ELECTRIC VEHICLE (EV) ADOPTION DISCOVERY REPORT:

FOCUSED ON LIGHT COMMERCIAL EV ADOPTION

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EXECUTIVE SUMMARY

Subject matter experts were approached and interviewed to obtain expert input on light commercial electric vehicle (EV) adaption. The perspectives of the interviewed experts range from Logistics Service Providers, Asset financiers, vehicle manufacturer specialists, fleet owners, retail logistics managers, and charging service providers. The interviewed expert's organisational level and experience profiles range from middle to senior manager and director level with 5-30 years of relevant experience.

Key take-outs derived from the interviews can be categorised as follows:

Financial and decision-making:

- The only true priority for changing fleets to EVs would be cost reduction.
- Large-scale EV adoption will not occur without guaranteed significant financial benefits with limited to no increase in perceived risk to service levels.
- A company's board of directors, with a perspective on technical and financial feasibility, will be the inevitable final decision-makers on EV adoption.
- The decision-makers must adapt their return on investment (ROI) expectation of 3 – 4, which fleet operators are used to, to ± 6 years for electric vehicles and keep in mind the extended reliable vehicle lifetime expectation of EVs.
- Detracting from EV adoption is the residual value uncertainty of the assets at the end of the lease, leading to higher financing costs.

Routing, distance travelled and charging time:

- Having dedicated routes, known trips, and concluded long-term contracts is crucial for finding suitable product types or applications for EVs.
- More opportunities arise in lower volume, short-distance distribution markets.
- The mid-heavy vehicle range has limited transition opportunities, with less than 5% of vehicle-route combinations being viable with current battery technology. As battery technology improves, so will the transition opportunities increase.
- Critical suggestions from pilot studies require freight owners to accurately record and track the standing time of vehicles to acknowledge charging opportunities.
- Tools in the set include vehicle state of charge simulation matching the freight task with the energy required to ensure logistics technical feasibility.
- New service level agreements must be negotiated due to operating time lost on charging time.

Sustainability:

- Sustainability in transport is strongly connected to public awareness and an attempt to achieve goodwill. Without regulatory pressure, as stated above, the priority for changing fleets to EVs would be cost reduction.

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1. INTRODUCTION AND BACKGROUND

South Africa signed the Paris Agreement with a significant carbon reduction target set for 2050, based on the availability of developmental funding. Whether South Africa can achieve these targets heavily depends on the transport sector contributing to a large-scale transition to renewable energy vehicles. To drive this transition, one would expect vehicle manufacturers to design, develop, and market these vehicles and be prominent in setting the pace of the transition through their provision of renewable vehicle solutions.

Technology change is a challenging process, with multiple questions leading to various dead-ends, large-scale uncertainty and possible additional costs. For early product adopters, this can be exhilarating or costly, depending on their level of satisfaction with the product and how it meets their business needs.

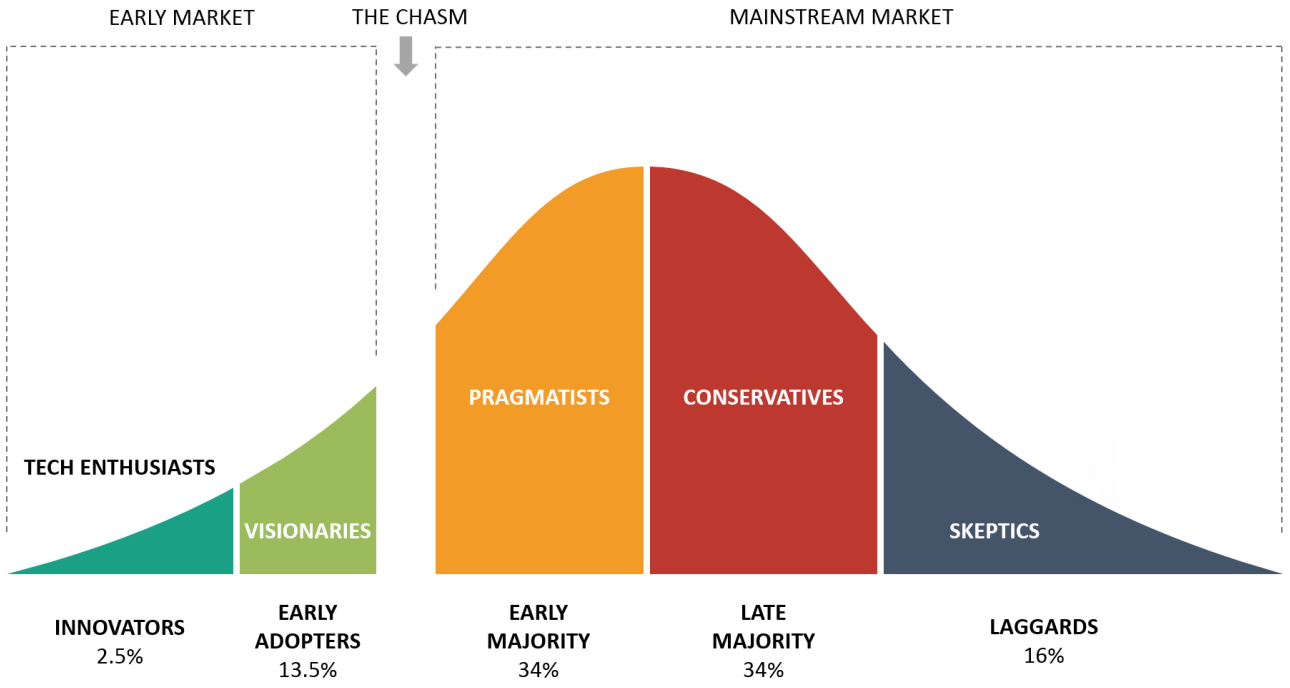

Figure 1: Technology adoption
Source: https://www.business-to-you.com

This report aims to provide a deeper understanding of the technology adoption position within the electric vehicle market in the South African light commercial freight context. A discovery approach was followed, whereby a researcher with knowledge of logistics in this field conducted interviews with several subject matter experts (SME). The intent was to understand various aspects of the transition to be considered, the role players involved and how the available information in the market shapes their decision-making.

2. SCOPE OF THE RESEARCH AND EXCLUSIONS

The freight market sector of this research focussed on light commercial vehicles, excluding heavy-duty vehicles and passenger vehicles. Stakeholders in the field of light commercial vehicles are:

- Vehicle manufacturers (OEMs)
- Logistics Service Providers (LSP)
- Freight owners (retailers, manufacturing companies, service providers)
- Banking and financial sector that finance movable assets
- EV fleet service providers, i.e. energy providers, charging service providers, etc.

The focus is on vehicles operating over shorter distances, and these stakeholders should find this report informative to their decision-making audience. Typical market segments that would be included in the investigation are:

- Logistics companies
- Fleet services
- Corporate fleets
- Field service companies - Consisting of teams carrying out ongoing maintenance on infrastructure, like Telkom roaming inspection teams

The typical products that would fit in these markets are vehicles like the DFSK EC35, the Daimler eCanter and the JAC N55. (See Appendix A for details and web links.) These selected electric vehicles and other brands in this category are small enough to fulfil the relevant transport requirements included in the scope of this report. Industry brands and services included could be the following:

- Bakers Limited
- DHL
- HeEurotel
- AVBOB
- DP World (Imperial)
- Courierguy
- City Logistics
- Skynet
- Amazon
- Takealot
- Octotel
- Telkom
- Bidvest

The focus will be on light commercial vehicles, with a far lesser focus on sedan-sized vehicles and larger-sized vehicles, like delivery trucks. The following brackets of services and vehicle configurations are excluded:

- Rental car fleets and E-hailing services
- Quad bikes, motorcycles, etc.

3. RESEARCH METHODOLOGY

The lead researcher (interviewer) developed a semi-structured interview guide based on prior knowledge and input received from project sponsors. This guide acted as a conversation starter, allowing the discussion to follow its course along with the specific expertise of each interviewee.

The interviewer initially provided background and scope limitations, followed by guiding questions. The broad themes covered in the interview guide were:

- Elements, attributes and stakeholders to be included in the transition decision process
- The possible product types or service applications that would fit into the scope
- Major concerns, risk aspects, and perceived barriers to the transition
- Priorities that freight owners would use to make the transition
- Identifying the ultimate decision maker(s) in the process

Interviewees were identified using multiple lenses, starting with known subject matter experts (SMEs). Since the interviewer has been active in logistics research for nearly 20 years, many close contacts and collaborators are SMEs and were reviewed for inclusion. Considering the scope of this specific research project, it was narrowed down to relevant individuals, cross-cutting the relevant stakeholder groups. From this, a snowballing approach was followed via additional references from interviewers to explore specific aspects that were not sufficiently informed by that point in time. This approach was followed until a sufficient topic saturation level was reached. A short anonymous summary of interviewees' profiles and experience are as follows:

1. A business development manager (BDM), working for a big-five logistics service provider (LSP), focused on developing customer solutions and, more recently, was involved in specific analysis to identify renewable energy transition opportunities for the LSP's customers.
2. A mainstream retail banker assigned to design financing products focused on logistics and specifically into entering the renewable energy vehicle market.
3. An original equipment manufacturer (OEM) specialist with the single assignment to introduce and market the company's electric freight vehicles into the South African marketplace.
4. Fleet owner who recently completed pilot studies and committed to the first larger-scale purchase of electric vehicles, replacing 10% of their ICE fleet over the next two years.
5. A big-five LSP business analyst with over 20 years of experience in both the automotive design and manufacturing sector, followed on with customer business analysis in the retailer distribution to retail store environment.
6. Former Logistics Manager at FMCG retailer (non-food) with 20 years of experience in the distribution centre to retail store distribution planning and execution in collaboration with third-party logistics service providers.

7. Director of a company developing and installing electric charging networks, selling charging as a service (CaaS) and energy monitoring solutions for individual businesses and developing collective regional and corridor designs.
8. A big-five LSP senior manager who focuses on strategy and sustainability with over 10 years of experience in logistics and advocates for transitioning to green transport.
9. An independent electric vehicles advisor with over 30 years of experience in electric vehicle design, energy planning and introduction to fleets
10. A provincial government official who is prominent in the freight transport planning space employed at a senior level within the provincial Department of Transport and Public Works.
11. A Logistics service provider focusing on smaller business-to-business deliveries to smaller retailers, restaurants, pharmacies and other essential non-consumer business deliveries, i.e. office equipment and supplies, etc.
12. Three researchers at a renewable energy research group were interviewed to determine their views on modelled energy supply and mix constraints seen from their work.

Detailed notes were made during each interview, and contributions to the outcome were captured in the results section to follow. A brief overview of interviewee perspectives, experience, and appointment level is shown in Table 1.

Table 1: Summary perspectives, experience and level of interviewees

NR	PERSPECTIVE	EXPERIENCE	LEVEL OR ROLE	COMMENT
1	Logistics Service Provider	> 5 years topic specific	Technical middle manager and business analyst	Engineer involved in technical feasibility analysis.
2	Asset financing	> 20 years	Senior management at retail bank	Seasoned banker focusing on developing her bank's offering to the EV transition
3	OEM EV specialist	> 20 years	Technical regional EV product manager	Electric vehicle product guru.
4	Fleet Owner	> 30 years	Operations Manager for fleet owner	Seasoned businessperson with a focus on financial feasibility before implementation.
5	Logistics Service Provider 1	> 20 years	Business Analyst	Key duty to develop customer logistics solutions
6	Retail Logistics manager	> 20 years	Senior Manager	Manager at Textile retailer involved in 3PL distribution contracts
7	Charging service provider	> 10 years	Director	Develop, install and operate chargers and charging networks as a service.
8	Logistics Service Provider	> 10 years	Senior Technology and Innovation Manager	
9	EV advisor	> 30 years	Independent consultant	Experience in EV design, energy planning and fleet introduction.
10	Western Cape Government	> 10 years	Provincial Deputy Director	Focus on freight mobility.
11	Logistics Service Provider	>10 years	Director	Senior think leader in their logistics operational company.
12	Renewable energy researchers	> 50 years combined	Research group with focus on energy	National energy mix focus with one transport energy expert.

4. RESULTS

The interview notes were analysed to reflect key discussion points and views to reflect the thoughts and perspectives of the subject matter experts. These results are represented in various sections relating to decision-making, drivers of priority in decision-making, exploring application opportunities, and identifying decision-makers. Perspectives on perceived barriers, risks and challenges are also included.

4.1 Decision-making on adopting EV fleets

The first point of discussion explores the methodology the stakeholder would follow in making decisions about adopting EVs into their fleet. The stakeholder's perspective reflects the lense through which they view the challenges.

The **business development manager** for an LSP has been involved in various business cases identifying and analysing opportunities for EV fleet transition. From his perspective, the process starts with a technical analysis to verify the technical feasibility and ensure that the vehicle specifications meet the freight movement effort. This might include technical analysis related to simulating the state of charge, energy requirements and locations, etc. Once technical and operational feasibility is established, financial calculations will be performed to determine the economic feasibility of the proposed solution. Through the analysis of various products and routes across their existing customer range, they developed an understanding of technical limits for specific vehicle-route combinations that can then, later, during their process, be applied to other existing or prospective customers. Their analysis shows opportunities in the mid-heavy vehicle range for far less than 5% of vehicle-route combinations. To increase the extent of transition improvement, battery technology, charging technology, import charges, and vehicle design for purpose are needed.

The **banker** zoned in more on the financial feasibility of the decision-making process. From her perspective, the decision is based on technical risk and financial viability. Banks will finance moving assets if there is an acceptably low level of risk to the bank. The financing extent includes, amongst others:

- Vehicle capital cost
- Extended infrastructure cost, i.e. chargers
- Miscellaneous other related assets (solar PV, substation upgrades, etc.)

Depending on the capital cost involved, the interest rate offered would be based on factors such as a proven residual value of the asset, and the transaction might require some proof of contracted mileage and the rate per kilometre charged. The well-established OEMs offer guarantees on residual value to ICE vehicle owners, leading to less capital required for new purchases. Often, when unknown OEMs enter the South African market, the residual value of their used vehicles is not proven yet. Banks might then be hesitant to own the risk, which could relate to shorter pay-off periods required and/or a zero residual value translating into larger monthly instalments required. The **FMCG logistics manager** confirmed this requirement for longer pay-off periods required for the larger investments required with EVs.

The **vehicle manufacturer** interviewed emphasised that the first task is to verify that the vehicle can technically do the freight transport work. They have developed a set of tools that can facilitate them in communicating with possible buyers to understand the technical solution before they make the final decision. Tools in the set include vehicle state of charge simulation matching the freight task with the energy required. This assists the client in the decision-making process of understanding whether a vehicle configuration can meet a specific freight task. The simulation also informs the size of batteries required for the vehicle, the number of charges involved, and the location of these charges. It also provides inputs in terms of energy requirements and ensures that sufficient energy can be supplied at the location where it is required. Third parties can then be involved at these locations to ensure adequate energy is available at the intermediate locations.

The **vehicle manufacturer** also states that EV adoption is a complex decision depending on multiple factors. An important aspect to remember is the return on investment that fleet operators are used to be in the range of three to four years, requires a mind shift to extend this to around six years for electric vehicles. This aligns more with the extended lifetime expected from the BEV with fewer moving parts.

A **fleet owner** interviewed who recently committed to a large-scale transition to electric vehicles for their fleet provides some sound advice on pilot studies. In their pilot study, they recorded significant savings in operating costs. He listed energy savings of 70%, maintenance spares savings of 50%, and maintenance labour savings between 30 and 50%. The critical suggestions from their pilot studies were that freight owners must accurately track the standing time of vehicles to acknowledge real charging opportunities and record the duration of those opportunities and the location of said opportunities. He also argues that actual vehicle trip data must recorded over a range of time to ensure that range anxiety is not overly enlarged due to individual perceptions or limited extended trip occurrences.

The second **logistics service provider** stated that decision-making in their environment would be dictated not by product or by carbon reduction incentives but by comparative or even lower than the present operating cost of ownership for an electric vehicle versus existing diesel vehicles. The driving decision-making factor will be the operational feasibility determining whether the electric vehicle can fulfil the task, enabling the logistics service provider to maintain service level agreements with customers.

The **EV advisor** has differing viewpoints on rethinking the mobility space outside of the accepted norms from ICE (internal combustion engine) vehicle ownership and operation. He also stated opportunities for retrofitting vehicles with electric drive systems rather than new designs. He argued that many businesses have vehicles that do not need body upgrades, and retrofitting should be part of the decision-making criteria. The total operating cost would be the significant driver coupled with the operational ability of the vehicle to fulfil the same function as the internal combustion engine vehicle. The **EV advisor** felt strongly about the decision-making process of adopting EV fleets, stating that existing technology might limit the thinking of vehicle designers. Aspects like battery swapping, electric road systems and localisation of critical components need to be carefully considered. He argued that the industry must think new and bold to design an ecosystem based on our strengths. He likened the EV transition to the transition from fixed-line telephones to mobile telephones, jumping from one technology entirely to a different technology and how that impacted the

communication industry. He further explained that with battery swapping one would have smaller batteries, charging stations distributed across various areas, reduced peak charging requirements and energy supply challenges at specific locations. Through a distributed charging station network, the battery levels can be centrally managed. This requires higher level systems thinking by multiple players in collaboration.

The **WC (Western Cape) Government official** was concerned about decisions being made by various parties in the transition without considering provincial and national-level electricity grid implications. The more significant dependence on energy supply will cause issues in terms of energy supply-related skills was another concern voiced by them. Whether the regional, provincial, or national level skills are available to support the vehicle transition, the energy supply and energy charging infrastructure at specific locations of truck stops, depots, and warehouses is to be decided and needs a higher level of public-private collaboration. Decisions on vehicle design and supporting infrastructure design would influence provincial and national truck stop capacity and subsequent safety for all road users. There are concerns for the vehicle and battery systems and policy uncertainty related to the technological changes in process.

The third **logistics service provider** confirmed what has been said before.

The **RE (renewable energy) research group** do not have significant knowledge of electric vehicle adoption. However, they have developed models on anticipated energy requirements to support a national vehicle transition over the medium to long term. The group has sufficient knowledge to model the energy requirements for national-level planning on energy supply and distribution required for additional vehicles in new energy sectors. Key challenges are that they receive conflicting renewable energy alternatives posed by industry, i.e. hydrogen, biofuel, LNG, LPG and electrification, causing multiple scenarios that could further confuse and delay the vehicle market with achieving a significant transition to renewable energy vehicles in the short term. Their modelling does recognise that a transition to electric vehicles for both passenger and freight will offset the diesel demand with an increase in electrical energy, and the question remains how much and by when.

4.2 Priority of decisions

All stakeholders agree that although much time is spent on agendas around climate change and environmental sustainability, the only proper priority for changing fleets to EVs would be cost reduction. All other aspects mentioned related to prioritising decision-making reflect on peripheral elements such as:

- Carbon reduction
- Noise reduction
- Driver comfort
- Etc.

The only aspect where priorities are shifted might be with decarbonisation incentives offered or CO2 penalties charged that essentially internalise the externality cost. Whether incentives are tax based or via pressure from customers or consumers, it still boils down to a financial

cost of ownership decision. Carbon credits can act as a form of additional revenue that could decrease the cost of EV adoption and increase the adoption speed.

Even the internal sustainability drive from individuals in management or executives is limited to pilot studies and investigations to obtain information that enables informed decision-making. If these do not prove to have a significant financial benefit with limited to no increased risk to service levels, then they will not be adopted by the larger board of directors. Most of the interviewees alluded to the fact that no company management can afford to risk the short-term financial sustainability of the business by paying a premium for the transport of products. It does not matter who it is, neither the freight owner, transport operator, retailer, nor the consumer can absorb additional cost. Incentives will have to be administered from outside the product supply chain environment, or they will wait until financial feasibility is achieved, at which point a large-scale transition will naturally occur.

The second **logistics service provider** explained that their focus is on improved decision-making to reduce the possibility of significant technical losses, resulting in a reduced financial benefit of EV fleets. Scope 3 (indirect) emissions, including subcontracted EV fleet transport, are included in the EV fleet customer base's carbon footprint and financial reporting. As stated previously, cost reduction remains the most significant focus. The result is that the net financial benefit to the customer could be reduced if higher pollution rates result in carbon penalties (in monetary terms) that could force the logistics service provider using the EV fleet to change its business model or service offering.

Business models requiring OEM data inputs, including telematics data on existing vehicles and expected performance data for renewable energy vehicles, will have to be reviewed. Data can be used to explain how a transition will impact the customers' carbon footprint.

The **EV advisor** further explained that cost reduction would be the major driver, and thus, a detailed vehicle lifecycle cost needs to be accumulated. The first argument here is that lifecycle extension is required for periods of 10 years or even more to compensate for the increased expected life of EVs. Net positive cash flow for EV fleets will not be in year 3 but may be expected only in 5 or 10 years, while the extended vehicle life cycle might have to be operationally considered and incorporated into the decision-making process.

The third **logistics service provider** confirmed that they experience low levels of pressure from their customer base to make significant shifts on environmental social and governance (ESG) reduction targets. They and their customers deem maintaining profit also as a sustainable practice.

On this aspect, the **charging service provider** merely confirmed what has been said before.

4.3. Possible product types/applications

The **logistics service provider** claimed that all product types can be included in the transition to EVs. One challenge is with hazardous products since sparks in the electric vehicle drive train can cause large-scale explosions where flammable product leakage is possible. Their experience is that predictable routes are essential to reduce the risk of

batteries running dead. Any product can be handled in this way if the route is predictable within a specific range of around 200-250 kilometres per day with current commercial technology. It can be expected that most of these transport tasks would be in the second distribution leg using smaller vehicles that run from distribution centres up to retail stores or for home delivery applications.

One specific example mentioned for light commercial freight vehicles includes product types in the building and construction industry. Smaller vehicles like the Hino 300 in a flat deck configuration can deliver various building and construction products from the distribution centre (DC) to small retail stores. The smaller vehicle is used to ensure accessibility to small retail stores located closer to residential areas and smaller construction sites.

Another application mentioned by the LSP is their vehicle support and breakdown teams. They usually operate from depots placed along freight corridors with a relatively short distance of about 150 kilometres from any possible breakdown. These vehicles typically have a long waiting time for a service call and allow for sufficient charging time.

The **banker** provided examples of product types and service applications she has been exposed to. In most instances, the examples relate to home deliveries as the critical focus. All examples involved a Financing Lease Model (FLM) with the agreement involving a third party taking vehicle ownership and leasing the EV to the freight operator. All these examples have been in the smaller vehicle market, involving vehicles in a smaller than three-ton range. This third party would then finance the vehicle and accept the risk of the new technology associated with the vehicle. Examples of these are (freight owner/operator – FLM partner):

- Takealot – Avis
- WW Dash – Everlectic
- Checkers Sixty 60 – RTT

The **vehicle manufacturer** interviewed stated that the product type transported was irrelevant to the technical feasibility. The distance is more relevant due to its direct relation to energy usage. Extremely heavy products might require marginally more energy due to energy losses increasing, which could translate into more frequent charging stops or require more onboard battery storage. However, the route distance and profile are more important than the product type.

In a combined interview with a **manufacturing company** and their logistics service provider, they argued that their application has lighter products that cause vehicles to often cube out before they weigh out; in other words, it reaches its volume capacity before hitting its maximum weight capacity. The same parties argued that the most important in finding suitable product types or applications for EVs are having dedicated routes, known trips and long-term contracts.

The **fleet owner** making a large-scale transition argued that range is the most critical aspect when finding possible applications, not product type. In their case, 200-300 kilometres per day is the sweet spot for their new vehicles to be deployed, irrespective of product type. Shorter routes are too expensive due to capital costs not being offset by reduced running costs. At the same time, the longer routes carry range risk.

The **charging service provider** mentioned that the variety of transported product types is not limited. They are providing private service applications across various product types, including FMCG retail (both brick-and-mortar and online with home delivery) and various LSPs operating in different economic sectors. The available electric vehicle options in the market are improving, and this creates a possible delay in decision-making towards a transition.

The c**harging service provider** alluded to the improvement in vehicle specifications and increasing capacity with charging infrastructure. They facilitate product rollouts in various sectors, including home delivery and larger-scale operations. Their vehicle charging products are incorporated across various industries and transport applications with limited exclusions like hazardous products, also mentioned before.

The third **logistics service provide**r indicated that product types will not dictate the adoption of EV fleets, but the distance travelled across various products is more critical. Some products will prevent a complete EV transition, especially fuel delivery and hazardous chemicals where there's a risk of explosions due to sparks caused by the electric vehicle. Cross-border operations are limited by legislation and introduce another significant challenge where some vehicles are used for both national and cross-border operations. Questions about cross-border charging opportunities and legislation allowing the vehicle to operate in neighbouring countries were raised.

The **EV advisor** agrees that the distance of operation is the significant challenge, not different product types. He also indicated that the existing retrofitting implemented will provide an indication of opportunity for EV applications. He referred to retrofitting on game drive vehicles and how that has changed the perspective of game drives.

The **WC Government official** is of the opinion that many renewable energy transition applications within the government mobility space are available. Government-owned vehicles used by government staff to perform their duty are low-hanging fruit for a renewable energy transition over the next few years. Government officials in decision-making roles do not necessarily have the skills and knowledge to drive this decision, and we'll have to be guided by industry. A concern raised is whether stated potentially EV fleet applications and benefits could actually be realised and whether the stated benefits were merely marketing material guided by parties in the EV industry with their own interests in selling their products.

The third **Logistics Service Provider** operates a pilot study with small store deliveries in the FMCG retail space on a hub and spoke model with some milk run elements. This involves an average of 150 km per day, with a maximum of 200-250 km per day. Delays during delivery complicate matters and might lead to state-of-charge issues with energy requirements of perishable items that need temperature control. He expects line haul on corridors to be a longer-term transition once larger vehicles obtain longer ranges. Mostly lighter weight products would be ideal since they experience a similar vehicle can carry 4 tons while the EV can only hold 3.2 tons.

4.4. Barriers and risks to mass EV fleet adoption

The **business development manager (BDM)** explained the contracted agreements between logistics service providers and their clients are based on a fixed price under service level obligations. This is typically a fixed-term contract for between two and five years, or it could also be a shorter rolling-term contract. New service level agreements will have to be negotiated due to operation time lost on charging time or other unique operational challenges that might arise.

The **BDM** identifies the most significant challenge as vehicle range and the resulting limitation to transport tasks that could be completed on a single battery charge. After range anxiety, finding charging time is often the most crucial element many companies ponder. The challenge is to schedule charging time within a day's required operational time. If night-time charging is planned, where does the energy come from, especially if there is a requirement that renewable energy should be used? In such a case, battery energy storage systems are needed which increases capital investment and the total cost of ownership. Other concerns mentioned are new skills and equipment required for EV maintenance and related training requirements for existing employees, which are unsure. It is often stated that EVs have less maintenance requirements and thus fewer maintenance personnel, which creates uncertainty about employee lay-offs.

The **banker** confirmed that the residual value of imported electric vehicles is a concern and possibly a barrier due to the extremely high fixed cost of 150-300% as expensive as existing internal combustion vehicles. This premium also attracts an import tax of 25% for electric vehicles versus only an 18% import tax for internal combustion engine vehicles. Currently, no mainstream locally manufactured vehicles are available, and this is an area that automotive manufacturers should explore and provide solutions for, but first, a market is required for off-take.

The **vehicle manufacturer** stated a significant barrier as existing perceptions of return on investment being three to four years. To overcome this, vehicle owners should take a new perspective in accepting that electric vehicles have a longer useful life and higher reliability over this longer lifespan due to fewer moving parts than internal combustion engine vehicles. He, therefore, argues that vehicle owners should be able to achieve similar service levels for up to over eight years and should consider longer replacement cycles than the current four to five years. Thus, a change in business model around these vehicles is required to enable a considerable transition.

The **vehicle manufacturer** also experienced concerns about energy availability. This concern can be addressed by incentivising many third-party service providers to develop and roll out charging solutions, although primarily for smaller vehicles. However, faster chargers for medium to heavier goods vehicles will also follow soon. Without these charging solutions, companies would be hesitant to transition to EV fleets due to uncertainty about energy availability along their operating routes. The ratio of vehicles to chargers will be a balancing act between availability to vehicle operators and underutilisation due to a low transition level to these vehicles.

A **manufacturer** was interviewed together with their logistics service provider. They were looking at longer-distance freight transport and were reasonably concerned about the adherence to their service level agreement. Energy availability on the route for the 1600 km round trip is the challenge they posed and the time lost due to multiple charging instances along this route.

The **fleet owner** indicated that battery life was a concern initially, but various battery second-life options are arising as they continue their pilots and transition. Older vehicles with reduced battery capacity can still be used by shifting these vehicles to shorter route applications or eventually re-purposing the batteries to store their self-generated solar PV electricity at their depots. This can then be used to charge vehicles when out of operation overnight. In their fleet application, there is sufficient operational downtime to justify the charging time needed for solar PV and/or out-of-peak charging, with some battery storage becoming more relevant operationally towards the end game of a complete fleet transition to electric.

The **fleet owner**, implementing the large-scale EV fleet transition, further states that the drive for sustainability in transport is merely connected to public awareness and an attempt to achieve goodwill. Companies on their own cannot invest in transition unless it is at a lower cost. He feels that government subsidies would be the only way to achieve promised targets for the decarbonisation of transport. He further advised that the South African Revenue Services should implement tax relief incentives based on income statement improvement to fast-track the transition.

The **FMCG logistics manager** had a vast learning experience from their transition to electric forklifts in their warehouse environments. They operate three large FMCG warehouses across South Africa, and this transition had its teething problems. Battery swopping was their chosen technology within their 24-7 operations. They experienced initial challenges in finding the balance between the number of additional batteries required and the speed of charging and capacity of chargers used. They also realised the risk exposure associated with being a first adopter of battery electric forklifts and the impact of a loss of this dedicated equipment. If, for example, a fire occurred in the charging bay, it could disable their complete warehouse operation since chargers and batteries at that time had a long lead time to replace, and replacement electric or other forklifts was not that readily available. The key message here was decisions should be based on managing risk and ensuring that operational performance can be maintained.

The **charging service provider** indicated that many pilot studies are directed at higher-range expensive batteries. The question should be asked about cheaper battery options such as Sodium-Ion-Phosphate with a lower range but half the price of Lithium-Ion batteries. Thus, offering modular designs with a level of configuration to customise the vehicle according to the intended application would benefit the transition. Range anxiety and sufficient charging station availability en route remain a barrier. However, the battery technology is improving quickly. Homologation of new vehicles is time-consuming and takes significant effort. (Initial pilot studies that the **charging service provider** has been involved with ranged between 14 and 23 months in duration.) The banks are experienced as too risk-averse to change this technology. However, some pilot applications have been financed via car rental companies and other fleet managers on a vehicle rent basis.

The second **logistics service provider** highlighted that the most significant concern remains the range of the vehicle. Some OEMs have recently launched new vehicles that are improving on previous models regarding range and carrying capacity. Higher capacity (MW) chargers will also significantly reduce the required charging time. Another concern related to the energy source and where the energy comes from, being renewable energy, how it will be stored with battery electric storage systems required and the subsequent cost of charging infrastructures. Anecdotally, the **logistics service provider** indicated that drivers support an EV transition since, during pilot tests, the driving experience was far less taxing on the body and driving was made easier. More studies could and should be done to confirm driver acceptance. An uncertainty for vehicle operators is maintenance level training and upskilling that must be done. Electrical skills are not only needed for maintenance and training but also for charging infrastructure installation and operation. This research is required at the OEM level but also at the vehicle owner level during pilot studies and early adopters after the transition has started. Customers are unwilling to absorb the cost. Thus, significant changes will have to happen regarding incentives or penalties that need to be implemented before a transition will naturally occur. An aspect that concerns this LSP is whether a complete vehicle lifecycle assessment has been done to compare diesel vehicles versus electric vehicles on a cost and well-to-wheel (WTW) carbon emissions level.

The **EV advisor** states that the first barrier to entry is support from the government to achieve Paris Agreement commitments. Change management is required, and the government will have to either provide incentives for a large-scale movement towards electric vehicles, or penalties through carbon taxes might change the business model to start a transition. Charging infrastructure advances also indicated some delay is experienced due to decision makers waiting to see whether a better product might be around the corner. The EV advisor also explained how, over 30 years in this industry, the skills and technology are improving, and a transition is imminent. He also indicated that by 2020, from a range perspective, no vehicle had a range of over 600 kilometres. In contrast, the top ten vehicles from a market perspective listed in 2024 all have over 600 kilometres of range available. However, blocking strategy from fuel companies bringing other alternatives like hydrogen vehicles into the picture confuses buyers and delays the transition.

The third **logistics service provider** is concerned about the vehicle's residual value at the end of their regular replacement cycles. Drivers welcome the EV vehicles for their silent and smooth operation and typically are disappointed when a pilot ends. The regulation about ownership responsibility of battery at the end of life is a barrier to decision making. Like tyres that have to be dealt with by LSPs, they are concerned about the batteries and disposing of them at the end of their useful life. Energy availability and charging facilities en route also hamper quicker transition. In some contract cases, customers have approached them to discuss joint value proposals for reducing carbon emissions but have not yet been keen to absorb a portion of the additional cost to adhere to ESG or other goals.

4.5. Ultimate decision-makers

Most interviewees confirmed a two-phased approach, including 1) a technical analysis and operational feasibility, followed by 2) a financial feasibility analysis. Some specific details provided by various interviewees are explored below.

The **business development manager** working for a logistics service provider stated that their technical team usually does a technical feasibility analysis based on either an internal sustainability drive or internal interest by the company. Another trigger might be a request by a client; after the technical analysis has been completed, the finance department would then make a financial proposal to the board of directors that would ultimately make the final decision. This process will be performed with input from the client and a business development manager.

The **banker** directs the ultimate decision-making power towards the executive management level since this change should be seen as a significant change in facility operations and incorporates a large element of risk associated with elements of unproven technologies. She believes that financing will fall to the side of the logistics service provider taking ownership of the assets. This would often be one of the larger top five logistic service providers like DP World, Supergroup or Unitrans. Financing could also involve the manufacturers' support instruments, such as buyback guarantees.

The combined interview with the **manufacturer** and **logistics service provider** concluded that a combination of technical and financial feasibility proposals should be tabled to a senior management team to make this decision together. They believe that pressure on carbon reduction will soon drive this decision-making higher on the agenda.

The **fleet operator** is transitioning to EV, which is 10% of their fleet scale, and started with solar panel installations many years ago. This first solar proof of concept to the board of directors prompted the belief in the first pilot study for EVs, which eventually led to a sound understanding of the possibilities, challenges, and opportunities of transitioning to an EV fleet. This led to further pilot studies on technical feasibility, and eventually financial feasibility and subsequently the decision to venture into the larger scale transition towards EV fleet adoption. The fleet operator unequivocally mentioned that once this two-year transition of 10% of the fleet has been completed, they are not sure whether they'll continue with a transition to more EVs or whether future vehicle replacements might see a move back to internal combustion engines. However, the data they will obtain from this 10% of their fleet being EVs will facilitate informed decision-making.

The **fleet owner** had to use operational justifications to convince the board of directors to perform a pilot study. The operational proof of concept provided sufficient data to justify a 10% fleet transition over the next 2 years inside the normal vehicle replacement cycle. He believes the data generated as the transition happens will direct their future decisions on the vehicle technology required to replace their other ICE vehicles to maintain their service level requirements.

The second **logistics service provider** indicated that ESG and compliance are the arguments to tick all the boxes for customers. However, logistics service providers are jammed in the middle between the product manufacturer and the downstream customer. From a strategy perspective, it is essential that innovation be part of the decision-making process and that it does not perpetuate archaic business models but a fresh financial perspective. Once electric vehicles become cost-comparative, the transition decision-making models will be simplified.

The **EV advisor** took a different view on this question other than technical feasibility and financial feasibility. He also advised that decision-makers should zoom out to a much higher level. If one is considering environmental change required, the question of what level the decision-making and response should be on, i.e. the company focus, a country focus or a global focus. These different levels under consideration would also be necessary for a country like South Africa to understand from an environmental perspective whether the carbon and climate change benefits we obtain from investing in technology is worth the resulting change.

The **WC Government official** was concerned that decision-makers take approaches that are limited to their preferences or short-term goals, leading to costlier outcomes for other infrastructure users. Without all stakeholders seeing and understanding the complete picture, this is a valid concern.

The third **logistics service provider** stated that his company wanted to show some level of ESG commitment to its customers, thus the pilot study with a small freight EV. Decision-making is done by the technical and financial teams in collaboration with the MD.

4.6. Results summary

The semi-structured interviews followed a similar pattern with each participant. Deviations were allowed based on personal areas of expertise and interest but also followed vital aspects that would be top of mind and relevant to each interviewee based on their company and individual perspective.

Aspects visited elaborated on the decision-making elements, process, key decision makers, barriers to entry into the market, and exploring the potential application areas. Towards the end of the twelve interviews, a level of saturation was achieved where comments made were more confirmation of previously raised points than putting new discussion points on the table.

5. MANAGEMENT APPLICATIONS

Several management perspectives can be drawn from the interviews. The most prominent ones are presented here, sorted under headings to combine specific concepts for different stakeholders to consider during a transition process.

5.1. Technical feasibility first

A solution that cannot derive the best possible technical implementation into the business operations will not adhere to service level agreements (SLA) with customers. First and foremost, it is required that a transition should not negatively impact the rest of the supply chain in any way. If the customer SLA is affected, it requires additional cost to buffer stock unavailability, which would be unacceptable and could lead to penalties and the overall rejection of the technology. Thus, it is critical for the sustainability of the transition solution to work technically and be operationally similarly efficient, if not even improved.

It is advised to record specific metrics for the existing fleet across all routes and individual vehicles. Performing technical feasibility on perceived metrics and maximum or assumed values has shown to skew the feasibility outcome to favour traditional ICE vehicles. Critical suggestions from pilot studies require freight owners to accurately record and track the standing time of vehicles to acknowledge realistic charging opportunities, including the duration and location of vehicle stationary opportunities. Actual vehicle trip data across multiple seasons must be recorded and analysed to ensure accurate range expectations are considered in the calculations and that perceptions of isolated worst-case routes are not seen as typical operating requirements.

5.2. Cost drivers

The capital cost of the initial electric vehicles is still considered high (50-200% higher than conventional ICE vehicles). It requires preferential interest rates and longer pay-back terms for the initial capital investment amount to be justifiable.

Some pilot studies indicate that energy and maintenance costs are significantly lower, at an expected 70% and 50% cost savings, respectively.

Operational availability remains a significant concern but proves to be of lesser concern once true opportunity charging during loading operations is understood and applied.

A mind shift on the asset's usable life should be incorporated into the decision-making. Due to less movable parts, the electric motors and drives can be used for over 50% more kilometres than conventional vehicles and, during this operation, maintain reliability as required by the customer SLA. Thus, a new cost mindset needs to be adopted by the transport industry to unlock the decision-making towards this renewable energy vehicle types.

5.3. Bank sector and green financing options

Business retail banks are designing financial products for the EV fleet sector with a specific focus on logistics businesses. This involves creating new asset codes within the banking sector specific to EVs and the miscellaneous equipment required to support the fleet transition. These financing products are linked to funding opportunities from international banks and institutions such as the World Bank, IMF, green funds, and other development initiatives that provide source capital. A project's carbon commitments and proven continuation of carbon savings delivery can then unlock concessions on interest rates and open longer timeframes to repay the capital amount, enabling banks to provide more preferential rates for financing these assets.

Concessions are often linked to specific proof of CO2 reduction from the project where the financing is allocated. This places additional requirements on the bank and the client to provide the required evidence and ensure that the funders' intended decarbonisation aims are achieved and maintained over the financing window.

Similarly, banks are also in discussions with the South African Reserve Bank (SARB) and the government about preferential rates and incentives provided to businesses for South Africa to achieve the Paris Agreement pledged for 2050 that the national government has entered.

5.4. Policy aspects

One aspect to keep in mind is vehicle homologation (granting of approval for use by the official authority). Vehicle manufacturers should plan carefully on time horizons to introduce new vehicles into the market since homologation is a time-consuming process and could delay the start of pilot studies, adding to hesitancy and concerns for potential users.

Some interviewees mentioned challenges related to delays in obtaining approval of Performance Based Standards (PBS) vehicles in multiple provinces, leading to a realistic cause of concern. Given this pattern, it might be questionable whether the homologation of electric vehicles will as easily be supported and quickly performed.

Other policy aspects to consider related to heavier-duty vehicles are axle weight limitations, vehicle length, driver licencing and safety expectations and regulations.

5.5 Change Management

Change can be difficult, and small benefits will not be chased. If the cost-benefit is insignificant, the transition will be slow and fraught with examples of failures. Once the cost-benefit is significant, it will be quick and occur naturally, with challenges in new energy vehicles and peripheral service availability being the major factors holding back the adoption rate.

Facilitating change management amongst new vehicle owners and communicating both pitfalls and success stories will create confidence and acceptance from prospective vehicle owners. Industry stakeholders who would gain the most benefit from the transition should collectively drive this change management. This would include vehicle manufacturers, charging infrastructure manufacturers and operators, and battery manufacturers.

5.6. Other notable points

Skills required for post-transition situations require the redeployment of multiple existing employees across the logistics sector. How this will be orchestrated and implemented is yet to be seen, but a critical facilitator to a smooth transition.

Appropriate planning and preparation are required for both pilot tests and small-scale initial transitions to be meaningful, informative and effective.

New service level agreements will have to be negotiated between logistics service providers and customers to reflect the operational limitations of renewable energy vehicles, if any.

6. CONCLUSION

South Africa signed the Paris Agreement with promises for action by 2050. This implies a certain level of commitment that should drive decision-making by various policymakers. This project established an interview guideline based on the project directive, followed by 12 interviews with subject matter experts in the logistics sector ranging from vehicle manufacturers to logistics service providers, freight owners, asset financing sector and EV feet owners. This input was discussed along with specific themes provided by the project scope statement.

Key take-outs from the interview discussions are that buy-in for EV transition is very much focused on the overall cost of operations reduction; however, it depends on the security of energy supply and confidence in the technical ability to adhere to customer service level agreement.

Another key thought is that this technology change is so significant that technology developers and adopters should not look at replacing the conventional vehicles but also think entirely new and innovative about the application of the technology in terms of the freight task required and outside of how they used to do this for multiple decades.

7. APPENDIX A: VEHICLE TYPE DESCRIPTIONS

DFSK EC35,

https://www.dfsk.com/portal/index/vehiclemodelmobile/id/61.html
https://envirowheels.co.za/Pages/EC35-Van.asp
https://www.autotrader.co.za/cars/news-and-advice/automotive-news/dfsk-showcases-all-electric-ec35-van-at-festival-of-motoring/10809

DAIMLER ECANTER

https://dtsa.daimlertruck.com/fuso/about/media/daimler-truck-southern-africa-powers-up-with-the-launch-of-its-eactros-and-ecanter-range-in-south-africa/
https://mercedes-benz-trucks.co.za/media/news/daimler-truck-southern-africa-powers-up-the-launch-of-its-eactros-and-ecanter
https://dtsa.daimlertruck.com/fuso/about/media/glimpse-of-the-future-with-fuso-ecanter/
https://www.engineeringnews.co.za/article/daimler-truck-to-start-selling-the-electric-ecanter-eactros-in-sa-next-year-2023-05-09

JAC N55

https://jacmotors.co.za/jac-motors-n55-ev-truck-plugs-into-an-electric-future/
https://www.autotrader.co.za/commercial/news-and-advice/agriculture-news/5-things-you-need-to-know-about-the-jac-n55-all-electric-truck/10930

8. APPENDIX B: AGREED SCOPE: EV ADOPTION DISCOVERY REPORT SCOPE – FOCUSED ON LIGHT COMMERCIAL EV ADOPTION

1. Who is the audience of this report?
   1.1. The bulk of the output will become a publicly available report – view it as 'industry collateral.'
   1.2. A 'soft touch' approach will be followed, where a non-competitive market player gathers industry-wide information that will be difficult to source by any single EV market player.

2. What mark segments will this Discovery Report focus on?
   2.1. Typical market segments could include:
      2.1.1. Logistics companies
      2.1.2. Fleet services
      2.1.3. Corporate fleets
      2.1.4. Field service companies - Consisting of teams carrying out ongoing maintenance on infrastructure, like Telkom roaming inspection teams.
   2.2. The main focus and use case should be light commercial applications:
      2.2.1. This mix features vehicles like the DFSK EC35, the Daimler eCanter and the JAC N55.
   2.3. Companies could be listed or other.
   2.4. Typical brands and services include:
      2.4.1. Bakers Limited, DHL, HeEurotel, AVBOB, DP World (Imperial)
      2.4.2. DHL, Courierguy, City Logistics, Skynet; Amazon, Takealot; Octotel, Telkom, Bidvest

3. What/who does this Discovery Report NOT focus on?
   3.1. The following transport market segments are excluded:
      3.1.1. Rental car fleets and E-hailing services.
      3.1.2. The focus will be on light commercial vehicles, with a far lesser focus on sedan-sized vehicles and larger-sized vehicles, like delivery trucks. This implies that quad bikes, motorcycles, etc. are excluded.

4. Who should the questions be asked to?
   4.1. A broad survey to a large audience will arguably not deliver good data as the field of study and research questions are very specific in a niche field. Without such a large audience, a statistical analysis (more than indicative) of the data will not be possible.

4.2. Similarly, a case study of one approach is not ideal as no single South African company/entity has such unique insight or success that the Discovery Report can only rely on this entity. (Such a unique entity would have been speaking to Tesla founders and building a Harvard Business School-like case study.)

4.3. The approach identified as most suitable is a semi-structured interview with key experts, each adding value in a specific area with potential overlap.

4.4. The researchers should help expand the identified experts. A broader approach could be followed by inviting participants from industry. Target those outside our network, aiming for 50+ and a conversion of about 20%, getting you to 10 interviews.

4.5. Typically, the experts can comprise some of the following:

COMPANY TYPE	EXPERT'S ROLE
FMCG	Sustainability expert
FMCG	Fleet manager
Logistic company	Fleet manager
Domestic financier	Low carbon finance products
International financier	Preferential funding expertise
Research institution	Sustainable transport focus, could pursue academic paper in kind

5. What are the key questions to ask?

5.1. Establish and order priorities: How are market segments (see section 2) making decisions on adopting EV fleets based on the following criteria and order them:

5.1.1. Cost reduction:

- Initial CAPEX and/or operating cost and/or lifecycle cost.

5.1.2. Carbon reduction:

- Does the company's sustainability framework incentivise EVs, and if so, how?
- Is EV fleet adoption a Carbon Tax consideration?
- Has the EU Carbon Border Adjustment Mechanism (CBAM, aimed to put a fair price on carbon) entered the discussion?

5.1.3. Preferred supplier/Market access:

- What do clients want as proof that EVs are less pollutant?

5.1.4. Who will be the ultimate decision-makers responsible for mass EV adoption within the company:

- Strategy
- Sustainability/ESG
- Compliance
- Fleet specific
- Procurement
- Other

5.1.5. Question to party interviewed: ‘What else am I not thinking of?’

5.1.6. What are the market segments (see section 2) viewing as the core risks/ stumbling blocks/barriers for mass EV fleet adoption?

- Does ‘range anxiety’ play a role?
- Are there existing fleet insurance concerns?
- Is charger availability a primary concern?
- Is electricity availability a primary concern?
- Question to the party interviewed: ‘What barriers and risks am I not thinking of? Please order them.’