

Cut Electrification Risk & Costs: The Residual Value Guarantee Blueprint

Introductory guide for governments and finance institutions to set up residual value guarantee programmes to support purchasing, financing, and leasing of battery electric trucks

EXECUTIVE SUMMARY

Residual value (RV) risk is making battery electric truck (BET) financing and leasing less accessible and more expensive than necessary.

RV risk is the possibility that a used BET will be sold for less than was anticipated at the start of a contract (the expected RV). In leasing, payments are set largely based on the gap between the retail price and the RV, so the lower the RV, the larger the gap – and the higher an end client's payments. In asset-backed financing, the vehicle is typically used as loan collateral. A low RV means the lender will be less likely to recoup their investment in case of a default, which makes lenders limit their credit offerings to highly creditworthy customers and reduces the amounts that borrowers can access.

A residual value guarantee (RVG) programme addresses these issues and can reduce leasing costs for fleet operators by approximately 12% per month. For a heavy-duty truck in the UK, this would add up to approximately £6,800 (\$8,100) per year. RVG programmes do this by partially protecting guarantee recipients against potential losses due to RV risk. By doing so, it encourages lessors to consider higher RVs, which translate into lower monthly lease payments. For lenders, it ensures they will be able to recoup a larger portion of their investment in case of default, leading to improved access to loans. By bringing down costs and expanding access to loans, RVGs can encourage more truck operators to adopt BETs.

A £10 million (\$13.5 million) reserve for RVGs could mobilise over £228 million (\$306 million) in private capital towards leasing of BETs. Such a reserve could help deploy 2,188 medium-duty trucks – two times more than what would be achieved using an upfront subsidy – , and generate nearly £32 million (\$306 million) in private capital towards leasing of BETs.

This guide aims to help stakeholders design successful RVG programmes to stimulate market development. Since an RVG's ability to bring costs down depends on market conditions, the importance of designing an effective programme cannot be overstated. Creating such a programme will require answering a series of questions, including: who and what the guarantee covers, when the guarantee pays out and why, how to benchmark RV setting, what level of loss coverage should be used, and how much the guarantee might cost, among others. This guide provides recommendations for navigating these questions, as well as a step-by-step process to move toward implementation and eventual phaseout.

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Please note that the views set out in the report are of the authors only. This guide has been produced for information purposes and does not constitute legal or financial advice. You should seek independent advice.

LIST OF ACRONYMS

BET	battery electric truck
MEL	monitoring, evaluation, and learning
MOU	memorandum of understanding
RV	residual value
RVG	residual value guarantee
SMEs	small – and medium-sized enterprises
TCO	total cost of ownership

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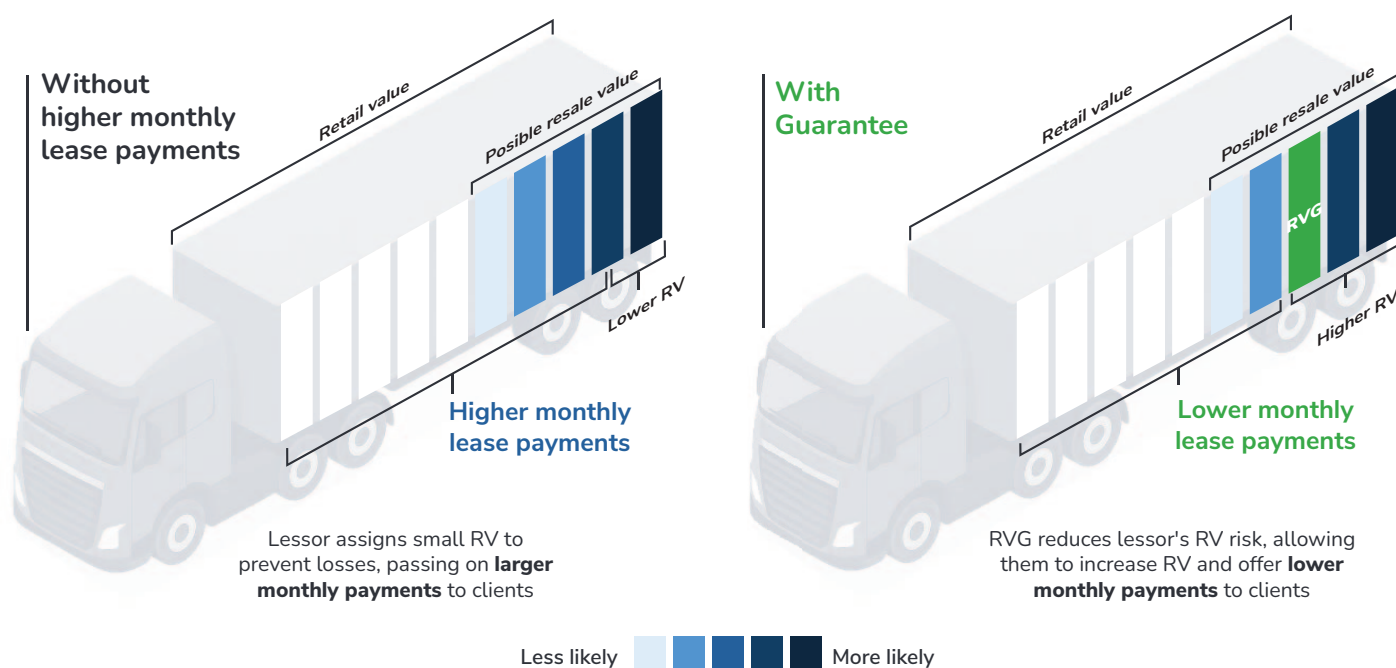
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1. RV Risk Explainer

Figure ES: RVG programs reduce potential losses for financial institutions due to uncertain resale values, allowing them to offer more affordable products to fleets



Source: authors

RV is the expected future worth of a vehicle after a period of use, typically at the end of a finance or lease contract term. RV risk refers to the possibility that a vehicle's fair market value when sold ends up being lower than the RV considered by a lender or lessor when defining the financing terms. For lessors, this would result in a loss, with the lessee having not paid enough over the course of their contract to cover the actual depreciation of the asset. For lenders, a loss would come if they had to repossess and sell the vehicle at any point to recoup the outstanding balance of the loan. This would occur if the borrower decides to return the vehicle, or if the vehicle is repossessed as collateral due to borrower default (not repaying the loan).

RV risk is not usually a significant concern for diesel vehicles, as resale data is widely available, technologies are mature, and fast changes are not expected. Diesel trucks have an established history of resale pricing data, which has historically supported confidence in diesel truck RVs. Diesel truck technologies have also matured over decades, with incremental improvements not typically expected to make previous versions obsolete and substantially impact their RV. The industry rule of thumb for diesel truck depreciation places the RV at 50% of its purchase price after 3 years, 40% after 4 years, and 30% after 5 years. As BETs become the cheaper, dominant technology, this is expected to change, with diesel vehicles more likely to become stranded assets.

In contrast, BETs are newer to the market, so resale pricing data is scarce, and technological advancements tend to be more significant than those of diesel vehicles. Because of this, financial institutions are often concerned that RVs may suffer significant losses due to varying factors, including price reductions in new models, risk of manufacturers disappearing, doubts regarding battery health, and unclear dynamics in the second-hand market, among others. Confidence in RV forecasting is growing, and as supply-side regulations —such as sales mandates— become more prevalent, captive finance companies in particular will be encouraged to increase forecasted RV values to offer more attractive financing and increase sales. However, to date, lenders and lessors still indicate that, without empirical data, their policies usually require assigning conservative RVs to BETs to limit their risk exposure ([CALSTART, 2024a](#)).

The higher RV risk for BETs translates into higher leasing payments and less attractive finance offerings for BETs. By assuming low RVs, lessors and lenders reduce their risk exposure, but this typically impacts the attractiveness or accessibility of the financial offerings. Under leasing offerings, periodic payments are typically calculated based on the difference between the truck's upfront cost and its expected RV (broadly speaking, **monthly lease payments = (vehicle cost – RV) / number of months in lease term¹**). As such, a lower RV results in higher periodic payments, making adoption more costly for fleets (Figure 1). Additionally, under most vehicle financing offerings, the vehicle acts as collateral, meaning that if the borrower fails to meet their periodic payments, the lender can take over property of the vehicle to re-sell it and make up for a portion of their losses. ([CALSTART, 2024a](#)). Lower collateral can result in failed loan applications or impact the size of financing facility operators can offer.

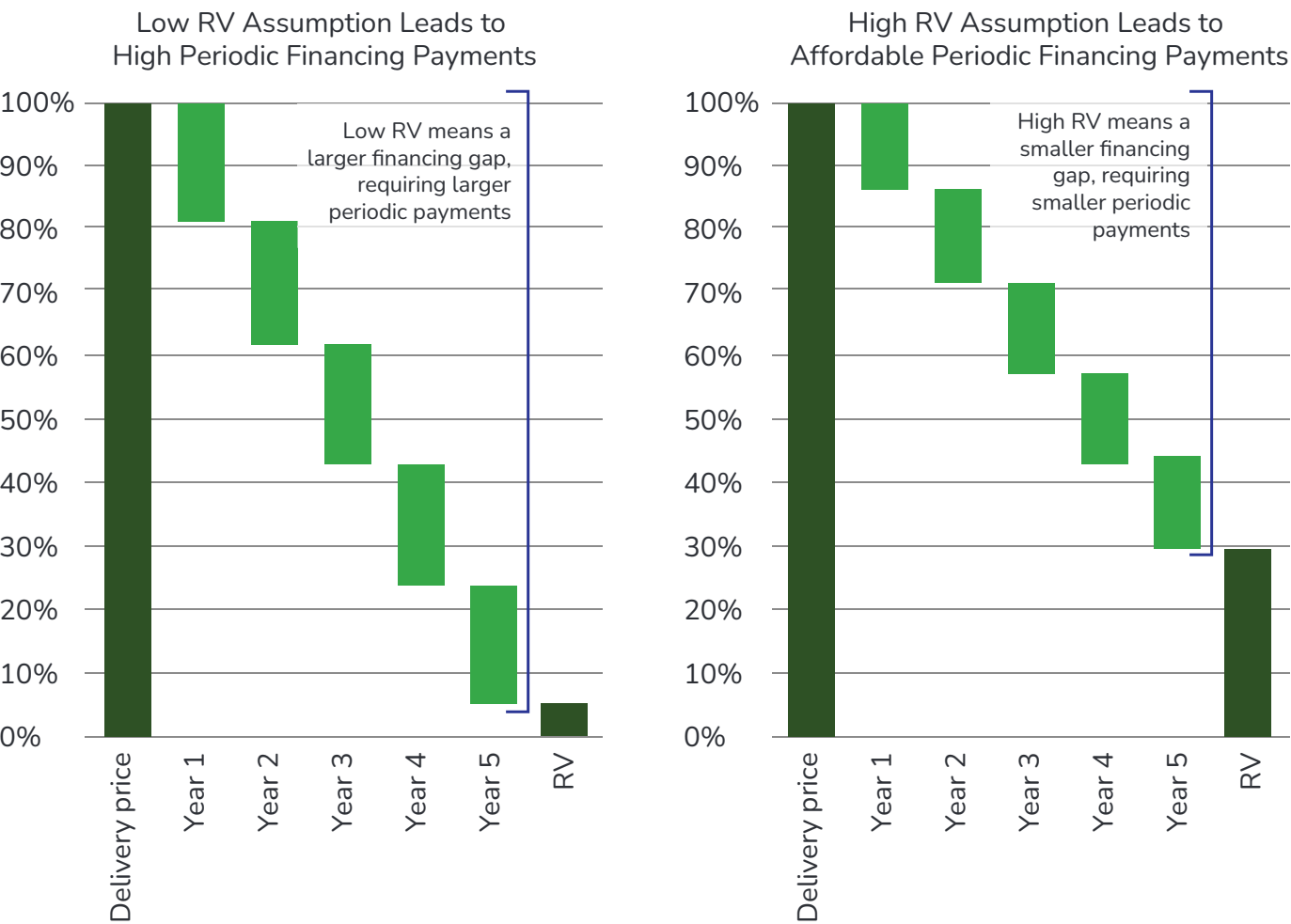
Access to low-cost finance and leasing options is critical to improving total cost of ownership (TCO) and stimulating adoption of BETs.

Although growing, BET adoption is still in early stages, with high upfront costs (as much as 1.5–3x that of a diesel equivalent) being one of the main challenges. For new vehicles, most operators use financing to acquire their vehicles and avoid a large capital outlay upfront. When financing is available, it is easier for operator to make procurement decisions based on TCO, rather than upfront costs alone. The biggest impact on cost of leasing for BETs is the depreciation, or the difference between retail value and residual value. Reducing this amount for BETs could enable the TCO to be more comparable to diesel, as the operational expenditures (namely energy and maintenance) are often lower.

Getting BET RVs on par with diesel RVs is critical to unlocking a \$100 (£74) billion-plus market opportunity in time to meet international targets. Carbon Tracker has estimated that the global heavy-duty vehicle sales market could reach \$100 billion as soon as 2026 and \$320 billion by 2035 ([Scott, 2025](#)). With 40 Global Memorandum of Understanding (Global MOU) signatory nations (as of May 2025) aiming to reach 30% new zero-emission truck and bus sales by 2030 ([Drive to Zero, 2025](#)) and leasing and financing solutions supporting over 90% of BET deployments ([CALSTART, 2024c](#)), widespread expansion of attractive financial offerings is critical.

¹ This is a simplified equation to illustrate how RV impacts monthly payments, and does not account for other factors such as interest, other costs such as battery replacement, tax, etc., which will all change the value of monthly payments.

Figure 1. Low RV Results in Higher Periodic Payments for Fleet



Source: CALSTART, 2024b

Residual value guarantees (RVGs) have gained support from key cross-industry stakeholders as a promising mechanism to scale up investments in BETs. Since 2021, financial experts in the United States have expressed support for first-loss protection against RV risk for zero-emission trucking ([Gurman, 2021](#)). Similar interest has been expressed by financiers in the United Kingdom, making RVGs one of the 10 demonstrator solutions that the Green Finance Institute identified to scale up investment in BETs ([Green Finance Institute, 2024](#)). The European Clean Trucking Alliance, an industry group that includes more than 35 of the largest manufacturing, consumer goods and logistics companies in Europe also published a report in 2024 recommending the scaling of RVGs to support adoption of BETs ([ECTA, 2024](#)).

The International Transport Forum, an OECD intergovernmental organisation with 69 member countries also recommended RVGs in its recent report ([ITF, 2025](#)). Multiple government agencies signatory to the Global MOU (a commitment to 100% new zero-emission truck and bus sales by 2040, and 30% by 2030) have further confirmed interest in this approach as a way to stimulate adoption while reducing the need for public investments in upfront subsidies.

2. RVG Benefits

An RVG reduces potential losses from lower-than-expected resale values for lenders and lessors. Through an RVG, a financial institution or government agency can protect a lender or lessor against a portion of the losses derived from a lower-than-expected resale value. When the vehicle is resold, the market value of the vehicle is compared to the expected RV, which the lender/lessor would have shared with the guarantee manager at the outset. If the market value is lower than the expected RV, the guarantee would pay out a portion of the losses to the financier. If the market value is higher than the RV, the benefit could be absorbed entirely by the lender or lessor as an added bonus or shared with the guarantee manager. RVGs are particularly effective for the new vehicle market where asset depreciation is fastest but also provide significant benefit for secondary owners as risk from battery degradation increases.

By mitigating risks, an RVG can reduce lease costs and increase access to finance, stimulating early demand and accelerating market maturity by 5–8 years. As stated before, the periodic payments of a lease are typically based on the difference between the retail price and the commercial RV. RVGs can be structured to incentivise higher commercial RVs, which reduces the difference and with it the size of the periodic payments for the fleet. Currently, feedback suggests that BET RVs are being set well below diesel RVs, despite BETs potentially lasting longer and therefore depreciating slower than their diesel counterparts. The market will naturally correct this over time and forecast BETs at a more reasonable level as the track record of used sales increases. However, considering a BET bought in 2025 will likely not be resold until 2030–2033, resale data will take years to accumulate. RVGs allow financial institutions to make decisions today with a certainty that the market would otherwise take multiple years to deliver. By doing so, they increase competitiveness and incentivise lenders and lessors to adjust their lending policies quicker than they otherwise would.

An RVG could help lessors be more willing to assume the risk of battery degradation, potentially lowering lease costs and supporting adoption in the secondary market. Original equipment manufacturers and leasing companies are cautious about battery degradation, often defining a first and second life for the battery. Lease payments are often then structured to cover the risk of battery replacement if the lessee's usage profile exceeds the expected norms (e.g. high mileage, energy throughput, frequent fast charging). This means lessees might be paying for both depreciation and potential battery replacement, even if the battery does not actually fail during the lease. An RVG can extend the confidence window for the first battery life by reducing the financial uncertainty for the lessor. If the RV is guaranteed, the lessor may be more willing to assume the risk of battery degradation, potentially lowering lease costs or extending lease terms, which can also help reduce monthly costs and improve TCO. This could delay or eliminate the need to factor in a second battery within the lease period, especially if the battery is expected to perform well beyond the warranty threshold.

An RVG can improve collateral for BET lending, reducing the cost of financing and increasing the size of finance facilities available to operators. This is particularly important when it comes to BETs, which typically cost more than diesel equivalents. Asset-backed financing is the most popular solution for fleet replacement. This type of finance relies strongly on RV because the financed vehicle is what protects the lender against substantial losses if the borrower is unable to pay. And because BETs are currently more expensive than diesel trucks, lenders have more to lose if a borrower is unable to repay. RVGs ensure that the lender will be able to recoup a certain amount if they are forced to repossess the vehicle and sell it for less than the expected RV. In doing so, RVGs reduce risks for lenders and can allow them to lend to borrowers that they otherwise would not – particularly helpful for SMEs, which in developed markets, like the UK, own cumulatively as many vehicles as larger companies ([CFSRF, 2023](#)).

An RVG can achieve a similar cost reduction to a subsidy, but at a lower cost. Upfront subsidies have been critical to accelerate BET adoption, encourage model variety, and incentivise demand. Now that technology is less of a risk and the economics are improving, RVGs may offer a more cost-efficient pathway to achieve similar outcomes. First, an RVG defers payments to a future date, while the subsidy usually pays out on the year when the purchase is made. Second, an RVG is only paid out if the expected scenario does not occur, in contrast to a subsidy which is always paid out. Third, an RVG can build in fees and the opportunity for the guarantee manager to benefit from upside. Finally, RVGs avoid, by design, the concern signalled by some stakeholders that suppliers may not pass on the entirety of subsidy savings to the end consumer.

Though the proportion of claims is expected to be high in the early stages of an RVG, this will reduce as the market matures. If an RVG is well-structured and the market conditions are favourable, it could make BETs more affordable at no cost, or even an upside, to the guarantee manager.

An RVG can stimulate investment in BETs, increasing access to low-cost finance and leasing deals for operators. Increased RV uncertainty for BETs means that lenders and lessors must hold larger capital reserves on their balance sheet. An RVG would help immediately reduce the size of those capital reserves and free up more capital for BET lending and leasing. Within securitised finance structures, an RVG can also be used to increase the total number of investment-grade bonds, increasing attractiveness to institutional investors and potentially reducing the overall transaction coupon, which could be passed on to the end user (operator). An RVG could also provide a pathway for future sustainable investment opportunities: as vehicle resale data emerges and the need for RVG support reduces, private sector appetite will increase, which could lead to private investors and insurers buying out guarantee managers.

In terms of real investment numbers, a £10 million (\$13.5 million) reserve for RVGs could mobilise over £228 million (\$306 million) in BET investments.² Illustrative modelling considers that the RV is set at 30% of the BET's retail price after 5 years, and the guarantee provides coverage of 30% of RV. Considering a medium-duty commercial vehicle with a retail price of £128,000 (\$173,000), this would bring up its expected RV from around 10% to 30%, which would bring down the cost of the fleet's periodic finance payments by 12%. A £10 million (\$13.5 million) budget would allow the programme to support 2,188 urban medium-duty trucks, resulting in nearly £32 million (\$43 million) in savings for fleets. **Achieving a similar cost reduction through upfront cost subsidies alone would require 1.9 times more public spending, without the upside of potentially not having to spend the money.**

The reserve would only be spent if the conservative RV ends up being lower than the actual resale price, which would be unexpected.

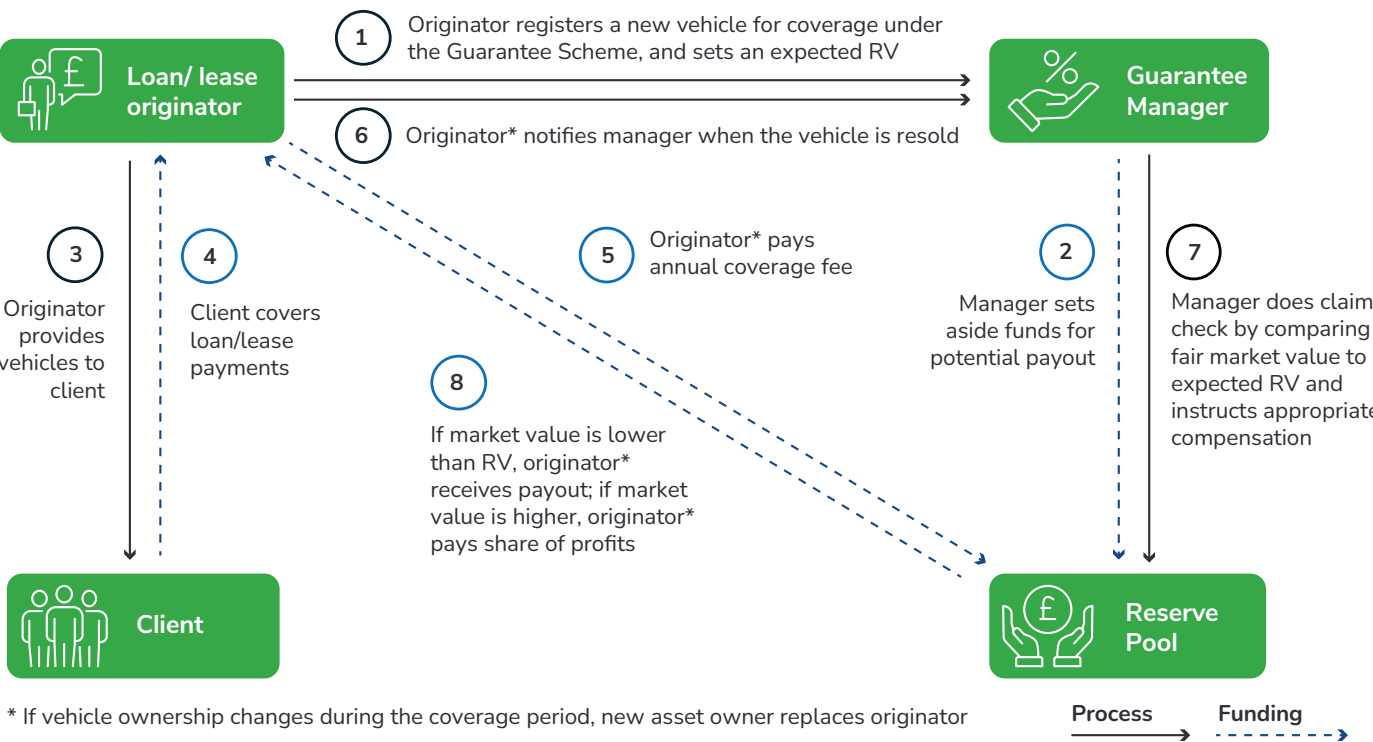
How often the guarantee will be claimed is uncertain, and guarantee managers should be ready to spend the allocated amount in its entirety. Conservative RVs reduce the likelihood of the guarantee being claimed but also reduce the economic benefit the program can have. If the market does not follow a pessimistic scenario and the guarantee is only claimed in 50% of instances, the programme would cost closer to £8 million (\$11 million), while supporting over two times the number of vehicles, as funds not disbursed can be recycled to guarantee additional vehicles.

² The actual number of trucks deployed would depend on the specific financing terms, market conditions, and original equipment manufacturer contributions. In this example, it is assumed that the vehicles are leased over a 5-year period.

3. Designing an Effective RVG

An RVG structure must respond to local market conditions. This section outlines key questions for financial institutions and governments to consider when setting up an RVG. Suggestions for approaching these questions are offered based on industry feedback, mostly from companies in the United States and United Kingdom. These suggestions may not be applicable to all cases, and a thorough, tailored assessment that includes local lenders and lessors, fleets, suppliers, and other key stakeholders is strongly recommended. Figure 2 offers a simplified guarantee structure that can serve as a point of reference for sections to come.

Figure 2. Commonly Used Structure From Insurance and Guarantee Products Across Global Markets



Source: authors

3.1: PARTIES: WHO IS INVOLVED IN THE GUARANTEE?

The guarantee considers four key stakeholders: the funder or donor, the guarantee manager, the lender or lessor (originator), and the end user.

The funder or donor is the institution putting in the capital to make the guarantee operational; this could be the guarantee manager itself or a third party, such as another government agency, philanthropy, or international cooperation fund. The guarantee manager is expected to be a national or multilateral development bank, a government agency who would typically offer vehicle subsidies (such as a ministry of transport or environmental agency) or in some cases a private asset management company. As the market matures, the role of both funder and manager could be taken on by private sector players, such as an insurance provider. The guarantee could be applied to a variety of financial constructions, with the recipient ultimately being whichever company takes on the RV risk for a specific vehicle, which is typically lender or lessor (originator). The end user would be the carrier or owner operator who makes use of the truck — in leasing structures, the lessee.

3.2: VEHICLE ELIGIBILITY: WHAT TYPE OF VEHICLES SHOULD THE GUARANTEE COVER?

The aims and resources of the guarantor should inform which vehicles receive coverage. With unlimited funds, an RVG should ideally cover all vehicle segments equally to drive uptake evenly, as operator use cases for electrification are varied. However, where resources are limited and a guarantor has more specific aims – such as replacing the worst polluters, maximising BET deployments, reducing air pollution close to people's homes, or other objectives – different vehicle segments could be targeted. For example, covering lighter vehicle segments where cost parity is usually closer and capital expenditures are lower can be most effective at maximising early uptake ([ICCT, 2025](#)). Vehicle applications best

positioned for early electrification are lighter segments with consistent back-to-base operations that are able to charge overnight and are dedicated to cargo that is volume- rather than weight-restricted ([CARB and CALSTART, 2022](#)). On the other hand, heavier vehicles typically face higher capital expenditure challenges due to higher retail prices and faster depreciation, but can offer higher societal benefits per unit. Long haul/tramping vehicles have the highest cost, but also the highest mileage and pollution levels. In the United States, compared to a passenger car, a heavy-duty semi-truck (tractor unit) covers six times the number of annual miles ([AFCD, 2024](#)) and emits around four times more carbon dioxide and 30–100 times more nitrogen oxides ([EPA, 2025](#)).

Types of covered vehicles could vary over time, depending on the phase of the scheme. In the earlier phases, focusing on segments where TCO parity with diesel is within reach can maximise deployment with limited funds and can be particularly suitable for achieving quick uptake. As financial institutions gain comfort with RVs in those segments and economics can stand on their own, the guarantee's coverage can be shifted or scaled back to focus on other vehicle segments still requiring support.

The scheme can be designed to allow for new vehicles as well as repowered/retrofitted vehicles. Uncertain RVs are a problem for new vehicles as well as repowered ones, where even though the chassis may already have some mileage, the electric drive train is still new (and concentrates ~70% of the vehicle's value ([CALSTART, 2024b](#))). The guarantee could allow for repowered vehicles to be eligible for coverage if resold as fully assembled electric vehicles later on.

3.3: GUARANTEE SCOPE: WHO SHOULD THE GUARANTEE COVER?

The guarantee would allow any approved leasing provider, lender, or asset owner to register for the programme and request coverage for specific vehicles on which they have exposure to RV risk. Early adoption sees a mix of financing and ownership models, including leasing, as-a-service, hire purchase, traditional loans, and project financing through special purpose vehicles, among others. The guarantee would be expected to see higher early traction if it can provide coverage to whichever party takes on the RV risk.

Companies receiving coverage for their BETs ought to pay participation fees in the form of an upfront annual premium to be eligible for future claims. This would contribute to funding the scheme and allow guarantee capital providers to receive income, making it attractive to future potential private sector investors. Because the RVG would essentially work as an insurance product, fees should be calculated based on insurance principles. For example, if annually the chance of a £100,000 loss event is 1 in 10, the cost to receive this potential coverage should not exceed £10,000, otherwise logic would dictate that it would be more suitable to self-fund. Industry feedback is that paying between approximately 3% and 8% in fees per year would ensure continued viability and ensure the guarantee still helps to lower cost for the end customer, accounting for the fact that, in leasing structures, costs of fees will likely be passed on to the end customer. For example:

£250,000 truck, forecast RV of 20% (£50,000) after 5 years. Guarantor has promised to cover first 40% (£20,000) of lessor RV position in a downside scenario. Annual fee is 3%, which means coverage for this vehicle is £600 per year.

The guarantee should aim to provide coverage regardless of the financing structure used and be portable as to cover whoever takes on the RV risk. The potential pay-out from the guarantee would go to the party who absorbs the loss as a result of the vehicle sale, which may be an owner operator, a lender or lessor, or the investor that sits behind. Ideally, if vehicle ownership changes hands, the guarantee coverage would also change hands: it would be portable and tied to the asset, rather than a specific institution leasing contract. This characteristic would ensure that the right party is protected at all times. Additionally, it could improve collateral for a lessor looking to raise debt and encourage re-leasing. To ensure that coverage continues after an asset changes hands, a claimant will need to demonstrate that participation fees for a particular vehicle have been paid, and that the claim is made within the pre-defined coverage period.

As the BET market matures, support could eventually be limited to transactions that support small- and medium-sized enterprises (SMEs) only. Larger operators have historically been the earlier adopters of BETs, as the typical purchasers of new vehicles, with increased access to capital. While first adopters still struggle to make a compelling business case, it is advisable the RVG provides coverage to transactions including fleets of any size. As the market matures and BETs become standard practice for larger operators, support can be finetuned to focus on SMEs, who usually face increased challenges to access competitive financing. Despite larger operators being included, it is important that SMEs are encouraged to participate in the programme from the outset. Early participation will advance an equitable transition, and will also help the market mature even faster, as SMEs typically procure from the secondary market, and increased used vehicle procurements will create the resale data needed for residual value risk to be properly understood and managed without the need for a guarantee.

3.4: TRIGGER: WHEN DOES THE GUARANTEE PAY OUT AND WHY?

The RVG payout check is triggered when the vehicle is resold on the secondary market within the pre-agreed coverage period. The pre-agreed coverage period can extend beyond the duration of the first lease contract, allowing lessors to re-lease vehicles as they typically would with a diesel one. The guarantee programme must be structured in a way that attaches coverage to the asset rather than the owner, allowing coverage to continue in cases where ownership changes hands without this being an outright sale (for example, with hire purchase, where the asset changes hands with the balloon payment at the end of the contract, or with a vehicle being repossessed as collateral due to a loan default). Under this structure, the RVG payout check is triggered whenever the vehicle is sold in the secondary market, regardless of the party who holds the coverage at that time.

When registering for the programme, participants must submit the expected RV for the vehicle after a given period of time. If the fair market value of the vehicle when it is sold is lower than this expected RV, the guarantee pays out. For example: a £100,000 BET is sold after 5 years for £20,000. The commercial RV set by the lessor when structuring the lease payments was 30% after Year 5, which would equal £30,000. As such, the lessor owner would have a £10,000 loss. In this case, the guarantee would pay out and cover a portion of that £10,000 loss so it does not fall entirely on the owner. The benefit of using fair market value (compared with actual resale value) is that it will provide an element of objectivity and reduce the ability for the guarantee to be exploited, though it may require more processing capabilities to gather the data.

If the fair market value of the vehicle is higher than the expected RV, the guarantor could receive a payment from the lender/lessor. If that same BET is sold after 5 years for £40,000, the owner would have a £10,000 profit. Because there is no loss, the guarantee does not pay out. Depending on how the guarantee is structured, the profit could be kept by the owner or shared to a certain degree with the guarantee manager, with that funding going into a revolving fund and allowing the programme to offer further guarantees. The extent of sharing will depend on the level of protection provided. Feedback suggests it would be logical for the upside to be shared on a *pari-passu* (proportionate) basis to the degree of risk being undertaken. For example, if the guarantor was providing coverage for 40% of losses, it should benefit from 40% of the upside.

The value of the claim should be calculated based on an expected RV at a specific point in time. For example, a lessor offering a 5-year lease term to a customer would set a 5-year RV that would be used for possible future claim calculations under the guarantee when the vehicle comes back after 5 years.³ Guarantee managers can choose whether coverage also applies for vehicles that come back early — for example, when a contract is terminated early because the customer is not happy with the product. Early terminations can increase the likelihood of vehicles being sold in bulk and at a discount, rather than their fair market value, which could affect the size of the claim, depending on which value the guarantee manager adopts. Extending the coverage period beyond the initial lease term can also be possible, and can be accomplished by building in processes to make pre-agreed upon adjustments to the expected RV. It is important that coverage for a vehicle continues within a given period until the point at which it is sold. The new RV can be calculated on a straight-line basis using the original rate of depreciation or a reduced rate of depreciation.

³ Note that TCO usually benefits from longer tenure. While 3–5 years is standard for diesel trucks, electric trucks benefit from extended terms that maximize savings from lower operational expenditures.

3.5: EXPECTED RV: WHO DEFINES THE EXPECTED RV AND WHY IS THIS IMPORTANT?

Expected RVs should be decided, with some restrictions, by the private sector, which is better equipped to do so. This step is important, because how RV forecasts are calculated will ultimately determine the cost of a guarantee scheme, which will in turn determine the level of losses and the size of claims. Though the guarantee does want to incentivise an increase in RV-setting, the increase must be reasonable and aim to approximate the future fair market value. Introducing RV benchmarks to anchor the RVs set by lenders/lessors within a certain range (a “cap and collar” system) is one way of achieving this. The benchmarks could be based on diesel equivalents, the RVs of other companies in the scheme, or BET component values. Benchmarks can be set both at portfolio and asset level to allow for varying levels of commerciality, depending on the asset.

To incentivise a market-wide increase in RV-setting, a scheme that builds in data-sharing will have the greatest impact on the market. One of the quickest ways to ensure that the RVG does improve RVs is by creating a method for independent data-sharing amongst competitors, which could be supported by a third party (such as a government agency or nongovernmental organization). Sharing aggregated and anonymised finance or battery monitoring data could be used to create an RV/state of health benchmark and ensure companies are not being overly optimistic or pessimistic. This would lead to the setting of more-accurate RV benchmarks, foster quicker learning, and potentially lead to emergence of private sector solutions that would replace the government-funded programme quicker. In practice, this may only work in a closed scheme, in which the parties trust each other and are incentivised to share data. A closed scheme could also help facilitate securitised models where assets are pooled and managed (collection of rentals, etc.) centrally by a general asset manager, who would

be appointed by the guarantee manager. This type of arrangement is known as a warehousing facility and, while more complicated to set up, could help overall capital allocations to enable the scheme to gather scope and scale and achieve the end goal sooner.

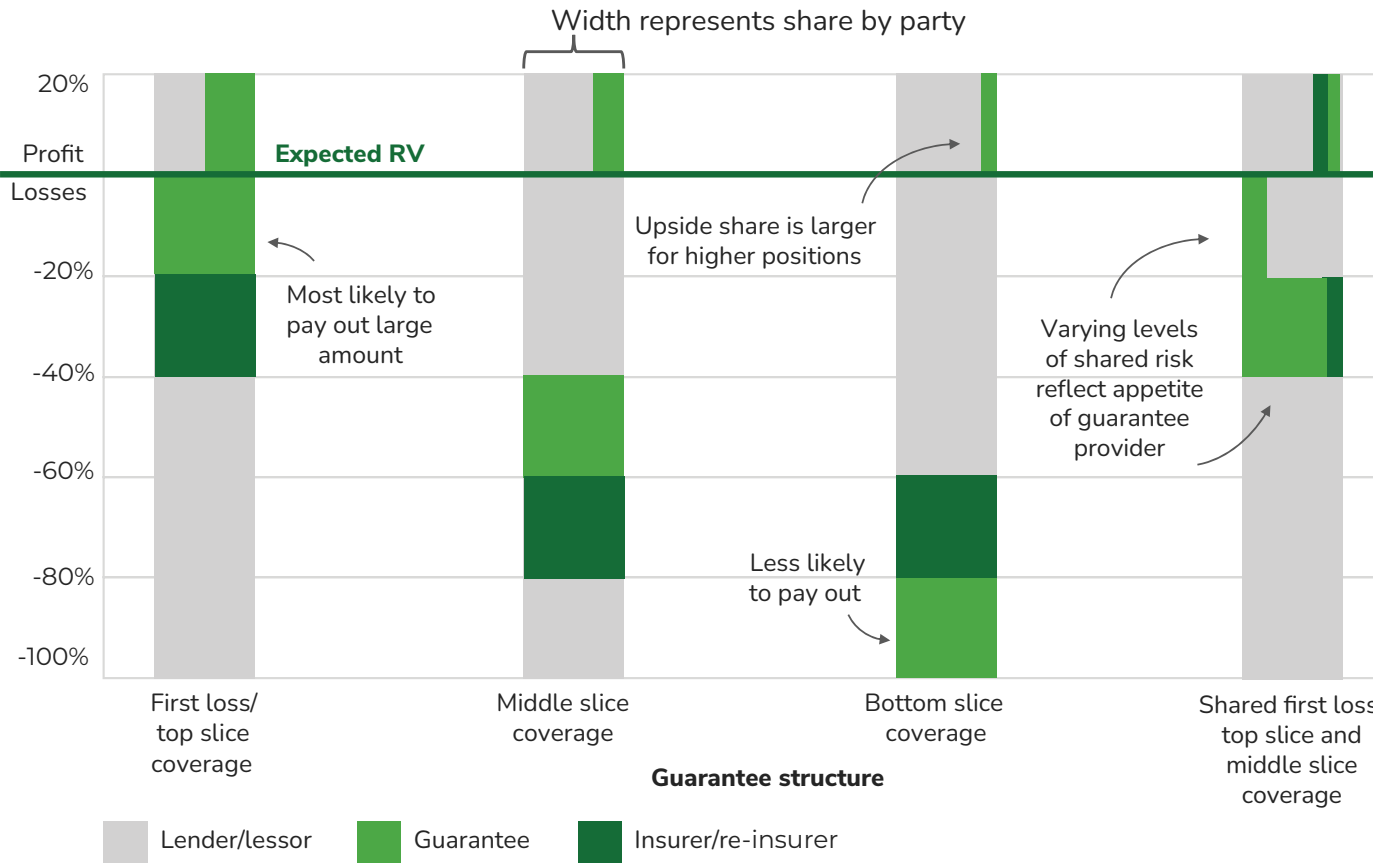
3.6: COVERAGE: HOW MUCH LOSS DOES THE RVG PROTECT AGAINST IN A DOWNSIDE SCENARIO?

The guarantee can encourage increased RV-setting by providing support that scales up and down with lender/lessor appetite. Instead of providing a specific monetary amount as coverage (e.g. £10,000 per truck) or establishing a market-wide RV benchmark against which all resale values are compared, the guarantee can provide coverage expressed as a percentage of the losses: for example, 25% coverage would cover £0.25 out of every £1 in losses. This structure rewards lenders/lessors willing to set higher RVs by providing them with additional coverage. This is the approach used by the British Business Bank’s Growth Guarantee Scheme, which offers 70% coverage ([British Business Bank, 2025](#)), and by California’s Zero-Emission Truck Loan Pilot guarantee, which offers 25% ([CARB, 2025](#)). Note that these two programs provide coverage against loan defaults, not RV. This approach allows lenders/lessors to determine pricing using their traditional risk valuation approaches, encourages competition, and rewards lenders/lessors for increased exposure.

Coverage for losses should maximise TCO impact within the guarantee provider’s risk appetite, realistic RV expectations, and capital availability. The coverage must be large enough to encourage lenders/lessors to offer better terms and increase their RV forecasts, while acknowledging that the greater the coverage, the fewer the number of transactions that can be supported with a fixed amount of program funding. Relatedly, the higher the position of the guarantee in the capital stack, the more likely the guarantee is to be claimed, which translates into lower coverage,

higher programme costs, or a lower number of transactions that can be supported (Figure 3). Guarantee managers should engage with industry to determine the preferred position for their sector. As TCO improves and resale data becomes available, coverage can be reduced until the program is phased out.

Figure 3. The Guarantee's Position in the Capital Stack Will Affect How Often It Is Claimed and How Much It Pays Out



Source: authors

Feedback suggests that, due to its simplicity, a first-loss or top-slice position is often preferred by lenders and lessors when they are confident the asset has some value, but are unsure of the exact amount. Top-slice coverage is straightforward to incorporate into financial modelling, and provides immediate relief against losses in a downside scenario. It is likely to result in a higher number of claims and therefore may be best used to provide a smaller amount of coverage. If the guarantee absorbs all or most of the top-slice losses, it may discourage lenders/lessors from getting the best deal when reselling the vehicle if the resale value is likely to fall slightly below the expected RV, as initial losses would be borne by the guarantee. This would not be an issue if likely resale values are higher than the expected RV. In Scenario A (Figure 3), with a top-slice position, the guarantee would pay out in full, the insurer would pay out partially, and the lender/lessor would be fully covered.

A bottom-slice position provides a backstop to losses and is more suitable when lenders and lessors are more concerned about a stressed (downside) scenario in which the vehicles could have no value at all. A bottom-slice guarantee may be preferred in a market with a higher probability of vehicles being scrapped and sold for parts and ensures lenders and lessors will have a minimum floor to rely on. By leaving top-slice exposure entirely to the lenders/lessors, lenders are incentivised to get the best price they can for the vehicles they sell in the secondary market; however, this method is less effective at incentivising increased RV-setting if the industry is already willing to take on exposure. Given that BETs are expected to at least have a value due to their component parts (as explained in Section 4.9), this could provide a suitable place to set the minimum floor. In Scenario A (Figure 3), with a bottom slice position, the loss would be borne entirely by the lender/lessor.

A middle-slice guarantee is best suited if lenders are already gaining some appetite for RV risk and there is little chance vehicles will have no value when resold. This is the case in some developed markets today, such as the United Kingdom and other European markets, where captive finance companies and select leasing providers have started to increase their RV exposure. By taking second position behind the lender or lessor, the guarantee manager ensures that lenders and lessors continue to have skin in the game, reducing risk of abuse and ensuring that lenders increase their RV exposure instead of simply taking whatever RV coverage a first loss would offer. In Scenario A (Figure 3), with the middle-slice position, the loss would also be borne entirely by the lender/lessor.

Shared risk structures can also be implemented, either across the whole exposure or within particular slices. For example, a guarantor could agree to take on 30% of the losses between 0% and 20% drop in residual value, and 80% of losses between 20% and 40% drop in residual value. This could allow a guarantee provider to take different levels of risk, depending on their own views about the likelihood of different levels of reduction in

value. However, more variations in structure increase complexity in transactions, making them more suited for smaller bespoke schemes.

Depending on the market, there may be appetite for private investors to take a share of the risk, including insurers or re-insurers. RV insurance products are being developed for automotive markets, but they are nascent and often expensive. Where there is appetite from the private sector, public or development bank capital could be used to help private insurance increase the risk it is willing to accept and boost the support available to lessors.

3.7: UPSIDE: SHOULD THE GUARANTEE MANAGER SHARE IN THE UPSIDE?

When the fair market value of a vehicle is higher than the expected RV, the guarantee manager should have a share of the upside. Setting up an RVG programme will require concessional funding. However, the need for continued injections of capital can be reduced by designing the scheme in a way that allows the manager to recoup a portion of their investment when there is an upside. This may help improve the business case for policymakers looking to gain support for allocation of public resources to a multiyear scheme.

Shared upside is more complex than a fee-based structure, can take longer to set up, and may not have the same benefits from a government accounting perspective. Contingent direct exposure limits (CDEL) are budgeting and accounting frameworks, often used in public sector accounting to track contingent liabilities. In these frameworks, annual fees can typically be offset against liabilities if they are a legally binding part of an agreement or contractual framework, which reduces the net fiscal exposure and the overall size of the government budget required for a scheme.

However, shared upside could be more effective at reducing costs for customers because they do not rely on a fee which can be passed on to end clients. Participation fees charged to lenders/lessors to participate in the guarantee programme would likely be passed on to the end clients, slightly increasing the cost of the financial product. In contrast, the costs of a shared upside would not be passed on. Upside-sharing improves the overall economic efficiency and value for money of the scheme, ensuring the public sector does not subsidise excess private gains. When upside-sharing is introduced, the level of upside the guarantor takes ought to vary depending on the position in a downside scenario. For example, if a guarantee manager is taking 30% of losses, it is also reasonable to expect the guarantee manager to benefit 30% from the upside – though this depends on the position in the overall loss structure.

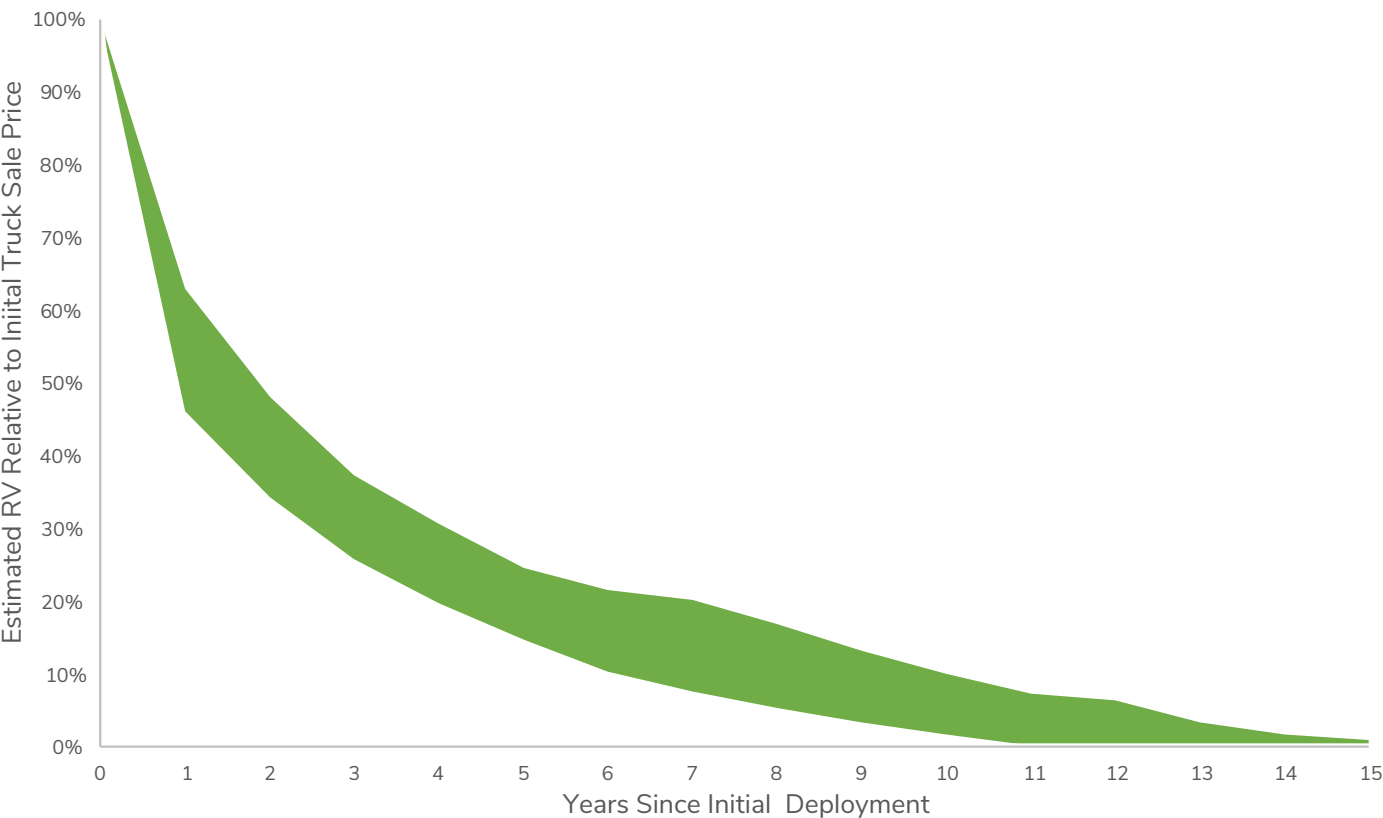
3.8: RV FORECASTING: WHAT CAN WE EXPECT FROM ACTUAL RESALE PRICES?

Early indications suggest that BEVs will likely last much longer than initially expected and are currently being undervalued. The industry rule of thumb for diesel truck depreciation places RV at 50% of its purchase price after 3 years, 40% after 4 years, and 30% after 5 years. By Year 10, some diesel trucks can still retain value if exported, but many fleets begin to consider scrappage. If BETs could confidently be assigned similar RVs, or perhaps even higher RVs, periodic payments could be reduced substantially. Industry inputs suggest that, because BETs have fewer parts, they are expected to last longer than diesel. Also, batteries are degrading much less than initially anticipated (only 1.8% per year) and are expected to retain value even after they are no longer suitable to power a vehicle, as they can be used for onsite energy storage ([Argue, 2025](#)). These factors point to BETs potentially being able to retain higher RVs than diesel. This gap will only increase as the diesel industry declines, sourcing parts becomes harder, gas pumps start to close, and stranded asset risk for diesel trucks increases ([Scott, 2024](#)).

Currently, few lenders/lessors feel comfortable pricing contracts based on these types of assumptions without evidence. Lessons and data can also be drawn from more mature BEV sectors, such as the car or bus sector, to provide an indication of when demand is likely to increase relative to supply. On this basis, by the time trucks that are acquired now reach their second life, the market will be further along the adoption curve (demand up) with few second-life assets to draw upon (supply down), which should provide confidence that there will be buyers, and therefore a higher RV.

The RV of BETs should at least match the value of their individual components, which provides a floor or worst-case scenario for the cost of a guarantee. Consider a scenario in which the manufacturer goes out of business, new BETs become much cheaper, and new vehicle technology improves substantially so there is little market appetite for a used BET. Even under these conditions, in which a vehicle may not have attractive market value as a vehicle, companies such as Zenobe are successfully demonstrating how vehicles can still be disassembled and components sold for repurposing and recycling. CALSTART developed a financial model to evaluate the RVs of BETs by their components using industry-informed degradation rates (CALSTART, 2024a). The model shows that reasonable RVs for this pessimistic scenario are still 27–38% by Year 3, 15–25% by Year 5, and 5–19% by Year 8 (Figure 4). Guarantee managers could increase the likelihood that this value will be realised by connecting fleet operators with battery stationary storage developers who will be best placed to acquire batteries if a vehicle is broken up.

Figure 4. BET RV Is Much Higher Than Zero Even if Sold by Its Components



Source: CALSTART, 2024a

3.9: OPERATIONAL RISK AND MORAL HAZARD: HOW CAN RISKS BE MITIGATED FOR A GUARANTEE PROVIDER?

Various measures must be built into a scheme to reduce moral hazard, which arises in situations in which risks and benefits are misaligned. For example, this could happen when an RVG incentivises lessors to set higher RVs, but the additional risk is disproportionately borne by the guarantee manager, or when a vehicle owner is less incentivised to sell a vehicle for the highest price possible because they know that the upside/downside is taken by another counterparty. Various measures can be taken to counteract this moral hazard, including:

Benchmarking RV-setting to ensure it does not become unreasonably high (discussed further in Section 4.5).

Financial structuring to ensure the guarantee takes a lower position in the capital stack so the lender/lessor takes the first wins/losses (discussed further in Section 4.6).

Introducing rules to prevent cherry-picking: Once enrolled, companies should not be able to cherry-pick which vehicles they put through the scheme because some vehicles may be viewed as riskier than others.

The way vehicles are used affects battery health and resale value. Battery health can be preserved by limiting fast charging when possible, keeping the state of charge between 20% and 80%, and minimising exposure to extreme temperatures ([Argue, 2025](#)). When these practices are not routinely followed, battery degradation can happen faster, which lowers the resale value of the vehicle.

Guarantors can put certain conditions in place to ensure vehicles retain their value as expected, without necessarily restricting operations.

Resale conditions, such as the need for a battery to be above 80% state of health at the end of its contract, can help ensure the guarantor is not taking on undue risk. Lenders/lessors usually define operational restrictions, and manufacturers can often establish certain operational requirements as conditions under service and maintenance contracts. Any resale conditions established by the guarantee would likely need to be less than the standard conditions imposed by these other players, and act only as a backstop to prevent extreme cases of unlimited operation. Return conditions are preferable to operation restrictions, which could act as a disincentive to the guarantee scheme for some operators and require additional effort and resources to ensure compliance.

3.10: PROGRAMME FUNDING: WHERE DOES THE MONEY COME FROM?

The guarantee programme can be funded or unfunded; unfunded programmes may potentially be cheaper and easier to set up. In both instances, the source of funding is the same, but timing for payment is different. Unfunded programmes do not have a budget set aside to cover all guarantees issued; instead, the guarantor makes the payment when the guarantee is called upon. This is the case, for example, with the British Business Bank Scheme in the United Kingdom, which offers credit risk guarantees to cover up to 70% of losses ([British Business Bank, 2025](#)). These guarantees may be easier to set up because they may not require agencies to have secured and set aside the full programme amount before launching. Depending on the accounting practices of the government providing the funds, they may also allow the agency to use a larger portion of their resources for other programs, instead of having the funds sitting in a bank account. Instead of relying on the set-aside to provide confidence to lessors/lenders, unfunded guarantees rely on the creditworthiness of the agency and the trust that industry places on it to be able to disburse quickly when the guarantee is claimed.

Funded programs, in contrast, can be harder to set up but may offer increased assurance. With funded guarantees, budget for each guarantee issued is set aside in a reserve account and kept there until the guarantee has expired. This is the case of California's Zero-Emission Truck Loan Pilot programme, which offers credit risk guarantees for loans to small owner operators to cover up to 25% of losses (CARB, 2025). Funded programmes are typically preferred by industry. Multiple lenders/lessors have indicated that not knowing that the funds are reserved to be claimed if needed reduces the confidence they can put on the guarantee programme itself, particularly when there is concern around the impact of a change in government or history of the particular government defaulting. This can reduce the scope of the guarantee to increase credit rating uplift and secure low-cost institutional capital. Creating a fund also makes programmes more attractive for a reinsurer or insurer as it supports solvency because of the ongoing requirement to make payments. This could increase the likelihood of government funding being replaced by the private sector, which could ensure a quicker and easier exit than winding down the scheme.

The guarantee can blend different sources of capital and charge participation fees in accordance with risk appetite and return requirements of capital providers. Funding can come from a variety of government, donor or philanthropic funds, and insurers or re-insurers, with participation fees or upside-sharing calculated based on each capital provider's risk-adjusted return requirements. Concessional or grant-equivalent funding may be needed to de-risk the product in its earlier stages, which could also be used to help build up the fund. This could come from government budgets, fuel price stabilization funds, private philanthropies, overseas development assistance programmes, carbon credit auctions, or other sources of funding. Opportunities may exist to repurpose existing funding, for example, by tapping resources assigned to climate mitigation but not yet earmarked for a specific use, or potentially by repurposing resources from petrol price stabilisation funds, as electric vehicle penetration grows.

The cost of the scheme could be reduced by making it only available to SME fleet operators, vehicles of a certain age post-registration date, or excluding leases that are terminated early. To reduce the cost of providing the guarantee, limitations could be introduced to make support more targeted — for example, to specific duty cycles or fleets of a certain size, which face tougher challenges to access affordable finance. Another option is to only cover RVs for vehicles that are sold after 2 years. Each additional year the vehicle is on lease, the more it will have depreciated, and the lower the guarantee payment will be if the lender takes a loss. Relatedly, the RVG could only apply to completed loans or leases, excluding early terminations, which for similar reasons would be likely to result in higher costs. All of these approaches aim to maximise the impact of the guarantee and make it operational even if funding is limited at the time.

3.11: PHASEOUT: HOW IS THE GOVERNMENT GUARANTEE REPLACED BY THE PRIVATE SECTOR?

The guarantee will make itself redundant as the market matures. As more resale data becomes available and BETs become the dominant technology, RV risk for BETs will be reduced. As RV risk is reduced, lenders, lessors, and fleets will become more comfortable increasing their exposure and would be expected to start assuming RVs that are higher than the coverage cap provided by the guarantee. At the same time, with the increase of resale data availability, insurance products by traditional insurance providers would be expected to emerge, providing further risk mitigation to lenders who are still hesitant to take on this risk.

Insurance and re-insurance companies should be engaged from the start and throughout the programme's operation to ensure relevant data is collected and shared to accelerate market maturity. Ultimately, insurance providers would be expected to carry forward the de-risking role that the guarantee initiates. As firms specialised in risk assessment, engaging them from the beginning will ensure the programme is designed in a way that obtains the data that insurance providers seek, while at the same time considering design elements that could potentially make it easier over time for the guarantee to be replaced by more attractive private sector offerings.

Simultaneously, as RV risk for BETs is reduced, RV risk for diesel trucks is expected to increase.

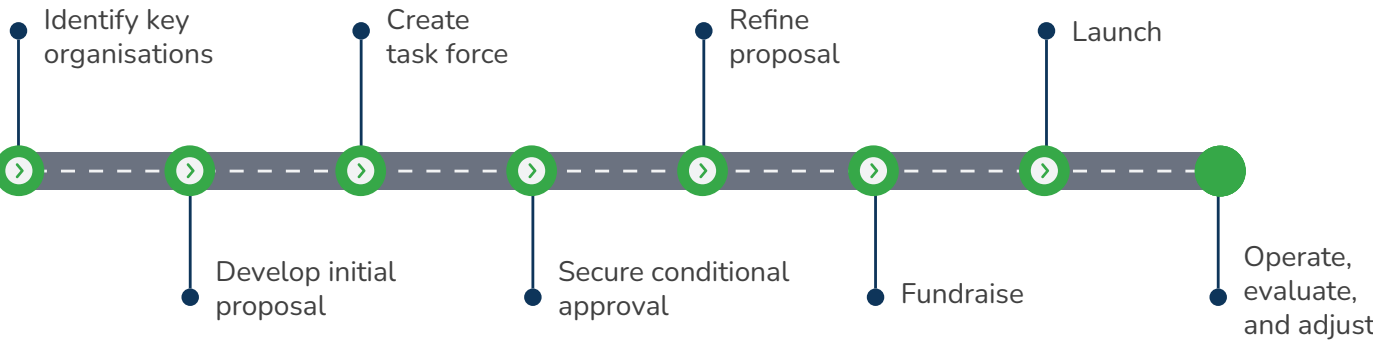
As the entire transportation landscape switches from one technology to another and diesel trucks become redundant, their RVs are expected to decline. This is a risk that historical resale data cannot yet reflect but will become much more prescient to financiers as individual markets (beginning by Norway) start to achieve +90% electric sales, diesel refuelling stations start to close pumps, and obtaining replacement parts becomes harder. The uncertainty is not around whether this will happen, but when, and which companies will be able to more successfully control these risks (Scott, 2025).

4. Implementation Roadmap

Implementation approaches will vary based on geography, guarantee manager, and market needs. As with most policies and financial mechanisms, the characteristics of the instrument, as well as the implementation roadmap, will depend on the who, where, and why of the effort. Adapted to each specific context, the following steps aim to guide the process of moving from intention to validation to implementation. Steps will not necessarily follow this exact order, and some will overlap. See Figure 5 for a visualisation of these steps.

IMPLEMENTATION STEPS

Figure 5. Tailored Eight-Step Implementation Roadmap to Verify Appetite, Secure Buy-In, and Set Up the Guarantee for Success



Source: authors

1. Identify the organisation(s) best suited to act as guarantee manager, capital provider, and lead implementer. Depending on the roles and responsibilities agencies have in different jurisdictions, the guarantee manager could be a government agency (i.e., the California Pollution Control Financing Authority in California), a development bank (i.e., the British Business Bank in the United Kingdom, Nacional Financiera in Mexico, or the World Bank in partnership with a national government agency), a green bank (i.e., the New York Green Bank), or another kind of public-backed financial institution. The guarantee manager would operationalise the resources provided by the capital provider (another government agency, international cooperation, or philanthropy). The most suitable lead implementer would typically be a party with embedded organisational capacity and experience setting up incentive or guarantee schemes. The lead implementer can be the same party as the guarantee manager, or a third party (such as a nonprofit or financial consulting firm). If the latter, it is critical that the guarantee manager is engaged in the process from the start.

Step 2. Develop initial proposal for feedback.

Using the content of this guide, the lead implementer can develop a basic structure of what the RVG would look like in practice, adapted to the jurisdiction and the operational capabilities of the lenders/lessors likely to enroll. This initial proposal is aimed at providing sufficient information for key stakeholders to react to and help co-create to maximise impact. Before investing significant time in initial development, exploratory conversations should be held with the investor community to validate initial appetite.

Step 3. Create task force and secure buy-in, including lessors, lenders, fleets, insurers, re-insurers, manufacturers, government agencies, and donors (if applicable). Finance providers, fleets, manufacturers, and other government agencies should be engaged early on to inform whether the RVG would be effective at addressing their concerns and encouraging wider access to better financing options. Stakeholders should be engaged at different stages throughout development. One way to do this is by creating an industry task force early on in the process, comprising individuals who are committed to providing feedback throughout. The task force should be accompanied by a widespread public consultation ensuring all relevant parties can submit their comments.

Step 4. Secure conditional approval for capitalisation. If funding is not secured, a conditional approval should be obtained from the appropriate government authority before investing significant efforts in fundraising, modelling, and mechanism design. The conditional approval should state that, provided certain conditions are met, including funding availability, the guarantee manager is authorised to set up and implement the guarantee. If funding is already secured, this step may still add value before the lead implementer invests significant efforts in developing the refined proposal.

Step 5. Refine proposal and develop monitoring, evaluation, and learning (MEL) framework. Once conditional approval is obtained, the lead implementer can incorporate stakeholder feedback and refine the initial proposal, including a detailed definition of how the mechanism will operate, roles and responsibilities, legal framework, and sources of funding, among others. The proposal should include a MEL framework that clearly lays out the impact expectations from the programme, considering the number of transactions supported, the savings resulting from lower cost finance, and RVs assigned by financiers, and the secondary market prices for both backed and non-backed vehicles. The MEL framework will help identify what data-sharing requirements financiers must comply with to be part of the programme. Stakeholders must be allowed to provide input on the refined proposal to further mitigate risks of the programme not meeting expectations.

Step 6. Fundraise. In parallel to proposal refinement, if funding has not been secured, the lead implementer and guarantee manager must collaborate to find a capital provider willing to support the effort.

Step 7. Obtain final approvals and launch programme. Once the proposal is refined and funding is secured, the guarantee manager should obtain final approval and launch the programme.

Step 8. As programme runs, carry out outreach, track key datapoints, adjust if needed, and release interim reports with anonymised data. Outreach to beneficiaries will help speed up capital deployment. Data tracking, following the MEL framework, will ensure impact can be verified and challenges in implementation can be identified and addressed early on. Releasing interim reports with anonymised data will help inform participants and non-participants about how the market and its RVs are evolving over time. This will help financiers further refine their vehicle appraisal strategies, regardless of whether they are a direct programme recipient or not.

The RVG Accelerator Programme

As government agencies and financial institutions move toward implementation, CALSTART/Drive to Zero and the Green Finance Institute are here to help. CALSTART/Drive to Zero and the Green Finance Institute have set up an RVG accelerator programme that can help guarantee managers set up these programmes in their own jurisdictions, leveraging proprietary tools for component-based pricing and guarantee modelling, as well as years of experience in financial structure setup and incentive scheme design and management. If you are interested in exploring how RVGs could help bring down BET costs and stimulate adoption in your jurisdiction, please reach out.

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Glossary

As-a-service: Business model offering access and use of assets (in this case, a BET) as a subscription-based service. As-a-service offerings tend to include more than the BET, such as charging infrastructure, maintenance, telematics, and fleet management software, among other services.

Asset-backed finance: A financing method where loans or securities are supported by underlying assets, such as vehicles, which serve as collateral for the repayment of the debt.

Battery electric truck (BET): Truck powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source.

Cap and collar: A type of agreement that sets both a maximum and minimum limit, or range.

Capital stack: The capital stack refers to the different layers or slices of financing used in a structured financing arrangement to fund a real estate project or company, outlining the order in which investors are repaid. The top slice (first position) is paid out first.

Captive finance companies: Wholly owned subsidiary of a vehicle manufacturer that finances retail purchases from the parent firm.

Carrier: Company whose business model is based on transporting goods for other companies (shippers).

Collateral: An asset that a lender accepts as security for extending a loan. If the borrower defaults, the lender may seize the collateral to recoup the remaining balance.

Commercial RV: RV that financiers use for structuring a payment plan with customers. It is usually based on the estimated RV, with an additional cushion.

Concessional funding: funding provided on terms that are more generous than what the borrower could obtain in the open market. It's often used by governments, development banks, or international financial institutions to support projects in nascent or developing markets.

Depreciation: The decrease in value of an electric vehicle over time due to factors like age, mileage, and market demand, which impacts its resale or trade-in price.

Downside: Potential decrease in value compared to the initial estimate.

Estimated RV: A lender or lessor's forecast value for a vehicle after a period of time and use.

Lender: Financial institution offering loans to purchase an asset (in this case, a BET).

Lessee: Person or company who rents or leases an asset from a lessor, typically a carrier or fleet operator.

Lessor: Owner of an asset (in this case, a BET) that is leased, or rented, to another party.

Market value: Selling price of an asset on the open market, based on what buyers are willing to pay and what sellers are willing to accept, sometimes known as the "fair" market value.

Moral hazard: The risk that a party to a transaction may change their behavior and take on excess risk because they do not bear the full consequences, often due to the protections of insurance or financial arrangements.

Outstanding balance: Remaining value of a loan.

Owner operator: Business that owns and operates its own trucks.

Position: The specific ranking or seniority of an investor's or lender's claim to repayment in relation to other claimants within a structured financing arrangement, with higher positions typically having priority in receiving payments.

Present value: Referring to the time value of money when considering future payments, to reflect the fact that money in the future is worth less than money and therefore needs to be discounted.

Residual value (RV): The estimated future worth of a vehicle, typically at the end of a contract period.

Residual Value Risk: Possibility that a vehicle's fair market value when sold ends up being lower than the residual value considered by a lender or lessor when defining the financing terms.

Securitisation: A method of raising debt finance that involves pooling and reselling groups of homogenous assets, often used to attract larger institutional investors that can provide funding at lower cost.

Slice: A specific layer or portion of the total financing in a structured deal, each with its own risk and return characteristics, often representing different seniority levels.

Special purpose vehicle: A legal entity created to fulfil a specific, limited objective, often related to financial transactions or asset ownership.

State of health (SOH): A measure of a battery's overall condition and its ability to store and deliver energy compared to its original (new) state. It is typically expressed as a percentage, where 100% SOH means the battery is in its original condition, and lower percentages indicate degradation over time.

Total cost of ownership (TCO): Overall cost of owning and operating a truck throughout its life cycle.

Transaction Coupon: The fixed interest rate or payment amount that an investor receives periodically from a financial security or structured finance transaction.

Upside: Potential increase in value in comparison to the initial estimate.

Zero-emission vehicle mandate: Government policy tool that requires vehicle manufacturers or suppliers to sell a certain percentage of zero-emission vehicles each year.

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