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ELECTRIC MOBILITY FINANCIERS ASSOCIATION of INDIA

How to Finance India's First 10,000 Zero-Emission Trucks

Report / February 2025

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Executive Summary

India stands at a crucial juncture in its transition to zero-emission trucking. The launch of the PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme marks a transformative step, introducing the country's first dedicated funding for electric and zero-emission trucks (ZETs). With INR 500 crore (US$57,762,400) allocated to accelerate adoption, this initiative underscores India's commitment to reducing the transportation sector's environmental footprint, improving air quality, and strengthening energy security.[i]

Industry actors are also making significant inroads to accelerate ZET adoption. Original Equipment Manufacturers (OEMs) are driving innovation, introducing over 10 domestic ZET models designed for diverse freight duty cycles. Meanwhile, fleet aggregators and infrastructure providers are committing to early deployment projects across high-impact use cases, including freight corridors, ports, cement, and e-commerce. Although policy and industry support for ZETs is growing, large-scale adoption will require substantial financing. Mobilising financial resources is essential, with targeted interventions to accelerate the transition.

> **"With INR 500 crore allocated to accelerate adoption, PM E-DRIVE underscores India's commitment to reducing air pollution from the transportation sector."**

This report focusses on strategies to fund the first 10,000 ZETs in India — an illustrative benchmark to jumpstart market growth and establish the financial conditions necessary to scale. For example, if ZET sales account for 1% of annual new truck sales over the next three years, this could result in 10,000 ZETs being sold. While this may seem like a modest percentage, it represents a crucial first step in catalysing the ZET transition.

i. US$1 = INR 86.56 at time of writing.

To support this transition, the report details financing strategies that mitigate risks and minimise potential losses in case of default. A solution-oriented approach highlights practical interventions to overcome market challenges and facilitate lending for ZET adoption. **Exhibit 1** below presents the impact and implementation pathway of key financial interventions.

Exhibit 1 Strategies for addressing ZET financing risks: impact and key stakeholders

Intervention	Impact: Risk Mitigation and Loss Coverage	Critical Implementing Actors
Warranties and Buybacks	Warranties and buyback clauses shift product and residual value risks to OEMs or third parties, ensuring reliability and instilling financier confidence.	OEMs and fleet operators
Mezzanine Facility	Can address customer risk by mitigating default risk by easing the fleet operator's up-front financial burden, preventing overleveraging.	Third-party facility manager and multilateral development banks (MDBs) or development finance institutions (DFIs) in collaboration with financier
Revenue Assurance Contracts	Mitigate customer risk, assuring that stable revenue will be generated to cover loan repayments and reduce the chance of default.	Corporate aggregators and fleet operators
Charging-as-a-Service	Reduce operational risk by providing greater assurance regarding revenue generation and utilisation.	Charge point operators (CPOs) and fleet operators
Service-Level Agreements	Mitigates operational risk by reducing ZET downtime and repairs.	OEMs and fleet operators
Insurance	Can cover residual risk as the financier can claim compensation for the vehicle in case of an accident or theft.	Insurance providers and fleet operators
Residual Value Guarantee	Assures residual value and enables financiers to hedge against losses.	A third-party guarantor, either a private actor or MDB/DFI
Risk-Sharing Facility	Distributes loss in instances of default.	Guarantors and financiers
Concessional On Lending	Can mobilise capital offering financiers lower interest funds to be on-lent to end-borrower.	MDBs and DFIs would need to initiate

Source: RMI. **Note:** In financial transactions referred to in this report, fleet operators are the primary borrowers of ZET loans.

Mobilising ZET financing requires a strategic, risk-managed approach. This study provides a market assessment to scale adoption, analysing products, end consumers, and high-potential fleet segments to guide early deployment. Key takeaways outline critical considerations for OEMs, charging operators, fleet operators, and financiers — including banks, non-banking financial companies (NBFCs), development organisations, and multilateral development banks — as they refine strategies and scale investment. Expanding access to ZET financing and mitigating market risks will require targeted interventions within a structured framework that enhances risk management, minimises losses, builds market confidence, and accelerates growth.

- **Consider ways to bridge cost and strategically foster ZET demand amongst early movers**

  Early adopters — such as corporate fleets with ESG commitments and specialised ZET operators — are essential in creating initial demand. However, without purchasing incentives, ZETs currently have a capital cost approximately three times higher than diesel trucks, with a total cost of ownership (TCO) that is 14%–22% greater.[ii, iii] Over time, policy support, economies of scale, and advancements in battery technology will enhance ZET's cost competitiveness, making them more attractive to fleet operators.[1]

- **Strategically select initial products and use cases to finance**

  Financiers entering the market can look to reduce risk and find a market footing by financing ZETs from established OEMs and prioritising financing ZET use cases, such as high utilisation and frequent, closed-loop logistics operations. This strategic approach enables lenders to build market confidence while ensuring that financed vehicles deliver predictable returns.

- **Fleet segmentation shows ZET adoption led by corporations and ZET-only operators due to their financial strength and global mandates**

  Large corporations and ZET-only fleet operators are likely to be at forefront of ZET adoption, driven by financial strength, ESG mandates, and Scope 3 reduction targets. Companies, e-commerce businesses, and fast-moving consumer goods fleets have a high-risk appetite for early ZET adoption. Meanwhile, internal combustion engine (ICE)-dominant operators and small businesses, which rely on informal financing and

ii. ZET technologies include battery-electric, hydrogen fuel cell, and hydrogen combustion trucks. References to charging and electric trucks appear in this report due to their market prominence to date but are not intended to signal preference or exclude other technologies.

iii. The TCO was derived over a seven-year operating period utilising market costs today, refer to the **Appendix** for more details.

operate older diesel trucks, will face more significant barriers in transitioning to ZETs given the high up-front costs. Adoption across all segments depends on affordable ZET models, targeted subsidies, and robust charging infrastructure — without these, uptake will remain slow, especially for smaller players.

- **Financing the first 10,000 ZETs and seeding the market for scale requires addressing four core risks**
  Successfully financing the first 10,000 ZETs requires mitigating key risks through data sharing and structured interventions:

  - **Product risk:** ZETs are still evolving, with limited real-world life-cycle data. Rapid technological advancements may also lead to early obsolescence.

  - **Customer risk:** The high up-front costs of ZETs do not immediately translate into increased revenues for fleet operators, raising the risk of default.

  - **Operational risk:** The lack of established charging infrastructure and trained technicians present significant operational hurdles.

  - **Residual value risk:** The absence of a secondary market complicates asset recovery in case of loan defaults.

Addressing these risks systematically will improve lender confidence and encourage greater capital inflows into the sector.

- **ZETs have a higher expected loss — a key metric used by financiers to evaluate lending potential — compared to their internal combustion engine counterparts**
  This is primarily due to a higher probability of default driven by elevated product, customer, and operational risks, as well as an increased loss given default resulting from the lack of a secondary market and uncertain residual values. Additionally, the exposure at default for ZETs is greater due to their higher purchase price compared to ICE trucks. To lower expected loss and mobilise financing, it is essential to reduce the likelihood of default and hedge against losses through effective contractual agreements and structured financial mechanisms.

- **Financiers are primarily focussed on minimising the risk of default when assessing the viability of financing ZETs**

  Several strategic interventions can be deployed to manage risks effectively. Long-term warranties can be established to ensure product reliability. Customer risks can be reduced via revenue contracts to secure stable cash flows, and mezzanine facilities can work to bridge up-front costs. Service-level agreements can minimise downtime and effectively manage maintenance, while charging-as-a-service agreements transfer ownership and operational risks of charging to the party best equipped to handle them.

- **Two financial interventions can be leveraged to mitigate losses in the event of default**

  Residual value guarantees seek to secure a minimum resale value for ZETs, and securing even 10%–15% of truck value can be impactful; however, it can be challenging to implement these in the market with limited data on battery health and a lack of secondary markets.[2] First-loss default guarantees, covering 80%–85% of losses on individual loans ranging from INR 50 lakh (US$ 57,762) to INR 1.5 crore (US$ 173,287), can bolster financiers' confidence to lend for ZETs. Financiers have indicated that a fee of 0.5% to 1.5% on the guaranteed amount under the risk-sharing facility (RSF) aligns with this coverage level, making it attractive and feasible.[3] To manage risk effectively, the RSF would cap its exposure to different fleet operators based on their creditworthiness. More financially stable fleet operators could be assigned a higher cap, such as INR 100 crores, while those with weaker financial profiles might receive a lower cap, around INR 50 crores.[4] Additionally, the fee charged to fleet operators could be adjusted according to their financial standing, ensuring an equitable and sustainable structure.

- **Manage cost additions for borrowers and risks**

  Interventions must be carefully evaluated for their cost impact on end borrowers, often fleet operators. High loan costs and high up-front investments are already significant barriers. Interventions such as warranties and service-level agreements can provide substantial value relative to their cost, directly addressing key financier concerns and improving access to credit.

Mobilising ZET financing is a feasible objective, contingent on the implementation of a comprehensive strategy that integrates risk management, cost reduction, and market confidence-building. Effective scaling requires collaboration among key stakeholders in the ZET market, including financiers and MDBs. Certain strategic measures can be implemented to enhance risk mitigation, provide safeguards against financial losses, and optimise resource allocation towards the most viable use cases for financing and deploying the first 10,000 ZETs.

1. Introduction

India's trucking sector plays a pivotal role in driving economic growth, transporting 70% of the country's freight and underpinning critical supply chains.[5] However, it also presents a significant environmental challenge, contributing 53% of particulate matter (PM) emissions and 27% of road transport CO_2 emissions despite accounting for only 3% of the vehicle fleet.[6] As global freight demand rises and truck sales are projected to increase by 165% in India by 2050, the urgency to transition to ZETs has never been greater.[7]

Globally, ZETs are seen as a transformative solution to decarbonise the freight sector. Trucks, while accounting for only 3% of the total vehicle fleet (including passenger and freight), are responsible for 53% of PM emissions, significantly impacting air quality and public health. The ZET transition offers a critical opportunity to address these challenges, improving air quality and reducing health risks. Furthermore, by 2050, nearly all new trucks sold worldwide must be zero-emission to meet climate goals, cutting cumulative CO_2 emissions by 29 gigatonnes compared to business-as-usual scenarios.[8]

Adopting ZETs also presents an economic opportunity, offering sustained fuel cost savings, significant logistics cost reductions, and enhanced energy security. By enabling a 17% reduction in logistics costs, ZETs can directly lower the cost of goods and commodities, benefiting the public. Additionally, widespread ZET adoption in India could save INR 116 lakh crore (US$1.5 trillion) in oil costs and reduce diesel consumption by 838 billion litres by 2050.[9]

Factors Creating Interest in ZETs in India

Interest in ZETs in India is driven by supportive policies like PM E-DRIVE, the Bharat Zero Emission Trucking Policy Advisory, and the Production Linked Incentive (PLI) schemes; subnational efforts to develop ZET corridors; demand aggregation initiatives such as the e-fast platform; introduction of models by OEMs; and early deployment initiatives like those at Jawaharlal Nehru Port Authority. Global benchmarks from the EU, the United States, and China further inspire confidence, creating a foundation for scaling and financing ZET adoption.

Policy and Market Support

India's policy ecosystem is increasingly conducive to ZET adoption. The recently launched PM E-DRIVE scheme marks a significant milestone, with INR 500 crore (US$57,762,400) allocated specifically for ZET incentives.[10, iv] Even though the specific guidance under the scheme has yet to be issued, the government's commitment to the ZET transition has encouraged OEMs, fleet operators, corporations, and financiers to develop the ZET market more proactively. Additionally, the PLI scheme for advanced chemistry cells aims to catalyse domestic EV battery manufacturing and reduce reliance on imports, while the PLI auto scheme further encourages EV production. The latest Union budget for FY25–26 also outlines tax measures to bolster the development of a robust domestic production ecosystem for EVs.

OEM Commitments and Product Readiness

India's leading OEMs, including TATA Motors, Ashok Leyland, and global OEMs such as BYD, are driving innovation in ZETs, alongside companies such as IPL Tech. Recent launches of medium- and heavy-duty ZET models from well-established legacy OEM players demonstrate the product readiness

iv. For a detailed analysis of ZET-related policies, please refer to *Accelerating Zero-Emission Trucking: A Comprehensive Global Policy Handbook with a Focus on Roadmap for India* by RMI.

for market adoption and usage. These vehicles are starting to be deployed in high-frequency use cases like fast-moving consumer goods (FMCG) distribution, e-commerce, cement, and port operations.[11]

Pilot Announcements

Players such as JSW Cement have begun pilots to test the operational feasibility of ZETs.[12] These pilots have started to validate the payload performance and operational savings of ZETs, particularly in high-mileage and urban logistics settings. TATA Steel has also been piloting ZETs as part of internal testing efforts to explore their suitability for industrial logistics.[13]

Global Trends

The EU, the United States, and China are driving ZET adoption through robust product development pipelines, innovative financing mechanisms, and large-scale infrastructure deployment.[14] These advancements are setting clear benchmarks and providing market proof points that demonstrate ZET viability, encouraging stakeholders to align with international best practices.

Intention of the Report

This report addresses the core question: **What financial instruments and stakeholder actions are needed to finance the first 10,000 ZETs in India?** The 10,000 trucks number serves as a benchmark for initial market penetration, aiming to jumpstart market growth, build confidence in the technology, and accelerate the shift to cleaner transportation. Financing will be a critical factor in this transition.[15] Although the PM E-DRIVE Scheme's INR 500 crore (US$57,762,400) allocation signals the intent to support the ZET transition, these funds alone will not be sufficient to sustain market growth and development. Covering the cost of the first 10,000 zero-emission trucks alone requires approximately INR 11,000 crore (US$1,270,772,800), with additional investment needed to develop supportive infrastructure.[v] Subsidies, though helpful, are not enough; achieving mass electrification will require broader financial strategies and lending to drive market growth.

v. This represents the capital cost needed to purchase the first 10,000 ZETs; results were derived per RMI analysis.

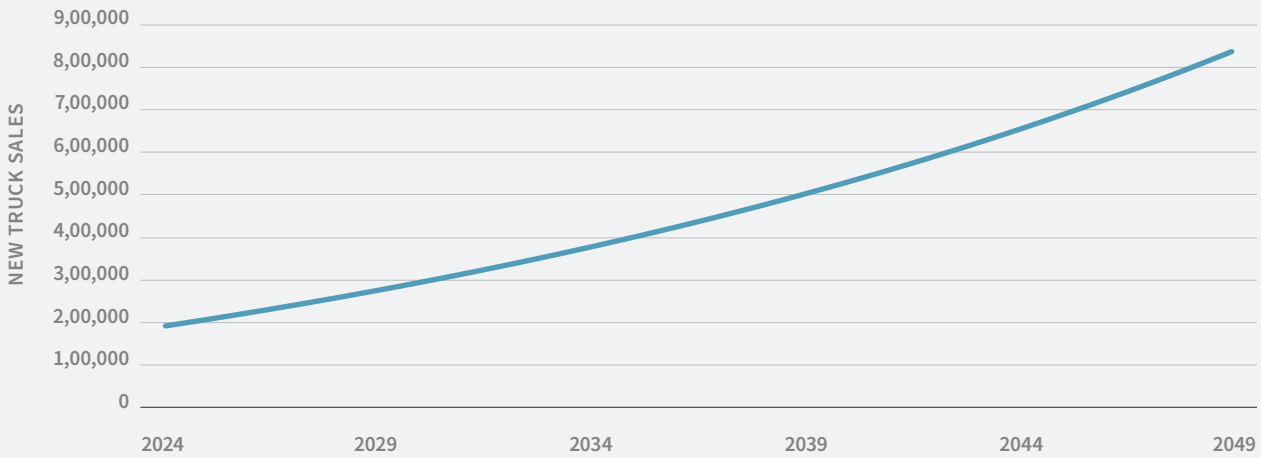
This report provides an overview of the ZET landscape, highlighting the evolving product market, operational costs, and profiles of likely early adopters. It outlines actionable approaches for market participants — including OEMs, fleet operators, CPOs, financiers, and development finance institutions (DFIs) — to share ZET product, customer, operational, and residual risks effectively. Lastly, the report details innovative financing mechanisms to overcome loss and mobilise capital. It outlines a technical implementation pathway to develop interventions to foster a supportive lending environment for accelerating ZET adoption, building on the *Comprehensive Guide to Financing the Zero-Emission Trucking Transition in India,* 2024, and *Outlook on Zero-Emission Truck Financing in India: Insight Brief for Public-Sector Decision Makers,* published by RMI.

2. Snapshot of the Asset and Financing Market

India's trucking market is poised for remarkable expansion. Projections indicate a fourfold increase in road freight mobility by 2050, fuelled by the growing demand for freight and logistics nationwide.[16] Currently, approximately 320,000 new trucks are sold in India annually, a figure that is expected to grow at a compound annual growth rate of 3.8% through 2050.

Such growth can lay the foundation for the ZET transition, as ensuring that new truck sales include a greater share of ZETs over time will be the key to invoking this transition. Even if ZET penetration is initially small, it can have a profound impact in catalysing the broader transition. For example, if ZET sales account for just 1% of annual truck sales over the next three years, this would result in 10,000 ZETs being sold. Although this may seem like a modest percentage, it represents a critical first step towards scaling ZET adoption and advancing broader decarbonisation goals.

Exhibit 2 Projected annual truck sales in India



RMI Graphic

Source: RMI analysis based on VAHAN dashboard and BloombergNEF Long Term EV Outlook, 2024

This section will examine the current state of the ZET market and the role of 10,000 ZETs in the broader evolution of the industry. A summary of available ZET products, operational costs, market segmentation (including borrower types), and the financing landscape provides insight into how incremental changes and financial interventions can help reshape the market toward more sustainable freight solutions.

Product Landscape

India's ZET ecosystem is evolving steadily, with established OEMs such as TATA Motors, Ashok Leyland, VE Commercial, and BYD starting to initiate progress. These players have the capacity to leverage their extensive supply chains and robust service networks to deliver ZET models tailored to intra-city, inter-city, and industrial logistics. Emerging manufacturers, like EKA Mobility and Pepper Motion, and specialised firms, such as Kalyani Powertrain and IPL Tech, have brought innovation into the market, addressing niche applications like mining logistics and municipal waste collection.

A diverse range of vehicle models span the medium-duty vehicle (MDV), trucks sized at 3.5–12 tonnes, and heavy-duty vehicle (HDV), considered as trucks sized at above 12 tonnes, market with applications extending across ports, urban freight, e-commerce logistics, and industrial operations such as mining and cement transportation. For instance, vehicles like TATA Motors' Ultra T7 and Kalyani Powertrain's Repowered Electric Truck cater to urban freight and FMCG distribution, while HDTs like Ashok Leyland's 55-tonne tractor-truck have been deployed at ports and IPL Tech's 55 tonne tractor trailer and Propel's EV dumper trucks have supported industrial mining and port logistics. The wider array of ZET offerings highlights the growing adoption of ZETs in specific high-utilisation, point-to-point use cases, such as factory-to-warehouse routes and controlled mining loops, where infrastructure utilisation is minimised. **Exhibit 1** outlines several MDVs and HDVs available in the market today.[vi]

vi. This list is provided for illustrative purposes; it is not exhaustive given the constantly evolving ZET landscape as OEMs continue to test and manufacture both hydrogen and battery-electric trucks.

Exhibit 3 Non-exhaustive list of MDV trucks currently in the market (3.5 to 12 tonnes)

Tonnage	Parent Company	OEM Name	Truck Model	Range (km)	Typical Use Case
3.5 tonnes	**Ashok Leyland**	Switch Mobility	Switch iEV4	120	FMCG and last-mile logistics
3.5 tonnes	**Pinnacle Industries Limited**	EKA Mobility	7T	200	Mid-mile logistics
5.45 tonnes	**Volvo Eicher**	VE Commercial	Eicher PRO 2055 EV	162	FMCG and last-mile logistics
5.5 tonnes	**Omega Group**	Omega Seiki Mobility	Rage+ Frost HD Cargo	180	FMCG and cold chain logistics
7.2 tonnes	**Ashok Leyland**	Switch Mobility	Switch iEV8	250	Mid-mile logistics
7.4–8.7 tonnes	**TATA Motors**	TATA Motors	Ultra T 7-Retrofit	100	FMCG and mid-mile logistics

Source: RMI analysis

Exhibit 4 Non-exhaustive list of HDV trucks currently in the market (greater than 12 tonnes)

Tonnage	Parent Company	OEM Name	Truck Model	Range (km)	Typical Use Case
12.9 tonnes	**Kalyani Powertrain**	Bharat Forge	Repowered Electric Truck (Retrofit)	110–130	FMCG and last-mile logistics
14 tonnes	**Ashok Leyland**	Ashok Leyland	Boss 14T BEV	230	FMCG, auto parts, e-commerce logistics (e.g., Amazon)
18 tonnes	**Ashok Leyland**	Ashok Leyland	18T Electric Truck	210 or 310*	E-commerce FMCG
28 tonnes	**Megha Engineering**	Olectra	28T Electric Truck	120–150	Mining
28 tonnes	**TATA Motors**	TATA Motors	Prima H.28[vii]	550	Cement, steel, coal, agriculture
45,55 and 60 tonnes	**Propel Inc.**	Propel	EV Dumper Truck	NA	Mining and construction
44 tonnes	**Volvo**	Volvo	FM Electric	300	Mining and construction
55 tonnes	**Murugappa Group**	IPL Tech	RHINO 5536E	185	Mining and construction, container movement at ports, steel, cement
55 tonnes	**Ashok Leyland**	Ashok Leyland	AVTR 55T 4x2 Electric Tractor	185	Mining and construction, container movement at ports, steel
55 tonnes	**TATA Motors**	TATA Motors	E55 S	350–500	Cement, steel, coal, agriculture
55 tonnes	**Pinnacle Industries Limited**	Eka Mobility	55T	200	Mid-mile logistics
75 tonnes	**BYD**	BYD	Q1R –75 Tonnes Maximum	100	Ports mainly

*Based on two differing battery configurations
Source: RMI

vii. Hydrogen powered, currently being piloted within the TATA ecosystem.

Due to the early stage of the ZET market and limited evidence on ZET durability in freight operations, financiers are likely to enter cautiously. They are expected to prioritise established OEMs with proven performance records, as supporting a new product class and an unproven manufacturer would be considered a high-risk move. Established OEMs provide a lower-risk entry point, enabling financiers to mitigate product quality and reliability concerns.

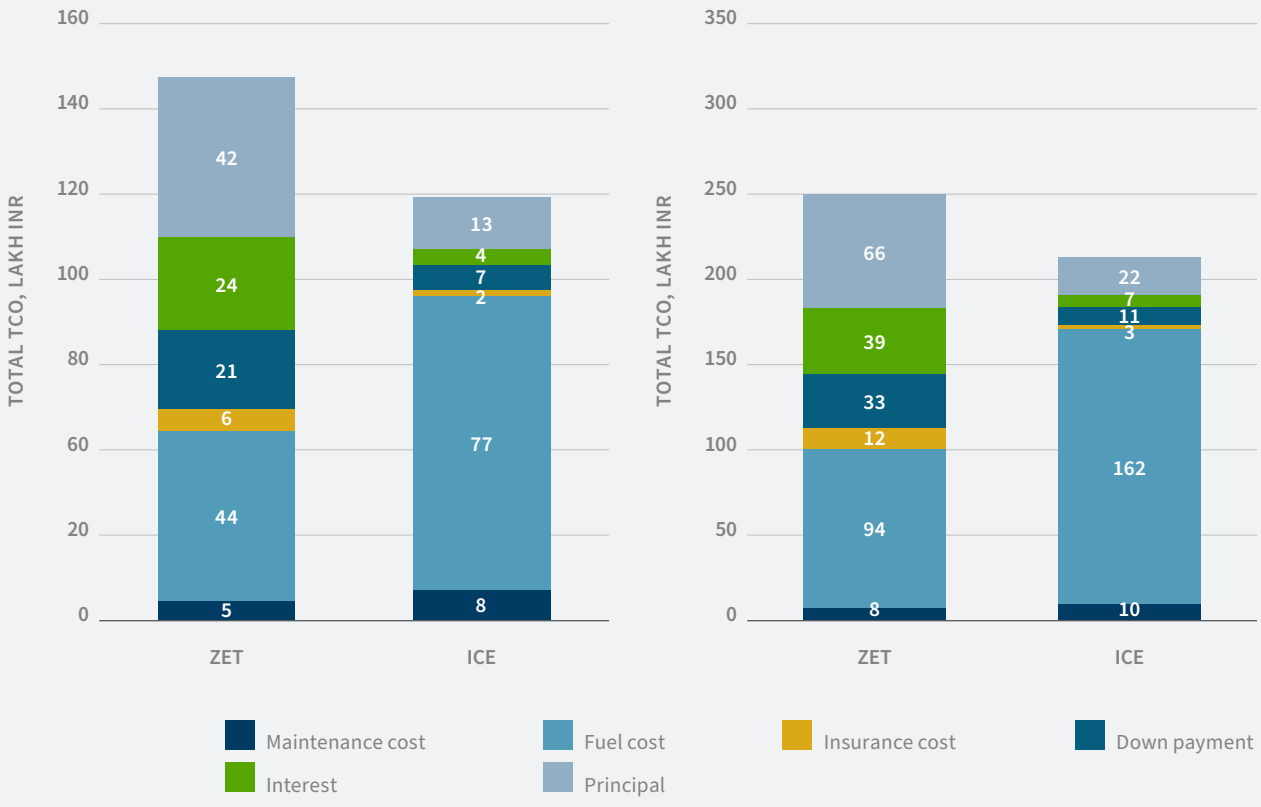
The Cost of ZETs vs. ICE Trucks

ZETs currently face higher purchase prices and TCO than diesel trucks, posing a barrier to widespread adoption. The purchase price for MDVs ranges from INR 50lakh (US$57,762) to INR 90 lakh (US$103,972), while HDVs cost between INR 1.3 crore (US$150,182) and INR 2 crore (US$231,049), with battery size being a major cost driver. This results in ZETs having approximately three times the up-front capital cost of internal combustion engine (ICE) trucks, significantly affecting their TCO. On a TCO basis, ZETs are currently 14%–22% more expensive than diesel trucks, as illustrated in **Exhibit 3**.

Despite the up-front costs, ZETs offer significant operational savings due to 65% greater powertrain efficiency, lower maintenance costs, and reduced energy expenses. Over time, economies of scale and advancements in battery technology are expected to reduce ZET prices to parity — or potentially below — those of ICE trucks by the end of the decade. Until then, policy measures such as purchase subsidies, interest subventions, and tax and toll waivers can help bridge the TCO gap and accelerate adoption.[17]

> **“Over time, economies of scale and advancements in battery technology are expected to reduce ZET prices to parity — or potentially below — those of ICE trucks by the end of the decade.”**

Exhibit 5 MDV and HDV total cost of ownership



RMI Graphic. **Source:** RMI

Note: A seven-year period was chosen as it represents the typical lifespan of a truck before it is resold. This aligns with the completion of common lending and borrowing terms and corresponds with the typical useful life cycle of a truck's battery.

Note: These cost figures do not include re-powered e-truck retrofits, which involve used truck bodies and drivetrains — typically with around eight years of use — that are retrofitted with a battery. The cost of such retrofitted trucks is generally lower, at approximately INR 30 lakhs to INR 40 lakhs (US$34,657–US$46,209) for an MDV model. Based on these capital costs, retrofitted trucks' TCO is lower than their diesel equivalents.

As shown in **Exhibit 6,** fuel costs and interest are critical factors influencing the TCO of ZETs. Strategies that work to keep charging prices low, such as implementing captive charging strategies or extending EV tariffs to ZETs, could significantly reduce the TCO.

For example, refuelling a ZET at a charging rate of INR 7.5/kWh would substantially impact the TCO (see **Appendix** for more details on the modelled assumptions).[viii] Similarly, access to more affordable capital would make the TCO favourable. ZETs, currently facing a 16% interest rate, could secure rates comparable to ICE trucks (around 9%), and their TCO could approach — or even drop below — that of conventional trucks, as shown in **Exhibit 6** below.

Exhibit 6 Comparison of per kilometre cost

	MDT	HDT
ZET	INR 19.3/km	INR 34.2/km
ZET Intervention Defrayed Interest Rates	INR 17.9/km	INR 31.9/km
ZET Intervention Defrayed Charging Rates	INR 16.8/km	INR 27.8/km
Combined ZET Intervention Defrayed Charging Rates and Interest Rates	INR 15.4/km	INR 25.5/km
ICE	INR 15.1/km	INR 29.3/km

Source: RMI

Note: Values are all expressed in INR/km. Costs are derived based on the duty cycle and operating costs within a seven-year period, where the graph above is the total TCO; see **Appendix** for all modelled assumptions.

viii. Per findings in the *Comprehensive Guide to Financing the Zero-Emission Trucking Transition in India,* 2024, a tariff of INR 12–INR 14.4/kWh is necessary to recover the costs of charging, as this higher rate accounts for the need to cover capital investment costs. Achieving a lower ZET charging rate would need to stem from policy interventions, for example a tariff of 7.5 INR/kWh if extended to ZETs even for a specified period of time would have a significant impact on the ZET TCO and economic justification of adoption.

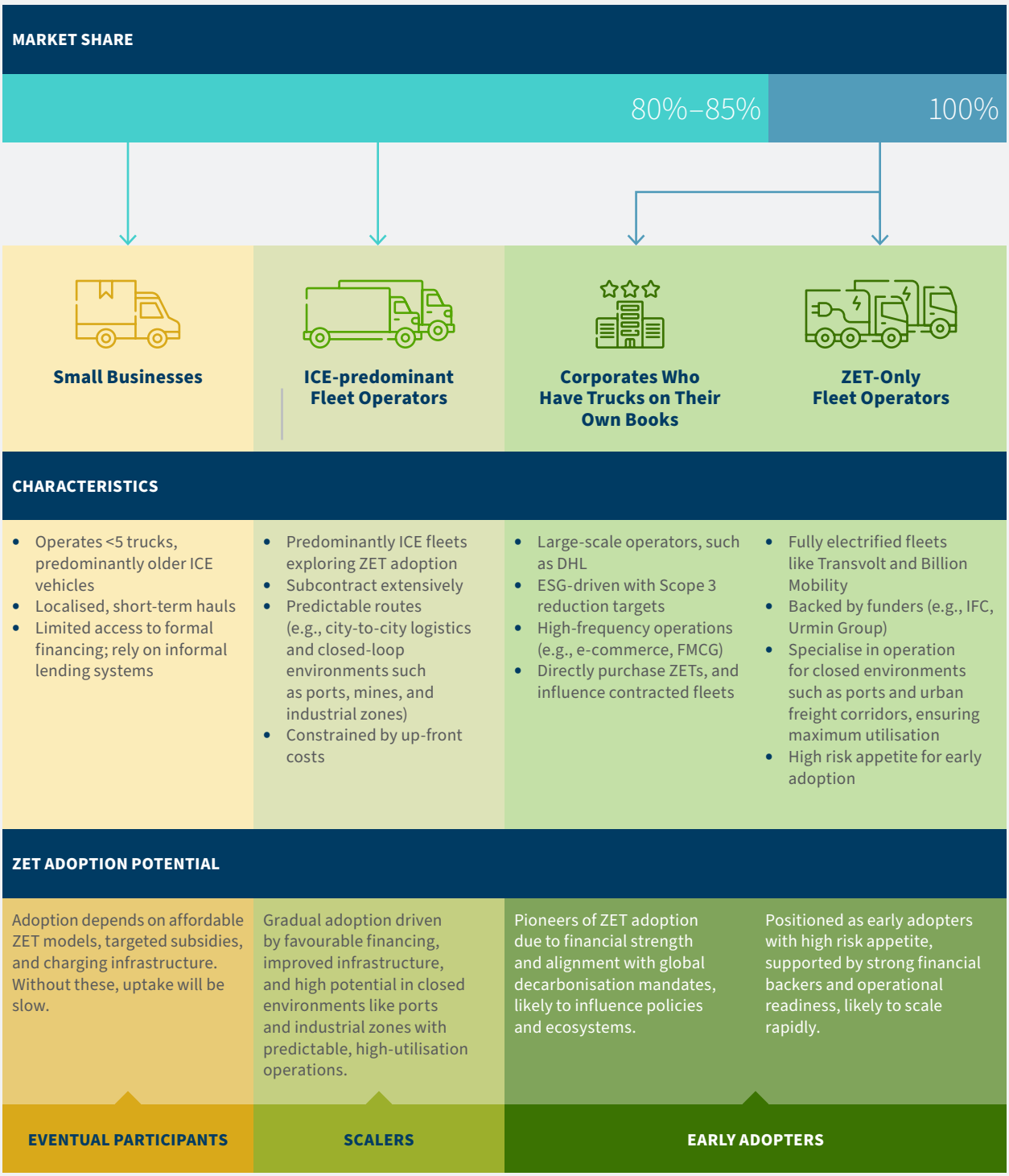
Borrower Segmentation

India's fleet operator ecosystem includes a diverse range of players, from small-scale operators to global logistics companies, each with unique motivations and challenges for adopting ZETs. India's freight market is highly fragmented, with 85%–90% of operators owning fewer than five trucks, primarily serving regional routes. These small players often rely on informal financing, face inconsistent cash flows, and operate on tight margins, making it difficult to afford the high up-front cost of ZETs. This fragmentation increases customer risk for financiers, which deters lending and slows ZET adoption among smaller fleet operators.

> **Corporations with fleets and ZET-focussed operators will likely drive early adoption, while traditional fleet operators will follow as infrastructure and financing mechanisms mature.**

The seasonal fluctuations and volatility of freight returns, along with a fragmented market of small players and unskilled drivers, increase customer risk and make financing less accessible. Understanding the spectrum of trucking operators and potential ZET borrowers is thus crucial to identifying first movers that will seek financing to deploy the first 10,000 ZETs.

Exhibit 7 ZET fleet operator segmentation and market dynamics



RMI graphic

Source: Market actor conversation with author (Market share statistics), CareRatings research, and RMI[18]

Corporations with fleets and ZET-focussed operators will likely drive early adoption, while traditional fleet operators will follow as infrastructure and financing mechanisms mature. Each group plays a distinct role in shaping the market:

Pioneers: Corporations and ZET-Only Operators

Large corporations, such as DHL, JSW Steel, and IKEA, are leading ZET adoption to align with their ESG mandates and targets to reduce Scope 3 emissions. They are piloting ZETs for high-frequency, controlled-use cases such as urban logistics, e-commerce, and FMCG deliveries. Concurrently, ZET-only operators like Billion Mobility (backed by Urmin Group) and Transvolt (backed by IFC) are aggressively scaling operations, leveraging strategic funding and robust partnerships with OEMs and charging providers to establish operational benchmarks and build industry confidence.[19]

Scalers: Traditional Fleet Operators

Traditional fleet operators, predominantly running ICE vehicles, are cautiously exploring ZET adoption through pilot projects on predictable, high-frequency routes. This category includes medium-sized operators and large operators, with significant differences in cash flows and operational efficiencies. Larger operators benefit from economies of scale and more streamlined operations. Larger operators also have better access to formal financing through NBFCs and banks.[ix] As the ecosystem matures with improved infrastructure and favourable financing mechanisms, these operators are poised to play a pivotal role in driving widespread ZET adoption. These businesses typically secure capital through NBFCs and banks. As the ecosystem matures with improved infrastructure and favourable financing mechanisms, these operators are poised to play a pivotal role in driving widespread ZET adoption.

Emerging Participants: Small Businesses

Small businesses, often family-run, have traditionally been a key player in transporting agricultural goods or conducting urban freight delivery routes. They rely on high truck utilisation and informal or NBFC lending to sustain operations, often purchasing second-hand trucks. Cash flows are sensitive to

ix. NBFCs offer banking and financial services but do not qualify as banks. Most NBFCs are not deposit-taking institutions and are primarily focussed on lending and investment activities.

demand and payment delays. Their adoption of ZETs will depend heavily on affordable vehicle models, targeted subsidies, sustained market confidence in ZET technology, and localised charging infrastructure.

Large fleet operators and exclusive ZET-focussed fleet operators are the most likely borrowers for the first 10,000 ZETs. Large corporate fleet operators have the financial resources to purchase ZETs, backed by robust balance sheets, strong financial positions, and established relationships with financiers. Fleets running high-frequency, closed-loop truck operations potentially present a lower lending risk because they generate consistent revenue.

State of the ZET Financing Market

Internal combustion engine (ICE) trucks are typically financed through asset-based lending, where the truck itself serves as collateral for the loan, with banks and NBFCs providing commercial vehicle loans. In contrast, the ZET market remains nascent, and to date, loans for ZETs have primarily been extended through project financing or other commercial loans. These loans often use additional assets on the borrower's balance sheet as collateral, with the lender seeking to mitigate risk by securing the loan against the corporate balance sheet. Although this is the current approach to financing ZETs, it is anticipated that, over time, the market will evolve. For the widespread adoption of ZETs, it would be beneficial to see commercial vehicle loans tailored for ZETs emerge in the marketplace.

To understand how lending for ZETs may evolve, one must examine the electric two-, three-, and four-wheeler (e-2/3/4W) and ICE truck financing markets. Electric two-wheeler financing increased approximately eightfold from 2021 to 2023 due to rising sales and a higher share of vehicles being financed rather than purchased outright.[20] This trend reflects financiers' increasing familiarity with e-2/3/4W products and highlights the presence of local financing institutions working to invest in the space.

Specialised NBFCs focussed on e-2/3/4W lending could be natural first movers to finance initial ZET offtake through pilots. However, the high price point of ZETs poses a challenge. Large NBFCs, traditionally serving the ICE trucking market, are key to scaling ZET financing but may need targeted interventions to build confidence in ZETs' financial viability. These institutions will be instrumental in enabling the transition to ZETs and supporting the industry's shift towards sustainable transportation. **Exhibit 8** below highlights the various types of financiers that could be involved in ZET financing.

Exhibit 8 Financiers and their role in the ICE, E-2/3/4W, and ZET market

Category	Financing of Existing ICE Trucking Market	Approach to Electric Two, Three-, Four-Wheelers (e-2/3/4W) Financing	Interest in Financing ZET MDV and HDV
Banks	• Dominate lending for new diesel truck purchases, holding 30%–40% of the market share.[21] • Primarily serve larger fleet operators with strong credit ratings. • Offer relatively lower interest rates (closer to 9%) but have stringent lending criteria.[22] • Major players include public sector banks (e.g., SBI, Union Bank) and private banks (e.g., HDFC).	• Focussed on financing for e-2/3/4W. • Limited offerings for ZETs, restricted to light-duty vehicles for last-mile logistics.	• Banks are typically cautious in financing ZETs, requiring established proof points on the cost and revenue potential of use case applications and guarantees. • Willingness to explore MDV/HDV ZET financing for large, creditworthy corporations and fleet operators with predictable revenue stream. • Likely to wait for greater ZET and infrastructure maturity and risk-sharing mechanisms.
Captive NBFCs	• Primarily finance vehicles from their parent companies. Their focus is on enabling sales for the parent company, primarily financing new diesel truck purchases. Typically offer competitive interest rates due to close alignment with parent OEMs. • Examples include TATA Capital (for TATA Motors) and Mahindra Finance (for Mahindra vehicles).	• Actively expanding EV offerings, although primarily limited to e-2/3/4Ws developed by their parent OEMs. • Players such as TATA Motors are providing value-added solutions like extended warranties for TATA four-wheelers and commercial vehicles to mitigate risks for EV financing.[23]	• Likely to show interest in MDV/HDV ZET financing, aligned with their parent companies' strategic goals. • Can drive ZET adoption in MDV/HDV segments through OEM-backed guarantees. • Positioned to play a key role in scaling ZET adoption for fleet operators partnered with their OEMs.

Exhibit 8 Financiers and their role in the ICE, E-2/3/4W, and ZET market (continued)

Category	Financing of Existing ICE Trucking Market	Approach to Electric Two, Three-, Four-Wheelers (e-2/3/4W) Financing	Interest in Financing ZET MDV and HDV
Non-Captive Large Established NBFCs[x]	• Major players in commercial vehicle financing, accounting for 42% of the market.[24] • They serve small- and medium-sized fleet operators, typically offering higher interest rates (12%–14%) to offset the increased customer and product risks associated with financing used trucks. • Examples include Shri Ram Finance and Sundaram Finance, which support both new and used ICE trucks.	• Gradually entering the electric vehicle (EV) financing space, focussing primarily on e-2/3/4Ws.[25]	• Show moderate interest in MDV/HDV ZET financing but remain cautious due to technology risks, lack of residual value certainty, and infrastructure gaps. • Strong OEM warranties and risk-sharing support are required to expand ZET financing offerings. • Likely to prioritise ZET adoption for predictable closed-loop use cases.
Non-Captive EV-Focussed NBFCs	• Minimal role in ICE trucking but caters to high-risk, underserved borrower segments.	• Specialise in financing e-2/3/4Ws, targeting high-risk borrowers with micro-financing solutions. • Known for leveraging innovative digital underwriting tools to evaluate the creditworthiness of high-risk borrowers, have been instrumental in financing e-2/3/4Ws. • Examples include RevFin, cKers Finance, AMU Leasing, and others	• Emerging interest in ZET financing but currently limited to MDVs due to capital constraints and risk exposure. • Willing to partner with OEMs and financiers to pilot HDV ZET financing models. • Concessional financing or risk-sharing instruments are required to scale their participation in the ZET ecosystem.

Source: RMI analysis

x. Established NBFCs are those that have been operating for many years, with a large network of branches and customer touchpoints across India, particularly in rural and semi-urban areas. These actors are distinct from EV-focussed NBFCs that are newer entrants, leveraging technology and digital presence to both attract borrowers and assess risk.

The ZET financing market is still developing. Due to the real and perceived risks associated with ZETs, detailed in **Section 3** to come, financing terms are less favourable compared to ICE trucks and feature higher interest rates and lower loan-to-value (LTV) ratios. High interest rates result in paying more for the same principal amount, impacting the ZET TCO. LTV ratios are crucial because they determine the down payment required to secure financing. Given the high capital expenditure (CAPEX) of ZETs, down payments can be prohibitively high compared to ICE trucks. Lastly, the term length of ZET loans is important as it directly impacts equated monthly instalment payments, and many ZET borrowers will seek longer tenures to make payments more manageable. **Exhibit 9** below compares the average market lending rates for ICE trucks versus ZETs, summarising the state of the financial market for ZETs.

Exhibit 9 Average lending terms for ICE trucks vs. ZETs

Parameter	ICE Trucks	ZETs
Interest Rate	9%–14%*	14%–16%
Loan Tenure	5–7 years	5 years
LTV	80%–85%	70%–80%

*Banks may extend financing to fleet operators with strong credit profiles at interest rates closer to 9%. In contrast, NBFCs, facing higher funding costs and lending to riskier segments, typically charge interest rates in the range of 12% to 14%, according to recent market interviews.

Source: RMI in consultation with market actors

3. Risks from a Financier's Lens

Risks shape financial decision-making. This section outlines how ZET risks are heightened compared to their ICE counterparts. The section examines four key risks that significantly impact the ZET market: product, customer, operational, and residual value risks. By better understanding these risks, market actors and financiers alike can develop strategies to distribute and manage them more effectively.

Primary Risks Impacting the Adoption of ZETs

Financing ZETs presents unique challenges and risks compared to ICE trucks, primarily due to higher up-front costs, evolving technology, the need for charging and associated grid infrastructure, and a lack of established secondary markets.

The following analysis highlights the key risk factors:

Product risk

Product risk refers to uncertainty in the performance, reliability, and technology of ZETs. This risk arises from nascency and the rapidly evolving nature of the technology, where current models may become obsolete over time. There is a risk that evolving battery technologies and alternative zero-emission vehicle solutions, such as hydrogen fuel cells and electric trucks, could make existing technologies obsolete. Concerns include battery durability, interoperability, efficiency under varying conditions, and payload handling capabilities.

Customer risk

Customer risk refers to the borrower's ability to repay a loan, which is influenced by their financial stability and revenue volatility due to market conditions. For ZET consumers, customer risk is higher than that of their ICE counterparts. ZETs have three times the capital cost of ICE trucks, meaning customers must generate significant operational savings and revenue to achieve the same profit margin. However, uncertainties such as limited routes and charging infrastructure can exacerbate revenue volatility, increasing the risk of defaults. Financiers are particularly concerned with costs and potential revenue, as they need to ensure that customers can repay their loans. Additional customer risk then varies depending on the customer segment.

- **Large corporations that own fleets:** Financiers prefer lending to this group due to their creditworthiness and established banking relationships.

- **Traditional fleet operators:** Large operators (over 100 trucks) in the organised sector are at lower risk. Additionally, in transitioning a handful of trucks to ZETs at the onset, they would likely still have some ICE trucks; thus, ZET loans would, in a way, be hedged by ICE truck cash flows. Medium operators (5 trucks–100 trucks) are riskier depending on contract revenue stability.

- **EV-focussed fleets:** New start-ups backed by venture capital face higher credit risk due to a lack of profitability, long-term revenue streams, and historical financial data. Unlike traditional fleet operators, they do not have alternative cash flows from ICE operations to help diversify risk. However, there is a positive aspect: these fleets align more closely with sustainability-focussed banks and NBFCs.

- **Small businesses:** These are a part of the unorganised sector and are most affected by market volatility. Such small actors often lack a formal credit history, adding to their customer risk.

Operations risk

Operations risk is driven by the underdeveloped charging infrastructure and the limited availability of technicians trained to service and maintain ZETs. Grid stability issues also add to the risks of providing high-powered charging for ZETs. These factors — limited charging infrastructure and technician availability — reduce fleet utilisation and revenues, ultimately increasing the risk of default.

Residual value risk

Residual value risk refers to the uncertainty in determining and recovering the market value of ZETs at the end of their lifecycle. Currently, no secondary market exists for ZETs, which raises significant concerns for financiers. Unlike ICE trucks, which benefit from a vibrant second-hand market, particularly among smaller fleet operators that purchase used trucks, ZETs lack established resale and recycling infrastructure. This absence of benchmarks for residual values or end-of-life recycling options limits cost recovery for ZETs. Without a secondary market or recycling options, the ability to recover the full loan value diminishes, making it harder for financiers to secure their investments in ZETs.

Impact of Risks on Financier's Loss

The impact of risks on a financier's loss is captured through the formula below, where expected loss represents the anticipated financial loss due to a borrower's default. Probability of default (PD) is the likelihood of default, loss given default (LGD) is the proportion of the loan that would be lost in case of default, and exposure at default (EAD) is the total value at risk at the time of default. These factors together determine the expected loss from lending.

Expected Loss (EL) = Probability of Default (PD) × Loss Given Default (LGD) × Exposure at Default (EAD)

For ZETs, the **probability of default** is higher due to the product risk of ZETs, borrower credit risks, and operational risk. The **loss given default** is also elevated, as the absence of a robust secondary market and uncertain residual values make recovery challenging in case of default. Furthermore, the **exposure at default** is significantly greater for ZETs because of their higher purchase price compared to ICE vehicles. These combined factors substantially increase the overall **expected loss** for ZETs, highlighting the importance of risk-sharing mechanisms to enable scalable financing for the sector.

Exhibit 10 Risks impacting probability of default and loss given default for ZET financing

Risk Type	Impact on PD	Impact on LGD
Product	• Battery durability and rapid obsolescence create operational uncertainty, increasing default likelihood. • Repair costs discourage borrower repayment.	• The lack of data on the value of used products makes cost recovery at repossession challenging.
Customer	• High up-front ZET costs can over-leverage small and medium operators.	• High loan amounts and limited secondary markets result in poor cost recovery. • Defaults lead to significant unrecovered balances.
Operations	• Limited charging infrastructure and technician availability can reduce fleet utilisation and revenues, increasing default risks.	• Downtime reduces the resale value. • Operational inefficiencies heighten financier losses in case of repossession.
Residual	• Uncertainty around resale value and recycling options increases borrowers' perceived risk, potentially raising their financial strain and the likelihood of loan defaults.	• Lack of resale and recycling infrastructure results in minimal loan recovery.

High impact Low impact

Source: RMI

4. Interventions to Address ZET Market Risks

“Reducing default risk is key to unlocking ZET lending. Effective management of product, customer, and operational risks can drive financing. Once loans are issued, mitigating losses and financier liability becomes essential. Prioritising risk reduction first, followed by loss mitigation, is crucial for scaling ZET financing.”

This section is structured to outline a sequential approach to financing ZETs, providing a clear roadmap for financing ZETs. Based on market analysis, when financiers consider funding a ZET, their primary focus is on reducing the risk of default. This is primarily done by working to address the product, customer, and operational risks, as shown in **Exhibit 10** on page 32 under primary mitigation strategies. Once the loan is made, financiers assess strategies to reduce potential losses in the event of default. This includes securing a residual value or addressing residual value risk, which is outlined in the graphic as a secondary mitigation strategy.

This section is divided into two subsections, explaining how various strategies collectively mitigate risks from a financier’s perspective. The exhibit on the following page illustrates the different strategies associated with addressing risks, along with specific interventions. Interventions fall into two categories:

- **Contractual agreements:** These are formal commitments between parties that define the terms and conditions under which one party assumes responsibility for ZET repairs, servicing, or freight shipment, often to establish liability or formalise a commitment.

- **Financial mechanisms:** These are structured arrangements that establish specific financial liabilities and allocate capital under predefined conditions.

The interventions outlined in **Exhibit 11** below and described in this section were selected based on the priority given to these measures by financiers during our interviews. Although not exhaustive, this list highlights key initiatives that may be most instrumental to financing the first 10,000 ZETs and those that market actors have examined in sufficient detail to offer specific insights into design considerations.

Exhibit 11 Interventions to manage risk and finance ZETs

Reducing Interest Costs	
PRODUCT	**Warranties and Buyback Guarantees:** Agreements that outline liability and, in some cases, include a buyback provision in the event of a ZET failure or repair help safeguard against product failures.
CUSTOMER	**Mezzanine Facility:** A structured finance mechanism that bridges up-front ZET costs. **Revenue Assurance Contracts:** Multi-year freight agreements with corporate aggregators ensure predictable cash flows, stabilising revenue streams for loan repayments.
OPERATIONS	**Service-Level Agreements (SLAs):** Contracts covering maintenance, spare parts availability, and penalties for noncompliance, safeguarding fleet performance. **Charging-as-a-Service:** Agreements with charging providers to develop, maintain, and operate charging infrastructure, transferring installation and operational risks.
Reducing Losses in the Event of a Default	
RESIDUAL	**Residual Value Guarantees (RVGs):** A guarantor secures a stipulated resale value.
REMAINING	**Residual Sharing Facilities (RSFs)**: Reduce financier's liability in case of default.
Reducing Likelihood of Default	
STOP-GAP	**Concessional On-Lending:** Concessional capital is offered to financiers to on-lend for ZET procurement, mobilising capital, and incentivising lending to ZETs.
Enabling Insurance Coverage	
INSURANCE	**Comprehensive Insurance Products:** Comprehensive insurance covers specific ZETs and batteries as well as residual risk, and the financier can claim compensation for the vehicle in case of an accident or theft.

Note: This exhibit illustrates how financiers initially manage risk to facilitate lending, strike a deal, and then move to mitigate loss in case of default. In many cases, the interventions described do not align with just one risk or impact; the exhibit highlights the primary risk or impact an intervention poses.

RMI graphic. **Source:** RMI

The contractual agreements outlined above distribute the risks associated with lending to ZETs from the borrower, and subsequently the financier, to designated market actors like OEMs or CPOs that have established partnerships and dedicated business lines to manage operational and product risk more effectively. However, such actors will only bear such risks at a cost, and the end-borrower will likely come to bear the cost through fees. Similarly, financial instruments like mezzanine facilities result in repayment costs for ZET borrowers over time. Instruments such as residual value guarantees and risk-sharing facilities carry fees that financiers must pay to DFIs or third-party providers. These costs are typically passed on to fleet operators through loan financing terms. Consequently, it is essential to balance these strategies' risk mitigation benefits and the additional costs they impose. Overburdening fleet operators with additional costs will undermine the economic viability of ZET adoption, especially for the smaller or less financially resilient ZET operators. Lastly, the costs associated with each strategy depend on the design of the intervention and how expenses are distributed among market actors. Further discussions are necessary to clarify these implications and tailor strategies to the specific needs of each project on a case-by-case basis.

Building on the need to mitigate financial risks and potential losses, this section evaluates specific interventions that can effectively address these challenges. It not only provides detailed design considerations for each strategy but also offers practical guidance on their implementation and applicability, equipping financiers with the necessary tools for successful risk management.

Mitigating Default Risk in ZET Financing

Financiers aim to reduce their exposure to risk when issuing loans by limiting the likelihood of borrower default. To achieve this, they seek to implement checks and balances that distribute risk among market actors while supporting the borrower's capacity to meet repayment obligations.

Warranties and Buybacks

Contractual agreements between the OEM and the fleet operators stipulate liability in the event of ZET failure or repair.[xi]

DESCRIPTION

Long-term warranties and buybacks for ZETs refer to strategies employed by OEMS or third-party service providers to manage risks associated with the longevity and performance of ZETs. Through warranties, OEMs guarantee the performance and durability of critical components such as the battery, powertrain, or electric systems for an extended period. Additionally, through buyback programmes, OEMs or a third party agree to repurchase the ZET at a pre-determined price. Unlike standard warranties for ICE trucks, ZET warranties are often shorter or unavailable because the market and technology are still emerging.

DESIGN CONSIDERATIONS

- **Battery warranties:** Warranties can be structured to cover battery replacement or repair in case of failure, based on a set number of years or kilometres driven. This protects the operator from the risk of paying for battery replacements and unpredictable maintenance costs during that period.

- **Extended warranties:** OEMs have tie-ups with insurance companies to offer long-term warranties at additional costs for electric vehicles. For instance, ACKO General Insurance launched an extended battery warranty in collaboration with Ather Energy and Ola Electric, offering battery life coverage for up to four years, with performance coverage of up to 60,000 km.[26] A similar structure could be explored for electric MDVs and HDVs, enabling OEMs to offer a battery warranty up to 7 years or more. Another option is aligning the ZET extended warranty with the expected battery life.

xi. The stakeholders mentioned in the interventions are provided as illustrative examples; other actors could also be involved. The intention is to highlight, at a high level, parties likely best positioned to take on and participate in a specific intervention.

- **Buyback clauses:** Financiers often prefer OEMs to provide buyback guarantees, demonstrating accountability for their products. Although new OEMs may initially offer buybacks to build market trust, they tend to reduce these commitments as confidence in their products grows, as buybacks can sometimes be interpreted as a sign of uncertainty. Alternatively, dealers can offer buybacks on behalf of OEMs, helping to establish early market confidence.

IMPACT

Warranties transfer product risks to the OEM or a third party, boosting fleet operators' and financiers' confidence in ZET reliability. Buyback clauses further enhance this by addressing product and residual value risks, demonstrating the OEM's commitment to the asset's long-term value and performance.

Mezzanine Facility

A financial mechanism is established between a financier (bank or NBFC), third-party fund manager, and DFI to bridge the remaining financing gap that can occur even after the borrower's down payment and the financier's loan.

DESCRIPTION

A mezzanine facility is a hybrid financing instrument aimed at reducing the burden of high capital costs. It can be structured as a bridge mechanism to cover the gap between the required down payment and what the ZET fleet operator can afford (i.e., a down payment that more closely matches a diesel truck's). A third party or DFI can offer such coverage. Lenders generally require borrowers to make a substantial down payment to ensure they have a vested interest in maintaining the asset and fulfilling their loan repayment obligations. However, the high costs of ZETs present a significant barrier for fleet operators with limited capital. Lenders are generally unwilling to adjust the LTV ratio beyond 80%–85% to limit risk and ensure borrowers have sufficient capital invested to discourage default. Thus, the mezzanine facility can cover a portion of the down payment that a ZET owner is expected to make.

DESIGN CONSIDERATIONS

The structure of a mezzanine facility can vary based on the parties involved and the terms of the agreement. One option is an equity investment in the fleet operator, where the party providing bridge financing — such as a DFI or third party — takes a stake in the fleet operator at the onset and offers capital for the down payment. The investor can later recover its investment by selling its stake to another financier. The fleet operator does not need to pay the entire down payment, receiving the trucks without a high up-front cost, while the investor gains partial ownership in return.

Alternatively, the facility could be structured as a convertible loan, where the DFI or third party provides a loan that can later be converted into equity instead of being repaid in cash. This structure allows the fleet operator to access immediate capital while offering the investor a stake in the business. Additionally, this intervention can include a grace period, enabling ZET owners to generate revenue from operations before beginning loan repayments. Another option is to structure it as subordinate debt. In this case, the ZET owner would repay this portion of the down payment as a secondary loan but only after fully repaying the primary loan from the senior debt provider (e.g., the bank). A mezzanine facility can thus help address the high up-front capital costs of ZET procurement and provide flexibility in repayment terms as it can align repayment schedules with revenue generation.

Exhibit 12 on the following page illustrates one iteration of such a structure and highlights how it differs from the business-as-usual approach. Within the mezzanine facility, the following stakeholders play key roles:

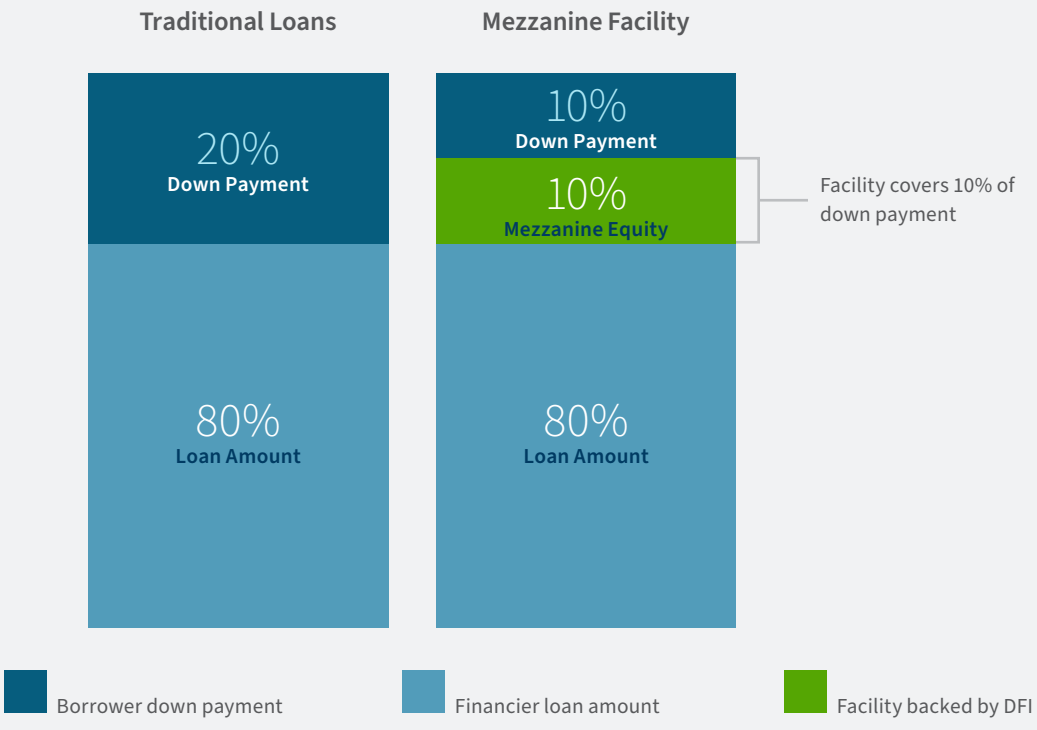
- **Financier:** Lenders, such as banks or NBFCs, provide debt to fund the ZET loan while maintaining the desired LTV ratio.

- **Borrower:** Fleet operators contribute a down payment or equity investment toward the ZET.

- **Development finance institution:** This supplies the capital needed to cover the remaining 10% equity investment (as shown in the example on the next page), helping the fleet operator complete the down payment and secure financing for the ZETs.

- **Financial intermediaries:** Third-party fund managers structure and manage the ZET funding facilities. They help raise capital from DFIs and secure additional public or private funding to cover the cost of ZETs. They also oversee the facility, assessing the financial viability of deals and evaluating ZET operations' customer and revenue potential. For example, they may introduce technology solutions or assist with contracting to improve the economics of vehicle operations.

Exhibit 12 Illustrative mezzanine facility structure



RMI graphic. **Source:** RMI

The lending characteristics in this graphic represent typical LTVs and down payments expected as of February 2025. For instance, financiers indicated they are willing to finance up to 80% of the total cost of a ZET, leaving the remaining 20% to be covered by equity investment. Based on this, the analysis derived a down payment structure that more closely aligns with that of an ICE truck. For example, with an 80% LTV ratio, the down payment for a 55-tonne ICE truck is approximately INR 9 lakh (US$10,397). In comparison, the down payment for a 55-tonne ZET is significantly higher at INR 27 lakh (US$31,192), given market prices derived from expert interviews and detailed in the **Appendix**. However, if the down payment for a ZET is reduced to 10%, the down payment decreases to INR 13.5 lakh (US$15,596), with the remaining amount, INR 13.5 lakh (US$15,596), being covered by the mezzanine facility. This makes the down payment for the ZET more comparable to ICE trucks and more affordable.

The structure of this financing facility could vary. This is just one conceptual iteration of how a mezzanine facility might be structured to support fleets that would otherwise struggle to afford the higher down payments typically required for ZETs.

IMPACT

A mezzanine facility can mitigate customer risk by easing the borrower's financial burden, the down payment in this case, preventing overleveraging. It can also provide flexibility in the loan repayment process via the implementation of grace periods. Lastly, the involvement of a third party or DFI also acts as a means to share risk, as it would obligate another actor to perform due diligence and work to protect against default.

Revenue Assurance Contracts

Contractual agreements between fleet operators and end users to secure freight shipment over a specified duration to secure a viable revenue stream.

DESCRIPTION

Multi-year freight agreements between fleet operators (e.g., Blue Dart, DHL) and corporate aggregators (e.g., Amazon, Flipkart) can work to stabilise revenue. In India, the freight shipment market is highly fragmented, and many freight transportation companies execute freight deliveries on a per-trip basis with spot contracts. Brokers act as intermediaries, connecting shippers with carriers and negotiating rates for individual trips. Moving from a per-trip model to multi-year freight agreements would offer distinct advantages, such as predictable revenues and more stable business relationships.

DESIGN CONSIDERATIONS

- **Guaranteed freight volume over a fixed period:** Contracts where shippers and aggregators commit to the shipment of minimum freight volume over a multi-year duration. This ensures carriers have a predictable revenue stream throughout the year, enabling better financial planning and operational efficiency. Typically, fleet operators and corporations negotiate diesel contracts yearly. To promote ZET operations, corporations should consider aligning contracts with the 5-to-7-year loan period of ZETs. However, given the dominance of spot contracts in India's logistics market, negotiating these conditions requires a significant deviation from the norm, and very few actors may be willing or able to enter such agreements. Therefore, the ability to negotiate and the time to do so may be a challenge.

- **Revenue floors and contract tenures:** Consider Incorporating minimum revenue guarantees to protect fleet operators from demand fluctuations.

- **Aggregator partnerships:** Build strategic alliances between fleet operators and corporate aggregators to create stable demand pipelines. These partnerships can reduce variability in shipments and enhance the predictability of revenue streams for ZET carriers. By building these partnerships, fleets can minimise empty running or instances when they make a return trip with no load to maximise revenue generation further.

IMPACT

These contracts mitigate customer risk by demonstrating the long-term revenue potential of ZET operations, ensuring a stable income stream for loan repayment. Multi-year freight contracts provide predictable cash flows, enabling financiers to better assess a borrower's creditworthiness.

Service-Level Agreements

Contractual agreements between OEMs and fleet operators cover maintenance stipulations.

DESCRIPTION

SLAs are contractual commitments that define performance standards for ZET operations, often focusing on uptime, maintenance, and operational efficiency. These agreements are essential for mitigating operational risks and ensuring that ZETs remain reliable assets. SLAs typically involve OEMs, fleet operators, and, in some cases, financiers, with specific responsibilities assigned to each party to safeguard ZET performance and utilisation.

DESIGN CONSIDERATIONS

SLA clauses can vary depending on the parties involved and the freight application. Below are a few possible design parameters to safeguard against prolonged asset downtime and ensure diligent preventive maintenance servicing:

- **Operational uptime guarantees:** SLAs should define a minimum operational uptime target, such as 95%, ensuring trucks are available for use except during pre-agreed maintenance windows. These guarantees can also cover response times for breakdowns, commitments to have an adequate stock of essential replacement parts, routine maintenance frequency, and ZET performance.

- **Penalty for non-compliance:** If these commitments are not met, OEMs can be held financially liable, ensuring fleet operators are compensated for disruptions.

- **Driver training support:** OEMs provide structured training programmes for fleet operators and drivers. These programmes focus on efficient ZET operation, battery management, and optimal vehicle usage, enhancing performance and reducing operational risks.

- **Extended SLA durations:** SLAs for ZETs could extend over a 10-year period to encompass battery replacement cycles, ensuring vehicles remain operational throughout their economic life.[27]

- **Telematics monitoring:** OEMs and fleet operators can leverage telematics to monitor real-time data on vehicle performance and proactively schedule maintenance.

IMPACT

A service-level agreement reduces operational risk by reducing the likelihood of repair downtime. In case of repair, it minimises revenue disruptions for the end borrower. It can also extend the vehicle's lifespan, contributing to a higher resale value and reducing residual value risk.

Charging-as-a-Service Agreement

Contractual agreements between CPOs and fleet operators (owners of ZETs).

DESCRIPTION

Agreements between fleet operators and CPOs ensure reliable charging access for fleets without fleets needing to purchase the charging equipment outright. Such agreements typically specify the cost structure, detailing how the CPO will develop and deploy charging infrastructure at a designated site in exchange for a fee paid by the fleet operator for ongoing usage. In most cases, the CPO assumes financial and operational responsibility for installing and maintaining the charging equipment, shifting the capital and maintenance burden from the fleet operator. Charging-as-a-service agreements leverage the CPO's expertise, ensuring optimal installation, ongoing maintenance, and reliable availability for ZETs, reducing operational risk. By transferring responsibility for installation and upkeep, fleet operators minimise up-front capital investment and operational risks. As ZET fleets grow, CPOs can scale their services to meet increasing charging demand, fostering growth opportunities.

DESIGN CONSIDERATIONS

- **Strategic design and placement:** Charging and fleet operators should agree to co-locate charging infrastructure within logistics hubs and rest points, specifying charger sizes, desired charging times, and the number of stations and connector types to meet fleet needs. Subsequent pay-per-use fee models should be agreed to.

- **Ensuring charger functionality:** Agreements can include maintenance stipulations to ensure chargers remain functional most of the time, with no more than one charger requiring servicing at any given moment. These terms may outline response times for repair requests, ensuring charging equipment is operational and ready for use, with penalties for service failures. This ensures the fleet operator can rely on the charging infrastructure for their ZETs' operational needs.

- **Grid readiness:** Government agencies, distribution companies (DISCOMS), and CPOs must collaborate to ensure that grid infrastructure supports high-demand charging corridors.

IMPACT

A charging-as-a-service agreement reduces operational risk by providing easy access to charging infrastructure. It also indirectly mitigates customer risk by minimising their capital investment in ZET charging equipment.

Strategies to Reduce Losses in the Event of Default

After deciding to issue a loan, financiers evaluate the potential losses in the event of default. Their goal is to minimise losses if loan repayments are not fully recovered. In such cases, financiers typically repossess the vehicle, making the asset's residual value a critical factor. Thus, maximising or securing assurances on the residual value is a key strategy. Another means is to participate in guarantee programmes to offset some of the losses.

Residual Value Guarantee

A financial mechanism established between fleet operators, the financier, and the guarantor securing a stipulated resale value

DESCRIPTION

Residual value guarantees are financial assurances offered by a third party, a DFI, or a government entity to ensure a minimum residual value for a ZET after a lease term or fixed period of use. These products can be valuable in the early stages of market development and technology nascency, where the absence of a robust secondary market creates uncertainty about the value of the ZET or used battery. Guarantors contractually agree to a minimum viable value for an asset or battery. They can have the confidence to give such a guarantee as they develop agreements with refurbishers and recyclers to facilitate the resale and capture some liquidity in the battery and/or vehicle.

RVGs can be important in building market confidence in new products like ZETs. They have so far been used to back electric two- and three-wheeler transactions and mature products such as buses. Established bus OEMs use RVGs to manage risk by protecting against declines in vehicle market value. If the market value falls below the guaranteed residual value, the OEM can recover a predetermined amount, reducing exposure to market fluctuations and maintaining financial stability.

DESIGN CONSIDERATIONS

- **RVGs-backed OEM buyback programmes:** OEMs can use RVGs offered by third parties/DFIs to backstop their buyback programmes. Being the most confident about their technology and products, OEMs can leverage RVGs as a risk mitigation tool to cover potential underperformance.

- **Direct RVGs by third-party/DFI:** Third-party guarantors or DFIs can provide RVGs independently of OEMs. In this model, the guarantor enters a triparty agreement with the fleet operator and financier, agreeing to offer RVG coverage for a fee. For example, Eqaro, a third-party financial guarantor provider that specialises in underwriting residual value guarantees and facilitating asset buyback programmes, collaborated with Log 9 and Three Wheels United to offer RVG on Log9's Rapid X6000 and 8000 batteries utilised in electric three-wheelers.[xii, 28]

- **Pricing and coverage:** Given the nascent state of the ZET market, determining the true residual value is challenging. Discussions with stakeholders have suggested that an initial RVG for ZET could offer coverage of 10%–20% of the ZET's value.[29] The associated fees could range from 2% to 3% of the guaranteed amount per annum. This pricing structure must be carefully calibrated to historical data, projected depreciation curves, or global benchmarks to balance affordability for fleet operators with the financial viability of the RVG mechanism. Excessive fees could deter adoption, while insufficient pricing might undermine the guarantor's ability to manage risks effectively.

- **Monitoring mechanisms:** Advanced telematics systems embedded in ZETs are essential for monitoring vehicle usage, ensuring compliance with RVG terms, and reducing the potential for disputes over buyback conditions. These systems can track battery health, mileage, and operational conditions, providing data to validate claims and maintain transparency between all stakeholders. Effective monitoring mechanisms will be crucial for building trust in RVG arrangements.

Although RVGs can be an effective tool to build initial confidence in ZETs, they present challenges for guarantors, particularly in pricing and development, due to the nascent stage of the ZET market and limited data on battery performance. RVGs are most effective in market segments where guarantors can assume risks that financiers avoid, using better access to historical data or advanced underwriting tools.

xii. This guarantee was provided explicitly for the battery. The residual value of ZETs, very much like EVs, lies in the ability to resell the battery. Financiers interviewed noted a preference for battery-specific RVGs, as this is where the majority of the residual risk lies as there is an established scrapped market for the other components of the vehicle. However, given the nascent ZET secondary market, guarantors may seek to provide a guarantee on both the truck body and battery, as with this approach, they can have assurance in obtaining some value through the scrappage of the vehicle body.

Therefore, it is crucial to implement strong safeguards and address potential challenges to ensure the success and sustainability of RVGs in the ZET sector.

- **Implementation challenges:** Discussions with market players have highlighted significant challenges in implementing RVGs, including accurately predicting the future residual value of a ZET, which is particularly challenging in a rapidly evolving market. Technological advancements and fluctuating market conditions introduce substantial uncertainty, and errors in residual value estimation could expose guarantors to significant financial risks. Secondly, RVGs or structured buybacks risk being misconstrued as a lack of confidence in the product's quality, potentially undermining brand reputation and trust among stakeholders.

- **Implementing safeguards:** Guarantors can reduce their liability by establishing safeguards and setting clear parameters for the products they guarantee. These measures may include routine battery health checks, adherence to preventive maintenance schedules, and limiting guarantees to specific duty cycles or maximum range thresholds to manage wear and tear effectively. Such safeguards ensure that the products covered under the guarantees remain in optimal condition, reducing the likelihood of claims.

- **Launching pilot programmes:** Introducing RVG pilots with large fleet operators and corporations can offer valuable insights into the practical implementation of these guarantees. These pilots can collect critical performance data, refine guarantee structures, and identify best practices. Stakeholders such as DFIs, philanthropists, and others committed to scaling ZET adoption can play a pivotal role by funding these pilot initiatives. These efforts will help establish the viability of RVGs and create a foundation for broader market adoption.

IMPACT

RVGs reduce residual value risk by ensuring a minimum viable resale value. This measure helps reduce losses in case of default, as the financier can recover some value by selling the repossessed vehicle.

Risk-Sharing Facility (RSF)

A financial mechanism established between the financier and guarantor to hedge against losses.

DESCRIPTION

A risk-sharing facility provides a mechanism to offset potential losses for financiers by reducing their liability in the event of default. RSFs work to protect against losses (subject to design), allowing financiers to hedge against risk and have more confidence in lending to nascent segments. An RSF can be structured in two ways: either at a portfolio level or at an individual account level. Under portfolio-level RSFs, the risk is distributed over an aggregate portfolio of loans, reducing the impact of an individual default. In contrast, an individual loan-level facility applies risk-sharing to each loan in a portfolio. By partially covering losses in default cases, the RSF allows financiers to gain practical experience in underwriting loans for ZETs. Over time, this fosters greater confidence in lending to the segment until the market matures, paving the way for increased capital mobilisation and broader market participation.

Box 1 Derived market insights on the contours of a risk-sharing facility for ZETs

The insights detailed below were derived from a series of market interviews aimed at identifying effective RSF structures, specifically in terms of loss coverage share, the protection offered to financiers, and the associated fees. Based on these insights, the text box outlines various risk-sharing structures that can be employed to mitigate risks while exploring how these structures could be adapted for the ZET market. **Exhibit 13** below outlines the various coverage types — first-loss, pari-passu, and second-loss — along with key considerations derived from interviews with market participants.

Exhibit 13 Differing RSF coverages and consideration for the ZET market

RSF Type	Proposed Coverage	Considerations
First Loss: commonly deployed in high-risk markets. A guarantor absorbs the initial portion of losses incurred by a lender or investor up to a predetermined percentage and specified amount.	• The RSF covers the first tranche of losses up to a predefined limit. • The loss can be covered up to different portions (e.g., 70%–100% of the loss amount within a predefined upper limit cap). The upper cap on the number of loans or size of the portfolio is fixed to ensure the loss incurred by the RSF is not unlimited, and the financial stability of the facility is not compromised.	First-loss RSFs are ideal for nascent markets like ZETs, as they build lender confidence by offering substantial up-front risk coverage. Safeguards, such as invoking RSF coverage only after financiers exhaust recovery efforts, should ensure proper due diligence by local financiers.
Pari-Passu: A near-even split of loss between lender and guarantor.	• Losses are shared proportionally between the RSF and the financier, starting from the first rupee of loss (e.g., 50%–60% of the loss incurred).	This structure is best for established borrowers with moderate risk profiles. It ensures that financiers remain incentivised to mitigate risks actively due to shared loss responsibility.
Second Loss: Protect against high runaway losses. The lender covers losses to a specified level, and beyond this, the guarantor backstops a portion of losses.	• Losses are covered only after a threshold (e.g., the first 3% of non-performing asset [NPA] is borne by the financier, after which the RSF would cover the loss incurred up to a maximum cap, such as 13% NPA).[xiii, xiv, 30] • The RSF can choose to cover a certain portion of the second loss (e.g., 75%100% of losses in the range of 3%–13% NPA).	Second-loss RSFs are better suited for mature markets with systemic risks rather than asset-specific risks. Requiring financiers to absorb initial losses minimises and ensures that local lenders conduct proper due diligence. However, this structure is less effective for ZETs, as financiers require more up-front risk protection given the nascent market dynamics.

xiii. Non-performing assets (NPAs), defined by the Reserve Bank of India as loans overdue by 90 days, serve as a key benchmark for assessing potential losses in facility design. The NPA ratio provides a critical reference for estimating default risks and structuring ZET loan facilities to mitigate financial exposure.

xiv. Structure contours derived from the SIDBI Shell foundation facility.

Box 1 Derived market insights on the contours of a risk-sharing facility for ZETs (continued)

Risk coverage may vary based on the borrower (i.e., fleet operator). Market interviews revealed that there is historical precedence for offering differential terms to borrowers based on their financial stability. From a financial standpoint, it makes sense to prioritise creditworthy borrowers, as they represent a less risky segment.[31] However, borrower segmentation should also balance social welfare needs and encourage market participation from small and medium enterprises (SMEs) to prioritise inclusion. **Exhibit 14** below illustrates one iteration of how a lender may evaluate the creditworthiness of borrowers and receive differing risk-sharing coverage.

Exhibit 14 Types of borrowers (i.e., fleet operators) covered under RSF

Type of Fleet Operator	Assessing the Creditworthiness of a Fleet Operator	Maximum RSF Guarantee Coverage to a Fleet Operator
TIER 1 **Strong Credit Fleet/ Borrower**	Fleet operators with strong creditworthiness and a substantial asset base benefit from predictable cash flows driven by long-term contracts or partnerships with corporate clients. They have a proven repayment history and access to diverse revenue streams. These operators are not first-time borrowers and typically include large corporations seeking to own ZETs or established fleet operators with 100+ trucks and well-established business lines.	85% of the loan taken by the fleet operator
TIER 2 **Credit-Constrained Fleet/Borrower**	Moderately creditworthy fleet operators have higher leverage and medium-sized asset bases. Their cash flows come from a mix of contracts and spot business, resulting in moderate predictability. These operators may have limited repayment history or exposure to commercial debt but maintain manageable debt levels. This category could include exclusive ZET-focussed fleet operators that are new to the market but have established operations and are backed by credible investors.	80% of the loan taken by the fleet operator

Source: RMI

Note:
1. All content was ascertained from interviews and is captured to be illustrative of how the design and segmentation of borrowers could unfold. It represents one iteration and should be further negotiated and refined based on the application.

2. The maximum coverage to an individual fleet operator can be revised over time as fleet operators expand their ZET operations and service prior loans successfully.

Box 1 Derived market insights on the contours of a risk-sharing facility for ZETs (continued)

To receive RSF coverage, the participating lender must pay an annual fee, as they benefit from the risk distribution. The fee helps maintain the financial sustainability of the RSF programme, and by requiring lenders to pay for coverage, the RSF encourages proper due diligence conducted during the loan evaluation process. The fee would be based on the loan coverage. **Exhibit 15** below illustrates how a tiered fee structure could be offered for a given loan amount. Typically, a higher loan amount would attract a higher fee as the quantum of capital at risk is higher for the RSF provider to bear.

Exhibit 15 Proposed tiered fee structure for ZET RSFs

Loan Amount	RSF Guaranteed Amount With 85% Coverage Assumed	Standard Fee (% of the Coverage)	Fee Amount
Up to INR 50 Lakh	INR 42.5 lakh	0.55	Up to INR 0.2 lakh
INR 50 Lakh–INR 1 Crore	INR 42.5 lakh–INR 85 lakh	0.6	INR 0.2 lakh–INR 0.5 lakh
INR 1 Crore–INR 1.5 Crore	INR 85 lakh–INR 1.28 crore	1.2	INR 1 lakh–INR 1.5 lakh

Source: RMI

Note:
1. The loan amount is based on the average purchase price of MDV and HDV ZETs ranging from INR 50 lakh (US$57,762) to INR 1.5 crore (US$173,287).
2. The standard fees have been taken as a reference from SIDBI's CGTMSE scheme, which offers loan-based coverage to micro and small enterprises.[32]
3. Structure contours derived from the SIDBI Shell foundation facility.

Lastly, a discount on the guarantee fee percentage may be offered based on specific parameters. For example, discounts could be granted to women-led fleet operators or to fleets exclusively operating on ZETs. Conversely, a risk premium may be applied to borrowers classified as tier 2, reflecting a higher likelihood of default due to factors such as lower creditworthiness, higher leverage, or unpredictable cash flows.

Box 1 Derived market insights on the contours of a risk-sharing facility for ZETs (continued)

The **table** below illustrates how the RSF would work for a ZET loan scenario.

Scenario parameters

- **Type of borrower:** Strong credit tier 1 borrower (no risk premium added)
- **ZET purchase price:** INR 1.35 crore (US$155,958) (average reported ZET HDT price)
- **LTV ratio:** 80%, meaning the financier is willing to provide a loan for 80% of the purchase price, with the borrower providing equity through a down payment.
- **RSF coverage:** First-loss coverage at 85%, mitigating the financier's risk exposure.

Deriving the RSF coverage and fee on a per-loan basis

1. **Loan amount:** INR 1.35 crore × 80% = INR 1.08 crore (loan amount provided by the financier). INR 1.08 crore (US$124,767) is the total amount of loss potential a financier would face in the event of default; thus, per the scenario, they chose to participate in the RSF to mitigate the risk.
2. **RSF coverage:** The RSF provides 85% coverage on the loan amount, meaning the RSF would cover INR 1.08 crore × 85% = INR 91.8 lakh (US$106,052) in case of default.
3. **Fee:** The financier pays a fee based on the RSF coverage amount. The fee is calculated as INR 91.8 lakh (US$106,052) × 1.2% = INR 1.1 lakh (US$1,271).

This illustration provides a simplified view of the RSF fee structure; in practice, additional factors such as structuring fees, margin fees, and administrative costs would also be incorporated into the overall pricing.

DESIGN CONSIDERATIONS

- **Loan-level coverage preferred for ZETs:** Market actors have suggested that in nascent markets like ZETs in India, an individual loan-level RSF would be better than a portfolio-level RSF. This recommendation reflects the market dynamics and the nature of investments, as ZET investments involve high-ticket sizes and gradual fleet adoption rather than immediate high volumes. By focussing on individual loans, the RSF could more directly address lenders' concerns about underwriting a product they may not be familiar with, thereby reducing perceived risks and encouraging lending. The coverage and fees under such a facility would be tailored to the specific loan amounts, ensuring the RSF is tailored to each ZET purchase.

- **Selecting risk allocation models:** Stakeholder discussions have highlighted that a first-loss structure with a high coverage percentage, for instance 80%–85%, is recommended for nascent markets like ZETs as it absorbs higher initial risks and builds lender confidence. The coverage amount can differ depending on the creditworthiness of the fleet operator. Pari-passu structures, which involve proportional risk sharing, are well-suited for moderate-risk portfolios, and second-loss coverage is designed for addressing systemic risks in mature markets but is less applicable to the current state of the ZET market.

- **Fee structures and tiering:** A tiered fee structure can enhance sustainability and balance risk-sharing. Drawing from examples like the CGTMSE scheme, which charges fees based on the loan size and risk profile, a similar framework can be proposed for ZET RSFs.[33] Market interviews suggest that a fee of 0.5% to 1.5% of the loan amount covered through the RSF would be appropriate for the first-loss 80%–85% coverage arrangement on a loan basis. Tiered fees would reflect the variability in risk levels associated with borrower types, fleet sizes, or geographic coverage.

- **Concentration risk:** To prevent overexposure to a single borrower or use case, limits should be set on the number of loans eligible for RSF coverage. This ensures a diversified portfolio and reduces the potential impact of defaults in a specific segment. For instance, the RSF could include stipulations to limit exposure per borrower (e.g., a maximum of Rs. 50 crores for a tier 2 fleet operator and INR 100 crore for a tier 1 fleet operator) or to allocate funds across multiple use cases such as long-haul, urban logistics, or cold-chain applications. These caps encourage a balanced deployment of capital and mitigate systemic risks.

- **Monitoring Impact:** It is crucial to design a robust monitoring and evaluation process to track the usage and impact of the RSF. This should include a framework to monitor disbursement efficiency, track the number and types of claims, and document the fleets that have loans supported by the facility, to assess both performance and socio-economic impact.

Further collaboration between the RSF's administering body and participating financiers is needed to refine its design. The recommendations outlined help mitigate risks for financiers, enabling confident lending while ensuring fair and accessible terms for borrowers. As the market evolves, RSF parameters should be adjusted to support the current market state.

IMPACT

An RSF absorbs a share of the financiers' losses in the event of borrower default, reducing risk exposure and increasing lender confidence in underwriting a new product.

Box 2 Reducing interest costs through concessional on-lending

There are two pathways to making lending for ZETs more affordable: reducing the risk associated with lending, which creates conditions for lower lending rates over time, or reducing the cost of lending for financiers. This ensures that the cost savings are passed on to fleet operators. Given that risk-reduction strategies typically take time to translate into lower lending rates, concessional loans can serve as a critical interim solution by directly lowering the cost of borrowing.

DESCRIPTION

A concessional on-lending facility is a financial mechanism designed to make ZET financing more affordable by leveraging lower-cost capital from MDBs or DFIs. Such a tool can be a pivotal tool to address the high cost of capital — one of the primary barriers to ZET adoption. By offering preferential terms such as lower interest rates or extended repayment periods, this facility eases the financial burden on fleet operators. It also makes ZET financing more attractive and feasible for local banks and NBFCs. Financiers, in turn, can extend loans at reduced rates, aligning repayment schedules with fleet operators' cash flows and facilitating broader market adoption.

MULTILATERAL DEVELOPMENT BANK (MDB) LEADERSHIP

MDBs are uniquely positioned to catalyse the transition to ZETs by leveraging their capital, convening power, and technical expertise to drive transformative development outcomes. Their global presence enables them to identify and share best practices, technologies, and financing solutions across regions, while their commitment to development and environmental goals ensures a holistic and sustainable approach.

Supporting concessional on-lending for ZETs aligns with MDBs' mission to address critical global challenges. First, it enables MDBs to contribute directly to climate commitments, as India's freight sector accounts for over 27% of road transport emissions. By accelerating ZET adoption, MDBs can support the decarbonisation of one of the most difficult-to-abate sectors, advancing the Paris Agreement and SDG 13. Second, MDBs can foster innovation by supporting ZET market growth, driving demand for batteries and infrastructure, and positioning India as a global leader in clean technology manufacturing in line with SDG 9. Third, by mitigating road freight emissions, MDBs improve air quality and public health, reducing disease burdens in urban and industrial areas and advancing SDG 3. Finally, ZET adoption strengthens India's energy security by reducing reliance on diesel imports, lowering economic vulnerabilities, and ensuring affordable, accessible energy solutions aligned with SDG 7. Together, these interventions underscore the critical role MDBs play in enabling equitable, sustainable, and resilient economic transitions. By aligning investments with social and economic priorities, MDBs can help bridge

Box 2 Reducing interest costs through concessional on-lending (continued)

financing gaps, support workforce transitions, and ensure that the benefits of clean transportation reach underserved communities, advancing a just energy transition and promoting equity.

DESIGN CONSIDERATIONS

- **Stipulate interest rate pass-through:** Structured agreements among MDBs, DFIs, and financiers must ensure that concessional benefits (e.g., 5%–6% MDB lending rates) are fully passed on to fleet operators. Oversight mechanisms should prevent intermediaries from inflating margins, ensuring reduced interest rates (e.g., 10%–12% instead of 15%+) reach end borrowers.

- **Volume-based incentives:** Tie concessional funding availability to loan disbursement milestones, encouraging financiers to scale ZET portfolios. For example, MDBs can unlock additional tranches of funding only when financiers meet predefined targets, such as financing a set number of ZETs or extending credit to underserved regions.

- **Versatility:** Concessional finance on-lent for ZET or charging infrastructure. MDBs and DFIs might also prioritise and stipulate on-lending to specific projects or borrowers aiming to aggregate demand in a corridor or address other market development priorities.

IMPACT

Concessional financing lowers borrowing costs, making capital more accessible and reducing risk for financiers. This incentivises lending for targeted activities, such as ZET adoption, by improving project viability and attracting additional private investment.

Box 3 Insurance products for ZETS

DESCRIPTION

Insurance provides financial protection for ZET customers by covering the cost of damage. In India, there are two main types of auto insurance: third-party insurance and comprehensive insurance. Third-party (liability) insurance is legally required and covers costs incurred from bodily injury or property damage caused by the insured vehicle to a third party. Comprehensive insurance covers additional damages and protections, such as those incurred from accidents, natural disasters, theft, or vandalism, offering broader coverage for the vehicle. Comprehensive insurance is crucial for ZET customers to mitigate risks associated with vehicle operation, ensuring they are financially protected in case of unforeseen events, which can enhance confidence in ZET financing and market growth.

DESIGN CONSIDERATIONS

- **ZET-specific insurance products:** Develop insurance products tailored to ZETs by developing customised depreciation schedules based on telematics data and battery management metrics. This would allow insurers to adjust depreciation according to the actual condition of the batteries, offering measurable recoverable value for used batteries and reducing residual value risk. ZET insurance products can also cover battery damage, cargo protection, damages due to charging, and repairing or replacing any parts or components.

- **Customised ZET insurance premium models:** Develop competitive ZET insurance premiums based on operational data, allowing for more accurate risk assessments and better pricing for policyholders.

- **EMI protection:** Offer EMI protection insurance for loan coverage of the vehicle in case of breakdowns, ensuring the borrower can continue loan repayments while the vehicle is under repair and unable to make shipments for a specific duration.

For further details on how policy interventions may also impact the situation, see the *Unlocking Capital for Zero Emission Trucks: Case Studies from Global Markets.*[34]

Box 3 **Insurance products for ZETS (continued)**

IMPACT

Insurance helps reduce the residual risk associated with ZETs, reducing the potential financial burden of unexpected incidents for the financiers. Insurance also reduces customer risk, as features such as EMI protection would cover the borrower's loan in case the vehicle is being repaired. Financiers prefer borrowers to have insurance tie-ups, as the lack of coverage for ZET damage in case of an accident increases the risk of default.

Impact Summary

Evaluating the efficacy of the above-outlined interventions would require an in-depth study of the cost, the ability to reduce risks, the transaction time and cost, and the likelihood of reducing ZET TCO associated with each intervention. Although this overview provides a broad understanding, a detailed cost-benefit analysis would require tailoring these interventions to a specific use case, project, or pilot initiative.

Implementing these strategies in a real-world setting is essential to generating actionable insights and evaluating their true effectiveness. Conducting a pilot would enable stakeholders to refine their understanding of cost implications, risk mitigation benefits, and operational outcomes. By testing these interventions, the market can build evidence-based confidence and address uncertainties that currently limit the scale-up of ZET financing and adoption.

> **"The first step in unlocking ZET financing is to build trust in the product and ensure the borrower's creditworthiness."**

Exhibit 16 Evaluation of costs, risk impact, and loss mitigation strategies

Tonnage	Soft Costs and Time	Risk Mitigation	Loss Mitigation
Warranties and Buybacks	X	X	X
Mezzanine Facility	X	X	X
Revenue Assurance Contracts	X	X	X
Charging-as-a-Service	X	X	X
Service-Level Agreements	X	X	X
Residual Value Guarantees	X	X	X
Risk-Sharing Facility	X	X	X
Concessional On-Lending	X	X	X
Insurance	X	X	X

Soft costs and negotiating time*	Ability to effectively reduce risks	Loss reduction
X High	X – Direct impact on risk	X – Direct impact
X Moderate	X – Indirect impact on risk	X – Indirect impact

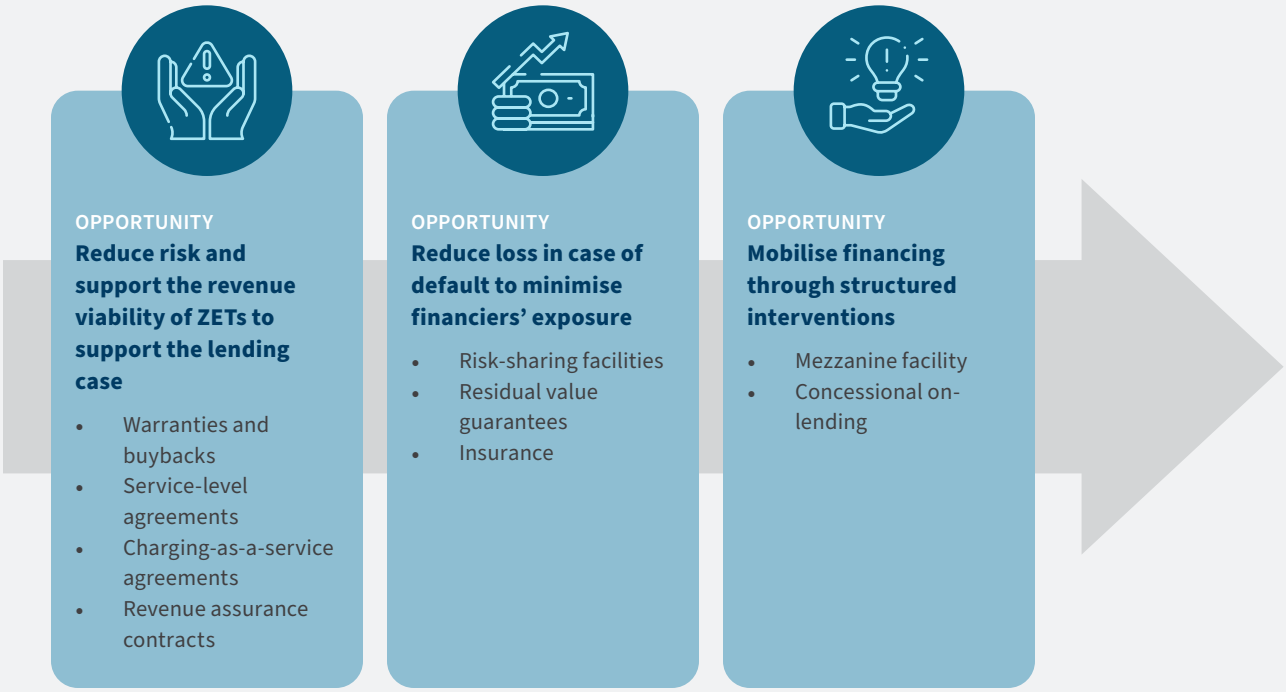
* Considers the costs incurred through negotiations, personnel required to design and implement an instrument, and the time necessary for its deployment.

Note: Additional parameters could be evaluated beyond those presented here. Additionally, the results depicted are subjective to some extent. These findings are based on qualitative insights gathered from stakeholder interviews and may not encompass the full range of perspectives or considerations relevant to the topic.

RMI graphic. **Source:** RMI

The first step in unlocking ZET financing is to build trust in the product and ensure borrower creditworthiness. Key interventions include warranties, buybacks, service-level agreements, and charging infrastructure, all of which reduce risk and improve economic viability. Securing long-term revenue contracts would further enhance financing viability but remains challenging in an evolving market. Once default risk is lowered, the next priority is mitigating losses. Given the low or uncertain residual value of ZETs, introducing a residual value guarantee (RVG) could significantly impact the market. However, structuring RVGs in a nascent market carries risks for guarantors. Risk-sharing facilities and insurance can also help address residual value concerns, though insurers may be slow to adapt. Structured finance mechanisms can further mobilise investment. A mezzanine facility can reduce up-front costs but add to overall transaction expenses. Concessional capital can lower interest rates, though MDBs have limited resources to establish such credit lines. A cost-benefit analysis of facility design is essential to ensure concessional funds are effectively leveraged. **Exhibit 17** below outlines how interventions can be prioritised from a financier's perspective, as they play a central role in funding ZET adoption.

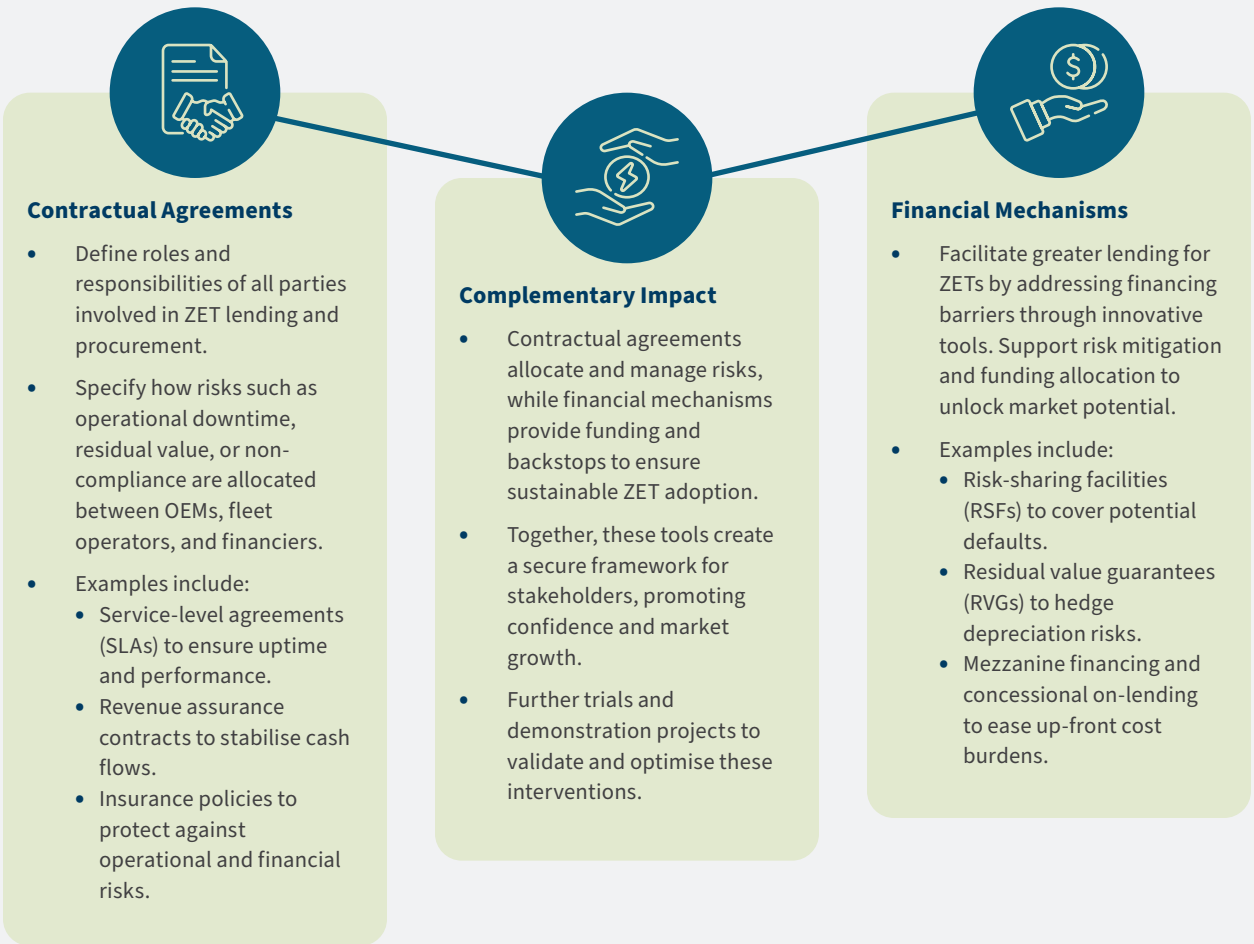
Exhibit 17 Opportunities to reduce risk, loss, and mobilise financing



RMI graphic. **Source:** RMI

Contractual agreements and financial mechanisms together create a comprehensive framework for allocating risks, responsibilities, and capital through structured financial products. Market actors can implement contractual agreements, and both borrowers and OEMs should proactively engage in these arrangements to drive ZET adoption. Financial mechanisms, structured to channel capital into the ZET market, require support from MDBs and DFIs for funding, while local financiers play a key role in shaping their design. Ultimately, success depends on negotiation — no single measure will suffice. Instead, interventions should be tested, adapted, and combined for maximum impact.

Exhibit 18 Complementary contractual agreements and financial mechanisms



RMI graphic. **Source:** RMI

5. Collaborative Roles in Advancing ZET Financing and Adoption

The transition to zero-emission transit vehicles requires collaboration from a wide range of market actors, including original equipment manufacturers, CPOs, fleet operators, financiers, and MDBs and DFIs. Each of these stakeholders plays a crucial role in mobilising capital and driving the shift towards sustainable transport. The following sections will discuss the roles of various actors and how their collaboration is vital to overcoming ZET market risks to unlock capital for this pivotal transition.

The Role of ZET Market Actors, Including OEMS, Fleets, and Corporate Aggregators

ZET market actors must form partnerships and agreements to manage product and operational risks, boosting confidence in ZET performance and economic viability to support lending.

Exhibit 19 Summary of actions needed by market actors

Actor	Action
OEMs	• Offer extended warranties for ZETs and/or batteries that align with the loan tenure • Offer buybacks at the onset of ZET purchase • Offer service-level agreements • Produce high-quality, reliable vehicles and invest in technological advancements to minimise product risk and enhance long-term performance.
Fleet Operators (ZET Borrowers)	• Partner with charging operators to ensure smooth access to charging, lowering operability risk • Enter and pursue revenue assurance contracts • Enter into warranties and service-level agreements wherever possible • Explore and procure comprehensive insurance covers • Seek to maximise ZET utilisation and minimise uptime to maximise operational cost savings and revenue generation to support the financial case of ZET procurement
CPOs	• Offer charging as a service to fleets, installing, managing, and maintaining charging infrastructure to provide seamless on-site charging
Insurers	• Offer ZET-specific comprehensive insurance products at competitive prices
End Users (Corporations Paying for Freight to be Shipped)	• Establish revenue agreements with fleet operators that define freight shipment volumes over fixed periods, ideally with long durations, to ensure greater stability.

Source: RMI

The Role of Financiers (Banks and NBFCs)

Customer risk is inherent in the evolving ZET sector, requiring financiers to adopt data-driven approaches and refine their risk management strategies. To support sustainable mobility, financiers can demonstrate commitment by providing initial capital through early lending pilots. They should also leverage their expertise to design financing interventions — such as RVGs, RSFs, mezzanine financing, and on-lending facilities.

Exhibit 20 Summary of actions needed by local financiers

Actor	Action
Financiers (Banks, NBFCs)	• Offer loans, leases, and other financing products to fleet operators, ensuring the up-front costs of ZET procurement are manageable • Build technical depth in understanding ZET technology to facilitate underwriting of the asset • Shape the design of financing interventions, including RVGs, RSFs, mezzanine financing, and concessional on-lending facilities. • Engage with MDBs and DFIs to secure concessional capital or guarantees that lower the cost of financing.

Source: RMI

The Role of Third Parties, DFIs, and MDBs

Private third-party mezzanine financing can bridge funding gaps for ZET procurement, while guarantors supporting RVGs can ease depreciation concerns and boost resale value, instilling confidence in lenders. DFIs and MDBs play a catalytic role by leveraging concessional capital to create favourable financing terms, reducing the cost of capital and improving fund accessibility.

Exhibit 21 Summary of actions needed by third parties, DFIs, MDBs

Actor	Action
Third Parties	• Trial residual value guarantees for ZETs • Foster the creation and administration of a mezzanine financing facility for ZETs
DFIs, MDBs	• DFIs and MDBs can significantly reduce the cost of mezzanine financing for borrowers by lowering the equity stake required • Provide technical expertise and guidance regarding the creation of an RSF and conduct the cost-benefit analysis needed to support RSFs • Explore the design of a concessional on-lending facility, conceptualising the facility size and the transaction costs for the parties involved to drive the greatest market impact • Engage with financiers to iterate on terms and conditions and optimal structured finance intervention(s) to accelerate ZET market growth

Source: RMI

6. Conclusion

Scaling the adoption of 10,000 zero-emission trucks is a critical step in advancing India's transition to sustainable transportation. However, achieving this goal requires overcoming financing challenges, including high up-front costs, market risks, and uncertainties about residual value. This report has outlined a solution-oriented approach to addressing these barriers, unlocking the capital needed to drive market growth and facilitate ZET deployment.

At the core of this approach are the complementary roles of contractual agreements and financial mechanisms. Contractual agreements define responsibilities and allocate risks — such as product, customer, and operational risks — to the parties best equipped to manage and mitigate them.

Financial mechanisms, such as mezzanine financing and concessional on-lending, help facilitate ZET financing, while risk-sharing facilities and residual value guarantees serve to protect against losses in the event of default. Together, these tools create a robust, secure financing framework that provides the confidence financiers need to invest in ZET technology. Implementing these interventions requires collaboration among key stakeholders, including financiers, development finance institutions, OEMs, and fleet operators. By working together on trials and pilot projects, these stakeholders can design and implement complementary contractual agreements and financial mechanisms.

> **ZET adoption will generate significant cost savings for fleet operators, reduce climate pollution, and contribute to a more sustainable future for India's trucking industry.**

Ultimately, a well-structured financing framework can make the deployment of 10,000 ZETs a reality and lay the foundation to unlock capital to scale the ZET transition. As the market matures, ZET adoption will generate significant cost savings for fleet operators, reduce climate pollution, and contribute to a more sustainable future for India's trucking industry, delivering both economic and environmental returns on investment.

Appendix: ZET TCO Details

Exhibit 22 Capital costs

	ZET	ICE
MDV (3.5 tonne to 12 tonne)	INR 85 lakh (US$97,226): Average price derived via market interviews	INR 27 lakh (US$30,882): Average price derived via market research
HDV (12 tonne to 55 tonne)	INR 135 lakh (US$154,411): Average price derived via market interviews	INR 45 lakh (US$51,467): Average price derived via market research

Exhibit 23 Lending characteristics

Cost Component	Metrics	Rationale For Value Estimation
Down Payment	0.25% purchase cost	Based on the market average of 75% LTV, our model calculated the down payment using the remaining 25% LTV.
Interest + Principal	Nominal interest rate: 16% per annum	Based on the market interviews, the initial interest rate for ZET fleet loans is 16%. This is higher than the diesel interest rate because ZET technology is still nascent.
Loan term	Five years	Based on the market standards for diesel trucks, five years is used as the loan term for ZETs.

Exhibit 24 Operational cost components

Cost Component	Metrics	Description of How Value Was Derived
Maintenance Cost	• 120% diesel maintenance cost (year 2024–26) • 80% diesel maintenance cost (year 2027–29) • 60% diesel maintenance cost (year 2030 onwards)	Based on the market average diesel maintenance costs, the ZET maintenance cost declines from 120% to 60% during its lifespan. The reason is the gradually increased resource availability for repairs, technical expertise, and skilled service technicians who maintain ZETs. The ZET maintenance costs are projected to achieve parity with diesel maintenance costs by 2027 and will decline in the years ahead.
Fuel	• MDV fast charging with 50 kW charger, INR 12/kWh (US$0.14/kWh) • HDV ultra-fast charging with 500 kW charger, INR 14.4/kWh (US$0.16/kWh)	Based on the analysis in C*omprehensive Guide to Finance the Zero-Emission Trucking Transition in India,* 2024.
Defrayed Fuel Costs	• MDV fast charging with 50 kW charger, INR 7.5/kWh • HDV ultra-fast charging with 500 kW charger, INR 7.5/kWh	Based on the analysis conducted in the *Technology Assessment of Zero-Emission Trucking on The Delhi-Jaipur Corridor.* This tariff was benchmarked against the average EV tariff of INR 5/kWh. A slightly higher tariff was then derived for this favourable intervention scenario, given higher-powered charging.
Insurance	• 3% depreciated value	Based on the market derived depreciated value rate

Exhibit 25 Duty cycle assumptions

Cost Component	Metrics	Description of how value was derived
Lifespan	Seven years	For more details, see *Technology Assessment of Zero-Emission Trucking on the Delhi-Jaipur Corridor,* published in November 2023.[35]
Yearly Vehicle Kilometres Travelled	105,000	Based on an average scenario of 350 km a day over 300 days.

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