Explore penalty clauses to be introduced for defaulters.
9. Establish performance target monitoring and credit mechanisms to support the transition.

STAKEHOLDERS

1. All India Transporter's Welfare Association / All India Motor Transport Congress
2. Confederation of Indian Industry, Federation of Indian Chambers of Commerce & Industry, Associated Chambers of Commerce, and Industry of India), Cement Manufacturers Association and other such organizations
3. Shippers
4. Logistics Service Providers
5. Small fleet owners and truck drivers
6. Ministry of Heavy Industries

7. Ministry of Road Transport & Highways
8. Ministry of Ports, Shipping and Waterways
9. Transport depts. of State Governments
10. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 18: TIMELINES TO ROLL OUT PHASED DEMAND SIDE MANDATE

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A credit mandate requiring truck owners to transition a certain percentage of their fleet to zero-emission trucks.

ADDITIONAL READING LINKS

1. Aggregator Scheme, Delhi Government (ev.delhi.gov.in/files/aggregator scheme_july_2022.pdf)
2. Advanced Clean Fleets Regulation Summary, California Air Resources Board (https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-summary)
3. Delhi Government To Mandate Conversion Of Vehicles Of Aggregators To All-Electric By April 1, 2030, JMK Research & Analytics (https://jmkresearch.com/delhi-government-to-mandate-conversion-of-vehicles-by-aggregators-to-all-electric-by-april-1-2030/)
4. Breaking Down CA's Advanced Clean Trucks & Fleets Rules, Breakthrough Fuel (https://www.breakthroughfuel.com/blog/breaking-down-californias-advanced-clean-trucks-and-advanced-clean-fleets/)

3.17 CREDIT GUARANTEES

OBJECTIVE

First loss guarantees are a form of financial protection provided by a guarantor to a lender against potential losses incurred from loan defaults. In this arrangement, the guarantor agrees to cover the initial portion, or "first loss," of any losses suffered by the lender due to borrower defaults, giving confidence to lenders to give out loans.

Credit guarantees are commonly employed to spur investment in emerging technologies. For example, the Asian Development Bank launched the Solar Power Generation Guarantee Facility Program in 2011, offering a partial credit guarantee to lenders for solar power projects in India, and covering 50% of default risk on bank loans[42]. Similarly, the European Commission and European Investment Bank developed the Loan Guarantee Instrument to facilitate private sector financing for the Trans-European Transport Network Infrastructure, reducing traffic risk during project ramp-up with a risk capital of ₹8932 crores[43].

Given the challenges of high capital expenditure (CAPEX) and limited financing options that can hinder the adoption of ZETs, a first loss risk-sharing mechanism can serve as a potent tool to alleviate potential risks associated with investments in ZETs. Efficient first-loss protection mechanisms should:

- Include appropriate mechanisms to mitigate technology risk and ensure OEMs provide the required service levels for batteries.
- Align with risk-adjusted returns expected by investors.
- Enable credit rating agencies to assign investment-grade ratings to ZET project bonds or loan portfolios.
- Offer competitive pricing compared to alternative investment options available in the market.
- Address and minimize risks associated with the mechanism itself.
- Operate within a framework guided by a "green agenda" to ensure resources are mobilized for investments promoting climate-friendly initiatives.

The guarantees can be administered by national bank as a program manager. Ministry of Heavy Industries and Ministry of Road Transport and Highways as supporting ministries for battery electric and hydrogen fuel vehicles respectively

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Finance

RECOMMENDED METHODOLOGY

1. Conduct a market analysis for ZETs, identify the existing landscape of financing truck purchases, financial instruments available and how they are utilized by different kinds of fleet owners.
2. Assess applications of financial instruments on ZETs, and identify potential challenges (technology, market, regulatory and financial), barriers, and areas requiring financial support.
3. Study national and global examples of risk coverage such as first loss, etc., for ZETs and other vehicle classes.
4. Identify potential financial instruments/ funding sources such as guarantees or insurance for implementation and securing funding for schemes.

5. Design credit guarantees mechanisms to address identified risks, define parameters, entities, and conditions where coverage is applicable.
6. Develop legal and regulatory frameworks for implementation.
7. Organize stakeholder consultations (government, industry, financial organizations, and environmental organizations) to gather insights, concerns, and recommendations.
8. Roll out credit guarantees for ZETs.
9. Conduct periodic evaluations to assess the policy's impact and identify areas for improvement.

STAKEHOLDERS

1. International Finance Corporation and World Bank
2. NITI Aayog
3. Reserve Bank of India
4. Climate financiers
5. Financial institutions
6. National and international banks
7. Non-Banking Financing Company Fintech companies
8. Investment Facilitation Agencies
9. Original Equipment Manufacturers
10. Distribution Companies
11. Refuelling station operators (Charge point operators/hydrogen)
12. Trucking associations
13. Logistics Service Providers
14. Battery manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 19: TIMELINES TO ROLL OUT CREDIT GUARANTEES

ACTIVITY	PERIOD (Months)									
	2	4	6	8	10	12	14	16	18	24
Research, analysis and benchmarking										
Stakeholder consultation										
Establishing regulatory framework										
Policy roll-out										

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by MoF/MHI/MoRTH granting the identified agency to establish and operate a first-loss risk program for ZETs, which includes the fund allocation, natures and extent of coverage provided.

ADDITIONAL READING LINKS

1. Driving Affordable Financing For Electric Vehicles In India, NITI Aayog, BCG, ADB (https://www.niti.gov.in/sites/default/files/2023-07/ADB-EV-Financing-Report_VS_compressed.pdf)

2. Banking On Electric Vehicles In India, NITI Aayog And RMI India (https://www.niti.gov.in/sites/default/files/2023-02/Banking-on-EV_web_2.0a_0.pdf)
3. Risk Gaps: First Loss Protection Mechanisms. Climate Policy Initiative (https://climatepolicyinitiative.org/wp-content/uploads/2013/01/Risk-Gaps-First-Loss-Protection-Mechanisms.pdf)
4. USD 1 Bn Tripartite Funding To Speed Up India's Drive To Net Zero Emissions, ET Auto (https://auto.economictimes.indiatimes.com/news/industry/usd-1-bn-tripartite-funding-to-speed-up-indias-drive-to-net-zero-emissions/101980421)

3.18 ACCELERATED DEPRECIATION FOR ZETS AND CHARGING INFRASTRUCTURE

OBJECTIVE

Accelerated depreciation allows business to incur higher depreciation expenses during earlier years. Allowing businesses to deduct a greater portion of their investment from their taxable income in initial years lowers initial investment cost. This improves return on investments (ROI) and cash flows, attracting more investments.

Accelerated depreciation can encourage the adoption of ZETs and development of charging infra by allowing businesses and fleet operators to depreciate the value of assets at an expedited rate for tax purposes, thereby reducing the overall cost of ownership. This will attract more investment for ZETs and allied infra development. This approach poses minimal risk for financial institutions and operators.

Czech Republic and Ireland provide accelerated depreciation benefits[44] that allow companies to deduct a large amount of a ZET's purchase cost from their books initially. This reduces companies' immediate tax liability and improves the return on investment through reduced taxable income.

Accelerated depreciation, under Section 32 of Income Tax act[45], increases the financial incentive for the commercial sector to invest in solar projects. India experienced a significant increase in solar installation from 2010-2022, achieving a solar levelized cost of electricity lower than fossil fuels in 2018.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Finance

RECOMMENDED METHODOLOGY

1. Study and analyse the depreciation of ICE trucks vs ZETs.
2. Study and analyse the depreciation of ZET refuelling infrastructure.
3. Identify key parameters of depreciation and associated depreciation values.
4. Define depreciation rates for ZETs and ZET infrastructure.
5. Discuss with Department of Revenue and other ecosystem stakeholders regarding suggested depreciation values.
6. Amend the Income Tax Act for ZETs' accelerated depreciation.
7. Develop implementation and compliance monitoring.

STAKEHOLDERS

1. Income Tax Department
2. Logistics Service Providers
3. Small fleet owners and truck drivers
4. Shippers
5. Original Equipment Manufacturers
6. Refuelling station operators (Charge point operators/hydrogen)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 20: TIMELINES TO ROLL OUT ACCELERATED DEPRECIATION FOR ZETs AND CHARGING INFRASTRUCTURE

ACTIVITY	Period (Months)								
	2	4	6	8	10	12	14	16	18
Research, analysis, and benchmarking									
Stakeholder consultation									
Income Tax rule Section 32 amendment									
Policy roll-out									

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment of Section 32 of the Income Tax Act (under tangible assets) to accelerate the depreciation rate for ZETs.

ADDITIONAL READING LINKS

1. Rates Of Depreciation, Income Tax Department (https://incometaxindia.gov.in/charts tables/depreciation rates.htm)
2. Accelerated Depreciation Tax Benefits: A Detailed Look for India's Commercial and Industrial Solar Users, LinkedIn (https://www.linkedin.com/pulse/accelerated-depreciation-tax-benefits-detailed-look/)
3. Accelerated Depreciation For Electric And Hydrogen Vehicles Under Vamil Scheme, Code F3109 – Policies, IEA (https://www.iea.org/policies/7215-accelerated-depreciation-for-electric-and-hydrogen-vehicles-under-vamil-scheme-code-f3109)
4. India's Accelerated Depreciation Policy For Wind Energy | International Institute For Sustainable Development (https://www.iisd.org/system/files/publications/india-accelerated-depreciation-policy-wind-energy-case-study.pdf)

3.19 TAX CREDITS FOR ZETS AND RE-FUELLING INFRASTRUCTURE FOR LIMITED PERIOD

OBJECTIVE

Innovative financial solutions will be crucial to address the high upfront capital costs of zero emission trucks and its refuelling infrastructure. e-MHDVs often require higher power charging solutions compared to light-duty electric vehicles due to their larger batteries and higher energy consumption. Higher power charging systems, like those delivering 350 kW, 900 kW[46], or more, are essential to minimize downtime and enable efficient fleet operations. These lead to higher installation and operation costs.

While capital incentives can support adoption, tax benefits for reducing a vehicle's purchase and registration costs, along with other fiscal benefits, can play a significant role in making ZETs financially viable. Additionally, tax benefits, such as road and toll tax exemption, reduction of GST, or income tax can aid in ZET adoption. These measures can support buyers by reducing the time period to achieve parity on the TCO of ZETs, compared to conventional variants. With charging infrastructure, a lower GST rate on charging activities, exemptions/subsidies on electricity tax for installing high-powered charging stations, and a lower electricity tariff will support augmentation of charging infrastructure. These interventions need to be synchronized with other fiscal benefits being provided for ZETs and refuelling infrastructure. Periodic reviews should also be conducted to ensure they are effective and align with overall objectives.

Countries such as Finland, Germany, and Greece exempt registration tax on ZETs. In the US, the Inflation Reduction Act provides tax credits of up to ₹83.6 lakh or 30%[iii] of the cost per charger, whichever is lower, for alternative fuel vehicle refuelling infrastructure for ten years through 2032. Similarly, California provides tax credits under Low Carbon Fuel Standard (LCFS)[6] by direct investments under California Energy Commission's (CEC) program and through utilities' investment through California Public Utilities Commission's (CPUC) programs.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Finance

RECOMMENDED METHODOLOGY

1. Evaluate various taxes paid for ZETs and refuelling infra deployment for ZETs.
2. Evaluate the impact of tax benefits (individual and various combinations) to reduce TCO for ZET operations.
3. Study similar or parallel examples of tax credit models used globally and nationally.
4. Design a framework for orchestration of various policy measures for tax benefits along with withdrawal strategy.
5. Consult identified stakeholders for feedback.
6. Evaluate the fiscal burden on the government and a way to compensate fiscal burden.
7. Establish eligibility criteria and withdrawal conditions along with legal pathways.
8. Amend relevant taxation laws to accommodate ZETs and its infrastructure deployment.

STAKEHOLDERS

1. Ministry of Heavy Industries
2. Ministry of Power
3. Ministry of New and Renewable Energy
4. Ministry of Road Transport and Highways
5. Income Tax Department
6. GST Council
7. Charge Point Operators
8. Logistic Service Providers
9. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 21: TIMELINES TO ROLL OUT TAX CREDITS FOR ZETs AND REFUELLING INFRASTRUCTURE

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Stakeholder consultation												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by the Ministry of Finance that outlines tax credits for ZETs and their infrastructure notifying relevant ministry/ agencies for implementation.

ADDITIONAL READING LINKS

1. Alternative Fuel Infrastructure Tax Credit, AFDC (https://afdc.energy.gov/laws/10513)
2. Energizing Freight: Policy Toolkit for Medium and Heavy-Duty Truck Electrification in India, NRDC (https://www.nrdcindia.org/pdf/nrdc_heavy_trucking.pdf)
3. Charging Infrastructure for Electric Vehicles, Ministry of Power (https://powermin.gov.in/sites/default/files/final_consolidated_evci_guidelines_january_2022_with_annexures.pdf)
4. Electric Vehicle Charging Infrastructure and Its Grid Integration in India, NITI Aayog (https://www.niti.gov.in/sites/default/files/2023-05/Final-smaller_Electric-Vehicles-Charging-Infrastructure.pdf)
5. Study On Financing Mechanisms for Zero-emission Trucks and Their Infrastructure, European Clean Trucking Alliance (https://clean-trucking.eu/publications/study-financing-of-zero-emission-trucks/)

3.20 CONCESSIONAL LAND FOR ZET REFUELLING INFRASTRUCTURE

OBJECTIVE

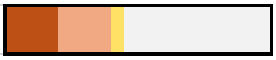
Availability of robust refuelling infrastructure is a crucial requirement for the ZETs. Given its high-power demands, setting up charging infrastructure for e-MHDVs can be expensive. Beyond costs associated with electrical infrastructure upgrades and expensive chargers, land acquisition or leasing presents a significant expense for CPOs. Offering land near freight corridors at concessional rates for a limited period, until the utilization of ZET charging infrastructure becomes financially viable, could incentivize both Small, and Medium Enterprises (SMEs) and startups to establish charging infrastructure, thus scaling up ZET refuelling facilities. The aggregation of land by public agencies and its allocation to small or new businesses for ZET refuelling infrastructure can create a structured, transparent process and enable large-scale deployment. Concerns regarding land availability have been a major concern, even for setting up of solar parks[iv] due to poor land records, delays in clearances, and scattered land allocation leading to high project costs. To address this issue, the Indian government introduced "Development of Solar Parks and Ultra-Mega Solar Power Projects" aiming to support land provisions to government, state governments/UTs, and private firms[v].

In 2021, the Department of Public Enterprises established a special purpose vehicle (SPV), the National Land Monetization Corporation (NLMC)[vi], to manage and monetize such assets. The NLMC is also tasked with the strategic disinvestment of these holdings. A framework can be devised to lease out these lands through an application system, identifying eligible candidates—such as MSMEs or startups—for leasing assets at nominal rates along highways to establish ZET refuelling infrastructure. Presently, the focus is on charging infrastructure for BETs, but a similar exercise will be necessary for hydrogen in the future.

NHAI has identified and awarded several wayside amenities[vii] for installing charging infrastructure for EVs. In addition, the agency has entered into a Memorandum of Understanding (MoU)[viii] with the Energy Efficiency Services Limited (EESL), where NHAI provides space or land near toll plazas and buildings for installing charging infrastructure on a revenue-sharing basis. EESL subsequently leases the operations of charging stations to private entities to ensure optimal utilization. Dedicated space can be allocated for ZET refuelling infrastructure, considering the distinct usage patterns between passenger EV charging and ZET charging requirements.

Denmark provides additional financial incentives for housing societies that set up charging infrastructure for all segments. While Finland provides funding support for charging infrastructure, Canada has supported its ambition of deploying 6,700 public fast-charging and over a lakh level 2 public charging infrastructure by increasing their budget and amending building codes[ix].

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Department of Public Enterprises, Ministry of Finance

RECOMMENDED METHODOLOGY

1. Assess ZET refuelling changing needs and respective land needs near major freight corridors and
2. Assess land availability to near demand clusters and prioritizing areas for early deployment.
3. Study global use cases/legislations that support ease deployment of ZET refuelling infrastructure.
4. Assess potential subsidy/concessional mechanisms that could support long-term lease for land and other areas.
5. Consult relevant stakeholders to identify mechanisms to increase viability of charging infrastructure public land.

STAKEHOLDERS

1. Department of Public Enterprises
2. Ministry of Road, Transport and Highways
3. Ministry of Power
4. National Highways Authority of India
5. National Investment and Infrastructure Fund
6. Invest India
7. EESL
8. Charge Point Operators
9. Distribution Companies

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 22: TIMELINES TO ROLL OUT CONCESSIONAL LAND FOR ZET REFUELLING INFRASTRUCTURE

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Demand and supply assessment for freight corridors												
Mapping of land availability												
Framework development for concessional land lease												
Tender out and refuelling infra installation roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order to PSUs for leasing lands for ZET refuelling infrastructure.

ADDITIONAL READING LINKS

1. Govt Approves New Corporation To Monetize PSU Land, Buildings, Mint (https://www.livemint.com/news/india/centre-approves-setting-up-of-national-land-monetization-corp-dpe-to-set-up-the-company-11646836939426.html)
2. Cabinet Approves Setting Up of National Land Monetization Corporation, Press Information Bureau (https://pib.gov.in/pressreleasepage.aspx?prid=1804286)
3. National Land Monetisation Corporation: Understanding Its Establishment And Purpose, Business Standard (https://www.business-standard.com/india-news/national-land-monetisation-corporation-what-is-it-and-why-was-it-needed-123062200401_1.html)
4. E-Charging Policy, MCDonline (https://mcdonline.nic.in/portal/downloadFile/rpcell_210716041253753.pdf)
5. Request for Empanelment (RFE) of Consultancy Firms, National Land Monetization Corporation Limited (https://dpe.gov.in/sites/default/files/RFE-NLMC.pdf)

6. EV Charging Stations Along National Highways, Press Information Bureau (https://pib.gov.in/Pressreleaseshare.aspx?PRID=1784174)
7. Global EV Policy Explorer, IEA (https://www.iea.org/data-and-statistics/data-tools/global-ev-policy-explorer)
8. Expression Of Interest, MAHAGENCO (https://www.mahagenco.in/wp-content/uploads/2023/06/webcopy-published-02.06.2023-1.pdf)

3.21 INTEREST SUBVENTION FOR A LIMITED PERIOD

OBJECTIVE

While incentives like FAME/PLI are crucial for reducing upfront cost barriers, the cost and availability of capital pose another hurdle for the transition to ZETs in India. The higher interest rates on loans for electric trucks compared to diesel trucks not only increase the cost burden but also negatively impact the Equated Monthly Instalment (EMI) parity for LSPs. This discrepancy between higher interest rates and shorter loan tenures for e-trucks arises due to a lack of confidence and data availability regarding ZETs by financial institutions. Interest subventions serve as a subsidy on the commercially offered interest rates, with the government covering the balance through associated banks. Implementing such schemes would significantly enhance the affordability of loans, a strategy already employed in other sectors such as agriculture, MSMEs and at the state level for EVs in Delhi.

The Delhi EV policy provides an interest subvention of 5%[x] on all loans granted for financing EVs, including e-LCVs/goods carriers. Similar benefits can be extended in a time-bound manner in central and state policies. Discussions with stakeholders suggest that an e-truck's total cost of ownership would reduce by 10% with such an intervention, thereby lowering financial burden on truck operators and owners.

Financial institutions could play a vital role by creating loan reserves specifically for ZETs, where a certain percentage of their loans is earmarked for electric trucks. Fiscal support through interest subvention and accessible finance could support uptick in sales and adoption.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Finance

RECOMMENDED METHODOLOGY

1. Understand the market for loans for ICE trucks and ZETs for interest rate, volume of loans required, default rates, and share of various financial institutions.
2. Research global case studies and sectors such as agriculture and MSMEs in India having similar schemes for sector growth.
3. Conduct a commercial impact analysis of interest subventions for ZETs to improve access to credit, access to market, technology upgradation, and sense of security for employees, etc.
4. Research eligibility criteria such as interest subventions for outstanding, fresh term, incremental or working capital along with eligibility criteria for borrowers.
5. Collect inputs from relevant stakeholders in the government and industry to determine mechanisms for availing benefits under potential schemes that would include interest subvention as a fiscal incentive.
6. Create a structure to implement this through public and private sector banks, with reimbursement through Reserve Bank of India.

STAKEHOLDERS

1. Ministry of Finance
2. Ministry of Heavy Industries
3. Reserve Bank of India
4. Financial institutions

5. State finance departments
6. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 23: TIMELINES TO ROLL OUT INTEREST SUBVENTION

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Market assessment and financial impact analysis – scenario building												
Design framework for eligibility criteria - loan type, borrower eligibility and percentage (varied/uniform)												
Stakeholder consultations												
Policy roll-out (along with withdrawal criteria)												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

Ministry of Heavy Industries would announce an interest subvention scheme that is notified by Reserve Bank of India.

ADDITIONAL READING LINKS

1. E-AMRIT (https://e-amrit.niti.gov.in/electric-vehicle-incentives)
2. Switch Delhi, Department Of NCT Of Delhi (https://ev.delhi.gov.in/)

3.22 PRIORITY SECTOR LENDING

OBJECTIVE

Priority sector lending mandates national and foreign banks to allocate a specific portion of their lending portfolios to sectors identified as priority sectors. Currently, eight such sectors have been identified under PSL. Including ZETs under PSL can address the financial challenges and barriers that often deter buyers and fleet operators from transitioning to electric vehicles.

The Banking Regulation Act, 1949, gives power to the Reserve Bank of India (RBI) to introduce directions for national and foreign banks in India. To include ZETs in priority sector lending, RBI should formally classify the electrification of MHDVs as a priority sector in Chapter II of the Reserve Bank of India (Priority Sector Lending – Targets and Classification) Directions, 2020[xi], defining lending targets and guidelines for banks to follow.

Countries such as Japan, Korea, Philippines, China, etc., have credit programs[xii] directed towards specific sectors such as agriculture, exports, declining sectors, and socio-economic purposes. Although each of the countries have faced their own set of challenges in operationalization of the loans and their sustenance, the following have been observed:

- Define prioritized sectors for a limited period with clear set provisions are desired.
- Channel lending through specialized financial institutions other than banks, such as Reconstruction Finance Bank (RFB) and Development Bank of Japan (DBJ) in Japan, Land Bank of the Philippines, etc.
- Develop effective credit appraisal and program monitoring.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Reserve Bank of India

RECOMMENDED METHODOLOGY

1. Study national and international examples for types of sectors/ activities included under priority sectors/ credit programs, challenges, and outcomes of the programs.
2. Undertake an impact assessment of PSL being introduced in other domains such as agriculture, MSMEs, including adverse impacts, such as economic burden on banks diverting funds from productive sector.
3. Assess the financial effectiveness of including electrification of MHDVs as priority sector.
4. Consult stakeholders to gather insights.
5. Prepare guidelines outlining allowed activities (truck/ related infrastructure).
6. Develop a proposal to the Parliamentary Standing Committee on Industry to consider ZET inclusion under PSL.
7. Recommend including ZET under PSL by the Standing Committee to the Government.
8. Assess the proposal by RBI and include its recommendation.
9. Create a draft circular/notification of formal inclusion of electrification of MHDV as priority sector.
10. Develop a phase out strategy, monitoring, and implementation.

STAKEHOLDERS

1. Banks and other financial institutions
2. Ministry of Heavy Industries
3. Ministry of Finance

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 24: TIMELINES TO ROLL OUT PRIORITY SECTOR LENDING

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Market assessment and financial impact analysis – scenario building												
Stakeholder consultation												
Amendment in PSL guidelines												
Phase out strategy, monitoring, and implementation												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

The electrification of MHDVs to be included under Chapter II of the Reserve Bank of India (Priority Sector Lending – Targets and Classification) Directions, 2020.

ADDITIONAL READING LINKS

1. Master Directions – Priority Sector Lending (PSL) – Targets And Classification, RBI (https://rbidocs.rbi.org.in/rdocs/notification/pdfs/mdpsl803ee903174e4c85afa14c335a5b0909.pdf)
2. Draft Technical Paper By The Internal Working Group On Priority Sector Lending, RBI (https://rbi.org.in/upload/content/pdfs/66391.pdf)
3. Lending To Priority Sector | RBI (https://rbi.org.in/Scripts/PublicationDraftReports.aspx?ID=488)
4. 309th Report On "Electric & Hybrid Mobility", Sansad (https://sansad.in/getFile/rsnew/Committee_site/Committee_File/Press_ReleaseFile/17/163/444P_2021_12_15.pdf?source=rajyasabha)
5. Review Of Priority Sector Lending Performance Of Indian Commercial Banks, Goyal, Neha & Agrawal, Rachna & Aggarwal, Renu (https://www.researchgate.net/publication/287799611_Review_of_Priority_Sector_Lending_Performance_of_Indian_Commercial_Banks/citation/download)

3.23 HYDROGEN CORRIDOR INCENTIVE

OBJECTIVE

Hydrogen is a promising zero-emission fuel with significant potential for reducing greenhouse emissions. While H2 ICE vehicles use hydrogen as a fuel with an internal combustion engine, FCVs use hydrogen fuel cells to generate electricity for the vehicle's motor. Once hydrogen fuel attains market maturity within the transportation sector, these incentives can be introduced for establishing hydrogen infrastructure to improve economic viability.

Hydrogen-powered vehicles, especially for medium to heavy-duty long-haul transportation, offer extended driving ranges while overcoming the limitations with battery weight, size, and recharging time. However, a strategically planned network of refuelling stations and supporting infrastructure, forming a hydrogen corridor, will be essential to support their refuelling requirements and their widespread adoption. It is crucial to offer financial incentives strategically focused on critical areas for developing hydrogen corridors. These critical areas include a robust network of hydrogen refuelling stations with stable supply of hydrogen, addressing the cost and challenges associated with setting up infrastructure and closing the gap between hydrogen's production cost and an economically viable purchase price. Location of hydrogen production facilities can be combined with the other hydrogen consumers or setting up the small-scale production facilities.

In the US, the Inflation Reduction Act (2022) extends tax credit with a 30% credit cap for the cost[iii] of alternative fuel refuelling property and installed equipment. Additionally, the Advanced Energy Project Credit further extends the 30% investment tax credit to hydrogen infrastructure projects. Currently, the US has 71 hydrogen refuelling stations[xiii].

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of New and Renewable Energy/Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Study national and global examples for incentivizing zero emission technology transportation corridors.
2. Analyse traffic density to determine optimal freight routes, identify priority corridors and expected hydrogen demand for incentivization.
3. Conduct comprehensive technological study to identify cost of infrastructure and prepare financial support framework offering subsidies/ tax credit incentives.
4. Implement targeted infrastructure support for H2 production and distribution, customized to the specific location and existing infrastructure around H2 refuelling stations.
5. Formulate best practices and safety guidelines for the infrastructure development and hydrogen handling and distribution.
6. Conduct cost analysis to determine the economic purchase price of hydrogen, calculating the required tax subsidies on sale of hydrogen.
7. Consult stakeholders for feedback on draft framework and refinement.

8. Assess budget allocation, along with forecasting impacts.
9. Roll out a hydrogen corridor incentive while simultaneously devising a withdrawal strategy for demand incentives.

STAKEHOLDERS

1. Ministry of New and Renewable Energy
2. Hydrogen production companies
3. Hydrogen refuelling station operators
4. Original Equipment Manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 25: 26TIMELINES TO ROLL OUT HYDROGEN CORRIDOR INCENTIVE

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by either MoRTH or MNRE releasing a hydrogen truck incentivization structure along identified corridors, which specifies allowed activities for direct and indirect incentivization.

ADDITIONAL READING LINKS

1. Alternative Fuels Data Centre, Alternative Fuel Infrastructure Tax Credit (https://afdc.energy.gov/laws/10513)
2. Qualifying Advanced Energy Project Credit (48C) Program, Department of Energy (https://www.energy.gov/infrastructure/qualifying-advanced-energy-project-credit-48c-program)
3. EU Type approval for Hydrogen powered vehicles, TÜV SÜD (https://www.tuvsud.com/en/resource-centre/case-studies/eu-type-approval-hydrogen-vehicles)
4. Hydrogen Internal Combustion Engines: Trending Topics from Hydrogen Engine Live, Cummins Inc. (https://www.cummins.com/news/2023/09/08/hydrogen-internal-combustion-engines-trending-topics-hydrogen-engine-live)
5. How hydrogen combustion engines can contribute to zero emissions, McKinsey (https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/how-hydrogen-combustion-engines-can-contribute-to-zero-emissions)
6. Regulatory needs for H2 ICE HDVs (https://unece.org/sites/default/files/2022-01/grpe-85-41e.pdf)
7. February H2IQ Hour: Overview of Hydrogen Internal Combustion Engine (H2ICE) Technologies (https://www.energy.gov/sites/default/files/2023-03/h2iqhour-02222023.pdf)

3.24 ENTRY TIME WAIVER FOR A LIMITED PERIOD

OBJECTIVE

Municipal authorities impose entry time restrictions for trucks within city limits, markets, and other areas to avoid congestion during peak hours. These restrictions severely impact efficiency of logistics operations. This varies across municipalities depending on congestion patterns. Given the low adoption of e -MHDVs currently, an entry time relaxation can be introduced for a limited period. This exemption can allow e-MHDVs to operate even during restricted hours, boosting vehicle utilization and visibility. Higher utilization throughout the day strengthens the business case for e-trucks, making them more attractive to potential buyers.

It will be beneficial to assess the designated operating routes within city limits, so that e-trucks are confined to logistics operational areas and not disrupting other movement in the city. This will need extensive collaboration between state agencies, urban local bodies (ULBs), and regional transport authorities (RTOs). This increased presence would also enhance ZET visibility, raising public awareness and fostering a positive perception of cleaner transportation alternatives.

The current Delhi EV policy exempts electric light commercial vehicles[xiv] from entry time restrictions. These exemptions have encouraged businesses to adopt e-LCVs in Delhi and nearby regions.

This can be further complemented by waiving parking fees. But this policy needs periodic review to understand its impact on city traffic. As e-truck adoption increases, the entry time relaxation policy will need to be updated to ensure freight vehicle movement is not impacting city mobility. Simultaneously, city mobility plans need to be aligned with the city's logistics plan to allow for dedicated freight routes.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption	
Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Housing and Urban Affairs

RECOMMENDED METHODOLOGY

1. Assess the current entry requirements for inter and intra-city truck operations and impact on traffic conditions.
2. Identify the financial impact of restricted entry time on asset utilization, parking fees on small fleet operators operating expenses.
3. Organise stakeholder consultations to identify states and cities willing to provide entry time relaxation for trucks.
4. Establish communication channels with selected municipalities to assess the feasibility of entry time waiver.
5. Assess traffic impact through a study, along with projected EV penetration for selected cities.
6. Launch an entry time relaxation for respective city, along with awareness program to promote e-truck operators to leverage policy benefits.

STAKEHOLDERS

1. Ministry of Housing and Urban Affairs
2. State municipal corporations

3. State transport government departments
4. State traffic departments
5. Airport Authority of India
6. Trucking associations
7. Logistic Service Providers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 27: TIMELINES TO ROLL OUT ENTRY TIME WAIVER FOR A LIMITED PERIOD

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders, shortlisting states and cities interested												
Traffic impact study for interested cities												
Policy roll-out along with awareness sessions												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment to existing state EV policies to waive entry time restrictions.

ADDITIONAL READING LINKS

1. Government of NCT of Delhi order (https://ev.delhi.gov.in/files/l5n, n1 exempt from plying and parking .pdf)
2. E-vehicles in Delhi can ply in no-entry hours, Delhi News - Times of India (indiatimes.com) (https://timesofindia.indiatimes.com/city/delhi/e-vehicles-can-ply-in-no-entry-hours/articleshow/87788346.cms)

3.25 ENTRY FEE WAIVER FOR A LIMITED PERIOD

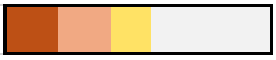
OBJECTIVE

Trucks are subjected to high entry fee at locations such as ports, airports, Special Economic Zones (SEZs), city/ urban conglomerates, etc. to conduct day-to-day logistic operations. Waiving these fees, levied by various agencies with varying rates, would incentivize cleaner technologies and lower operational costs. However, successful implementation requires collaboration between these agencies to establish a unified waiver system established by the identified nodal agency.

In London's Ultra Low Emission Zone (ULEZ)[xv], a congestion charge is applied on vehicles that do not meet Euro VI[xvi] standards. These standards are continuously tightened over time to improve air quality in the region. Although electric trucks do not receive any special exemption from these charges, they emerge as increasingly appealing choices for operating within the ULEZ due to their zero tailpipe emissions.

To ensure financial sustainability, a cost-benefit analysis that can include impacts on operational expenses and revenue will be essential. Identifying alternative funding sources, such as levies on high-emission vehicles, can support the waiver program to be implemented efficiently. Additionally, there is a need to develop strategies for gradually phasing out the waiver once momentum for ZETs is established.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption 

Ease of implementation 

RECOMMENDED NODAL AGENCY

NITI Aayog

RECOMMENDED METHODOLOGY

1. Assess the current entry fees and regulations related to truck operations at ports, airports, SEZs, urban conglomerates and other similar areas.
2. Identify the financial impact of entry fees at these strategic locations on fleet operators and the economic feasibility of ZET adoption.
3. Identify specific locations and respective agencies for entry fee waiver.
4. Establish a working group consisting of representatives from relevant government agencies, industry stakeholders, and environmental experts to evaluate the potential benefits and challenges of entry fee relaxation at critical locations.
5. Develop a comprehensive plan for phasing out or reducing entry fees for ZETs at ports, airports, industrial parks, and similar areas over a specific period.
6. Explore mechanisms for compensating revenue loss resulting from fee reductions, such as alternative revenue streams or subsidies.
7. Devise a strategy for implementation and withdrawal.

STAKEHOLDERS

1. Ministry of Ports, Shipping and Waterways/ Port Authorities
2. Ministry of Commerce and Industry
3. Ministry of Civil Aviation
4. Ministry of Environment, Forest, and Climate Change

5. Ministry of Housing and Urban Affairs
6. State municipal corporations
7. Ministry of Road Transport and Highways
8. Airport Authority of India
9. Trucking associations
10. Logistic Service Providers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 28: TIMELINES TO ROLL OUT ENTRY FEE WAIVER FOR A LIMITED PERIOD

ACTIVITY	Period (in months)					
	1	2	3	4	5	6
Background research and analysis						
Consultations with identified stakeholders						
Policy development						
Policy roll-out						

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by the identified ministries/ government agencies waiving entry fee for ZETs.

ADDITIONAL READING LINKS

1. London's Ultra Low Emissions Zone explained, Carwow (https://www.carwow.co.uk/blog/london-ultra-low-emissions-zone-explained)
2. Ultra Low Emission Zone - Transport for London (https://tfl.gov.uk/modes/driving/ultra-low-emission-zone)

3.26 STAKEHOLDER ENGAGEMENT AND AWARENESS

OBJECTIVE

Effective communication and stakeholder awareness on long-term benefits like reduced logistics costs, enhanced energy security, and foreign exchange savings will be key to promote ZETs. Consensus building among stakeholders creates an avenue for an 'outside-in' policymaking perspective. This collaborative exercise promotes inclusivity, addresses concerns, and garners commitment through transparency. Diverse perspectives enrich decision-making, transcending financial constraints, and makes policy design and implementation process more relevant. A sustainable policy framework that is aligned with stakeholder insights will be essential.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

NITI Aayog

RECOMMENDED METHODOLOGY

1. Identify a comprehensive list of stakeholders and conduct stakeholder analysis.
2. Benchmark similar awareness programs initiated by the GoI/ NITI Aayog.
3. Set up a national platform to foster collaborations among various stakeholders of the freight ecosystem.
4. Develop and deploy an information sourcing plan from global and local avenues.
5. Develop a communication plan for effective outreach and wider engagements.
6. Set up committees to monitor and evaluate impact of implemented policies and stakeholder expectations.
7. Establish techniques and trusted channels for knowledge dissemination, continued stakeholder engagements and growth.
8. Create a framework for gathering inputs and expectations from stakeholders that can be presented to decision-makers.

STAKEHOLDERS

1. Road freight industry stakeholders - shippers, logistics service providers, small truck owners, drivers, original equipment manufacturers, charge point operators, distribution companies, financial institutions, etc.
2. Office of Principal Scientific Adviser to Prime Minister of India, Ministry of Road transport and Highways, Ministry of Commerce and Industry, Ministry of Finance, Ministry of Corporate Affairs, Ministry of Heavy Industries, Ministry of Power etc.
3. Think tanks
4. Academic institutions

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 29: TIMELINES TO ROLL OUT STAKEHOLDER ENGAGEMENT AND AWARENESS

	PERIOD (Months)

ACTIVITY	2	4	6	8	10	12	14	16	18	20	22	24
Stakeholder mapping												
Design inclusive engagement framework												
Awareness and engagement initiatives												
Launch common engagement platform												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

1. Establishing a knowledge repository of financial, operational, and technical data for stakeholders to take evidence-based decisions.
2. Creating a cohort of first movers spreading a strong message about decarbonisation and adopting ZETs.

ADDITIONAL READING LINKS

1. What is e-FAST? (https://efastindia.org/)
2. National Truck Platforms - Making zero emission freight a reality (https://zero-emission-trucks.eu/)
3. Alberta Zero Emissions Truck Electrification Collaboration (AZETEC), Emissions Reduction Alberta (https://www.eralberta.ca/projects/details/alberta-zero-emissions-truck-electrification-collaboration-azetec/)
4. Electrification Coalition (https://electrificationcoalition.org/)

3.27 RESIDUAL VALUE FRAMEWORK FOR BETS

OBJECTIVE

Residual value guarantees (RVGs) are financial tools designed to mitigate depreciation risks, especially pertinent BETs, where technology evolution and market infancy pose uncertainties. RVGs can serve as crucial incentives for fleet operators and businesses to adopt these eco-friendly vehicles.

Several sectors have acknowledged the need to establish residue value frameworks so as to assess reliability of a technology, such as solar[xvii]. It is essential to assess the market demand, technology, and policy landscape to determine the framework. By providing a minimum residual value assurance for BETs at the end of a lease or financing terms, RVGs enhance confidence among lenders. This, in turn, enables lenders to set higher residual values, reducing finance costs for borrowers and facilitating greater access to BETs. Whether provided by a third party or government, RVGs play a pivotal role in promoting the adoption of BETs.

To ensure the effectiveness of a BET residual value framework, several critical areas require focused study and development:

1. **Establishment of a Secondary Market for BET Batteries:** Encouraging and facilitating the creation of a robust secondary market for BET batteries is essential. This market will provide valuable data on the residual value of these components, informing overall BET residual value assessments.
2. **Benchmarking and Standardisation of Second-Life Market Values:** Standardised pricing for both second-life batteries and truck chassis within the BET market is crucial. This will establish clear benchmarks for residual value calculations, promoting transparency and reducing uncertainty for stakeholders.
3. **Clarity on Second Life and End-of-Life Applications:** Defining clear pathways for both second-life utilization (e.g., stationary energy storage) and responsible end-of-life management of BET batteries and truck is crucial. This clarity will enhance market confidence and attract potential participants.
4. **Introducing Residual Value Guarantees:** Guarantees can mitigate risks and potentially lower leasing costs by acting as a safety net for captive finance providers and leasing companies, offering a minimum value that the BET would retain at the end of the lease.
5. **Scalability to Other Electric Vehicle Segments:** The BET residual value framework should be designed with scalability in mind. It should be adaptable to accommodate the evolving landscape of other electric vehicle segments, such as passenger cars and buses.
6. **Extension to Other Fuel Technology Trucks:** While the initial focus is on BETs, the framework should pave the way for the development of similar valuation structures for trucks utilizing other zero emission fuel technologies, such as hydrogen. This will ensure a comprehensive approach to residual value assessment in the future of sustainable transportation.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

NITI Aayog

RECOMMENDED METHODOLOGY

1. Identify experts and other critical stakeholders essential to devise residual value framework for BETs and convene into a working group.
2. Study and analyse the residual value framework for ICE trucks and other segments of electric vehicles, both national and global examples.
3. Study and analyse BET performance – battery degradation, maintenance costs, second-life battery market (pricing/ applications) and technology, financing, socio-economic challenges associated with BETs.
4. Identify areas and scope of work to be undertaken to establish residue value framework (Secondary market establishment, standardisation, guarantees, areas of applications, etc.)
5. Assess and develop frameworks and data around the identified work areas.
6. Convene industry stakeholders to brainstorm on the results.
7. Propose a comprehensive policy framework for residual value framework outlining guidelines, regulatory measures, and incentives to promote market development.

STAKEHOLDERS

1. International Finance Corporation and World Bank
2. NITI Aayog
3. Reserve Bank of India
4. Climate financiers
5. Financial institutions
6. National and International Banks
7. Non-Banking Financing Company
8. FinTech companies
9. Investment Facilitation Agencies
10. Original Equipment Manufacturers
11. Distribution Companies
12. Refuelling station operators (Charge point operators/ hydrogen)
13. Trucking associations
14. Logistics service providers
15. Battery manufacturers

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 30: TIMELINES TO ROLL OUT RESIDUE VALUE FRAMEWORK FOR BETs

ACTIVITY	PERIOD (Months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Background research and analysis												
Consultations with identified stakeholders												
Policy development												
Policy roll-out												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

A government order by NITI Aayog for conducting a study on residue value framework.

ADDITIONAL READING LINKS

1. Finance Zero Emission Trucks - European Clean Trucking Alliance, ECTA (https://clean-trucking.eu/publications/study-financing-of-zero-emission-trucks/)
2. Technology Assessment of ZETs on the Delhi-Jaipur Corridor (https://psa.gov.in/cms/web/sites/default/files/psa_custom_files/delhi Jaipur highway_311023_without blank %282%29.pdf)
3. Transforming Trucking in India, NITI (https://www.niti.gov.in/sites/default/files/2023-02/zetreport09092022.pdf)
4. Delivering Net Zero, Green Finance Institute (https://www.greenfinanceinstitute.com/wp-content/uploads/2023/11/delivering-net-zero.pdf)
5. Expanding Access to Financing For Zero-Emission Trucks in Latin America and the Caribbean, Global Drive to Zero (https://globaldrivetozero.org/site/wp-content/uploads/2023/11/Expanding-Access-to-Financing-for-ZETs-in-Latin-America-and-the-Caribbean_English.pdf)
6. Why electric vehicles are changing how we evaluate residual values, EY - US (https://www.ey.com/en_us/insights/automotive/why-electric-vehicles-are-changing-how-we-evaluate-residual-values)

3.28 CSR SUPPORT FOR ZET ADOPTION

OBJECTIVE

Corporate Social Responsibility (CSR) funds have the potential to act as catalysts for accelerating ZET adoption by creating synergy between corporate responsibility and sustainable mobility goals. Encouraging private sector investments can help fund pilot projects, feasibility studies, and investments in electrification infrastructure. Corporate entities that have a larger stake in the transportation and last mile delivery sector would especially benefit, allowing them to revamp their fleets quicker and more efficiently. CSR spending in the logistics sector transition offers an opportunity for companies to build their brand and enhance their corporate reputation, as well as inspire other businesses to follow suit.

Section 135 of the Companies Act, 2013[xviii] specifies ten activities that can be included by companies in their CSR policy activities. This should be amended to include freight electrification as an allowed activity, potentially under clause (iv) on environmental sustainability and maintaining quality of air.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Corporate Affairs

RECOMMENDED METHODOLOGY

1. Understand the potential to use CSR funding in freight electrification through stakeholder interactions.
2. Analyse CSR funds, areas of expenditure and how that can be incorporated in freight electrification.
3. Consult stakeholders to identify avenues for expenditure.
4. Design a strategy and eligibility criteria for CSR fund utilization.
5. Amend Section 135 of Companies Act, 2013.

STAKEHOLDERS

1. Corporate organizations
2. Ministry of Heavy Industries
3. Industry associations
4. Companies subjected to CSR regulations
5. Financial institutions/ banks

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 31: TIMELINES TO ROLL OUT CSR SUPPORT FOR ZET ADOPTION

ACTIVITY	PERIOD (Months)					
	1	2	3	4	5	6
Research CSR fund availability, utilization patterns, and impact analysis (if used for eMHDV adoption)						
Consultations with identified stakeholders						
Policy development						
Policy roll-out along with withdrawal strategy						

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An amendment in section 135 of Companies Act, 2013 to include freight electrification under the ambit of CSR activities.

ADDITIONAL READING LINKS

1. National CSR Portal (https://www.csr.gov.in/content/csr/global/master/home/home.html)
2. CompaniesAct2013 (https://www.mca.gov.in/ministry/pdf/companiesact2013.pdf)

3.29 SPECIAL PILOT INCENTIVE PROGRAM FOR SMALL FLEET OWNERS AND DRIVERS

OBJECTIVE

In India, ~67%[xix] of logistics service providers operate with small fleets, comprising up to 5 trucks. The higher initial cost and shorter repayment periods, coupled with elevated interest rates, create a notable disparity between EMIs for ZETs and ICE trucks. Small fleet owners' credit histories, combined with uncertainties surrounding evolving technologies, further compounds the challenges in ZET adoption. The Special Incentive Program can be another type of ZET facilitation program that specifically targeting small fleet owners, women or minority-owned businesses, and women truck drivers, among others. The program could target piloting defined number of trucks, allocate a specified fund, or both based on certain assessment criteria. Support can be provided in terms of streamlined/fast-track approvals, additional pilot vouchers/incentives, land provision for public charging infrastructure setup, etc. This should begin after the e-truck landscape has matured more.

Funding for the program can be sourced through just transition funds, inclusive community funds/ grants. The program can be administered through an application process, where candidates will be evaluated based on predefined parameters. These parameters will consider factors such as annual revenue, proof of operational capacity, viability of use case, and pilot deployment plan. California has nurtured successful pilots through such incentive schemes to overcome inhibitions of the small fleet owners. The innovative small e-fleet pilot program (ISEF)[xx] has been able to allocate about ₹961 crores between 2020-2024, funded by the broader Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)[12].

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Road Transport and Highways

RECOMMENDED METHODOLOGY

1. Study national and international examples to identify the type of support given driver and small fleet owners for ZETs for pilot deployment.
2. Consult stakeholders to understand challenges in ZET adoption and required support.
3. Determine key parameters for assessment that include:
    a. Annual revenue
    b. Operational capacity
    c. Use cases
    d. Corridor
    e. Vehicle class
    f. Implementation plan - timelines
    g. charging infra deployment
    h. Solution design
    i. Commercial analysis
    j. Sectoral/ geographical coupling

4. Establish sources for funding the program, identify risk sharing mechanisms and determine financing framework.
5. Set up evaluation experts from government, PSUs, academic institutions, or research organizations to assess feasibility of projects.
6. Devise a strategy for operationalization of the program and disburse funds.
7. Oversee timelines for implementation.
8. Notify special pilot incentive program for small fleet owners and drivers for applications.
9. Assess pilot project feasibility, business, financing, environmental and technical aspects for received applications.
10. Determine the success of pilot implementation based on success metrics such as lowest viability gap, match funding from private sector, scale of deployment, potential for replication and market transformation, etc.
11. Grant early pilot incentive for the shortlisted applications.
12. Establish a monitoring, evaluation, and learning (MEL) structure for the project and assess success of the program.

STAKEHOLDERS

1. Ministry of Skill Development and Entrepreneurship
2. Financial institutions
3. Urban local bodies
4. Small fleet owners and individual truck drivers
5. Original Equipment Manufacturers
6. Refuelling station operators (Charge point operators/hydrogen)

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 32: TIMELINES TO ROLL OUT SPECIAL PILOT INCENTIVE PROGRAM FOR SMALL FLEET OWNERS AND INDIVIDUAL TRUCK DRIVERS

ACTIVITY	PERIOD (Months)								
	2	4	6	8	10	12	14	16	18
Background research and analysis									
Stakeholder consultation									
Program development									
Program roll-out									
Administration and pilot deployment									

OUTCOME/LIKELY LEGISLATIONS AFFECTED

An official notification and SOP released by the identified nodal agency, specifying the number of trucks, assessment criteria and funding for the Special Pilot Incentive Program.

ADDITIONAL READING LINKS

1. City of Seattle's Electric Trucks Incentive Pilot – Environment, Seattle.gov (https://www.seattle.gov/environment/climate-change/transportation-/transportation-electrification/heavy-duty-truck-electrification)

2. Innovative Small e-Fleet Pilot Program, California Air Resources Board (https://ww2.arb.ca.gov/resources/fact-sheets/innovative-small-e-fleet-pilot-program)
3. Zero-Emission Truck Pilot Project (https://www.sdapcd.org/content/sdapcd/grants/grants-equipment/heavy-duty-trucks/zero-emission-truck-pilot-project.html)
4. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (https://californiahvip.org/wp-content/uploads/2023/08/hvip-fy22-23-implementation-manual.pdf)

3.30 SKILL DEVELOPMENT PROGRAMS

OBJECTIVE

By 2030, the EV industry is projected to create 10 million direct jobs and 50 million indirect jobs[xxi]. The transition to ZET technology is expected to impact the job market in four primary ways:

- **Powertrain Agnostics Skilling:** Skilling for efficiency improvements.
- **Material/Process Change:** Reskilling or upskilling, e.g. as per early pilots for e-trucks, trained drivers can deliver 15-20% better energy efficiency compared to untrained drivers.
- **Declining Jobs:** Reskilling for affected roles.
- **Emerging Jobs:** Comprehensive training programs to cultivate ready-made talent.

To meet the intricate demands of ZETs, a robust skill development initiative is essential. This initiative should cover various proficiency levels and involve collaboration between central, state, and local government agencies, along with industry capacity building in manufacturing, assembly, testing, service, and repair for zero-emission technologies. The National Skill Development Corporation (NSDC), in collaboration with sector skill councils like the Automotive Skill Development Council (ASDC) and Skill Council for Green Jobs (SCGJ) under the Ministry of Heavy Industries, as well as the Ministry of New and Renewable Energy, has initiated skill development efforts for electric mobility.

Additionally, the Capacity Building Commission in India conducts administrative capacity-building programs for government officials to enhance efficiency in policy formulation and implementation.

The intervention seeks to expand existing electric mobility courses and integrate critical training areas for zero-emission trucking. This includes certifications for ZET drivers, dealership personnel (sales and service), roadside mechanics, and staff at zero-emission refuelling stations (heavy-duty charging, battery swapping, and hydrogen refuelling). The program involves meticulous identification of skill development areas, curriculum/qualification pack development, and certifications approved by the National Council for Vocational Education and Training. A well-implemented program can upskill current truckers, making these jobs more appealing, and pave the way for a smoother transition to a just future for the trucking industry.

PROJECTED IMPACT ON ADOPTION AND EASE OF IMPLEMENTATION

Impact on adoption		Ease of implementation	

RECOMMENDED NODAL AGENCY

Ministry of Skill Development and Entrepreneurship and Ministry of Heavy Industries

RECOMMENDED METHODOLOGY

1. Study national and international skill development courses for ZETs.
2. Analyse existing courses for zero emission vehicles in India.
3. Identify on-ground challenges, conduct gap analysis, and need assessment.
4. Identify key stakeholders to be consulted.
5. Consult stakeholders and survey to assess the critical areas to be skilled.
6. Compile and finalize critical areas for skilling.
7. Identify partner agencies and funding mechanisms for deployment of skill development program.
8. Develop program and course structure detailing.
9. Raise awareness about the courses and its need.
10. Launch skill development courses.

STAKEHOLDERS

1. National Council for Vocational Education and Training
2. National Skill Development Council
3. Automotive Skill Development Council
4. Sector Skill Councils
5. Capacity Building Commission
6. Identified government officials from central, state, and urban local bodies
7. Original equipment manufacturers
8. Trucking associations
9. Logistics Service Providers
10. Labour unions
11. Component manufacturers and their associations
12. Ministry of Education
13. Public and private academic/training institutions

SUGGESTED TIMELINE FOR POLICY DEVELOPMENT AND ROLL-OUT

The timeline for activities under this suggested policy is provided in the following figure.

FIGURE 33: TIMELINES TO ROLL OUT SKILL DEVELOPMENT PROGRAMS

ACTIVITY	PERIOD (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Background research and analysis												
Consultations with identified stakeholders												
Program development and course structure detailing												
Awareness building and launch												

OUTCOME/LIKELY LEGISLATIONS AFFECTED

The launch of skill development programs by Ministry of Skill Development and Entrepreneurship, in partnership with identified agencies.

ADDITIONAL READING LINKS

1. Skill Centre, e-AMRIT (https://e-amrit.niti.gov.in/skill-center)
2. Electric Vehicle Jobs and Skill Gap, India's Auto Revolution (https://www.linkedin.com/pulse/electric-vehicle-jobs-skill-gap-indias-auto-revolution-teamlease-qzyfc/)
3. Electric Vehicle industry in India: Scope for skill development, National Skills Network (https://www.nationalskillsnetwork.in/electric-vehicle-industry-in-india-scope-for-skill-development-and-employment-generation/)
4. Zero Emission Skills Support in Scotland (https://www.transport.gov.scot/media/52215/zero-emission-skills-support-in-scotland.pdf)

4. CONCLUSION & WAY FORWARD

The Bharat ZET Policy Advisory is intended to be a dynamic document, evolving periodically to meet the changing needs of the ZET ecosystem. It will be circulated among various ministries and NITI Aayog. Comprehensive stakeholder consultations will be conducted to collect input, and their feedback will be incorporated to finalize and publish the Bharat ZET Policy Roadmap.

While thirty key policy interventions have been identified for a more immediate focus, this roadmap acknowledges the necessity for continuous review and adjustment. As the ZET market matures, particularly for hydrogen fuel cell electric trucks (FCETs), additional policy considerations will be required, such as understanding hydrogen infrastructure deployment needs and formulating supportive policies.

The Policy Advisory Panel has ranked intervention from high to low impact. Top interventions from supply and demand side have been represented in the table below:

Demand Side Policies	**Supply Side Policies**
Demand Incentive	CAFE Norms Tightening and ZEV Credits
Demand charge waiver for charging Infrastructure	Phased Supply Side Sales Mandates
ZET Toll waiver for Limited Period	Additional Gross Vehicle Weight (GVW), Max Axle Weight Allowance and Increased Overall Dimensions for ZETs
Early Adopters Pilot Program	Phased Localization Mandate

The highlighted policy interventions reflect the current maturity of the ecosystem and the immediate need for policy intervention, based on the panel's expert view. As the ecosystem matures and ZET adoption increases, this list of high-impact items will evolve. This evolution should be supported by broader stakeholder consultations to gain a nuanced understanding of on-the-ground realities. Moreover, safety standards for charging infrastructure remain a critical concern. The Centre of Excellence for Zero Emission Trucking (CoEZET), IIT Madras is actively working on developing these comprehensive safety standards and guidelines.

The identified nodal ministry will spearhead policy development and implementation. To ensure achievability, this process will necessitate extensive preparatory and technical work. This includes transforming these recommendations into clear and implementable policies, developing mechanisms for phasing out certain policies as market conditions evolve, securing necessary funding and personnel to execute the roadmap effectively, and working closely with all stakeholders, including industry players, government agencies, and research institutions.

By working cohesively towards the common goal of decarbonizing the road freight sector, India can achieve multiple benefits: enhanced energy security through reduced dependence on imported fossil fuels, improved air quality through cleaner emissions, and reduced logistics costs through more efficient ZET operation.

The successful implementation of the Bharat ZET Policy Roadmap requires a collaborative effort from all stakeholders. By prioritizing high-impact interventions, ensuring safety and standards, and fostering strong collaboration, India can pave the way for a more sustainable and prosperous future for its road freight transportation sector.

5. ACKNOWLEDGEMENTS

5.1 ADVISORY COMMITTEE

S. No.	Name, Designation, and Organisation	Role
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2.	Dr. Parvinder Maini, Scientific Secretary, O/o PSA	Member
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5.3 ACKNOWLEDGEMENTS

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ANNEXURE I – ZET POLICIES UNDER IMPLEMENTATION

The Government of India has been implementing certain policies at the central and state level to support EV adoption, complementing ZET adoption. Hence, they have not been included as part of the policy advisory. They are as listed below:

1. **Registration fee waivers:** Seventeen states and UTs offer road tax exemptions or registration fee waivers for e-freight vehicles, e-trucks registered in these states shall be eligible for these benefits.
2. **Phasing out of fossil fuel**: Four states have committed to phasing out of all fossil-fuel-based commercial fleets by 2030.
3. **Incentives for certain segment:** Haryana is the only state that offers incentives for e-tractors, as part of subsidies for buying medium- and heavy-duty electric vehicles.
4. **Electrification for government-operated fleet**: Seven states implemented policies specifically targeting the electrification of vehicles, such as garbage trucks, operated by public authorities.
5. **Charging infrastructure support**: Seventeen state policies offer fast charging at highways for electric freight vehicles.
6. **Incentives for charging infrastructure installation**: Charging-as-a-Service is already being implemented through FAME II Phase II. ₹800 crores has been allotted to deploy 7,432 public charging stations (fast and slow chargers).
7. **Supply-side incentives**: Production-linked incentives for electric vehicles.

ANNEXURE II – EXCLUDED ZET POLICIES

The following policies have been excluded, either since they are already under development or have been excluded as the ZET ecosystem is nascent.

1. **Charging system standardisation:** Already adopted the OCPP version 1.5 and higher versions of the same for its EV ecosystem.

2. **Carbon trading mechanism:** Vast topic covering several industries of which trucks would constitute only a small part. Considered in progress – a draft notification of the carbon trading scheme was notified in 2023.

3. **Battery circularity system**: Already been implemented under Battery Waste Management Rules 2022 - includes rules for reuse targets, specifically for battery electric vehicles.

4. **Land use policy**: Land use plans need not be separately amended for ZET infrastructure to be established.

5. **Battery-as-a-Service**: Already included under MaaS. Furthermore, difficult to implement given the technology maturity for e-MHDV battery handling.

6. **Life cycle emission assessment**: Difficult to administer and use as a policy for faster adoption.

7. **State-level adoption mandates**: Included under demand side mandate – central and state government agencies can also be mandated along with other shippers/ LSPs for adoption of ZETs.

8. **Government-led ZET adoption**: Volumes impacted might be low when considered as a separate intervention. Included under demand-side mandate.

9. **Low Emission Zones in cities:** MHDVs operate peri-urban and rural areas – do not have substantial needs to enter cities. Large volumes will not be impacted due to the policy.

10. **Per KM funding**: Difficulty in monitoring and passing the benefits to the truck operators.

11. **Preferential parking – urban/non-urban**: Truck parking (unlike car parking) is currently not a substantial issue and thus policies related to it may not result in faster adoption of ZETs.

ANNEXURE III – STATE GOVERNMENT SUPPORT

Achieving a unified integration of state-level initiatives with national goals is essential for a harmonized approach to zero emission trucking. As the trucking supply chain spans multiple states, coordinated efforts among state governments are crucial for seamless logistics operations. Clear pathways for implementing and translating policies from central to state and urban local bodies (ULBs) must be established to effectively decarbonize the trucking industry. Fast-track approvals and transparent administrative systems are vital for the efficient dissemination of policies from the state to central levels.

The advisory identifies several key policy interventions at national level that require critical attention from state to ensure successful percolation and implementation:

3.3 Early Adopters Pilot Program
3.13 Quality and Quantity of Power Supply
3.14 Refuelling Infrastructure Deployment Criteria by Road Classification
3.15 Demand Charge Waiver for Charging Infrastructure
3.16 Phased Supply Side Sales Mandates
3.17 Phased Demand Side Mandate
3.20 Tax Credits for ZETs and Re-fuelling Infrastructure
3.21 Land aggregation by PSUs and Retailing to Small Businesses
3.22 Interest Subvention
3.24 Hydrogen Corridor Incentive
3.25 Entry Fee Waiver for a Limited Period
3.26 Entry Time Waiver for Limited Period
3.27 Stakeholder Engagement and Awareness
3.29 Special Pilot Incentive Program for Small Fleet Owners and Drivers
3.30 Skill Development Programs

The success of interventions relies on the collaborative implementation of policies at every administrative tier. As we stand at the intersection of ambition and action, it is pivotal for each state and ULB to engage with and transpose central-level policies actively, fostering an ecosystem where the transition to ZETs becomes a shared commitment.

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