Executive Briefing

SWIS ROAD FREIGHT DECARBONISATION STRATEGY

Government of Western Australia – Department of Transport

Background

Transport is Australia's third-largest source of greenhouse gas emissions and is expected to become the largest by 2030. Heavy vehicles contribute 27% of road transport emissions despite comprising only ~3% of registered vehicles. Within WA, small to medium rigid trucks dominate heavy vehicle registrations, particularly in urban areas.

The Department of Transport is developing a Heavy Vehicle Decarbonisation Strategy and engaged MOV3MENT to assess future energy demand for electric trucks and the implications for the SWIS electricity network. The initial focus is on small to medium rigids over the next decade, reflecting their higher likelihood of early electrification in the Perth Metropolitan area.

Project overview

Over the past year, MOV3MENT undertook research, industry consultation, total cost of ownership (TCO) modelling, and a charging analysis to answer five key questions:

1. **What** uptake of electric trucks is expected by 2035?
2. **When** will electric trucks charge?
3. **How much** charging will occur?
4. **Who** can charge at depot?
5. **Where** is public charging required?

Insights were tested via a Steering Committee with iterative deliverables culminating in a final report in November 2025.

Methodology

- **Uptake modelling** was adapted from MOV3MENT's 2023 study for WA to project electric truck/van numbers to 2035, using the BAU ('low') scenario based on current sales and policy settings.
- **Research** was undertaken to assess the expected changes in battery technology, costs and charging capability. Public truck charging case studies were also evaluated to understand the expected locations and types of charging required.
- **Consultation** with 12 fleets and eight truck Original Equipment Manufacturers (OEMs) helped validate assumptions and develop ten representative charging profiles with different size, energy consumption and operating assumptions.
- **Total Cost of Ownership (TCO)** was assessed at the individual vehicle level with modifications through to 2035 based on technology and cost improvements to assess anticipated timing of price parity with diesel.
- **Charging analysis** occurred as the final stage and leveraged uptake modelling, research and consultation insights to assess how much charging could occur at depots vs public sites based on vehicle types, site constraints and locations.

The key methodology tasks (shown below) were combined into a first stage report (Research, Consultation and TCO Analysis), second stage report (Charging analysis), and final integrated report (SWIS Road Freight Decarbonisation Study). The following four pages present key findings related to each of these tasks including charging behavior and locations.

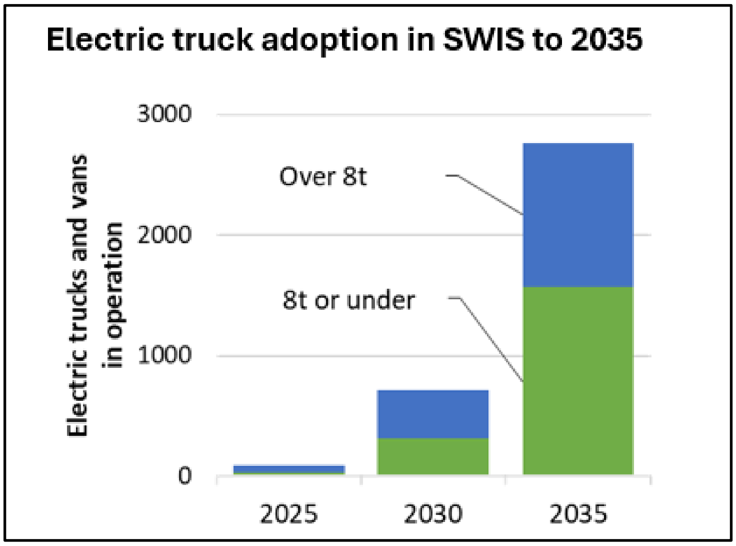
Key findings

Uptake modelling

By the end of 2025, around 90 electric trucks and vans are projected to be operating in WA, with Centurion accounting for roughly one-third of this early market.

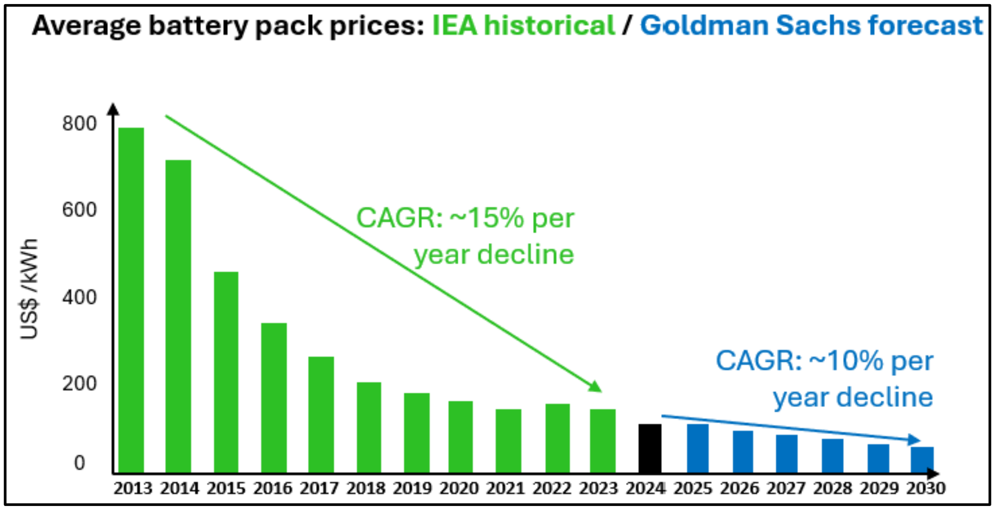
While initial sales are less than 1% in 2025, by 2035 electric trucks and vans are expected to represent over 15% of new sales, with 2,800 vehicles on the road by then. More than half of these vehicles will be 8 tonnes or under (see graph, right), concentrated in urban delivery and short-haul applications.

Under a 'High' uptake scenario, the fleet could grow to 12,000 electric trucks and vans—four times the BAU projection. This growth is expected to be more skewed toward larger trucks and would require significant government policy support.



Research

Batteries account for 30% to 50% of electric truck production costs. Therefore, expected reductions in battery prices of around 10% annually by 2030 (see graph, below) are expected to lead to 15% to 35% lower electric truck prices. This cost reduction aligns with accelerated adoption from 2030 when cost parity with diesel is likely in many segments, with 75% of electric trucks projected to be purchased after 2030 in WA.



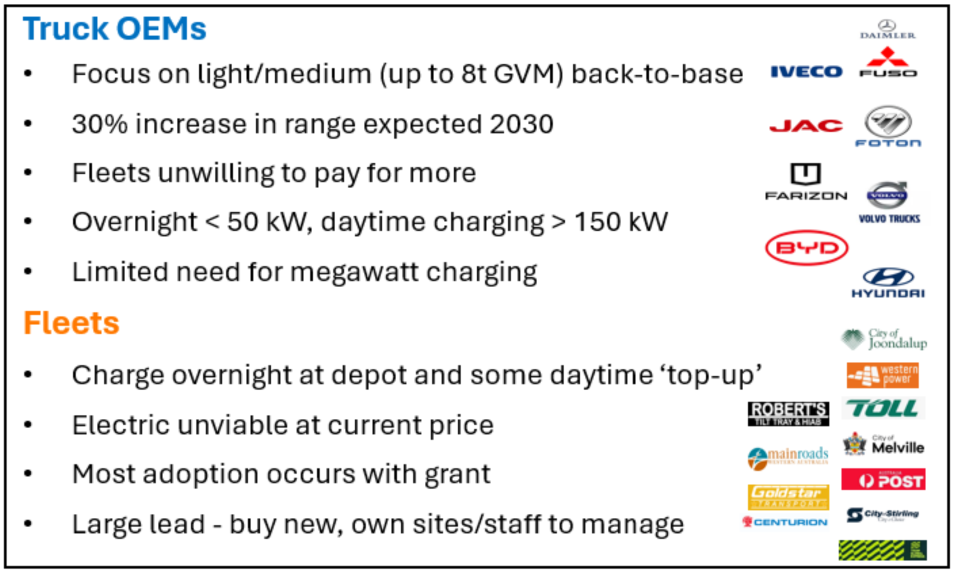
LFP (Lithium Iron Phosphate) battery chemistry will dominate electric truck supply, driven by performance improvements and the types of trucks sold. While energy density and battery capacity may double, additional cost and charging considerations mean vehicle range may increase by only about 50%. Truck charging speed capability (kW) could also double, but installed capacity may not scale at the same rate.

Research suggests that only 5% of electric truck charging locations in Australia will be public, primarily for enroute charging. However, site constraints may push 15% of charging to public sites, supplying around 30% of total energy demand. This is similar to Europe, where 10% of charging is expected to occur at public locations but accounts for 45% of electricity supplied.

Consultation

Truck manufacturers are accelerating production of light and medium rigid electric trucks (4.5–8t GVM). Their local representatives remain hesitant to embrace megawatt-scale public charging before 2030 (see 'Truck OEMs' summary below), aligning with analysis that up to 300 kW daytime charging will be sufficient for most tasks. Most current trucks are limited to 150 kW, with less than 50 KW needed overnight.

Larger electric fleets (>5 vehicles) have typically relied on grant assistance. Larger fleets are more likely to adopt electric trucks because they purchase new vehicles, own sites, and have staff resources (see 'Fleets' summary below).



Truck OEMs

- Focus on light/medium (up to 8t GVM) back-to-base
- 30% increase in range expected 2030
- Fleets unwilling to pay for more
- Overnight < 50 kW, daytime charging > 150 kW
- Limited need for megawatt charging

Fleets

- Charge overnight at depot and some daytime 'top-up'
- Electric unviable at current price
- Most adoption occurs with grant
- Large lead - buy new, own sites/staff to manage

TCO Analysis

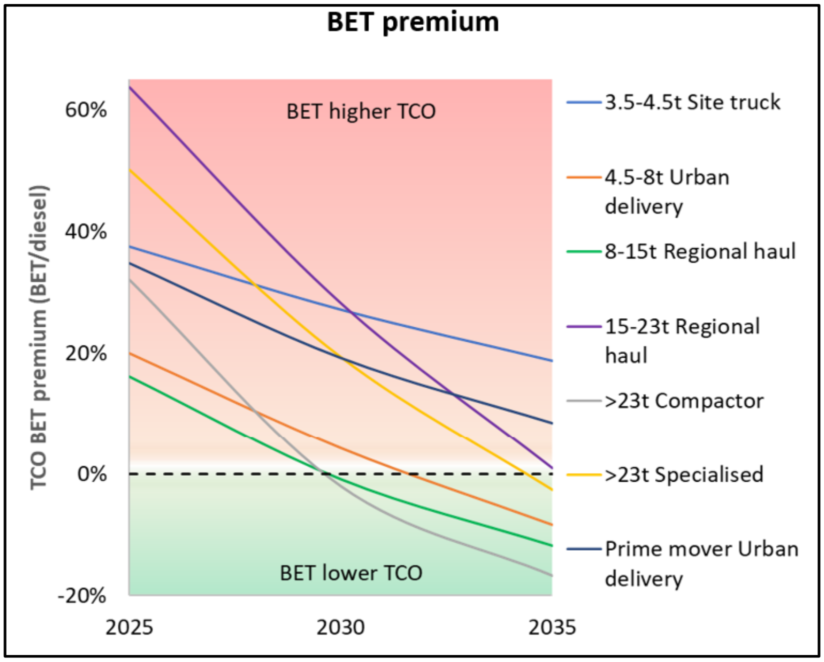
Total Cost of Ownership was assessed across a range of vehicle types, models and duty cycles in 2025, 2030 and 2035 (see graph opposite). Fixed costs included upfront truck price and upfront charging equipment and installation. Variable costs included fuel or electricity, servicing, and maintenance.

TCO parity with diesel is likely by 2030 in the following applications:

- Urban delivery (4.5-8t GVM)
- Regional (8-15t GVM)
- Waste compactors (23t GVM)

By 2035, most electric trucks will be viable, except for site trucks and urban prime movers, which may require higher utilisation to reach parity.

Lower purchase price (due to lower battery costs) and higher utilisation (due to improvements in range) are likely to drive improvements in the TCO over the next decade.



Charging analysis

Analysis of 10 representative truck applications showed that three can rely solely on depot-based overnight charging, three require daytime public charging to maintain operational flexibility, and four segments depend on the site constraints. Initially, fleets are most likely to charge immediately on return to depot; but over time (as confidence grows), most operators will delay charging until after 10pm to avoid peak tariffs and reduce energy costs.

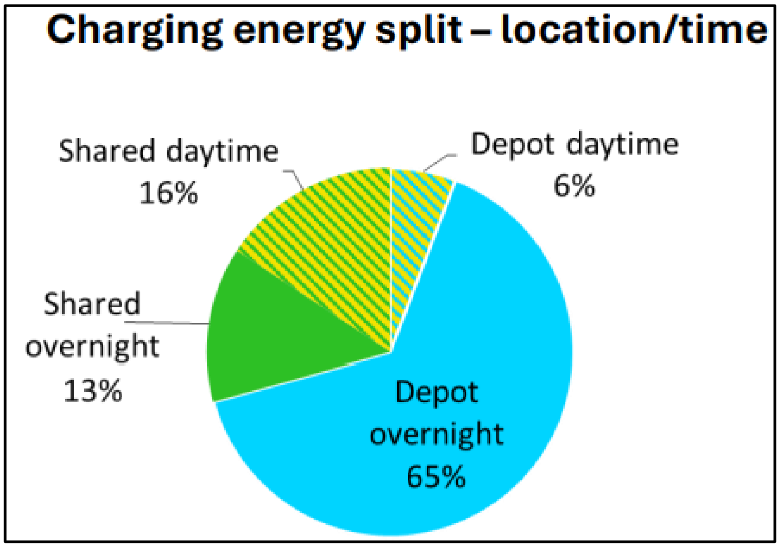
By 2035, depot-based overnight charging is expected to supply around 65% of total energy demand, with an additional 13% coming from shared or public sites overnight (see pie chart - top right). For smaller vehicles, overnight charging using 7 kW or 22 kW AC chargers will dominate. Heavier vehicles will increasingly depend on DC fast charging at shared or public sites for daytime charging to 'top up'.

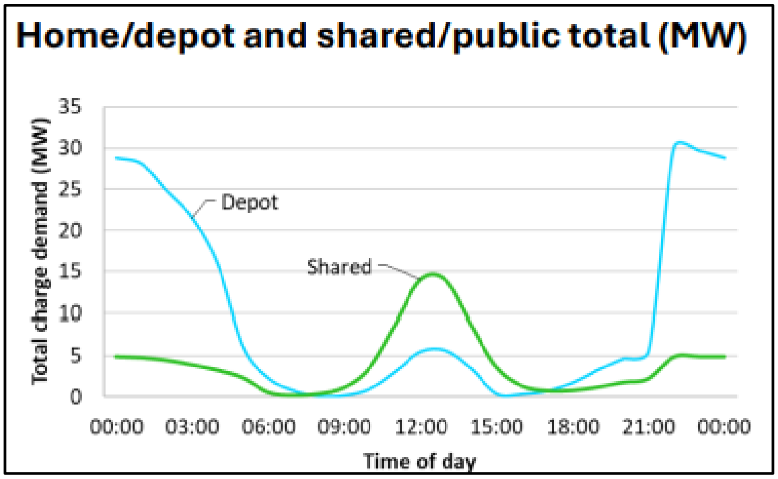
Daytime charging will account for 16% at off-site locations and 6% for vehicles returning to depot mid-shift. The highest aggregate demand will occur at depots around 10pm, reaching approximately 30 MW (see line graph – middle right). Shared and public sites will experience a daytime peak of 15 MW, while overnight demand at these locations will be closer to 5 MW.

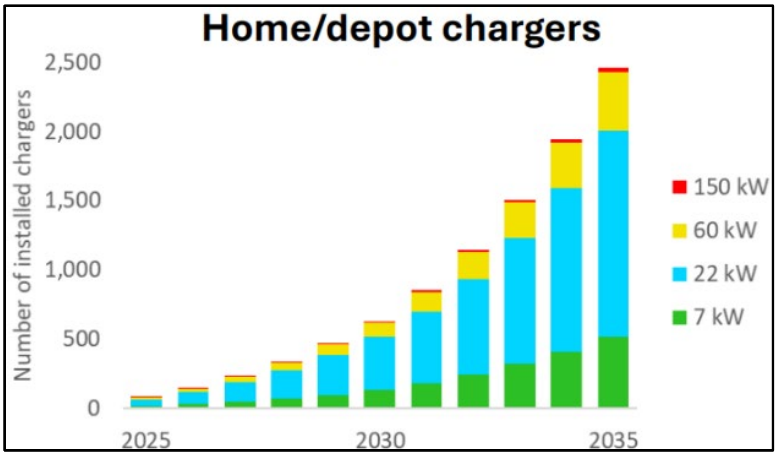
Vehicle uptake was aligned to land use types (as defined by WA Department of Transport). Around 1,800 depots will be electrified, split evenly between industrial and residential sites, with few commercial locations. Importantly, there is low likelihood of depots hosting more than 50 electric trucks, which means charging will be widely distributed rather than concentrated.

By 2035, two-thirds of electric trucks are expected to be based at industrial sites, reflecting the concentration of freight activity in these areas. However, electric fleets are unlikely to form large clusters. Instead, the market will be dominated by sites hosting only one electric vehicle, with fewer locations operating more than five vehicles.

To support this transition, around 2,500 home and depot chargers and 500 shared/public chargers will be required (see bar chart – bottom right).

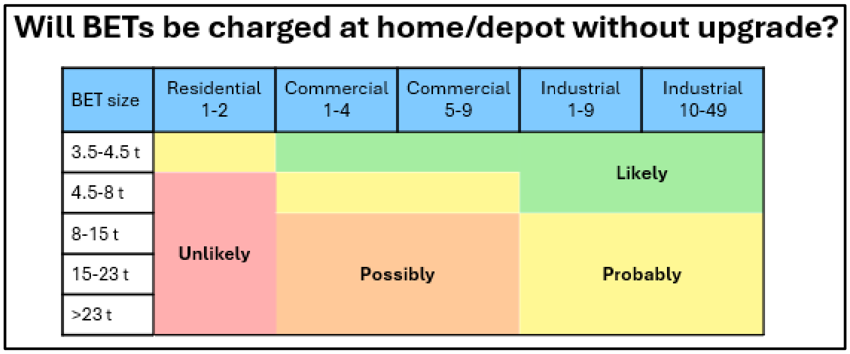






Charging behaviour

Site level electrical constraints are a key factor that will shape charging behaviour and locations (see table below). For example, electric trucks over 8 t GVM may not be able to charge overnight (without electrical upgrades) on residential and commercial sites. This may force larger vehicles or larger fleets to rely on shared/public sites nearby. Industrial sites will possibly accommodate larger fleets of vehicles, but it is uncertain if they could charge more than 20 electric trucks.



Will BETs be charged at home/depot without upgrade?

BET size	Residential 1-2	Commercial 1-4	Commercial 5-9	Industrial 1-9	Industrial 10-49
3.5-4.5 t	🟨	🟩	🟩	Likely	
4.5-8 t	Unlikely	🟨	🟨		
8-15 t		Possibly		Probably	
15-23 t					
>23 t					

Charging locations

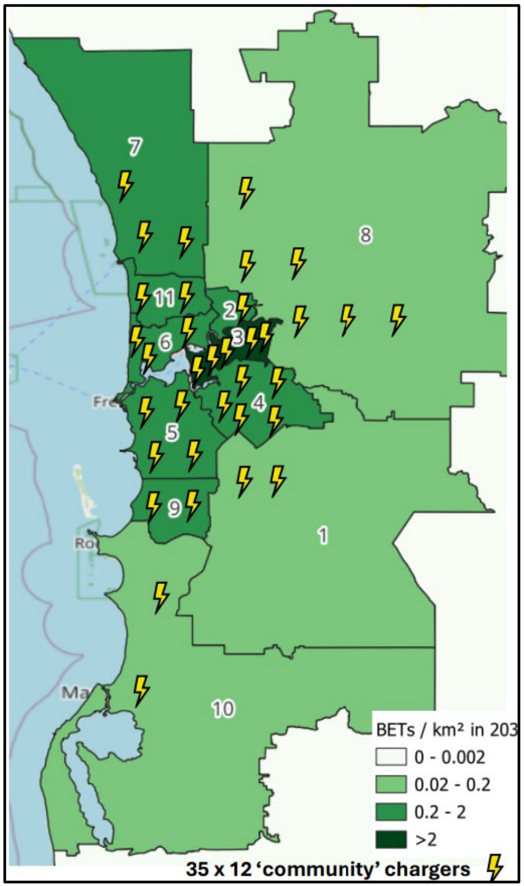
By 2035, 77% of electric trucks in the SWIS will likely be in metro Perth, with 10% in regional centres, and 13% spread across other areas. This allocation will be reflected in the location of approximately 2,500 home/depot overnight chargers. To support overnight charging for larger vehicles/fleets and daytime charging for high utilisation vehicles, around 45 shared/public sites (with around 500 chargers) will be required.

In metro Perth, 35 shared/public sites will likely be required (see map – top right). Based on the electric truck allocation and expected mix of vehicles in each community, the shared/public charging requirements were proportionally allocated with an average 1 MW site comprising a nominal 5 x 150 kW chargers (dedicated to daytime), 5 x 22 kW (overnight) and 2 x 60 kW (primarily for overnight charging with ad hoc daytime 'top up'). Different sites will likely use different combinations.

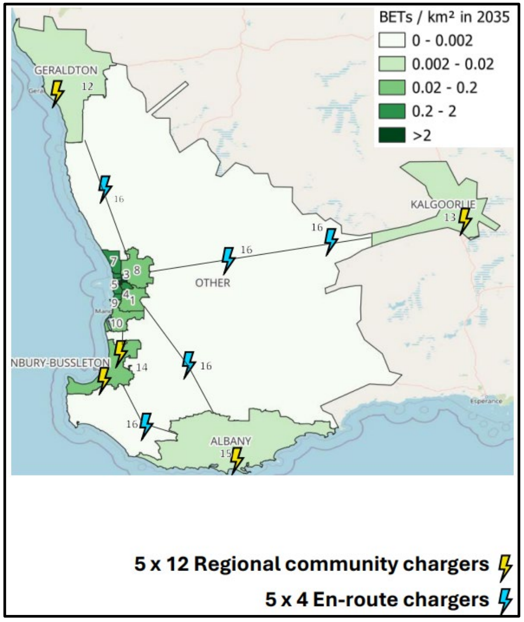
In regional centres, some vehicle types may try to access current passenger vehicle charging stations, but this practice is unsuitable and dedicated truck charging sites are needed. Within the four regional communities of Geraldton, Bunbury-Busselton, Albany and Kalgoorlie, a similar mix of electric trucks is expected to be in the Perth region.

Outside of these 15 allocated communities, 13% of BETs will have electrified depots, likely to be within 50 km proximity of major highways. Building regional enroute chargers at ~200 km intervals is likely the minimum level for those unable to access depot charging as well as ad-hoc needs for regional trucks passing through.

Enroute chargers along major highways are more likely to be grouped in combinations of 4 x 150 kW chargers at minimum, but the overlap with linehaul charging needs may lead to 300 kW to 600 kW. These sites may be standalone or integrated into existing 'truck-friendly' roadhouses (e.g. Puma Merredin, BP Williams, Liberty at Cataby or BP Baldivis). Indicative locations are shown in the map – bottom right.



35 x 12 'community' chargers ⚡



5 x 12 Regional community chargers ⚡

5 x 4 En-route chargers ⚡

Key assumptions and limitations

1. **Public or shared charging infrastructure** is a critical enabler and potential constraint on uptake for almost one third of electric trucks. Freight customers could support investment, but government will likely need to provide support.
2. **Charging threshold:** Fleets may charge more or fewer vehicles based on charging thresholds, but this will also be determined by space constraints, installation delays, short property leases, and unrecoverable capital costs.
3. **Linehaul is excluded** but is unlikely to account for more than 5% of the fleet with wider adoption closer to 2035.
4. **Usable battery capacity** is assumed at 70% to maintain battery health and remain within OEM warranty limits. Increasing this threshold (or larger batteries) could reduce demand for daytime charging.
5. **Concentration risk:** Fleet charging was aggregated at a community level across multiple postcodes, which may hide depot-level load risks or clusters around single substations. Considering the scale of the planned electricity demand and supply transformation on the SWIS, the incremental addition of charging demand may be negligible.

Conclusions

1. **Cost of ownership is within reach for BETs.** TCO parity is close for light trucks and vans expected by 2030 for medium rigids. By 2035 most BETs will outperform diesel except site trucks and urban prime movers, but segment-specific subsidies and shared charging incentives are essential to accelerate the transition for heavier vehicles.
2. **Charging is not "one-size-fits-all".** The 10 truck profiles modelled showed diverse duty cycles and energy needs with larger trucks (>8 t GVM) often exceeding residential/commercial site electrical capacity. An expected 30% range increase by 2030 will improve suitability, but battery cost and weight remain constraints for larger vehicles without fast and accessible charging. Linehaul will also require close to Megawatt charging to reduce dwell time.
3. **Uptake will be led by overnight depot charging but investment in public charging is needed.** Peak overnight electricity demand will total 30 MW (at 10 pm) with overnight depot charging supplying 65% of energy needs to 2,500 home/depot chargers. Shared/public charging is also critical for larger trucks and regional haulage, with 500 chargers across 45 sites needed mainly for daytime charging. On average, shared charging sites will require about 1 MW capacity each, with a mix of minimum 150 kW fast chargers for daytime use and 22 kW overnight chargers.
4. **Network planning must consider concentration risk:** Charging is likely to cluster where depots or freight activity is concentrated, creating localised grid impacts. Careful planning for land availability and grid upgrades is needed.
5. **Continuous market monitoring is essential:** BET uptake will be sensitive to changes in vehicle availability, price, range, and charging capability. These should all be monitored regularly to track shifts in the market.

Policy Recommendations

1. **De-risk shared/public charging:** Provide utilisation-linked subsidies for truck-capable chargers (≥150–300 kW) to overcome low confidence before they reach full utilisation. Prioritise industrial hubs and freight corridors.
2. **Fast-track land and grid approvals**: Create a cross-government taskforce for streamlined planning and grid connections. Use standard site upgrade templates and prioritise substation upgrades to cut delays.
3. **Close TCO gap with financial instruments:** Offer residual value guarantees, registration discounts, and/or scrappage rebates for older diesel trucks. Embed BET targets and charging provision in public service contracts. Target vehicle and charger incentives for light/medium rigids through 2030, tapering as TCO parity is reached.
4. **Develop best practice guide for dedicated truck charging** to better accommodate large vehicles and heavier axles with safe, maneuverable layouts including drive-through or herringbone parking, and truck zones separated from cars. Provide facilitates for drivers to wait comfortably while charging, including ancillary power for refrigeration.
5. **Monitor and engage:** Establish WA-specific electric truck and van data, including model availability, pricing, network capacity, and charging locations. Engage with fleets to disseminate information and review gaps with fleets and OEMs to refresh assumptions and track uncertainties.

MOV3MENT

WA Department of Transport

SWIS Road Freight Decarbonisation Strategy

Final report

Prepared for WA Department of Transport

24 November 2025

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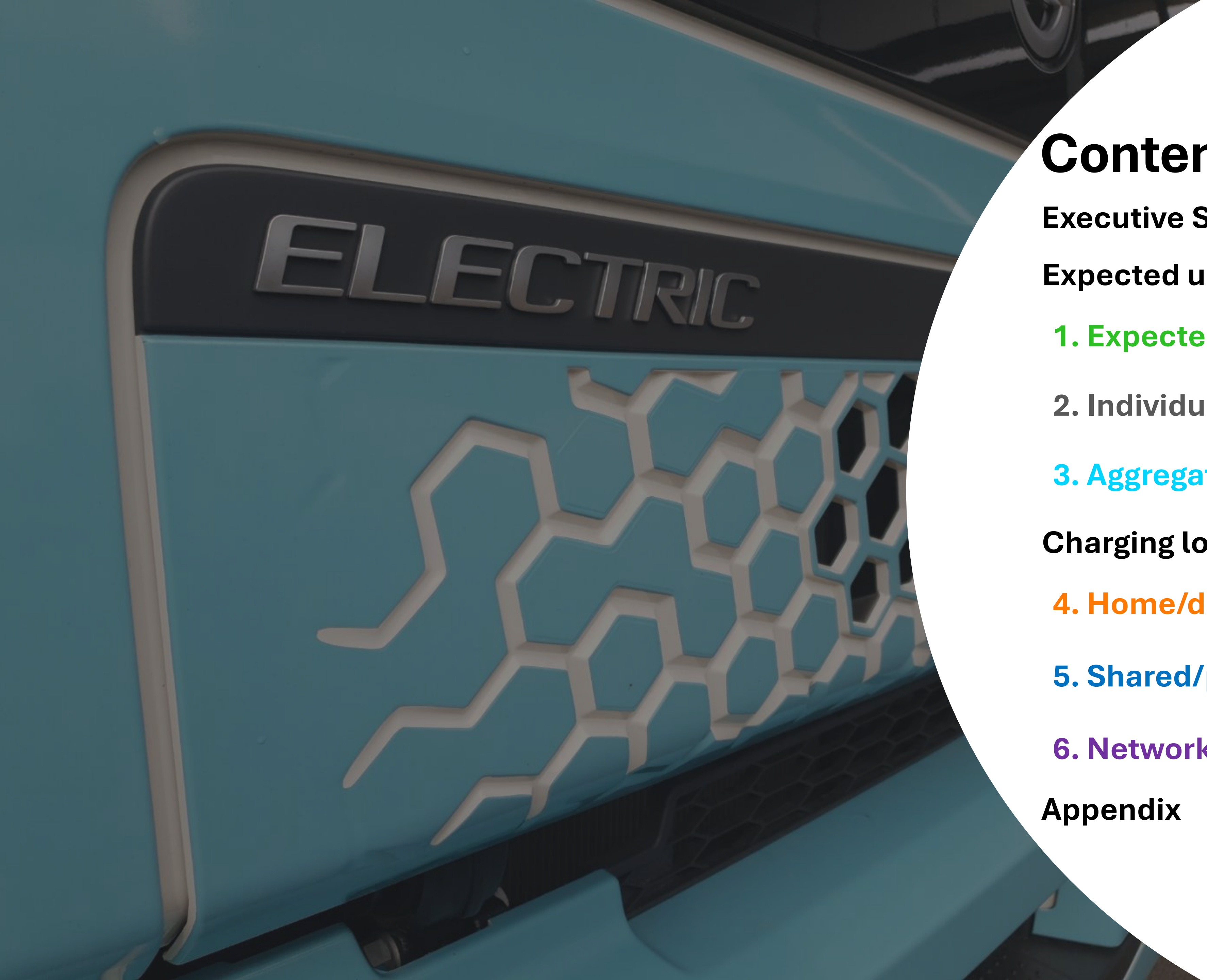

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Project overview and background

Project overview

This is the final report of the SWIS Road Freight Decarbonisation Study, covering all stages, including the final stage (Charging Analysis). It builds on the first stage report (*Research, Consultation and TCO Analysis,* August 2025) and uptake modelling - both key inputs into the analysis, as shown below.

Uptake modelling

TCO analysis

Research

Consultation

Charging analysis: 'What, when, how much, who, where?'

The purpose of this charging analysis report was to assess how many electric trucks and vans are expected ("what"), their charging profiles ("when"), and the aggregated fleet charging demand ("how much"). This is contextualised for different business types ("who") and locations ("where"), along with high level considerations for the network and for policy ("so what?").

The charging analysis

The charging analysis covers Task 4 and Task 5 of the overall project scope.

Task 4: Capability/limitations of home/depot-based charging

Feasibility of charging at residential (home) and commercial (depot) sites was assessed, focusing on standard three-phase AC connections for fleets of up to nine vehicles. For industrial sites, the need for DC overnight charging was evaluated for larger fleet sizes (up to 50 vehicles), and daytime charging demand at home/depot based on additional range required.

Task 5: Potential need for shared/public charging

Charging at shared/public sites is needed when trucks are unable or unwilling to charge overnight at their home/depot, including situations where enroute charging is required. To understand where this is necessary, site thresholds were applied for electrical load (in kW), considering the type of location and the size of the fleet. Factors like cost, timing, ownership, and charging effect on operations were also assessed. Stakeholders were consulted and research reviewed to evaluate where public DC fast chargers are planned, and how these locations align with likely uptake.

Executive summary

Research, Consultation and TCO Analysis summary

External research was compiled and consultation was undertaken (12 fleets and eight truck Original Equipment Manufacturers). This helped inform assumptions used in the assessment of purchase price parity and modelling of projected charging profiles across various locations. This full *Research, Consultation and TCO Analysis* report is included as Appendix B for reference. An updated **Executive Summary** for that report is provided below with relevant commentary and links to the charging analysis.

Research

Battery prices are expected to fall by around 10% annually, leading to 15% to 35% lower electric truck prices by 2030. This cost reduction aligns with accelerated adoption, with 75% of electric trucks operating in 2035 purchased after 2030.

The future market will be dominated by LFP (Lithium Iron Phosphate) battery chemistry, driven by performance improvements and the types of trucks sold. While energy density and battery capacity may double, cost and charging considerations mean vehicle range may increase by only about 50%. Truck charging capability (kW) could also double, but installed capacity may not scale at the same rate, as shared/public charging up to 300 kW will meet most operational needs.

Research suggests that only 5% of electric truck charging locations in Australia will be public, primarily for enroute charging. However, site constraints may push 15% of charging to public sites, supplying around 30% of total energy demand. This is similar to Europe, where 10% of charging is expected to occur at public locations but accounts for 45% of electricity supplied, highlighting the greater reliance on shared infrastructure overseas.

See Appendix A3 for comparative research and analysis.

Consultation

OEMs are accelerating production of light and medium rigid electric trucks (4.5 - 8 t GVM) for urban delivery, which is expected to be a dominant segment through 2035.

Most fleets currently charge overnight at depots. Larger electric fleets with more than five vehicles have typically emerged where grant assistance was available. Larger electric fleets are still more likely to adopt electric trucks because they purchase new vehicles, own sites, and can allocate staff resources. However, the rollout will be less concentrated, with deployments involving fleets of up to five vehicles spread across multiple sites.

OEMs remain hesitant to endorse megawatt-scale public charging before 2030, aligning with analysis that up to 300 kW CCS charging is sufficient.

TCO Analysis

Price parity is likely by 2030 for light and medium rigid trucks in urban and regional applications. By 2035, most electric trucks will be viable, except for site trucks and urban prime movers, which may require higher utilisation to reach parity. Price parity could occur by 2030 in the following key segments: 4.5 to 8 t GVM urban delivery, where many models are available, 8 to 15 t GVM regional haul, with higher utilisation and over 23 t GVM high-frequency compactors, on predictable routes.

Executive summary

Expected uptake and charging

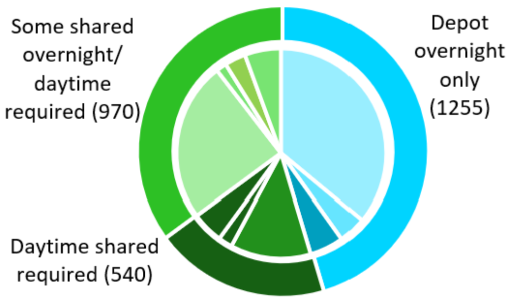
By the end of 2025, around 90 electric trucks and vans are projected to be operating in WA, with Centurion accounting for roughly one-third of this early market. While initial sales are less than 1% in 2025, by 2035, electric trucks and vans are expected to represent over 15% of new sales, with 2,800 vehicles operating. More than half of these vehicles will be under 8 tonnes GVM (see bar chart - top right), concentrated in urban delivery and short-haul applications where electrification offers immediate operational and cost benefits.

Analysis of ten representative profiles shows that three can rely solely on depot-based overnight charging, three require daytime public charging to maintain operational flexibility, and four more segments will charge depending on site level electrical constraints (see pie chart - top left).

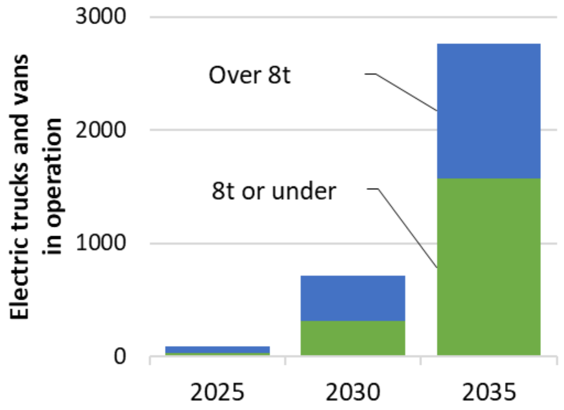
Fleets are likely to initially charge immediately upon return to depot, but over time (as confidence grows) most operators will delay charging until after 10pm to avoid peak tariffs and reduce energy costs. For smaller fleets, overnight charging using 7 kW or 22 kW AC chargers will dominate, while larger fleets and heavier vehicles will increasingly depend on DC fast charging at shared or public sites to meet energy requirements within operational windows.

By 2035, depot-based overnight charging is expected to supply around 65% of total energy demand, with an additional 13% coming from shared or public sites overnight (see pie chart - bottom left). Daytime charging will account for 16% at off-site locations and 6% for vehicles returning to depot mid-shift. The highest aggregate demand will occur at depots around 10pm, reaching approximately 30 MW (see line graph - bottom right). Shared and public sites will experience a daytime peak of 15 MW, while overnight demand at these locations will be closer to 5 MW. To support this transition, around 2,500 home and depot chargers and 500 shared/public chargers will be required.

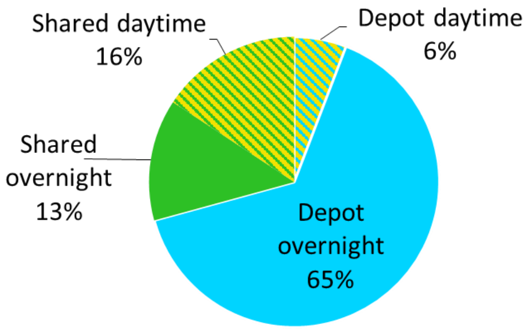
Charging behaviour (# of BETs)



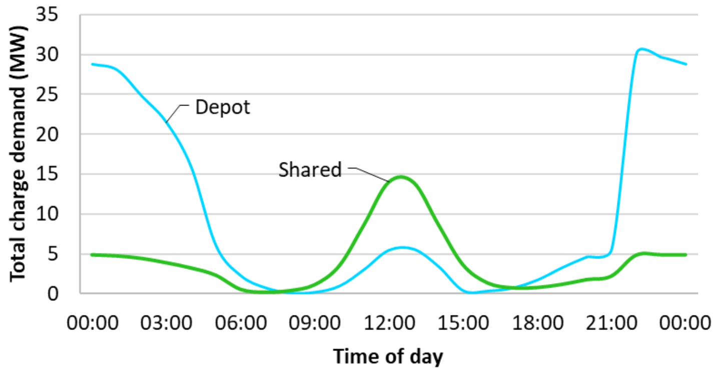
Electric truck adoption in SWIS to 2035



Charging energy (% of kWh)



Home/depot and shared/public total (MW)



Executive summary

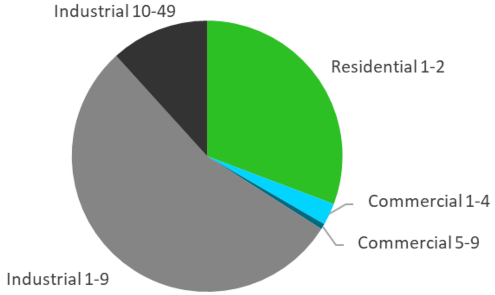
Charging locations

Vehicle uptake was aligned to land use types (as defined by WA Department of Transport). By 2035, two-thirds of electric trucks are expected to be based at industrial sites (see pie chart - top left), reflecting the concentration of freight activity in these areas. However, electric fleets are unlikely to form large clusters. Instead, the market will be dominated by sites hosting only one electric vehicle, with very few locations operating more than five vehicles. Around 1,800 depots will be electrified, split evenly between industrial and residential sites, with few commercial locations. Importantly, there is low likelihood of depots hosting more than 50 electric trucks, which means charging will be widely distributed rather than concentrated (see bar chart - top right).

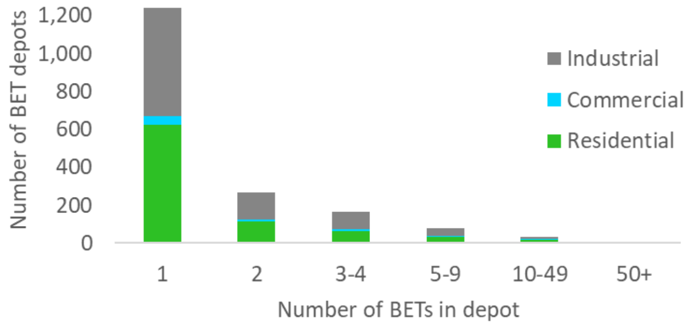
By 2035, 77% of electric trucks in the SWIS will likely be in metro Perth, with 10% in regional centres, and 13% spread across other areas. The population may be concentrated in three communities (see top table), together accounting for 37% of all electric trucks. To support daytime and enroute charging, around 45 shared/public sites will be required, each with an average installed capacity of 1 MW. A typical site was assumed to include 5 x 150 kW DC chargers, 5 x 22 kW AC chargers, and 2 x 60 kW chargers, enabling flexibility for different vehicle sizes and duty cycles.

Site level electrical constraints will shape charging behaviour. Residential and commercial sites may not be able to charge more than one truck over 8 t GVM overnight without electrical upgrades, forcing larger vehicles or larger fleets to rely on shared/public sites (see bottom table). Industrial sites will accommodate larger fleets of smaller vehicles with an average of 250 kW installed capacity, and up to 1 MW for depots hosting more than 10 electric trucks. High-demand communities may place pressure on substations, but average load per site will be minor as large fleet deployments are uncommon.

BET location distribution



Number of sites by EV fleet size in 2035



Key locations for electric truck operation and shared charging

Community	Description	% BETs in 2035	Shared charging sites
3. Kewdale/Forrestfield/Belmont	Intermodal logistics/airport	11%	5
4.Canning/Gosnells/Welshpool	Intermodal/major arterial	12%	5
8. Mundaring/Bullsbrook	NorthLink/Tonkin/intermodal	15%	7

Will electric trucks/vans be charged at home/depot without upgrade?

	Residential 1-2	Commercial 1-4	Commercial 5-9	Industrial 1-9	Industrial 10-49
3.5-4.5 t		**Likely**			
4.5-8 t	**Unlikely**				
8-15 t		**Possibly**		**Probably**	
15-23 t					
>23 t					


ELECTRIC

Expected uptake (“what”)

Current state

- **Approximately 90 electric trucks and vans are estimated to be in operation in WA by the end of 2025**, with Centurion accounting for a third (30).
- **The expected uptake** by vehicle type and application was adapted from previous modelling in *Low & Zero Emission Freight Vehicle Uptake in Western Australia* (MOV3MENT, 2023) to estimate the number of electric trucks and vans to 2035 using the BAU (‘low’) scenario based on current sales and policy settings.
- The scope for this project is **smaller geographically but largely similar as ~95% of electric trucks sales are expected to be within the SWIS until 2035,** based on the locations of major urban centres and regional routes. The uptake for long-haul electric trucks (i.e. prime movers over 70 t GCM) was removed and may represent up to 5% more electric truck sales by 2035, and likely to operate outside the SWIS. It is also expected that 77% of electric trucks will be in the Perth region by 2035.
- **Outside the SWIS:** Electric truck adoption in regional and remote areas is more likely to increase as more second-hand vehicles from the SWIS become available.

Uptake assumptions – BAU (‘low’) scenario

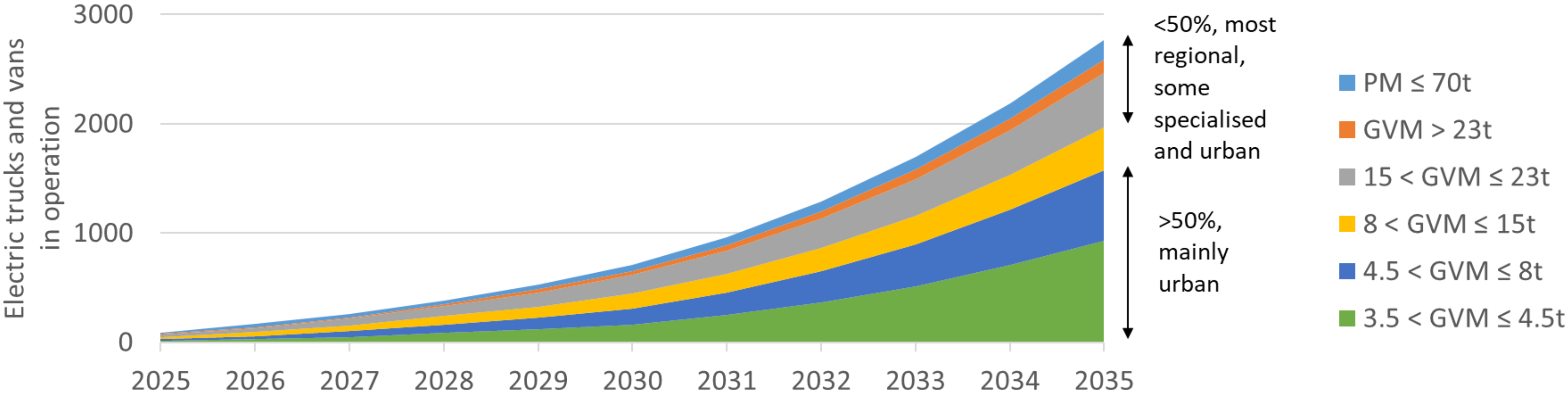
- **Policy and Regulatory Environment:** Assumes stable policy settings with no new incentives or disincentives (i.e. no introduction of a Road User Charge for electric trucks), limited concessions on axle limits and vehicle width. This was deemed to be closest to the current and near-term policy situation in WA. Government support for charging infrastructure is not guaranteed, though may be required to achieve expected uptake (see next point below).
- **Charging Infrastructure:** Charging infrastructure is a critical enabler and potential constraint on uptake for almost one third of electric trucks. Customers, fuel retailers, and finance companies could support some infrastructure investment, but government will likely need to fill some role as has happened overseas. Shared/public charging infrastructure is assumed to develop in parallel with vehicle uptake. Availability of shared/public charging is required for three out of ten fleet profiles that require daytime shared/public charging. Four additional profiles also may be constrained by depot-level overnight charging limitations.
- **Fleet Composition and Duty Cycles:** Fleet mix significantly affects energy needs as regional trucks require five times more energy than smaller urban trucks/vans.
- **Freight task:** Adoption is expected primarily in duty cycles with less than full payload (for example postal and parcel delivery are only volume constrained). From 2035, more freight tasks can be supported at full payload due to improved battery capacity and charging opportunities.
- **Battery Performance and Lifecycle:** Battery degradation is expected to be minimal with some cascade of older trucks into lower mileage duties, but less than 5% battery degradation is expected by 2035 for most vehicles as most are purchased after 2030.
- **Technology Pathways:** Battery swapping is not considered due to lack of commitment from Australian truck OEMs and inability to scale aftermarket technology. The main benefit of battery swap is similar to Battery Energy Storage Systems (BESS) as it would spread the impact from charging across a longer period. Vehicle-to-Grid (V2G) opportunities from trucks are less likely to occur based on relatively small battery sizes across the fleet and potential impacts to charger requirements.

Expected uptake ("what")

Future state

- **Approximately 2,800 electric trucks and vans are expected to be in operation in WA by 2035.**
- Electric trucks and vans as a proportion of total sales increase from **1% in 2025 to 1 in 6 sales (more than 15%) in 2035.**
- This assumes ~5% (or ~20) electric trucks and vans sold before 2028 will be scrapped or moved into regional applications outside the SWIS from 2033 onwards.
- **Over half** of electric trucks and vans in operation will be **light duty** (under 8 t GVM) and **mainly urban** delivery applications (see graph below). Most will also be able to rely on home/depot-based charging overnight without needing daytime charging. See Appendix A1 for detailed breakdown of BET adoption by segment and year.
- **Less than half** of electric trucks and vans will be **medium/heavy-duty (over 8 t GVM).** Heavier trucks over 15 t GVM will predominantly undertake regional activities (~30%) and require charging enroute if they cannot return to depot, with a smaller number (<10%) of specialised (waste, concrete and P&E) and urban trucks that require daytime top up.

Projected electric trucks/vans in operation to 2035 in the WA SWIS under BAU ('Low') scenario



<50%, most regional, some specialised and urban

>50%, mainly urban


ELECTRIC

Individual charging profiles ("when")

Two common types of charging locations were used in the analysis: **home/depot** and **shared/public** (with a further split of shared and public in the text box below).

'**Home/depot**' ranges from residential locations (for up to two electric trucks) up to commercial and industrial sites where transport and logistics is the main or ancillary activity with larger fleets kept on private land overnight.

'Shared/public' is more commonly understood to be open 'public' access with ad-hoc or flexible use enroute at major interchanges or distance-based waypoints. However, commercial models have evolved towards 'shared' charging at urban activity hubs that are semi-exclusive. In some cases, use is restricted to operators who serve a specific customer (e.g. distribution centre), but some private depot charging may also be set up to permit daytime use for third party vehicles with a contract for more regular access.

Home/depot (private):

Trucks that remain at depots overnight up to 10 hours for charging. Generally used to fully charge.

- Most light duty trucks will be able to rely solely on 7 to 22 kW home/depot chargers.
- Medium duty trucks over 8 t GVM will require 22 kW overnight; 60 kW DC is more likely for over 23 t GVM.
- Many electric trucks may not need to charge every night if they can charge on alternate nights or access faster (150 kW+) daytime charging.
- Site characteristics will be critical for electrical capacity and grid upgrade potential as this will determine the ability to charge larger vehicles and fleets. Some of these will require overnight charging away from home/depot.

Shared (destination)

Recharge when loading/unloading or cannot access overnight at home/depot. Mostly top up from 30-60%.

Shared charging is reactive to customer or fleet demand, balancing access and exclusivity. Examples include:

- IKEA offer 'delivery partners' 22 kW overnight and 75 kW and 150 kW for fast charging in the daytime.
- Zenobe offers Woolworth's fleet priority overnight but if chargers are unused others can use in daytime.
- Mondo truck charging hub in Laverton (Melbourne) is contracting 20 trucks initially, with opportunity for 20-60 other vehicles in the future.
- New Energy Transport is planning charging in Sydney and Wollongong for specific fleets only.

Public (en route):

Necessary for long-distance along highways or at key freight hubs, possibly within regulated driver breaks.

Investment in open-access charging is likely proactive and driven by an independent infrastructure provider offering transparent uniform pricing with time of use.

- Viva energy - first publicly accessible electric truck charging in Geelong (4 x 350 kW).
- Ampcharge has dedicated truck charging in Eastern Creek (4 x 300 kW) and plans for Wyong in late 2025.
- NewVolt – has plans for three charging hubs in Melbourne that will offer public charging bays (it will also allow booking of some bays for exclusive use)

Expected charging requirements

Light duty (<130 kWh) *Mainly home/depot (private) with possible daytime 'top-up'*

Medium duty (130-360 kWh) *More likely to need 'fast charge' at daytime destination*

Heavy duty (+360 kWh) *Regional will require en route (public) charging*

Individual charging profiles (“when”)

Vehicle charging constraints

70% of total battery capacity is assumed to be ‘usable’ and defined as the “overnight max” for charging. This is a conservative approach based on the following factors:

- **Operational buffer:** To maintain battery health and ensure consistent performance, a 20% buffer was assumed—keeping battery State of Charge (SoC[a]) between 10% and 90%—which aligns with best practices in fleet management and battery safety protocols. This also gives drivers confidence to return to base.
- **Additional OEM imposed limits and degradation**: Some Truck OEMs restrict charging. For example, Volvo limits usable SoC to a maximum of 70% for rigids and 80% for prime movers. Over a typical seven-year life, batteries may also lose up to 10% of their original capacity due to regular cycling and aging. For example, if applied to a Fuso eCanter (124 kWh battery), it may have ‘usable’ energy of 87 kWh, translating to a 140 km range vs. 200 km advertised, depending on duty/load.

Site electrical capacity is another constraint. In consultation with Western Power, thresholds were estimated based on assumed land use. The table below illustrates the *assumed* ***power available for charging before upgrade*** is required. This may be as low as 11 kW for residential and up to 500 kW for industrial. The proportion ***willing/able to upgrade if required*** beyond this threshold is also estimated between 0% for residential and 75% for large industrial. If fleets do not upgrade, shared/public charging may be required for some or all vehicles overnight. The estimated number of vehicles by type, by location, and estimates where fleets are **unlikely to charge**, could **possibly** charge or **likely to charge** in the depot, is presented in the following pages.

Site level charging constraints by land use

Land use category (simplified)	Included ABS[b] land use categories	Depot size (number of electric vehicles)	Average fleet size (mean number of electric vehicles)	Total site electrical capacity (kW)	Threshold (amount available for charging before upgrade)	Proportion of sites willing/able to upgrade if required[c]
Residential	Residential, Parkland	1-2	1.2	22	11	0%
Commercial	Commercial, Hospital/Medical, Education	1-4	1.4	44	22	25%
Commercial		5-9	6.5	180	90	50%
Industrial	Industrial, Transport, Water, Primary Production and Other	1-9	1.7	180	90	50%
Industrial		10-49	18	1000	500	75%

a. SoC is the key metric used to indicate how much energy is currently stored in a battery compared to its full capacity.

b. Based on Australian Bureau of Statistics definitions that relate to the dominant land use where possible. **Appendix A4 for further discussion and examples**.

c. Beyond the available capacity for charging and upgrade will be required.

Individual charging profiles ("when")

Australia's truck fleet is very mixed — not just in the size of trucks (configuration), but also in how they're used (body type), how much energy they need and when they're on the road (duty cycle). The diagram below illustrates the diversity of trucks in operation in WA.

To help understand this variety, 10 truck profiles were evaluated to best represent the expected electric heavy fleet in 2035. Each one is a common combination of:

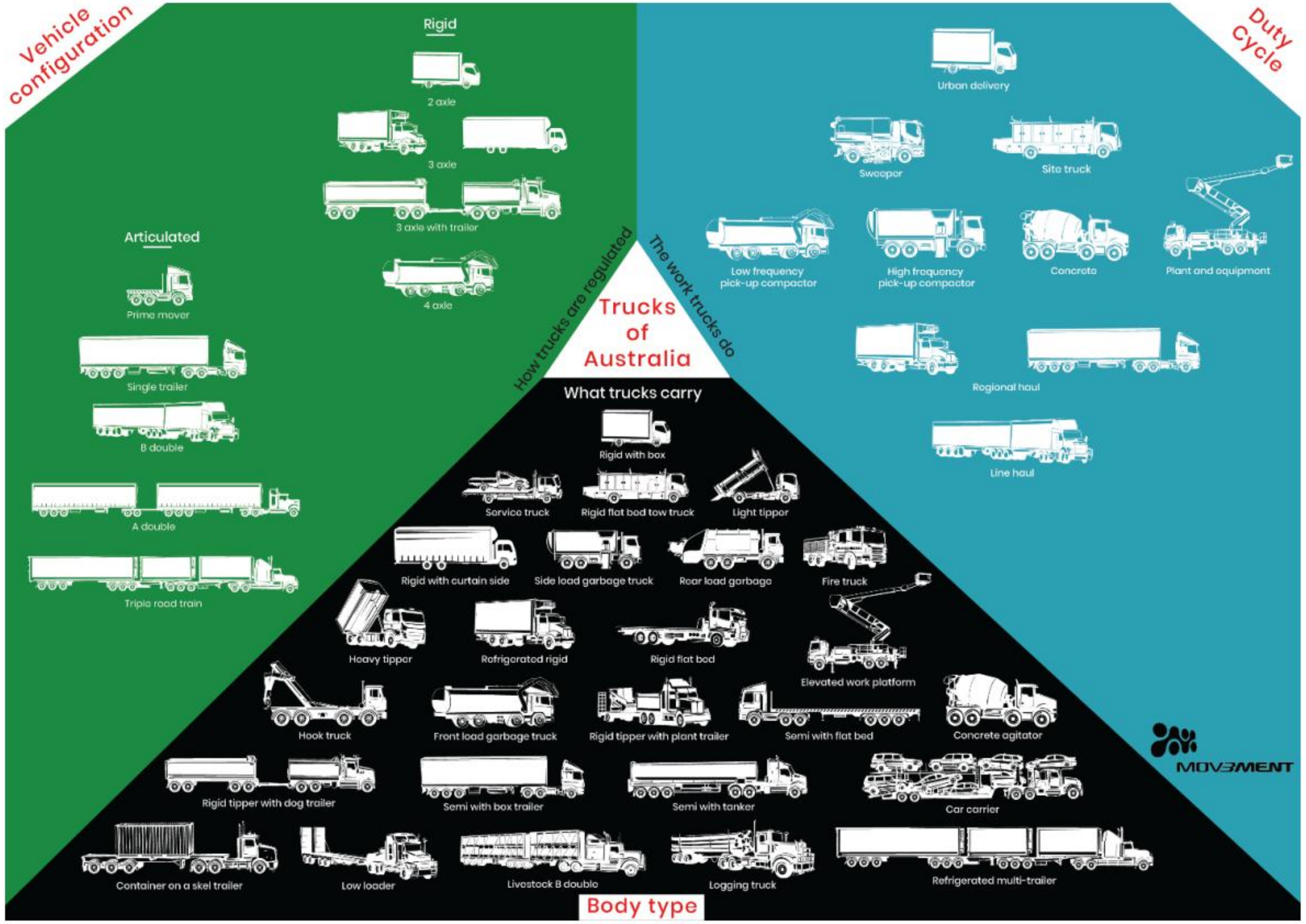
- **Truck size** (how heavy it is and possible trailer combinations)
- **Daily activity** (how far, how often and what kind of work it does)
- **Energy consumption** (required for accelerating/maintaining speed, idling, auxiliary load from power take off and opportunities to recover energy via braking)
- **Operating hours** (when it could be charged or required on road)

Together, these profiles help show:

- **How much** charging is needed
- **When** charging could occur
- **Where** charging could happen.

These profiles also estimate potential demand at:

1. **Overnight home/depot**
2. **Overnight shared/public sites**
3. **Daytime home/depot**
4. **Daytime shared/public sites**



Individual charging profiles ("when")

Each profile is presented below with a summary of key charging descriptors. Expected 2035 technology developments are incorporated. The following pages have details.

Profile	Typical GVM (t)	Duty	Electric fleet represented in 2035	Average daily distance (km)[b]	Average daily charge (kWh)[c]	Depot charger (kW)	Daytime charging (9am-3pm)[d]	Shared/public charging[e]	Charging strategy
1[a]	3.5 - 4.5	Urban delivery	995	160	46	7 or 22	0%	0%	Home/depot only
2	3.5 - 4.5	Site truck	115	70	20	7 or 22	0%-10%	0%	Home/depot only
3[a]	4.5 – 8	Regional haul	345	320	211	22	40%-50%	40%-100%	Essential daytime
4[a]	4.5 – 8	Specialised[f]	145	60	66	7 or 22	0%	0%	Home/depot only
5	4.5 – 8	Urban delivery	680	160	77	22	0%	0%-20%	Shared if required
6	8 – 15	Regional haul	60	320	279	22	20%-30%	30%-100%	Essential daytime
7	15 – 23	Regional haul	135	320	372	60	10%	10%-100%	Essential daytime
8	>23	High frequency compactor	45	100	139	22	20%-30%	0%-100%	Shared if required
9	>23	Specialised[f]	90	150	218	60	0%	0%-100%	Shared if required
10	Prime mover	Urban delivery	160	250	268	150	50%-100%	0%-100%	Shared if required

a: These three truck size/duty applications were introduced to broaden coverage or fill gaps left in the expected charging patterns by the original seven examples used for the cost parity analysis.

b: Consultation and examination of current fleets clearly show the average BET in 2025 has less utilisation than an average diesel truck; by 2035 BETs will have the same utilization as diesel counterparts.

c: Includes 10% charging losses.

d: The proportion of the trucks overall charge (kWh) that is expected to be done between 9am and 3pm. This varies by land use category and fleet size.

e: The proportion of the trucks overall charge (kWh) that is expected to be done at shared or public charging facilities. This varies by land use category and fleet size.

f : Specialised trucks cover a broad array of vehicles that carry out non-freight work. Often these trucks will have energy consumption measured against hours, rather than distance. Examples include elevated work platforms, mobile cranes and concrete mixers.

Individual charging profiles (“when”)

Implications of site level charging constraints on shared/public charging

- Larger vehicles or larger fleets may require charging to occur at shared/public facilities. As illustrated below, residential locations are unable to charge trucks over 8 t GVM overnight, due to energy required (over 100 kWh) and expected charging speeds (11 kW).
- Whilst commercial locations can charge some trucks, they will upgrade for multiple large vehicles or use shared/public sites. Industrial locations can charge large fleets of small vehicles but reach capacity at ~25 large vehicles.

Profiles	**Number of trucks that can be charged at home/depot without upgrade or overnight shared/public charging**				
	Residential 1-2	Commercial 1-4	Commercial 5-9	Industrial 1-9	Industrial 10-49
3.5-4.5 t Urban delivery	🟨 1	🟩 4	🟩 9	🟩 9	🟩 49
3.5-4.5 t Site truck	🟩 2	🟩 4	🟩 9	🟩 9	🟩 49
4.5-8 t Regional haul	🟥 0	🟧 1	🟨 7	🟨 7	🟨 42
4.5-8 t Specialised	🟨 1	🟩 4	🟩 9	🟩 9	🟩 49
4.5-8 t Urban delivery	🟧 1	🟨 2	🟩 9	🟩 9	🟩 49
8-15 t Regional haul	🟥 0	🟧 1	🟧 4	🟨 4	🟨 24
15-23 t Regional haul	🟥 0	🟥 0	🟧 2	🟧 2	🟧 14
High frequency waste	🟥 0	🟧 1	🟨 7	🟨 7	🟨 39
>23 t Specialised	🟥 0	🟧 1	🟧 4	🟨 4	🟨 26
Prime Mover Urban	🟥 0	🟧 1	🟨 5	🟨 5	🟨 31

🟥 **Unlikely** to charge any trucks in depot without upgrade (shared/public charging required)
🟧 **Possibly** charge most trucks in depot without upgrade (shared/public charging may be required)
🟨 **Probably** charge all trucks in depot (based on average fleet size)
🟩 **Likely** to charge all trucks in depot (based on maximum fleet size)

Individual charging profiles ("when")

3.5-4.5 t Urban

Operational description

Annual utilisation	40,000	km
Daily utilisation	160	km
Depot dwell	10	hours
Leave depot	5	am
Return to depot	7	pm
Daytime charge	None	

Energy requirement

Daily battery use	30	%
Daily requirement	46	kWh*
Battery Size	140	kWh
Overnight max	107	kWh*

Energy supply

Home/depot (7/22 kW)

Daytime	0	kWh*
Overnight	46	kWh*
Supply utilisation	9-49	%

Shared/public (150 kW)

Daytime	0	kWh*
Overnight	0	kWh*

Summary

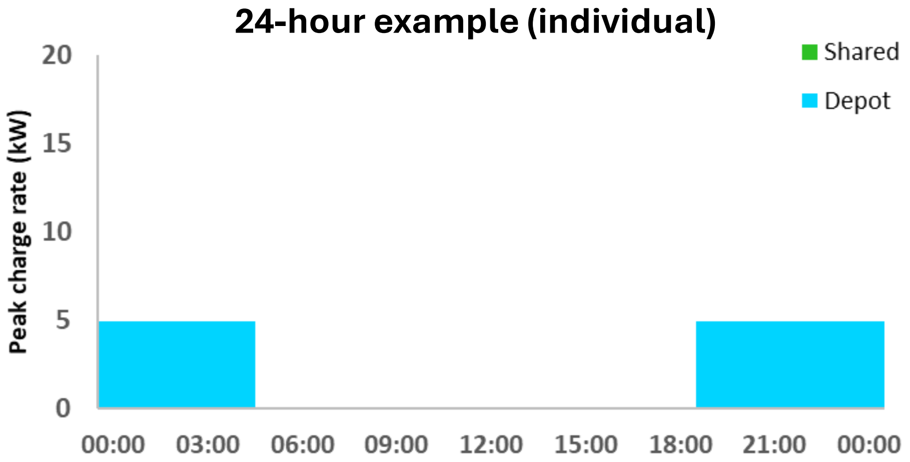
- **995 vehicles** (or 36% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- **Average 6 kW is required overnight** for daily energy requirement, but some fleets will use higher power (**7 or 22 kW charger**) or charge every second night.
- All vehicles have charge capability at each location type.
- **No charging expected in the daytime.** 24-hour example (individual) graph opposite.

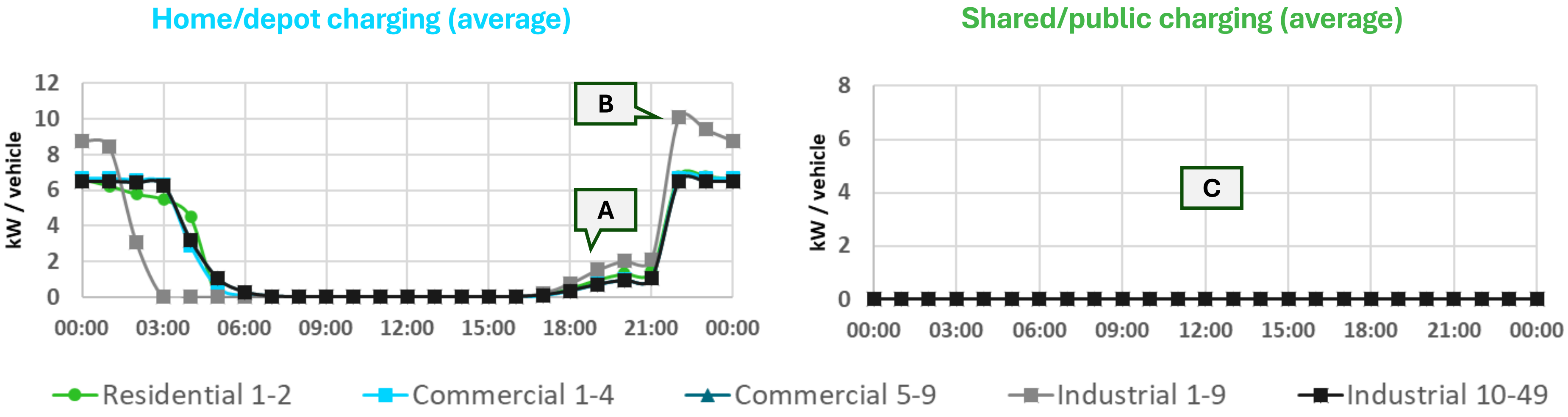
Annotations below refer to graphs at bottom:

A Some charge early evening on return to home/depot.

B Most wait for cheaper prices to start charging at 10 pm.

C No need for shared charging or daytime charging.





*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

3.5-4.5 t Site

Operational description

Annual utilisation	17,500	km
Daily utilisation	70	km
Depot dwell	14	hours
Leave depot	6	am
Return to depot	4	pm
Daytime charge	None	

Energy requirement

Daily battery use	13	%
Daily requirement	20	kWh*
Battery Size	140	kWh
Overnight max	107	kWh*

Energy supply

Home/depot (7/22 kW)

Daytime	0-1^	kWh*
Overnight	19-20	kWh*
Supply utilisation	3-15	%

Shared/public (150 kW)

Daytime	0	kWh*
Overnight	0	kWh*

Summary

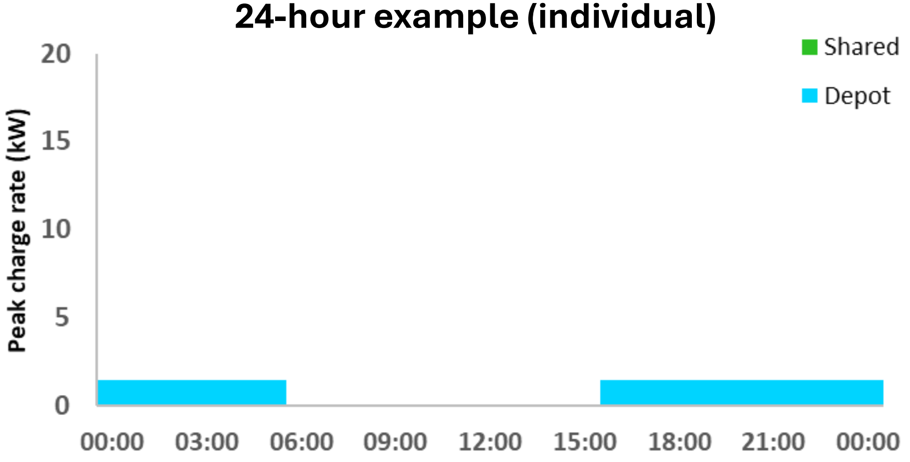
- **115 vehicles** (or 4% of electric truck/van fleet in SWIS) are represented by this segment in 2035 due to low utilisation affecting viability, but councils may purchase.
- **Average 2 kW needed to charge overnight**, but some fleets will use higher power chargers (7 or 22 kW) or charge alternate nights.
- All vehicles have charge capability at each location type.
- **No charging in the daytime but overnight charge may start before 3pm**. '24-hour example' graph opposite.

A Some charge mid afternoon on return to home/depot.

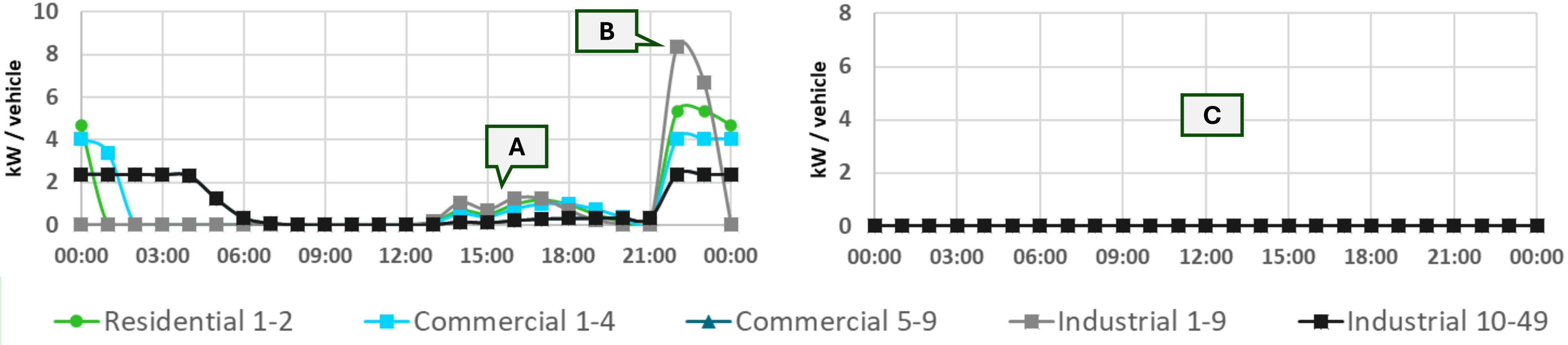
B Most wait for cheaper prices to start charging at 10 pm.

C No need for shared charging.

24-hour example (individual)



Home/depot charging (average) | **Shared/public charging (average)**



*energy requirement includes an estimated 10% charging losses

^charging on early return to depot

Individual charging profiles ("when")

4.5-8 t Regional

Operational description		
Annual utilisation	80,000	km
Daily utilisation	320	km
Depot dwell	10	hours
Leave depot	6	am
Return to depot	8	pm
Daytime charge	1-2	hour
Energy requirement		
Daily battery use	128	%
Daily requirement	211	kWh*
Battery Size	150	kWh
Overnight max	116	kWh*
Energy supply		
Home/depot (22 kW)		
Daytime	0	kWh*
Overnight	0-113	kWh*
Supply utilisation	0-82	%
Shared/public (150 kW)		
Daytime	91	kWh*
Overnight	7-120	kWh*

Summary

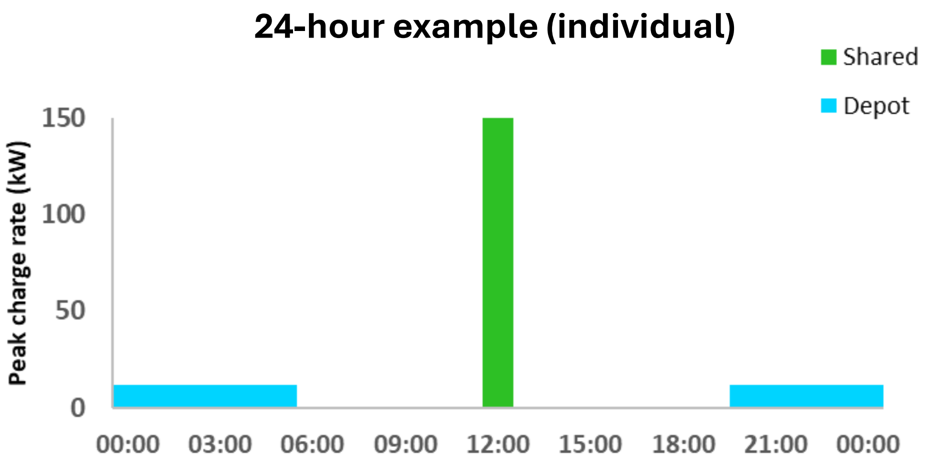
- **345 vehicles** (or 12% of SWIS fleet) represented in 2035.
- High utilisation (relative to battery size) means a 98 kWh 'top-up' charge is needed outside of the home/depot. Some of this (7kWh) will occur before 9am or after 3pm.
- **Average 13 kW is needed overnight (22 kW charger**) and 150 kW in daytime. 24-hour example (individual) graph opposite. This is too much for Residential, requiring shared/public charging in daytime and night.

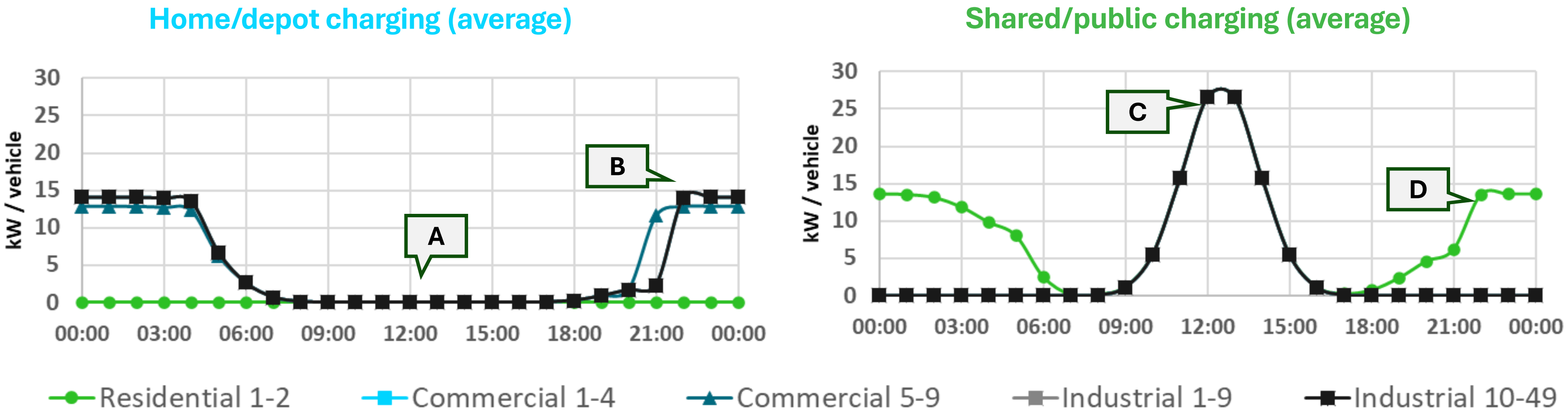
A Vehicles do not return to home/depot in daytime.

B Most wait for cheaper prices to start charging at 10 pm.

C **All need public charging en route during daytime.**

D Residential depots reliant on shared charging overnight.





*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

4.5-8 t Special

Operational description

Annual utilisation	15,000	km
Daily utilisation	60	km
Depot dwell	14	hours
Leave depot	8	am
Return to depot	6	pm
Daytime charge	None	

Energy requirement

Daily battery use	40	%
Daily requirement	66	kWh*
Battery Size	150	kWh
Overnight max	116	kWh*

Energy supply

Home/depot (7/22 kW)

Daytime	0	kWh*
Overnight	66	kWh*
Supply utilisation	9-50	%

Shared/public (150 kW)

Daytime	0	kWh*
Overnight	0	kWh*

Summary

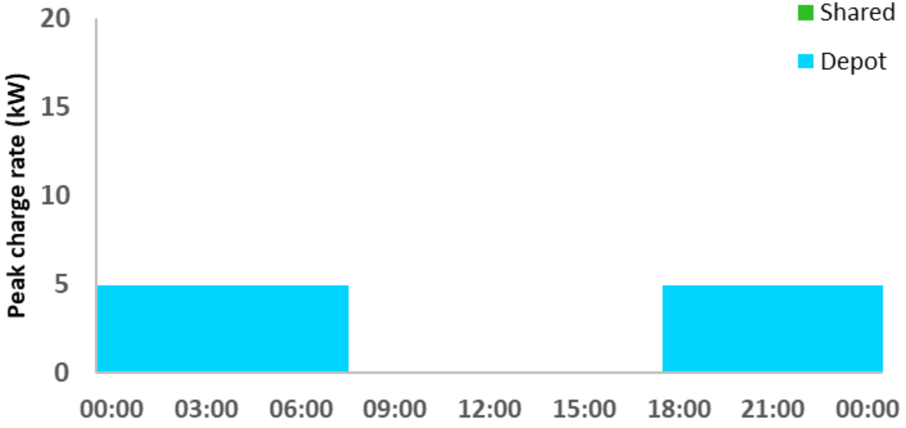
- **145 vehicles** (or 5% of electric truck/van fleet in SWIS) are represented by this segment in 2035. Low utilisation but high energy requirement (ePTO) supports viability.
- **Average 6 kW needed to charge overnight (7 kW charger)**. All vehicles have charge capability at each location type.
- **No charging occurs in the daytime.** 24-hour example (individual) graph opposite but some fleets vehicles in night shift and may charge mid afternoon.

A Some charge early evening on return to home/depot.

B Most wait for cheaper prices to start charging at 10 pm.

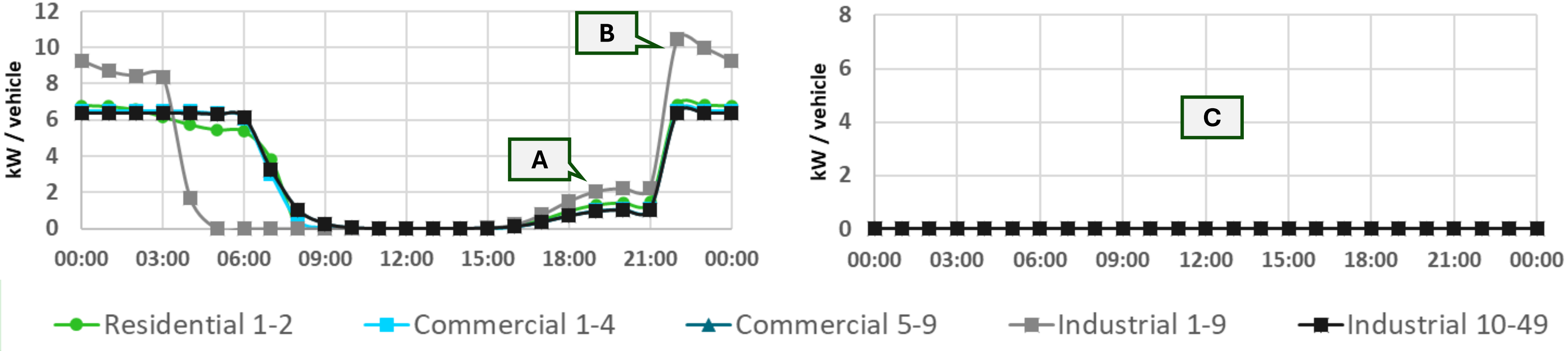
C No need for shared charging.

24-hour example (individual)



Home/depot charging (average)

Shared/public charging (average)



*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

4.5-8 t Urban

Operational description

Annual utilisation	40,000	km
Daily utilisation	160	km
Depot dwell	10	hours
Leave depot	5	am
Return to depot	7	pm
Daytime charge	None	

Energy requirement

Daily battery use	47	%
Daily requirement	77	kWh*
Battery Size	150	kWh
Overnight max	116	kWh*

Energy supply

Home/depot (22 kW)

Daytime	0	kWh*
Overnight	66-77	kWh*
Supply utilisation	15-81	%

Shared/public (150 kW)

Daytime	0	kWh*
Overnight	0-11	kWh*

Summary

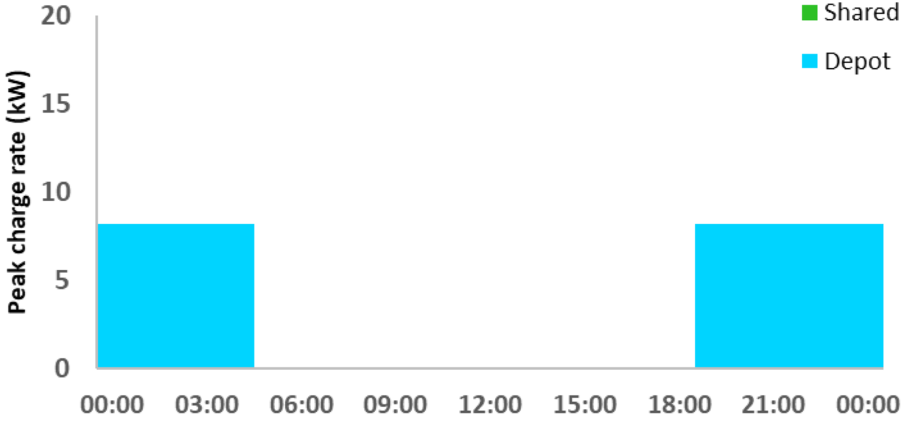
- **680 vehicles** (or 25% of electric truck/van fleet in SWIS) are represented by this segment in 2035. As with all profiles, it represents a diverse range of similar duties.
- **Average 10 kW** needed to charge overnight **(22 kW charger).** This will be at the limit for Residential locations, some will use overnight shared charging.
- **No charging required in the daytime,** but if possible, a daytime charge could reduce demands overnight to prevent the need for shared charging, 24-hour example (individual) graph opposite.

A Some charge early evening on return to home/depot.

B Most wait for cheaper prices to start charging at 10 pm.

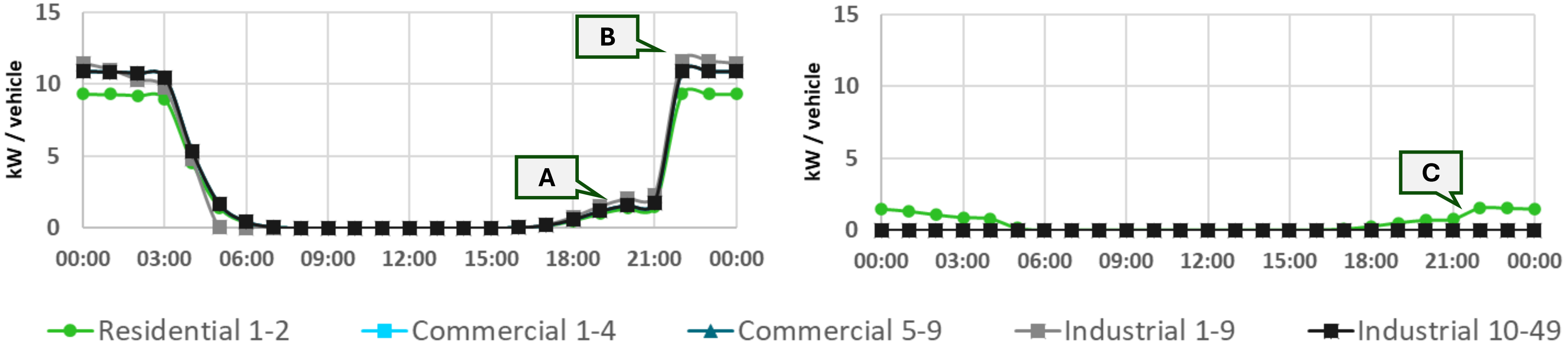
C Some residential depots use shared charging overnight.

24-hour example (individual)



Home/depot charging (average)

Shared/public charging (average)



*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

8-15 t Regional

Operational description		
Annual utilisation	80,000	km
Daily utilisation	320	km
Depot dwell	10	hours
Leave depot	6	am
Return to depot	8	pm
Daytime charge	1	hour
Energy requirement		
Daily battery use	101	%
Daily requirement	279	kWh*
Battery Size	252	kWh
Overnight max	194	kWh*
Energy supply		
Home/depot (22 kW)		
Daytime	0	kWh*
Overnight	0-194	kWh*
Supply utilisation	0-96	%
Shared/public (150 kW)		
Daytime	74	kWh*
Overnight	11-205	kWh*

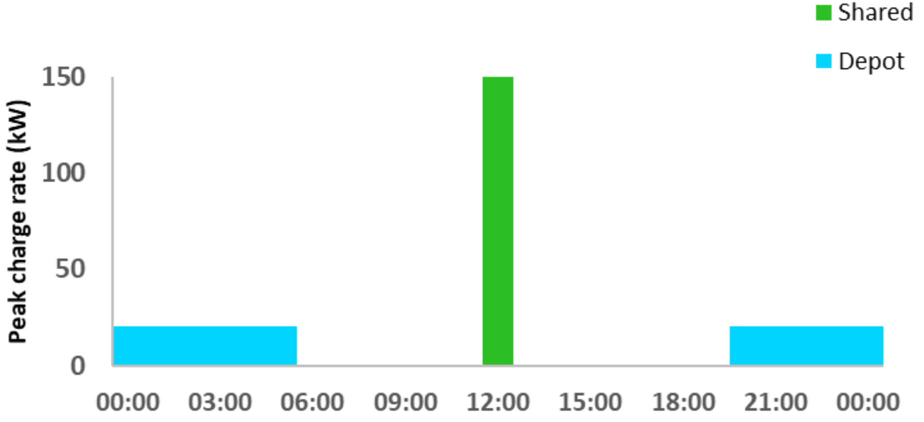
Summary

- **60 vehicles** (or 2% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- **22 kW not enough to charge overnight** unless SoC returned to 80-100% with **150 kW charge in daytime**. 24-hour example (individual) graph opposite.

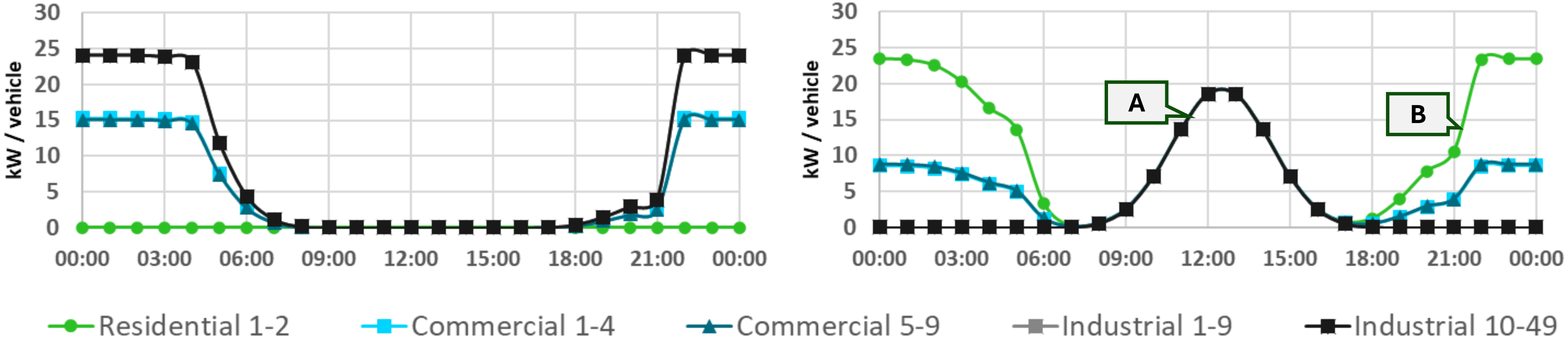
A All vehicles require daytime shared/public charging.

B Some vehicles require overnight shared/public charging due to site level thresholds at all residential and some commercial locations.

24-hour example (individual)



Home/depot charging (average) **Shared/public charging (average)**



*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

15-23 t Regional

Operational description

Annual utilisation	80,000	km
Daily utilisation	320	km
Depot dwell	10	hours
Leave depot	6	am
Return to depot	8	pm
Daytime charge	½ - 1	hour

Energy requirement

Daily battery use	82	%
Daily requirement	372	kWh*
Battery Size	412	kWh
Overnight max	317	kWh*

Energy supply

Home/depot (60 kW)		
Daytime	0	kWh*
Overnight	0-315	kWh*
Supply utilisation	0-90	%
Shared/public (150 kW)		
Daytime	35	kWh*
Overnight	22-337	kWh*

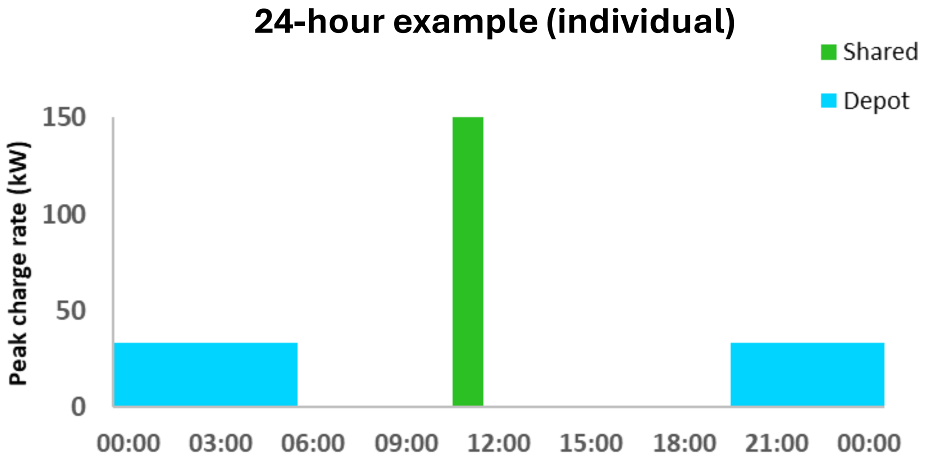
Summary

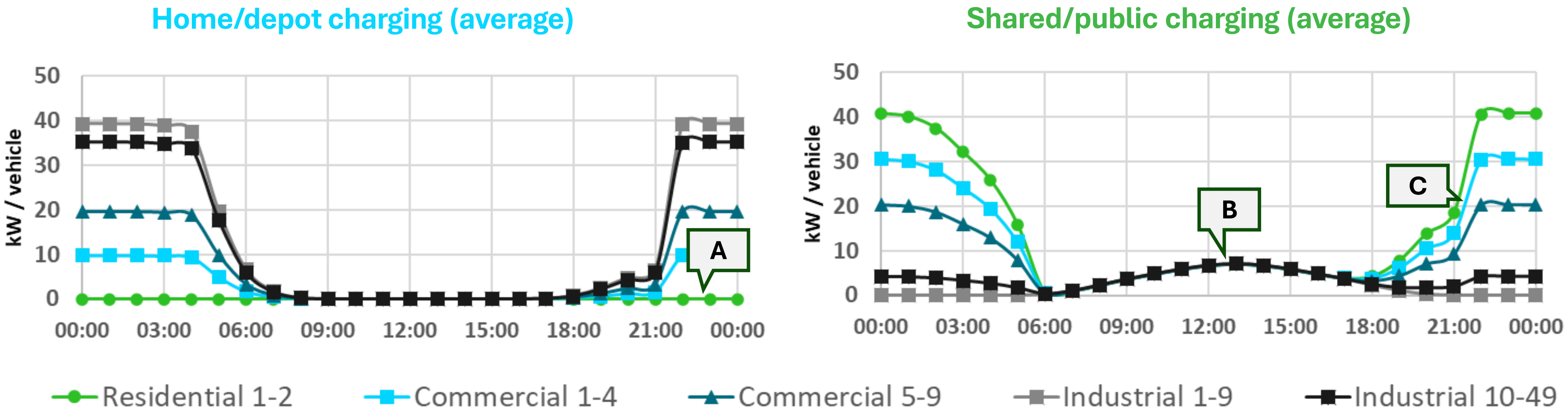
- **135 vehicles** (or 5% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- An average 38 kW is needed overnight (**60 kW charger**).
- This will be too much for Residential, Commercial and smaller industrial locations which will need to upgrade.
- High utilisation and battery size means **all vehicles will need a 50 kWh top-up in the daytime (150 kW charger)** at a convenient time/location between 8am and 6pm.

A Home/depot charging not possible for residential.

B All require daytime shared/public charging.

C Some vehicles require overnight shared/public charging due to site level thresholds , particularly large fleets.





*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

High frequency waste

Operational description

Annual utilisation	24,000	km
Daily utilisation	96	km
Depot dwell	11	hours
Leave depot	5	am
Return to depot	10	pm
Daytime charge	4	hours

Energy requirement

Daily battery use	29	%
Daily requirement	139	kWh*
Battery Size	438	kWh
Overnight max	337	kWh*

Energy supply

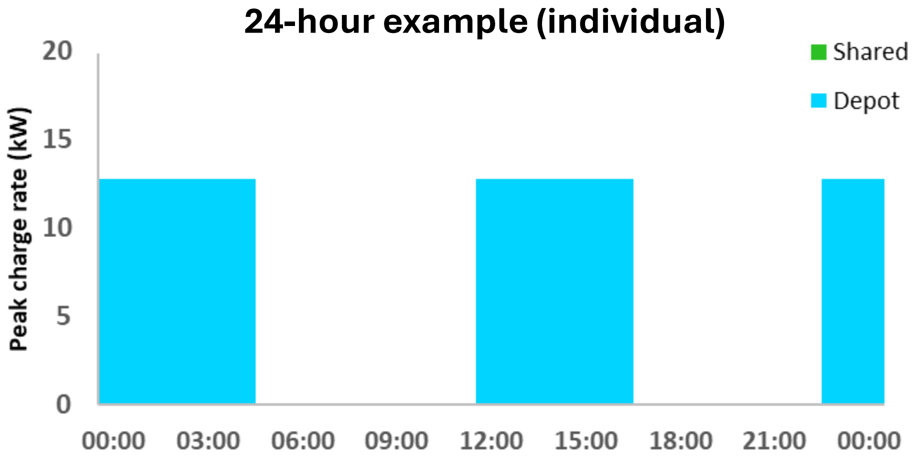
Home/depot (22 kW)		
Daytime	0-38	kWh*
Overnight	0-101	kWh*
Supply utilisation	0-96	%
Shared/public (150 kW)		
Daytime	0-40	kWh*
Overnight	0-100	kWh*

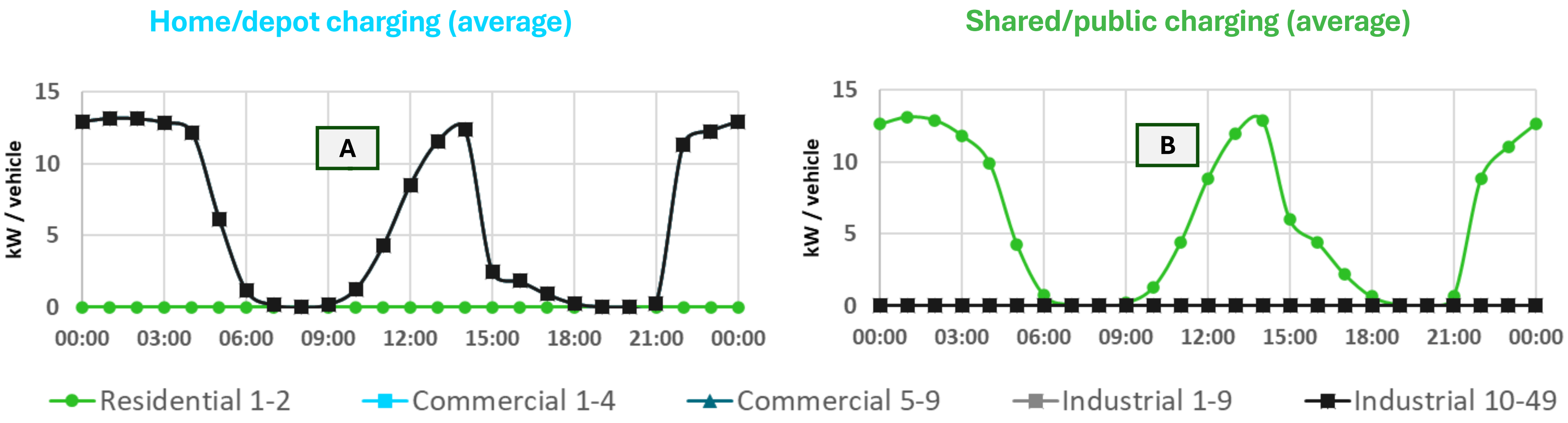
Summary

- **45 vehicles** (or 2% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- Average 13 kW (**22 kW charger) is needed overnight.**
- This will be too much for residential locations and may require councils to k shared charging at destinations (e.g. waste recovery facilities) during the day or night.
- Morning and/or evening shifts and large battery size allows significant flexibility to obtain **daytime charging with 22 kW charger** in the depot.

A All depots should be able to charge in daytime.

B Residential locations require daytime and overnight shared/public charging due to site level thresholds.





*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

>23 t Special

Operational description

Annual utilisation	37,500	km
Daily utilisation	150	km
Depot dwell	12	hours
Leave depot	6	am
Return to depot	6	pm
Daytime charge	None	

Energy requirement

Daily battery use	47	%
Daily requirement	218	kWh*
Battery Size	423	kWh
Overnight max	326	kWh*

Energy supply

Home/depot (22-60 kW)

Daytime	0	kWh*
Overnight	0-218	kWh*
Supply utilisation	0-95	%

Shared/public (150 kW)

Daytime	0	kWh*
Overnight	0-218	kWh*

Summary

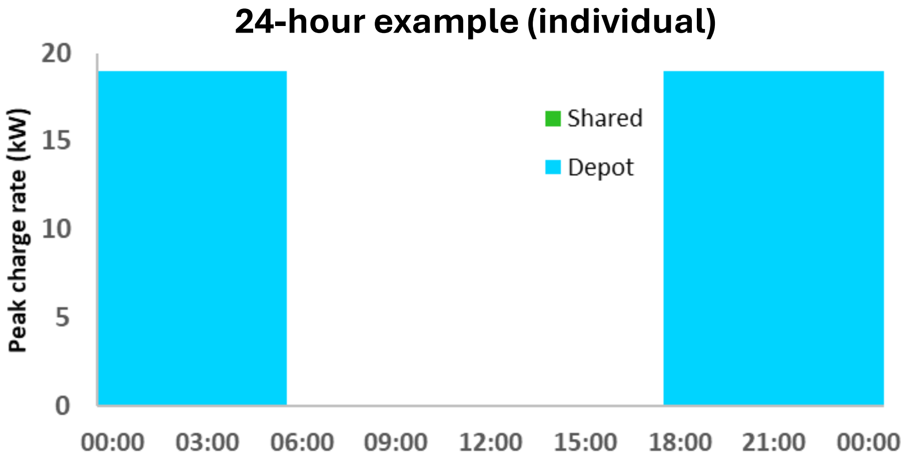
- **90 vehicles** (or 3% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- Average **26 kW (60 kW charger) is needed overnight**
- This will be too much for Residential and Commercial locations. Some Commercial locations will upgrade capacity or make use of overnight shared charging.

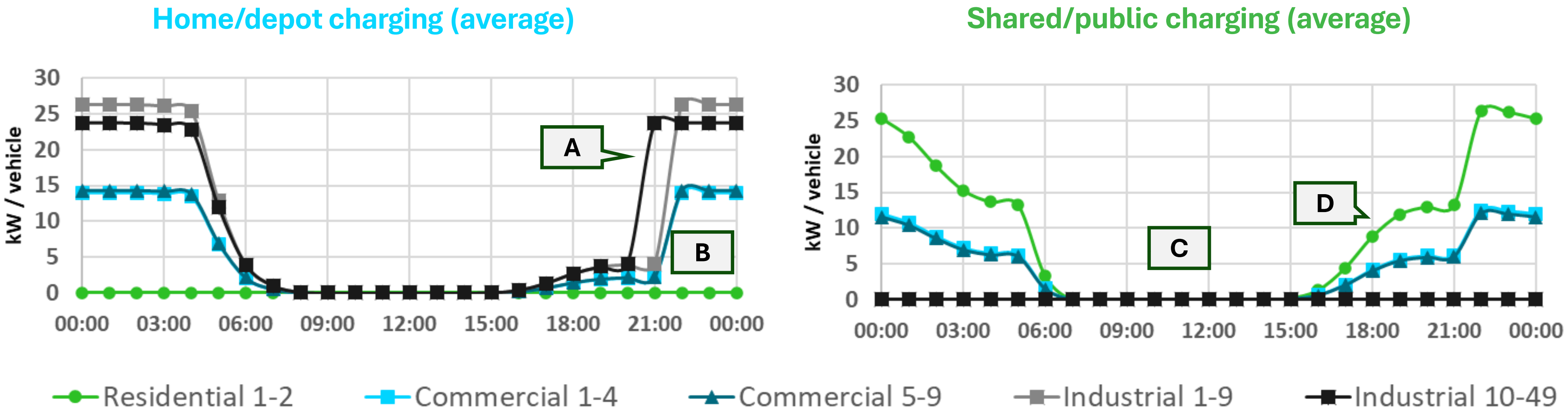
A Industrial fleets of 10-49 vehicles (black) start charging an hour earlier to avoid shared charging requirement.

B Home/depot charging not possible for residential.

C **No need for daytime charging** or shared charging.

D Some vehicles require overnight shared/public charging due to site level thresholds, particularly large fleets.





*energy requirement includes an estimated 10% charging losses

Individual charging profiles ("when")

Prime Mover Urban

Operational description		
Annual utilisation	63,000	km
Daily utilisation	252	km
Depot dwell	10	hours
Leave depot	4	am
Return to depot	8	pm
Daytime charge	2	hours
Energy requirement		
Daily battery use	57	%
Daily requirement	268	kWh*
Battery Size	424	kWh
Overnight max	326	kWh*
Energy supply		
Home/depot (150 kW)		
Daytime	0-141	kWh*
Overnight	0-127	kWh*
Supply utilisation	0-98	%
Shared/public (150 – 300 kW)		
Daytime	0-254	kWh*
Overnight	0-14	kWh*

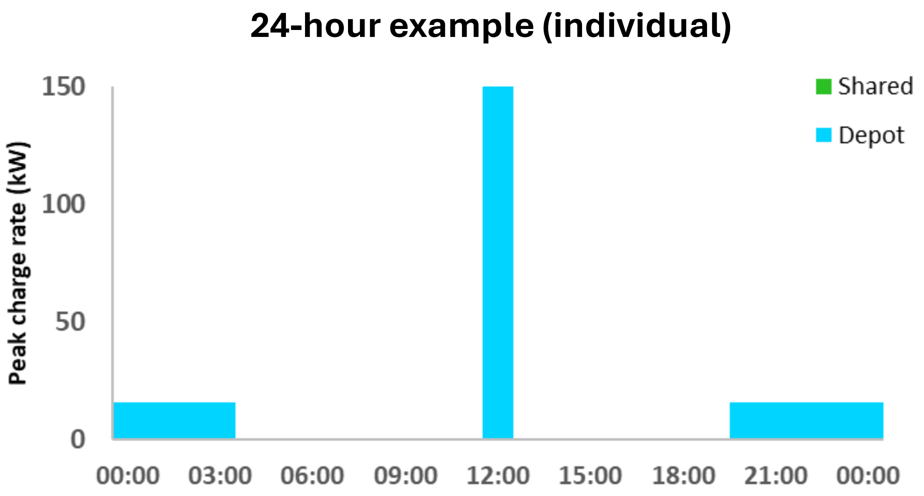
Summary

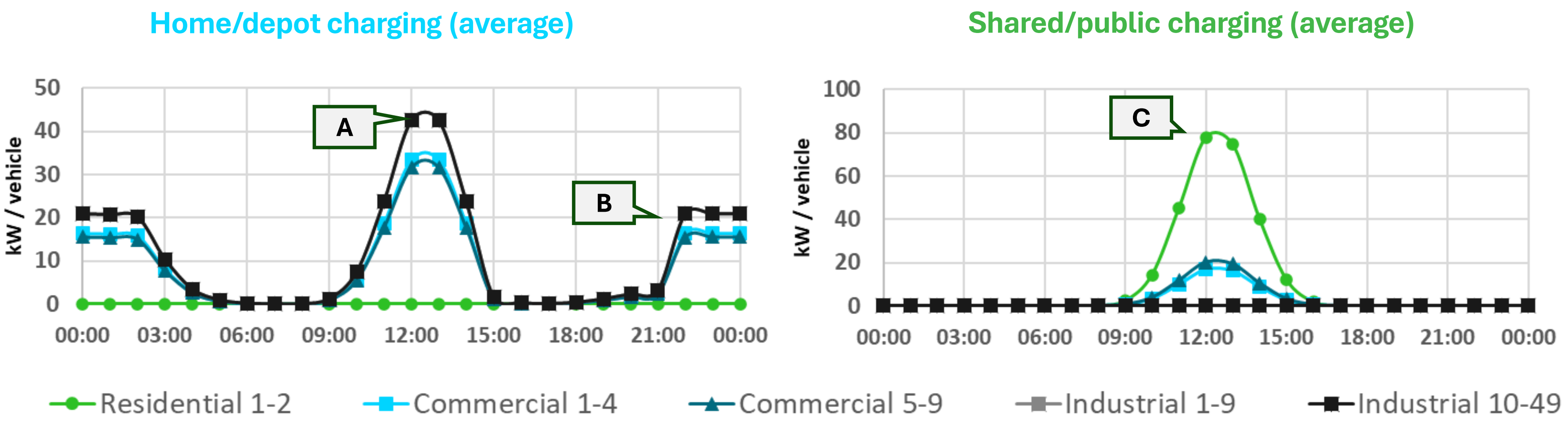
- **160 vehicles** (or 6% of electric truck/van fleet in SWIS) are represented by this segment in 2035.
- Average 19 kW **(at least 22 kW charger) is needed overnight**. This is too much for residential, and some commercial locations may need to upgrade.

A Significant amount of **daytime charging at 150 kW** and large batteries reduce higher cost of overnight charging.

B Most 'top up' from 10pm on return to home/depot.

C Residential locations are likely to do all their charging during the day at shared facilities and avoid overnight.





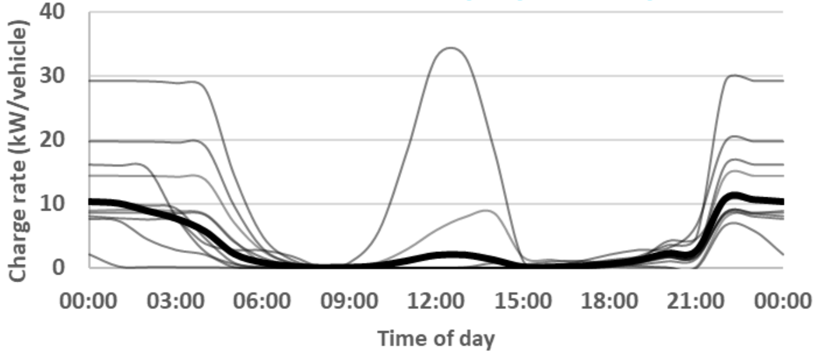
*energy requirement includes an estimated 10% charging losses


ELECTRIC

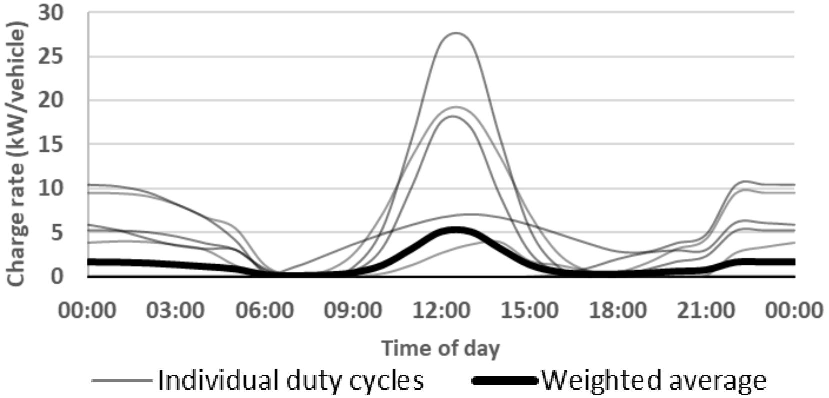
Aggregated charging (“how much”) by home/depot vs shared/public

- As illustrated in the individual charging profiles, there are differences depending on site level thresholds. The aggregated charge demand is therefore dependent on the number of vehicles, fleet sizes and location types. The graphs below illustrate the different individual profiles weighted by number of electric trucks and vans operating in 2035 (left graphs). Multiplying individual weighted averages by vehicle numbers (~2,800 times) results in total charge demand (right).
- The highest grid demand is expected to be at depots, where a spike of 30 MW is expected at 10 pm^. This is driven by delayed charging to avoid the peak tariff period. Shared charging is likely to have a 14 MW peak at around midday, driven by mid shift and enroute charging (weekday average with daytime much lower on weekends).

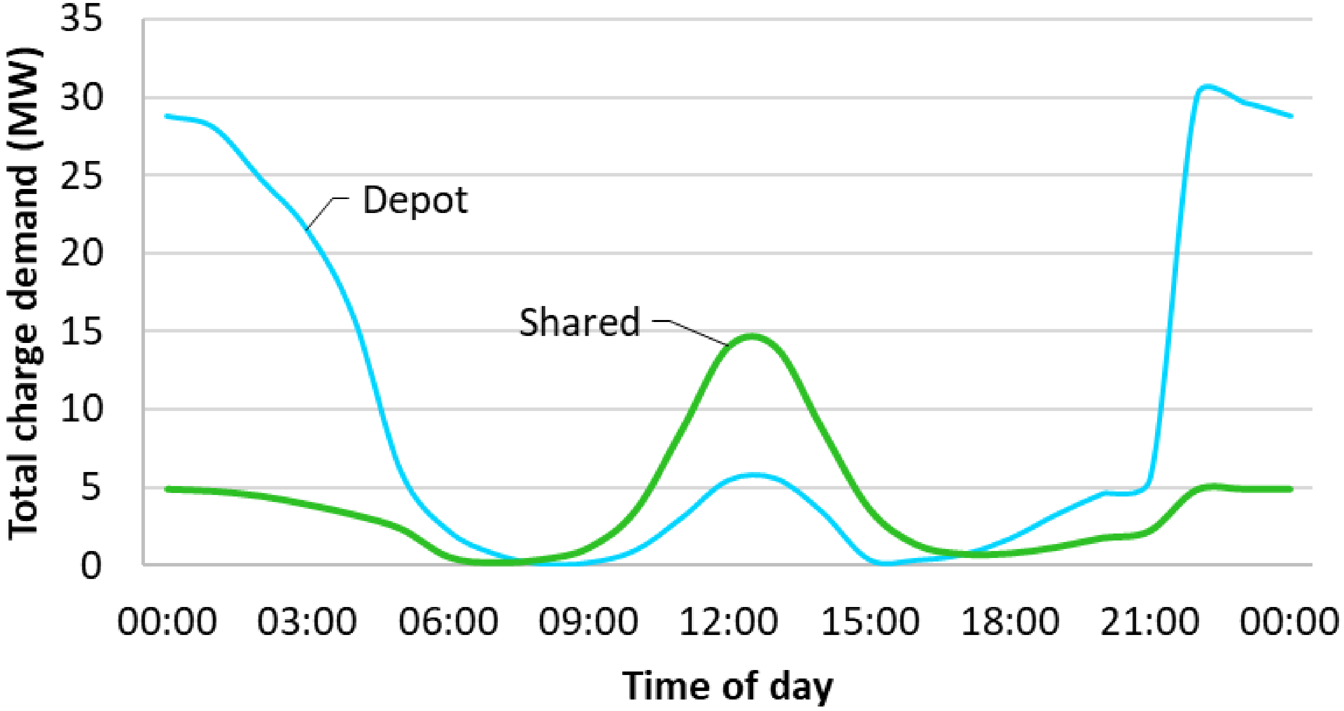
Home/depot charging (average)



Shared/public charging (average)



Total charge demand - home/depot and shared/public



^See Appendix A5. Over time fleet charging shifts to off-peak after 10pm with controlled charging to minimize costs but initial years or smaller fleets may charger immediately in come cases upon return.

Aggregated charging ("how much") by depot type

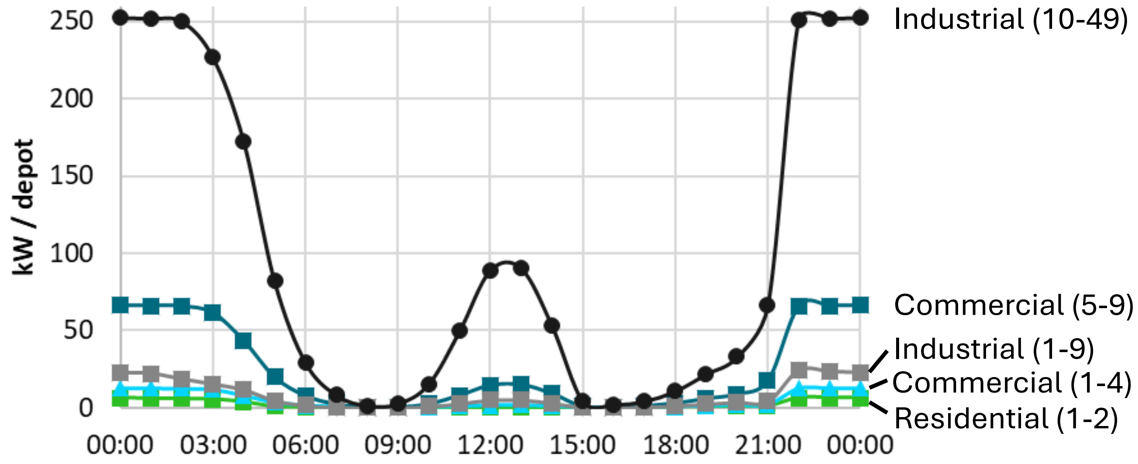
- **Large industrial depots (10-49 BETs)**: contribute 10% of peak charging demand (~3 MW) and utilise on average 250 kW (10 to 15 sites). Most (75%) are willing/able to upgrade beyond 1000 kW, but this is only needed for fleets with larger vehicles or many vehicles.
- **Small industrial depots (1-9 BETs):** contribute 68% of peak charging demand (~20 MW) and utilise on average 24 kW (~850 sites). These depots can manage charging needs without a connection upgrade.
- **Large commercial depots (5-9)** are expected to have a small contribution to the SWIS demand (under 20 vehicles total in 2035) across a few sites.
- **Small commercial depots (1-4)** contribute 3% of peak charging demand (~1 MW) and utilise on average 13 kW (~70 sites).
- **Residential depots (1-2 BETs)** contribute 19% of peak charging demand (~6 MW) and utilise on average under 7 kW (~850 sites).

Assumptions for existing loads, thresholds and upgrade by depot^

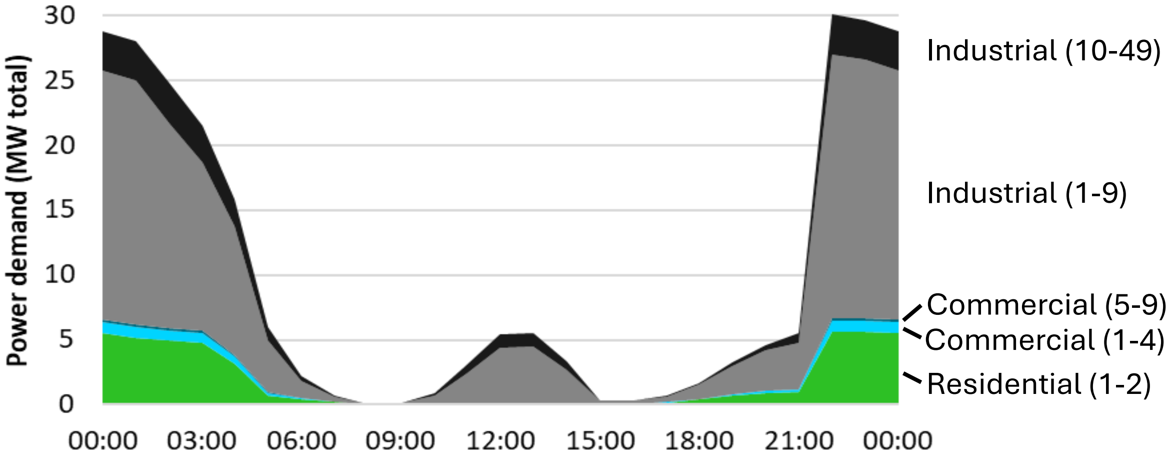
Land use	Depot size	Total site capacity (kW)	Threshold for charging	% willing/able to upgrade
Residential	1-2	22	11	0%
Commercial	1-4	44	22	25%
Commercial	5-9	180	90	50%
Industrial	1-9	180	90	50%
Industrial	10-49	1000	500	75%

^In consultation with Western Power, conservative assumptions were made as to the connection type and existing loads on each depot type. Most depots will charge as fast as site limits allow, resulting in continuous high rates from 10pm to about 3am.

Individual depot demands



Total depot contributions to SWIS



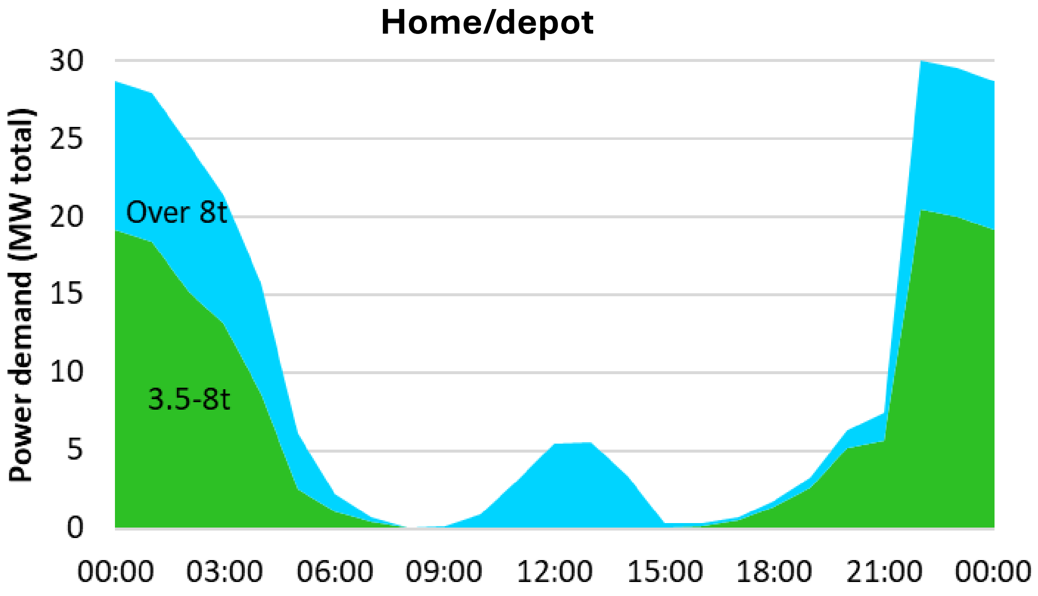
3. Aggregated charging (“how much”) by vehicle type

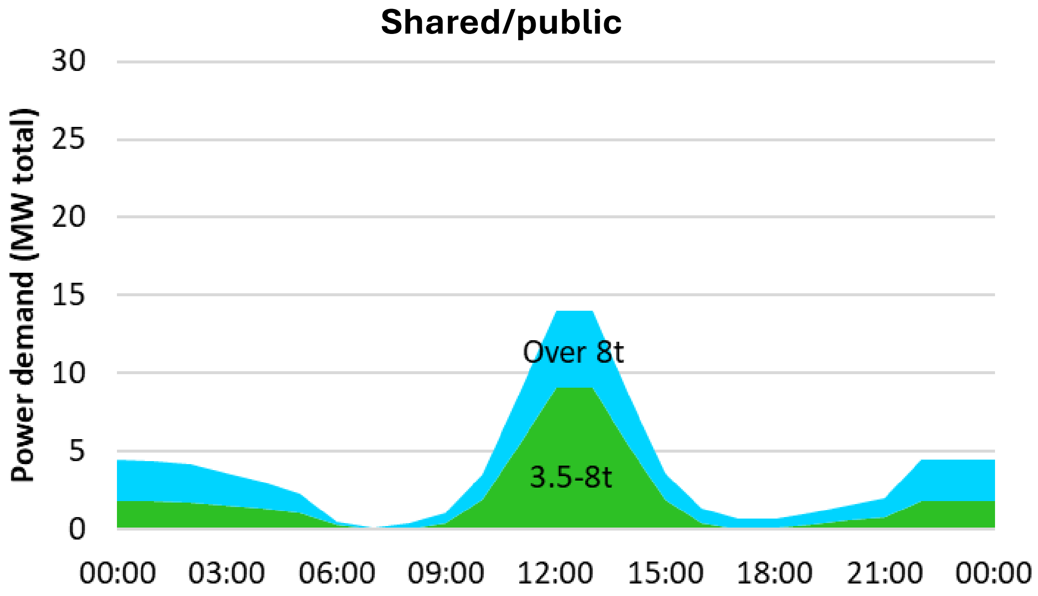
Home/depot

- Electric trucks **over 8 tonnes GVM** are projected to be the main contributors to daytime energy requirement at home/depot locations, with up to 5 MW of power demand expected by 2035. However, these larger vehicles contribute only about one-third of the total demand during the 10 pm charge peak.
- In contrast, electric trucks and vans in the **3.5 to 8 tonne GVM range** are expected to dominate overnight charging, accounting for up to 20 MW of the projected 30 MW total of the 10 pm demand. Overnight charging will decline more rapidly for smaller vehicles, reflecting lower energy requirements.
- These insights highlight the importance of **tailoring charging strategies** to vehicle class and usage patterns when planning depot upgrades.

Shared/public

- Electric trucks **over 8 tonnes GVM** are more likely to rely on shared or public charging facilities overnight relative to smaller trucks, due to limited access to suitable charging infrastructure at home or depot locations.
- During the day, electric trucks and vans under 8 tonnes GVM are key drivers of energy required. Some vehicle types may have ad hoc access to passenger vehicle charging, but this practice is unsuitable and limited by location.
- These findings underscore the need for flexible and scalable public charging solutions, particularly where access to depot charging may be constrained.



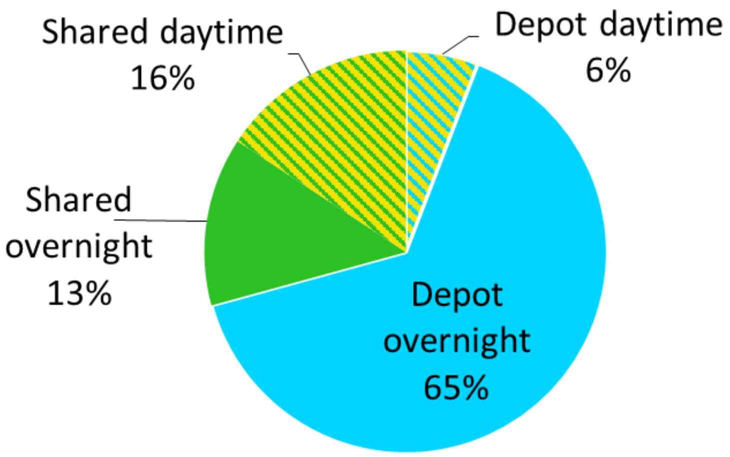


Aggregated charging ("how much") on SWIS

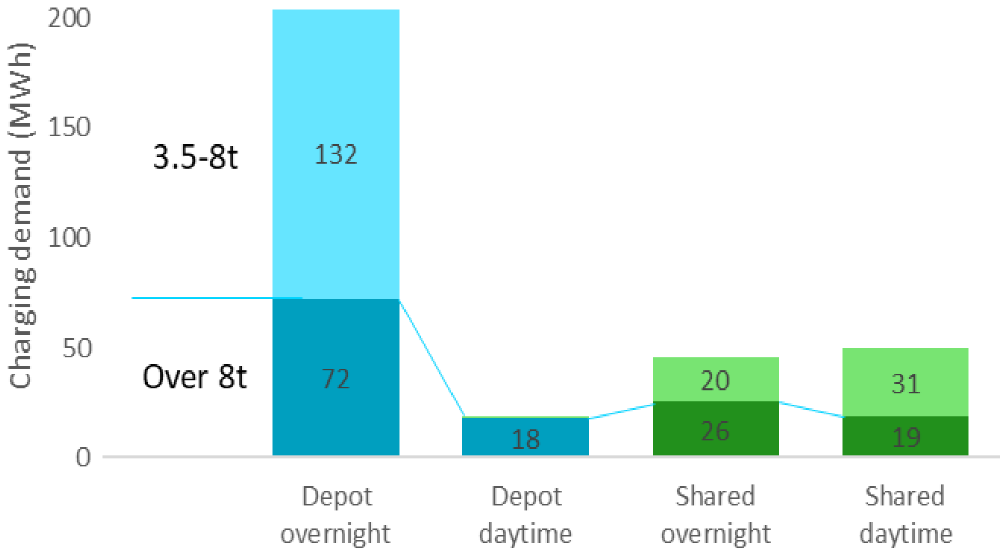
Total daily energy requirements

- Depot overnight charging is expected to meet 65% of daily energy needs, with 13% supplied by shared/public facilities overnight.
- During the day, 16% of charging will occur away from the depot, while 6% of vehicles will return to the depot for daytime charging.
- In 2035, the average daily energy requirement is projected to exceed 320 MWh with 70% or 220 MWh supplied at home/depot locations.
- 60% of this home/depot energy is expected to be attributed to trucks under 8 tonnes GVM (132 MWh)
- The remaining 30% (around 95 MWh) will need to be delivered via shared/public charging sites split evenly between daytime and overnight.
- Larger trucks, which consume more energy, are more likely to rely on shared/public charging in the daytime.

Charging energy split – location/time



Charging energy split – vehicle size

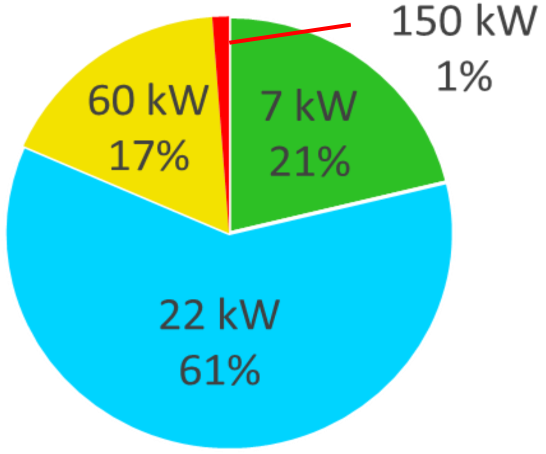


Aggregated charging ("how much") by charger type – home/depot

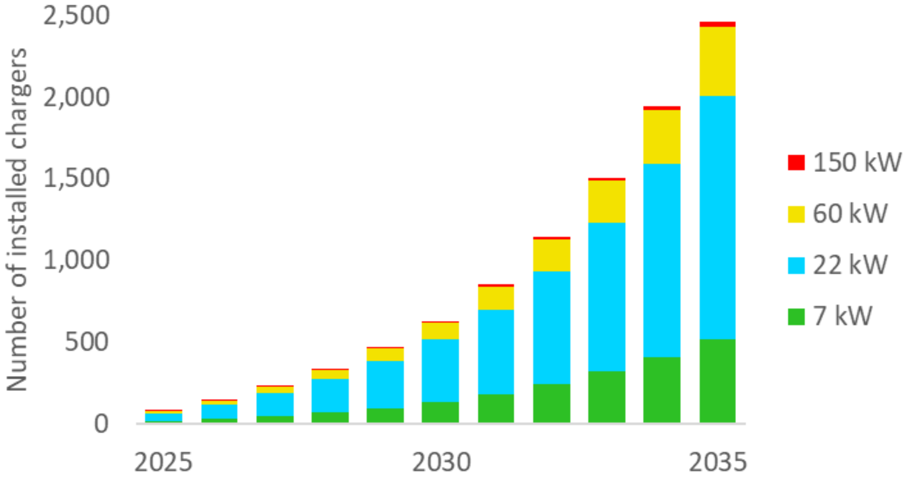
Home/depot charger requirements

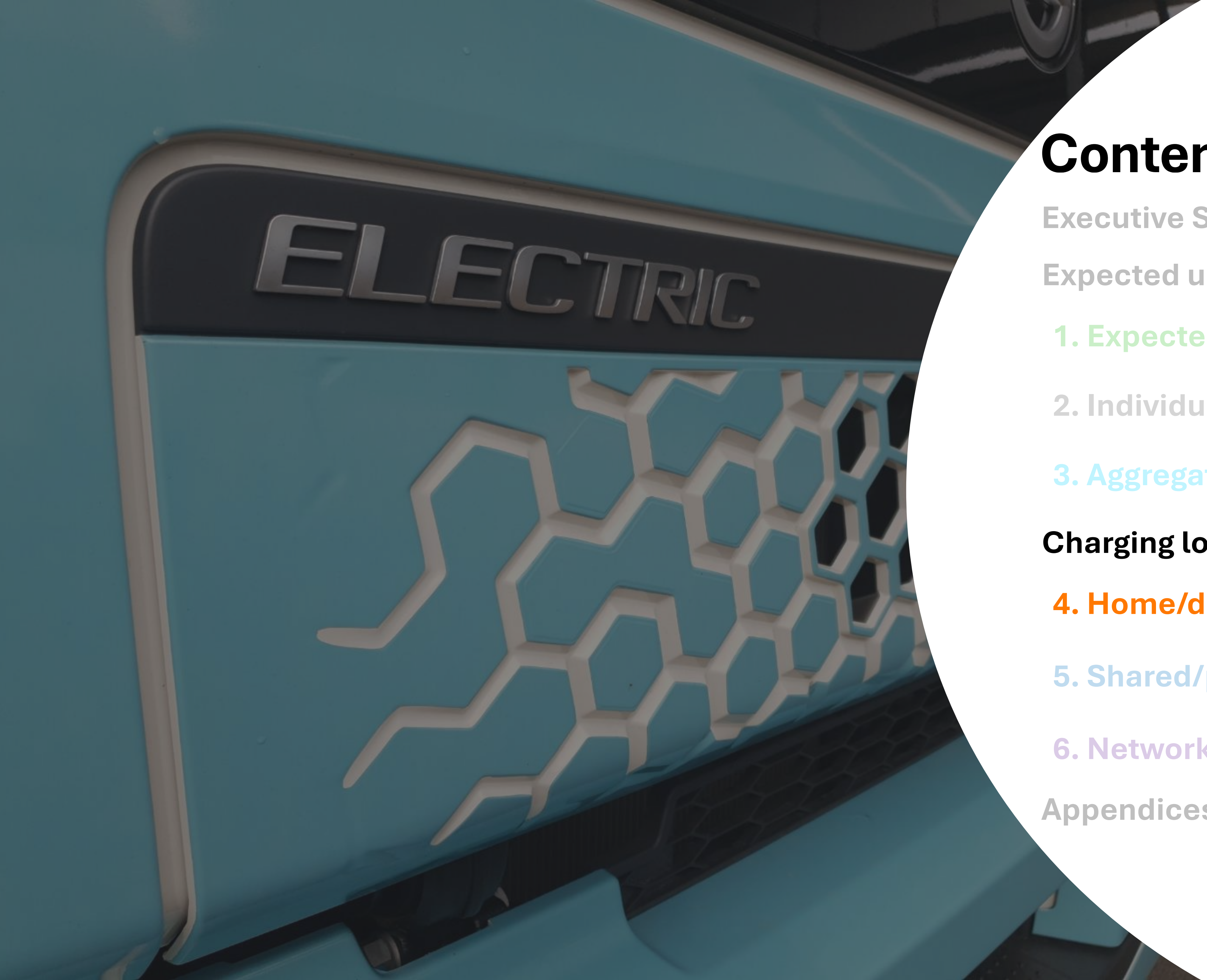
- ~2,500 home/depot chargers are required for overnight charging in home/depots by 2035 (assuming one charger per vehicle); 61% of chargers will be 22 kW chargers with selective installation of higher-powered chargers (e.g. 60 kW, 150 kW) based on duty cycles, depot electrical capacity, daytime and emergency top-up needs. The research and consultation phase also identified there is also a possibility that some electric truck models will not be able to utilise AC charging which may require DC chargers at 60 kW speeds when less than half that speed may be required.
- The overall expectation is that installed charging capacity will be higher than the theoretical minimum, as follows:
    - 10% of 7 kW chargers will be upgraded to 22 kW
    - 20% of 22 kW chargers will be upgraded to 60 kW
    - 30% of 60 kW chargers will be upgraded to 150 kW
- The weighted average installed charger capacity at home/depot is 27 kW per vehicle, with total installed charging capacity in 2035 close to 66 MW. This compares to a peak charging demand on the grid of ~30 MW at 10 pm (i.e. installed capacity is 2 times average peak requirement).

Home/depot chargers in 2035



Home/depot chargers





Contents

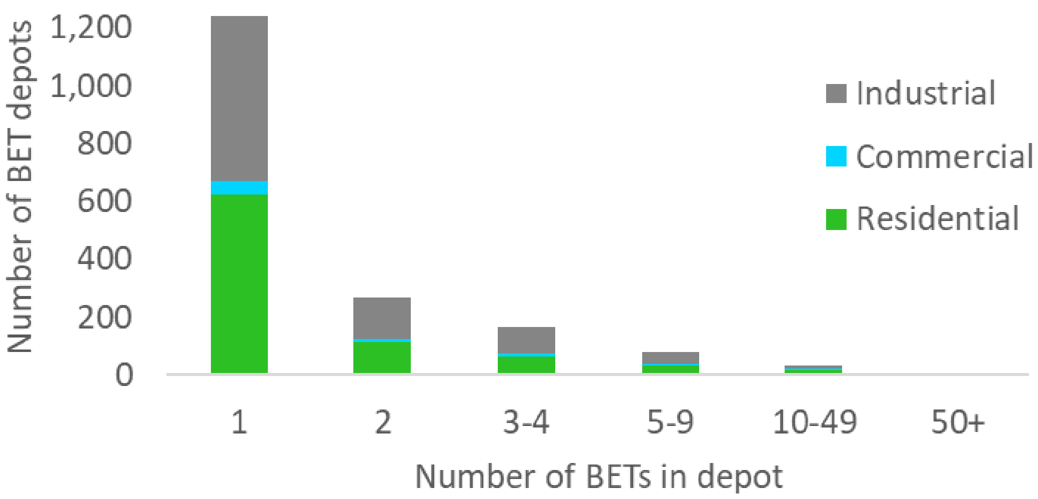
Home/depot profiles ("who") – Predominantly small fleets

Fleet size by location

The distribution of BETs (small vs large depots) is assumed to reflect today's distribution of diesel trucks as shown in the graph below, with approximately 5% of truck depots electrifying by 2035. Key projections include:

- Dominance of sites with only one electric vehicle
- 'Electric depots' evenly split between Industrial and Residential with comparatively few commercial depots
- Potential for BETs to be even more skewed to smaller fleets than diesel
- Low likelihood of massive BET concentration over 50 vehicles on a single site as large fleet operators more likely to spread state fleet over multiple sites.

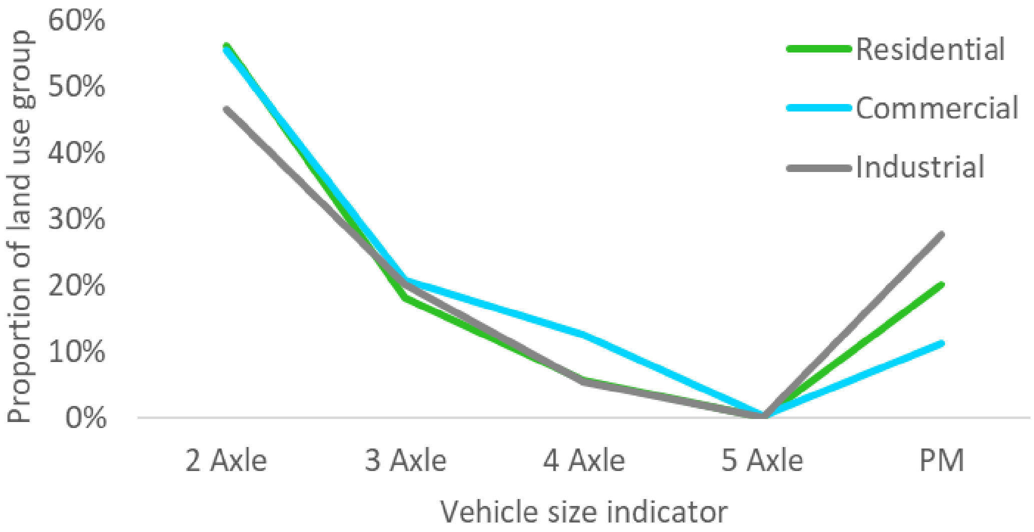
Number of sites/number of BETs by site 2035



Truck size by location

- It is difficult to discern truck duty cycles from registration data, so the axle count was used to indicate the likely spread of duty cycles.
- The distribution of rigid trucks (by number of axles) and prime movers was assessed in each of the land use categories.
- Prime movers are more common in industrial land use categories.
- Light rigids (two axle) are slightly more common in residential or commercial.
- There were limitations identified with registration data (See Appendix A7).

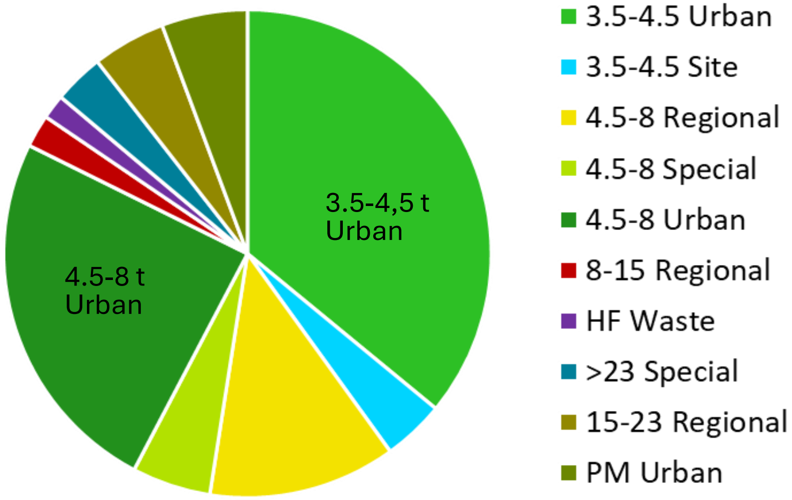
Registration data – truck size distribution



Home/depot profiles ("who") – Larger depots have more and larger vehicles

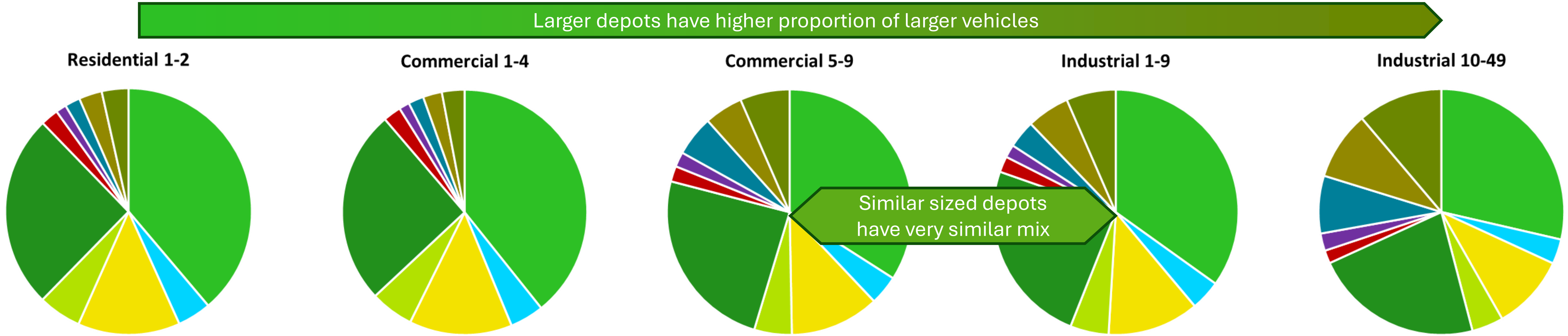
Fleet composition

- The overall BET fleet will have a heavy bias towards small, urban distribution trucks, with two urban profiles representing over 60% of the electric fleet (chart right).
- The profiles with highest energy requirements (PM Urban, regional haul, >23 t Special and HF waste) represent only 30% of the fleet.



Variation by location

- Variation by location was estimated by the number of axles recorded in the registration data, resulting in roughly similar profiles (charts at bottom).
- The smaller urban trucks dominate all locations.
- Larger depots have a higher proportion of larger trucks. This is likely more a function of larger depot sizes than land use classification.
- If the larger depots that do exist in residential postcodes were considered, it is likely that they too would show more of the larger trucks.

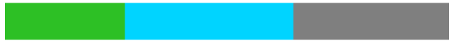


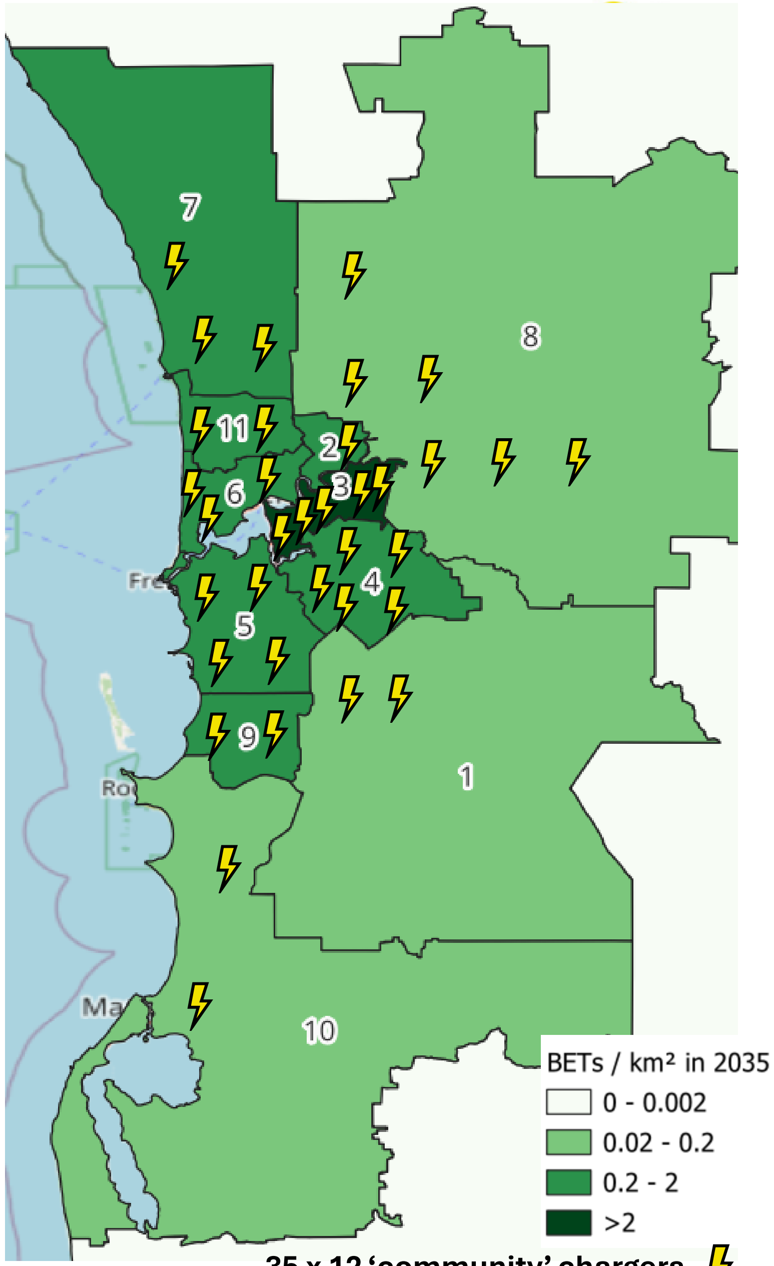
MOV3MENT

transport energy environment

Shared/public charging (“where”) – Metro Perth

- 11 communities were defined based on Main Roads’ 2024 Commercial Vehicle Study, that represent strongly interconnected truck activity and indicate potential proximity to routes for charging to utilise dwell time and avoid additional travel. Shared/public charging locations in each community were adjusted with traffic data*.
- It is assumed electric trucks will be concentrated in the postcodes where newer trucks are registered (see Appendix A9). Postcode data is aggregated at a community level to help overcome some of the inaccuracy of registration data being used a proxy for overnight location. The table below details BET operation and shared/public charging requirements in 2035.
- Based on the electric truck allocation and expected mix of vehicles in each community the shared/public charging requirements have been proportionally allocated with an average 1 MW^ site combination of 5 x 150 kW chargers (dedicated to daytime), 5 x 22 kW and 2 x 60 kW (primarily for overnight charging).

Community	Land classification by BET count	Proportion of BET fleet in community in 2035	No. of charging sites (~1MW average)
1. Byford/Southern River	 Residential, 85%	4%	2
2. Bayswater/Bassendean		2%	1
3. Kewdale/Forrestfield/Belmont	 Industrial, 69%	11%	5
4. Canning/Gosnells/Welshpool		12%	5
5. Cockburn/Fremantle/Bibra Lake		8%	3
6. Mosman Park/Perth City	 Commercial, 49%	7%	3
7. Joondalup/Wanneroo		7%	3
8. Mundaring/Bullsbrook		15%	7
9. Kwinana/Baldivis		3%	2
10. Mandurah/Rockingham		4%	2
11. Mirrabooka/Osborne Park		4%	2



35 x 12 ‘community’ chargers ⚡

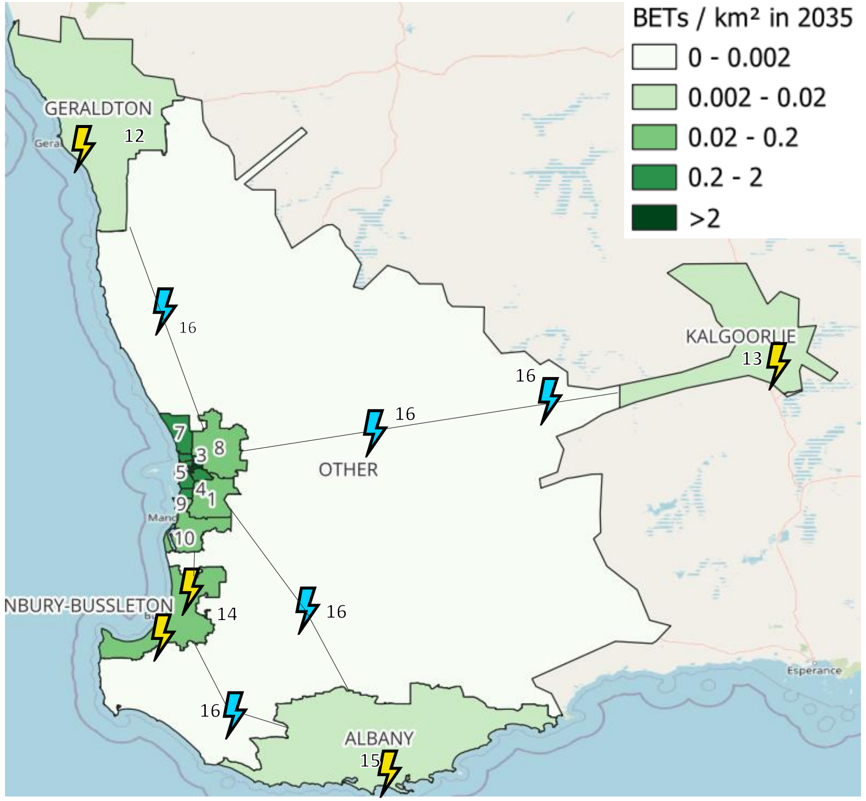
(*locations adjusted for traffic data. See Appendix A8)

^Sites expected to be 600 kW to 2 MW

Shared/public charging ("where") - Regional

- Whilst some vehicle types may try to access current passenger vehicle charging stations, this practice is unsuitable and dedicated truck charging sites are needed. The table below identifies the proportion of electric truck and vans in operation in 2035 in regional communities and estimates charging needs.
- Within these communities, a similar mix of electric trucks is expected to the Perth Metro region, with the same standard site combination of 5 x 150 kW chargers (dedicated to daytime charging) and 5 x 22 kW and 2 x 60 kW (primarily for overnight charging).
- 13% of the BET trucks will have depots in the SWIS but outside of these 15 allocated communities. The exact location is unclear, but they are likely to be concentrated but proximity within 50 km of major highways is expected.
- Even for these regional and urban trucks (line haul is out of scope), key routes between the regional areas will be important. Concentrations of BETs will align to locations of diesel registrations along these routes, as well as regional truck movements between the urban centres.
- Building regional enroute chargers at ~200 km intervals along these routes is likely to be a minimum effective support level. Enroute chargers along major highways are more likely to be grouped in combinations of 4 x 150 kW chargers at minimum, but the overlap with linehaul charging needs may lead to 300 kW to 600 kW. These sites may be standalone or integrated into existing 'truck-friendly' roadhouses (e.g. Puma Merredin, BP Williams, Liberty at Cataby or BP Baldivis).

Community	Land classification by BET count	Proportion of BET fleet in community in 2035	No. of charging sites
12. Geraldton		2%	1
13. Kalgoorlie		2%	1
14. Bunbury/Busselton/Picton		5%	2
15. Albany		2%	1
16. En route		13%	5



5 x 12 Regional community chargers ⚡

5 x 4 En-route chargers ⚡


ELECTRIC

Network considerations (“so what?”)

- There are 70 SWIS substations located across the 15 communities.
- Ninne service more than one community (Beechboro, Cottesloe, Joel Terrace, Morley, North Beach, Pinjarra, Riverton, Wangara, Welshpool **in bold**).
- Welshpool and Riverton substations are associated with high-demand communities (3,4,5 and 8 shaded grey below).
- No communities exceed peak demand of 5 MW and impact should be dispersed across multiple substations based on maximum 1,000 kW per average substation
- One uncertainty is growth areas where fleets are yet to deploy (e.g. Byford/Kwinana) though greenfield sites provide more flexibility when establishing connections.

Community	Peak kW	Daily MWh	Substations	Average kW/substation
1. Byford/Southern River	1,300	13	Byford, Southern River, **Pinjarra**	440
2. Bayswater/Bassendean	500	5	**Joel Terrace**, **Morley**, Hadfields, **Beechboro**	130
3. Kewdale/Forrestfield/Belmont	3,900	37	Clarence Street, Rivervale 132 KV, Belmont, Collier	980
4.Canning/Gosnells/Welshpool	4,200	40	Canning Vale, Bentley, **Welshpool**, Gosnells, **Riverton**	840
5.Cockburn/Fremantle/Bibra Lake	2,800	26	**Riverton**, O’Connor, Myaree, Amherst, **Cottesloe**, Edmund Street, Bibra Lake, Cockburn Cement	350
6.Mosman Park/Perth City	1,000	9	**Joel Terrace**, Cook Street, North Perth, Medical Centre, **Cottesloe**, Shenton Park, Wembley Downs, **Morley**	130
7. Joondalup/Wanneroo	1,200	11	North Beach, Landsdale, Padbury, Joondalup, Clarkson, Wanneroo, Yanchep, **Wangara**.	150
8. Mundaring/Bullsbrook/Forrestfield	4,900	46	**Welshpool**, **Beechboro**, Malaga, **Wangara**, Henley Brook, Darlington, Sawyers Valley, Kalamunda, Muchea, Wundowie, Forrestfield, Midland Junction.	410
9. Kwinana/Baldivis	1,000	9	Medina	1000
10. Mandurah/Rockingham	1,100	11	Rockingham, Waikiki, Meadow Springs, **Pinjarra**, Mandurah, Wagerup	190
11. Mirrabooka/Osborne Park	1,500	14	Osborne Park, Manning Street, North Beach, Arkana, Balcatta, **Morley**, Yokine.	220
12. Geraldton	600	5	Geraldton, Rangeway, Chapman.	200
13. Kalgoorlie	700	6	West Kalgoorlie, Piccadilly, Black Flag, Western Mining Kambald.	180
14. Bunbury/Busselton/Picton	1,800	16	Marriott Road, Picton 132, Bunbury Harbour, Capel, Busselton.	360
15. Albany	700	6	Mount Barker, Albany.	350
16. Other	4,800	42	Rest of SWIS	NA

Policy considerations ("so what?") - information

Strategic priorities to accelerate BET uptake by 2035: Information gaps

To monitor the transition to electric truck adoption and identify the barriers and opportunities for adoption information is required to identify, prioritise and refine the areas of policy focus. Potential information gaps are provided below:

Information

1. Monitor market evolution and opportunity

- **Issue:** No data or only national data available on technology trends.
- **Investigation:** Need to track BET sales in WA, model availability, vehicle prices, network capacity and charging locations suitable for trucks and share externally to identify opportunity relevant for fleets (example opposite)

2. Validate infrastructure requirements

- **Issue:** Shared public charging is critical, but current market signals show low confidence in deployment as utilisation likely to be very low in early stages.
- **Investigation:** Model likely ramp in utilisation to quantify subsidy levels to de-risk investment prior to 'full' utilisation.

3. Disaggregate charging cost

- **Issue:** Electric vehicle charging infrastructure has several cost components separate from the hardware costs such as planning/approvals, civil works, electrical conduits and grid upgrades.
- **Investigation:** Assess charger costs for a combination of different speeds and sizes and site upgrade requirements to inform subsidy.

4. Estimate effective subsidies

- **Issue:** TCO gap to diesel is less than the difference in upfront price, but how much does this change with vehicle utilisation?
- **Investigation:** Determine minimum subsidy level by vehicle segment

Information for opportunity identification

A challenge in identifying the opportunity for electric trucks in WA is the focus on national data and case studies. MOV3MENT's electric truck report assists fleets assess the opportunity but the quarterly WA passenger EV registrations data is more relevant to track progress and understand challenges and opportunities for adoption in WA.

Key aspects to consider are the transparency around available electric models, network capacity suitable for truck charging and charging locations.

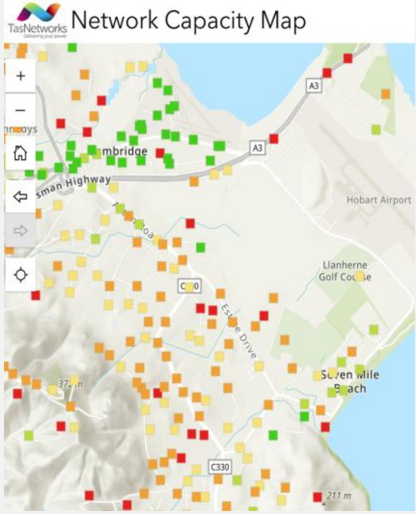
The images below are examples that could give fleets confidence when selecting or planning to operate an electric vehicle:

Model availability

MAKE	MODEL	SEGMENT	GVM (t)
Farizon	SV Cargo Van	Van	3.5
LDV	eDeliver7	Van	3.65
LDV	eDeliver9	Van	4.05
Ford	eTransit	Van	4.25
Daimler/Mercedes	eSprinter	Van	4.25
EV Automotive	EC11 E-Cargo	Van	4.5
JAC	N55	Rigid	4.5 - 5.5
Foton	T5	Rigid	4.5 - 6
Iveco	eDaily	Van/Cab chassis	4.5 - 7.2
Hyundai	Mighty	Rigid	4.5 - 7.3
Farizon	H9E	Rigid	4.5 - 8
Daimler/Fuso	eCanter	Rigid	4.5 - 8.5
JAC	N75	Rigid	7.5

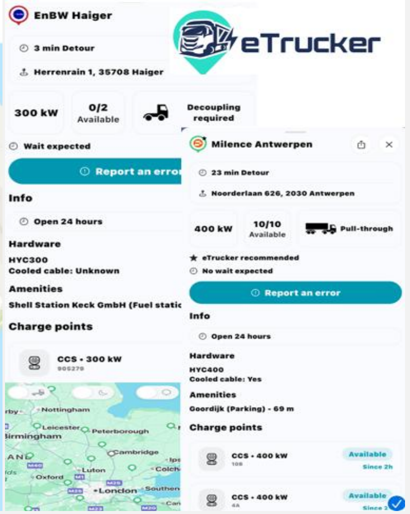
Source: Electric truck report

Network capacity



Source: TasNetworks

Charging locations



EnBW Haiger
3 min Detour
Herrenrain 1, 35708 Haiger
300 kW
0/2 Available
Decoupling required
Wait expected
Report an error
Info
Open 24 hours
Hardware
HYC300
Cooled cable: Unknown
Amenities
Shell Station Keck GmbH (Fuel static
Charge points
CCS • 300 kW

Milence Antwerpen
23 min Detour
Noorderlaan 626, 2030 Antwerpen
400 kW
10/10 Available
Pull-through
eTrucker recommended
No wait expected
Report an error
Info
Open 24 hours
Hardware
HYC400
Cooled cable: Yes
Amenities
Goordijk (Parking) - 69 m
Charge points
CCS • 400 kW Available Since 2h
CCS • 400 kW Available

Source: Etrucker app

Policy considerations (“so what?”) - actions

Strategic priorities to accelerate BET uptake by 2035: Potential policy actions

To accelerate electric truck adoption—or maintain BAU trajectory—the WA Government may need to act to support public charging deployment and/or subsidise upfront vehicle costs. Potential policy actions are provided below:

Actions

1. Infrastructure

- Develop best practice guide for dedicated truck charging (example opposite).
- Assess additional land requirements and grid upgrades for truck charging.
- Support or incentivize shared charging at freight customer sites in Perth.
- Support regional charging linking Bunbury, Geraldton, Albany and Kalgoorlie.

2. Incentives

- Advocate for reform to road usage tax that will favour BETs.
- Registration discounts, scrappage schemes, and residual value guarantees.
- Encourage BETs in public service contracts and offer port access benefits.

3. Demonstration & Innovation

- Innovation prize to encourage maximum distance or payload by electric trucks.
- Host events to showcase BET use cases.

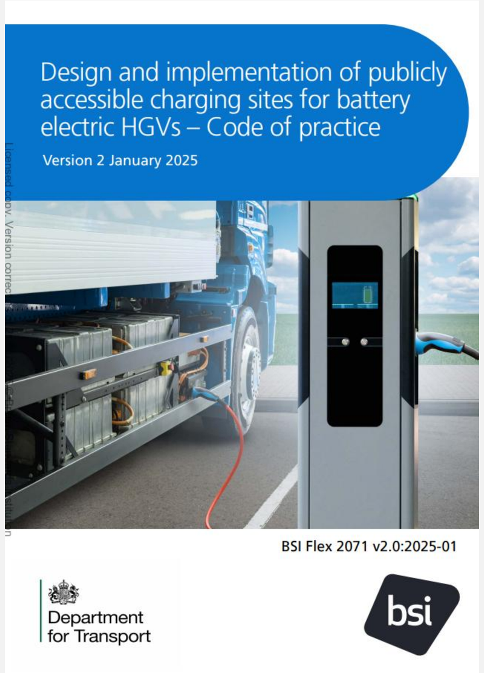
4. Collaboration

- Cross-government taskforce for land and approvals.
- Partner with ports on access.
- Work with ARENA on WA-focused projects for smaller operators.
- Engage OEMs to facilitate BET trials with small operators
- Join national EV or decarbonisation alliances to share best practices.

Guide needed, as no clear limitations for electric trucks to use passenger charging

UK code of practice (cover opposite) developed for electric truck charging has key design features:

- Large physical footprint with maneuverability.
- Access for vehicles up to 25.25 m and 60 t GCM.
- Drive-through and/or 'herringbone' parking
- Separate heavy vehicles from passenger cars
- Safe access to 'welfare facilities’ for long stays
- >1.2 m width of walkway between vehicles.
- <5 m headroom clearance should be signed.
- Supply ancillary power (e.g. refrigeration).
- Charge points with a rated power of > 300 kW



Design and implementation of publicly accessible charging sites for battery electric HGVs – Code of practice

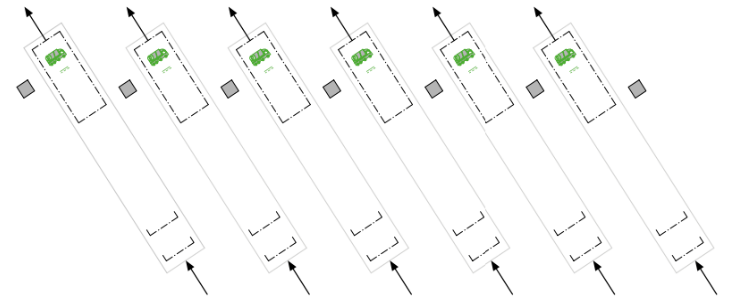
Version 2 January 2025

BSI Flex 2071 v2.0:2025-01

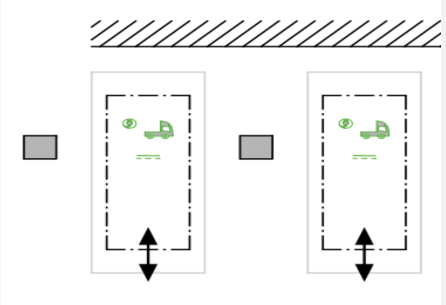
Department for Transport

bsi

Ideal charging layout example



Less desirable layout



Conclusions

Today, fewer than 100 electric trucks and vans operate in WA, but by 2035 the fleet is projected to grow to 2,800 BETs, representing 15% of new truck sales. This transition will require infrastructure investment, policy support, and industry engagement.

Cost of ownership is within reach for BETs

- TCO parity is expected by 2030 for light/medium rigids in urban and regional use. By 2035 most BETs will outperform diesel except site trucks and urban prime movers.
- Upfront cost remains the biggest barrier — segment-specific subsidies and shared charging incentives are essential.
- Longer contracts and customer support for charging remain key enablers for broader fleet adoption; but smaller fleets, which are harder to engage, require more attention.

Charging is not "one-size-fits-all"

- Ten truck profiles modeled show diverse duty cycles and energy needs with larger trucks (>8 t GVM) often exceeding residential/commercial site electrical capacity.
- OEMs are ramping up truck supply and reducing prices in light/medium rigid EVs. An expected 30% range increase by 2030 will improve suitability, but battery cost and weight remain constraints for larger vehicles.

Uptake will be led by light trucks and overnight depot charging

- Peak overnight electricity demand will total 30 MW (at 10 pm) with mostly light-duty (3.5 to 8 t GVM) trucks and vans for urban delivery, where electrification is most viable.
- Overnight depot charging dominates, supplying 65% of energy needs, with 2,500 home/depot chargers required by 2035.
- Shared/public charging is critical for larger trucks and regional haulage; 500 chargers across 45 sites will be needed (with 230 chargers capable of 150 kW or more).
- Charging will mostly occur after 10 pm to avoid peak tariffs, using 7 to 22 kW AC chargers for small and medium trucks and 60 kW DC for heavier vehicles.

Pubic and shared infrastructure investment is needed for daytime charging

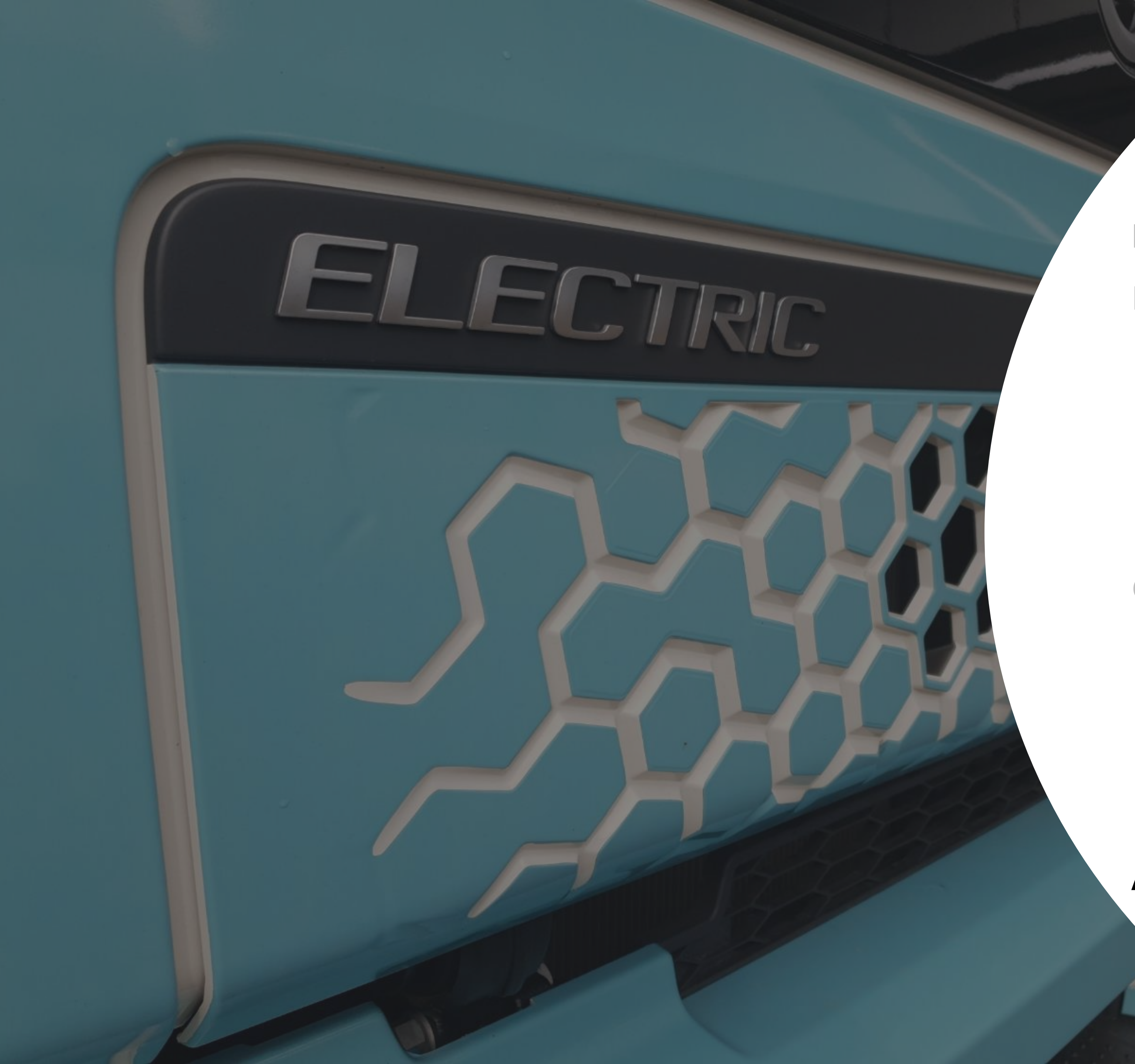
- Peak daytime demand will total 14 MW peak at midday, mainly at public and shared sites with a mixture of vehicle types.
- Shared charging sites will be required at metro hubs like Welshpool and Kewdale, with land reservation likely required for regional routes.
- On average, shared charging sites will require about 1 MW capacity each, with a mix of 150 kW fast chargers and 22 kW overnight chargers.

Network planning must consider concentration

- Charging is likely to cluster where depots or freight activity is concentrated, creating localised grid impacts. Planning for land availability and grid upgrades is needed.

Continuous market monitoring is essential

- BET uptake will be sensitive to changes in vehicle availability, price, range, and charging capability. These should all be monitored regularly to track shifts in the market.


ELECTRIC

Appendix A1

Expected uptake ("what")

Modelling assumptions and limitations

- The 2025 electric fleet composition is **heavily skewed by 30 medium and heavy trucks purchased with grant funding by Centurion**. It was assumed the long-term sales of electric trucks/vans under 8 t GVM would increase from around a third today (as a consequence of Centurion purchases) to over 50% in 2035, aligned to the estimates in the foundation uptake modelling.
- Whilst the adoption of larger electric trucks are expected to increased in line with opportunities for daytime charging, this may be impacted by higher electricity prices and/or network costs depending on how higher charging demands can be successfully integrated into the grid.
- The table below provides detailed electric truck and van uptake under BAU ('Low') scenario (rounded to nearest five vehicles). Annual adoption through new truck sales is assumed to increase from under 50 in 2025 to over 600 per year. Attrition, due to scrappage or sales outside the SWIS, will be low in this very new fleet. This will also fluctuate according to major fleet acquisitions, particularly in response to ARENA grant funding over the next two years.

Additional incentives that eliminate the TCO gap could feasibly double annual electric truck adoption by 2035.

- Under a 'high' uptake scenario the electric truck and van fleet could reach 12,000 vehicles (or four-times BAU) but will also likely be weighted to larger trucks with five times daily energy requirements in aggregate and five times the increase in peak electricity demand due to faster charging demands. See Appendix A6 for scenarios.

Projected electric trucks/vans in operation to 2035 in the WA SWIS under BAU ('Low') scenario

Segment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
3.5 < GVM ≤ 4.5t	10	10	15	30	50	80	115	155	245	365	515	705	930
4.5 < GVM ≤ 8t	10	10	20	30	50	75	110	155	205	280	380	505	640
8 < GVM ≤ 15t	0	10	20	35	55	80	105	140	175	215	265	320	390
15 < GVM ≤ 23t	0	5	20	35	65	90	130	170	210	265	330	410	500
GVM > 23t	0	0	5	5	15	20	30	35	55	65	90	105	125
PM ≤ 70t	0	0	10	30	30	30	40	55	70	90	115	145	180
Total	**20**	**35**	**90**	**165**	**260**	**380**	**525**	**710**	**960**	**1285**	**1695**	**2190**	**2765**

Appendix A2

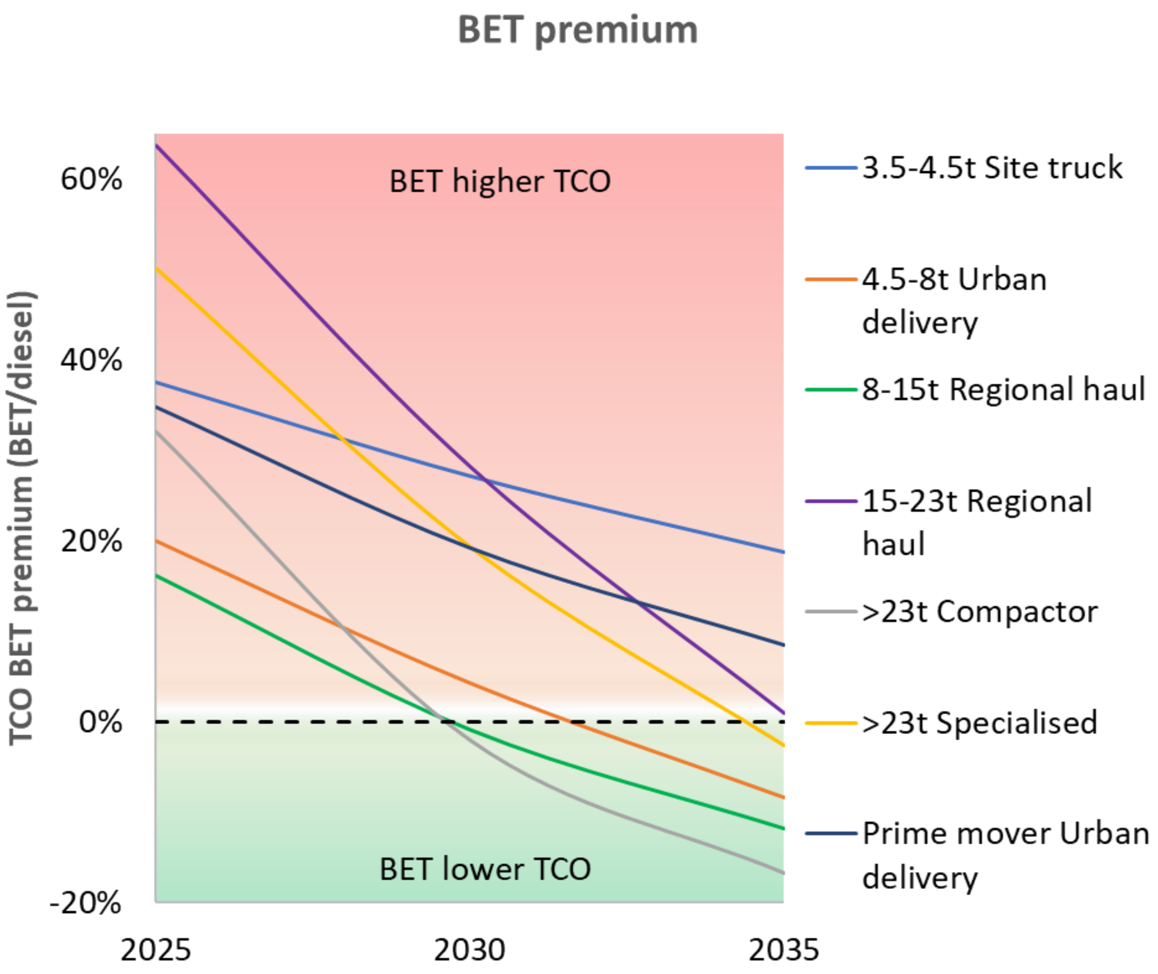
Expected uptake ("what")

The importance of viability for expected uptake

- **In 2025**, there is a TCO premium for all electric trucks with most sales driven by a need for evaluation (trials) or subsidies (e.g. ARENA)
- **In 2030**, parity is foreseeable in:
  - 4.5-8 t GVM urban delivery
  - 8-15 t GVM, regional haul with higher utilization.
  - >23 t GVM, high frequency compactors
- Urban delivery in particular is a key segment for adoption, yet regional haul may drive less sales if shared/public charging is limited.
- **By 2035**, all trucks are likely to have a lower TCO than diesel except:
  - 3.5-4.5 t Site trucks, which have very low utilisation **but** may achieve payback with longer ownership periods.
  - Prime mover urban delivery has a high cost for daytime charging, but access to suitable shared charging could reduce overall costs.

Caveats: results for individual trucks will vary, primarily depending on:

  - Actual purchase prices (these vary greatly, noting averages are used in TCO)
  - Utilisation, with higher annual km strongly favouring electric trucks if fleets can access affordable daytime charging
  - Longer dwell periods in the depot can lead to cheaper charging infrastructure
  - Better access to shared charging infrastructure that is more utilised can also lower the cost of daytime charging.



Appendix A3

Expected uptake (“what”)

Relevance of research and consultation to analysis

The charging analysis closely follows most findings from the research and consultation as relevant input was sought from local fleets and truck manufacturers. Research and anecdotes related to international electric truck charging were also considered but generally has less relevance. Key insights include:

- The **most likely segment for electric truck adoption** is last-mile urban delivery using light to medium rigids with back-to-base operations.
- In terms of the types of fleets expected to adopt electric trucks the expectation is **less concentration with most fleets only able to electrify a small number of trucks** relative to diesel fleet size. Most electric fleets will be 1 to 5 trucks at one location relative to diesel fleets of 10 to 50 trucks.
- Daytime charging behaviour is also expected to continue to occur at midday at home/depot locations with partial charging (33–66%), but larger trucks and longer distances from base will necessitate en route public charging. Overnight AC charging (65% in this analysis) is broadly consistent with AEMO electric vehicle projections (70-80%).
- Electrical site constraints were a common situation encountered by fleets in the research and this is consistent with how charging has been modelled.
- Research also indicated that depot charging often requires load management systems or response to avoid peak tariffs. This is a key driver of the 10 pm charging peak.

However, some research and consultation is inconsistent with assumptions in the modelling, as follows…

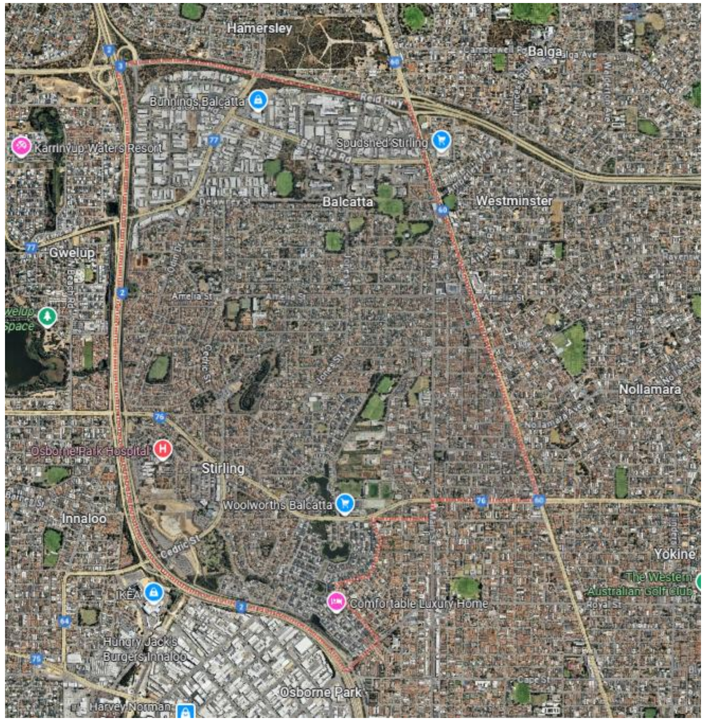
- Research from AEMO electric vehicle projections indicated only 5% of electric truck charging locations may be public in Australia (mainly en route charging).
- The analysis has found that site constraints may lead to 15% of charging located on shared/public sites, providing 30% of energy requirements. This is more comparable to Europeans expectations with 10% of charging located on public sites but providing 45% of energy requirements due to faster charging networks.
- Another insight based on uptake of specific truck profiles is that shared/public charging will be needed sooner and certainly before 2030.
- Over 600 home/depot chargers are likely to be needed in 2030 to support over 700 electric trucks and vans, but an additional 100 - 150 chargers may need to be located on up to a dozen shared/public sites, predominantly in Perth metro.
- Slower charging is required than was expected with 60 kW to 150 kW sufficient for most use cases until 2035. Higher 600 kW or megawatt speeds are not required for most truck use cases in the SWIS by 2035. It is expected, however, that an overlap with linehaul trucking needs will occur, and 600 kW chargers will be accessible in some cases.

Appendix A4

Individual charging profiles ("when")

Land use type

- The registration data provided by DoT identified each postcode by its predominant land-use category. These 10 categories were further grouped into the three simplified categories used in this project; Residential, Commercial and Industrial.
- There are limitations to this method. A good example is 6021 (Balcatta and Stirling). This is a predominantly residential postcode, and is treated as such in this project, looking at fleets of 1-2 BETs only, and assuming a 22 kW grid connection. However, the Balcatta industrial area, including Western Power's Balcatta depot and the City of Stirling operations centre, is within this "residential" postcode. Stirling operations centre alone has over 50 trucks in the depot. It already has BETs in 2025. It is unlikely that this depot will have the assumed residential connection of only 22 kW. Similarly, "Industrial" postcode 6031 (Neerabup) includes both Carramar and Banksia Grove residential suburbs.
- The net results of this is that truck populations do vary from he simplified categories modelled in this project (that assumption being a higher incidence of heavy trucks in industrial than residential), but they are more similar than might be expected across Residential, Commercial and Industrial.
- These "anomalies" in the simplified categorisation are likely responsible for a lot of the "remainder" in the final split of land use/fleet size combinations. See Appendix A7.



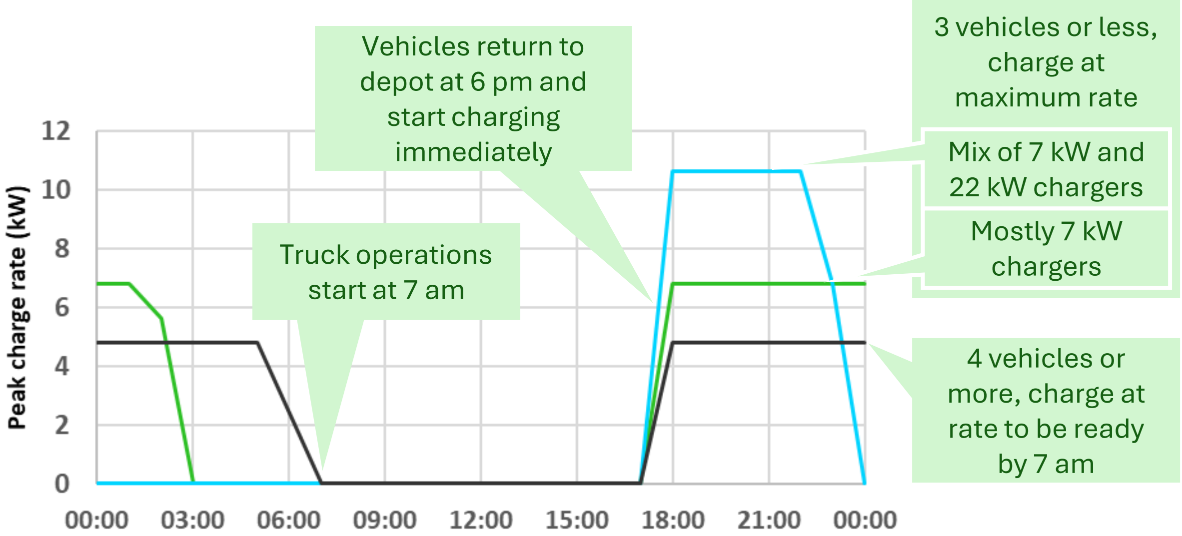
Appendix A5

Individual charging profiles ("when")

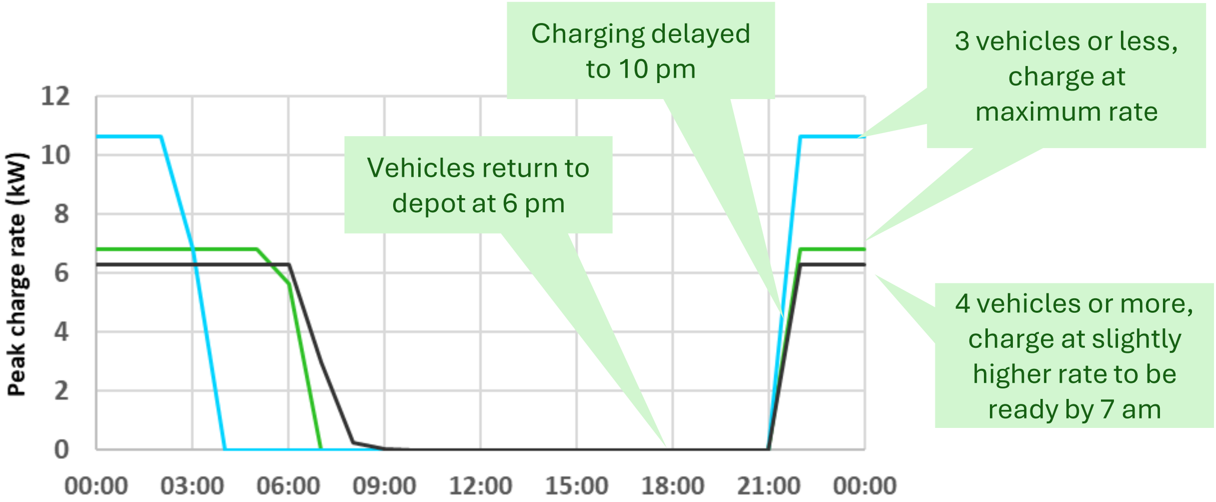
Charging strategy assumptions

- Fleets are expected to minimise their operational risk by charging as soon as possible in the first year, even if this occurs in peak tariff period at higher cost. This behaviour is evident in many early deployments of cars, trucks and buses – even with relatively large and "rational" fleets (e.g. councils and bus operators).
- Over time, as fleet EV experience evolves and electric fleets expand, fleets will gain confidence in the technology and delay charging until 10 pm to lower energy costs.
- Smaller fleets (with 3 or less vehicles) will charge at the maximum rate that chargers (7 or 22 kW) and depots allow.
- Larger fleets (4 or more trucks) will likely have charging controls in place to minimize grid capacity charges. Each truck will be charged as slowly as possible to reach 100% SoC an hour before they are needed the next day.
- The charts below illustrate this charging behaviour for three different types of depot, charging the same vehicle, needing 50 kWh overnight between 6 pm and 7 am.
- The average rate of charge is generally observed to be less than half the installed capacity, but this may still necessitate grid augmentation at the higher levels.

First year (charge as soon as possible)



Subsequent years (minimise cost)



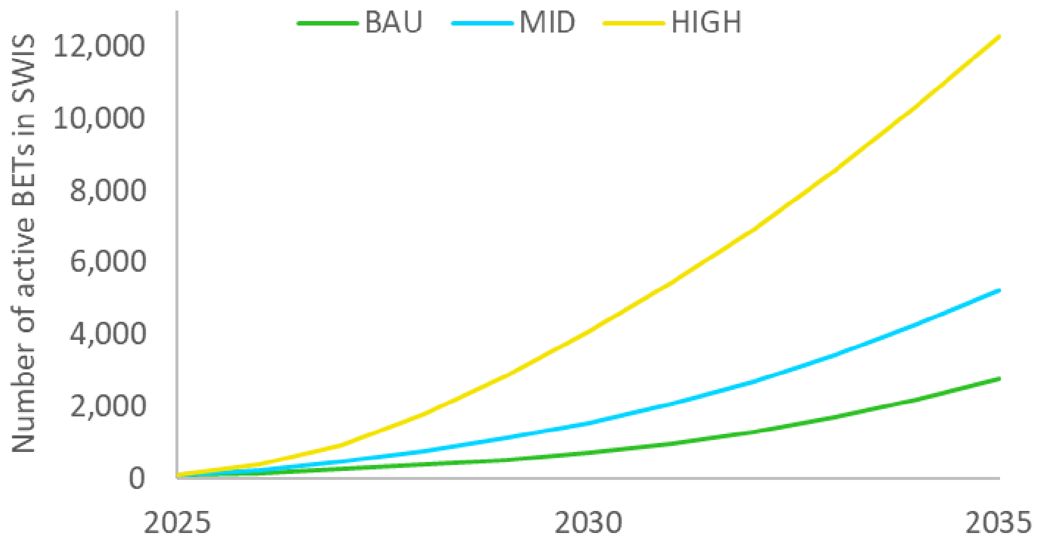
Appendix A6

Aggregated charging ("how much") by uptake scenario

Additional electrification scenarios and their implications

- Electric truck and van uptake projections to 2035 are based on prior modelling from *Low & Zero Emission Freight Vehicle Uptake in Western Australia* (MOV3MENT, 2023). The sales, policy, and technology changes since 2023 confirm that the Business-as-Usual (BAU) or 'Low' scenario should be used for this project.
- Under a 'High' uptake scenario, the fleet could grow to 12,000 electric trucks and vans—four times the BAU projection. However, this growth is expected to be skewed toward larger trucks, which will lead to a five-fold increase in daily energy requirement and peak electricity demand (i.e. 25% more per vehicle on average).
- These scenarios have significant implications for infrastructure planning, grid capacity, and charging strategy.
- For this reason, one of the key recommendations is to closely track the BET market data in coming years to understand which uptake scenarios appears most likely.

Projected electric trucks/vans in operation to 2035 in the WA SWIS under all scenarios



Projected energy and peak power requirement for charging in the WA SWIS under all scenarios

Scenario	Electric trucks and vans in 2035	Daily energy requirement (MWh)	Home/depot chargers required	Peak Power at 10pm (MW)
BAU	~2,800	~320	~2,500	~30
Mid	~5,200	~590	~4,700	~60
High	~12,000	~1,500	~11,000	~140

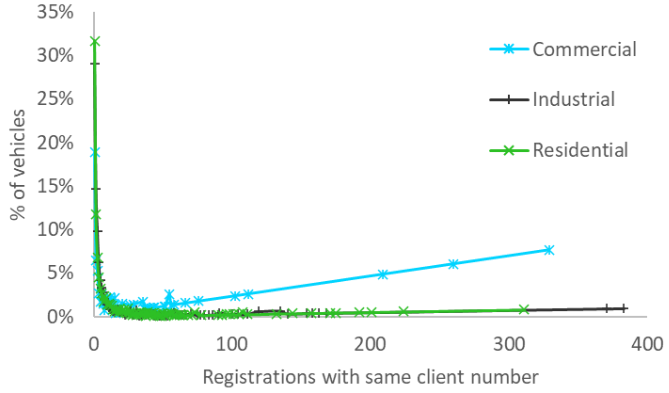
Appendix A7

Home/depot profiles (“who”) – Limitations of registration data

Truck ownership profiles and the spatial distributions

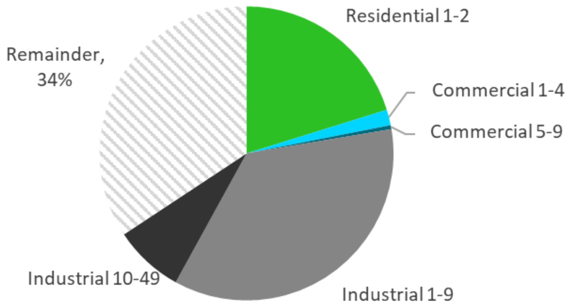
- There is no single complete record of what trucks are based where in WA.
- Registration data was used as a proxy, assuming all trucks associated with a client number operate from a single depot in that postcode.
- There are limitations to this approach, as evidenced by the 1,800 vehicles registered in the 6000 postcode, nearly 200 of them B-doubles and road trains. It is unlikely this number of large trucks are parking in the CBD overnight.
- **Many trucks are clearly registered at company offices**, rather than the location of their depot. This has two effects:
  - Trucks may be attributed to the wrong location
  - Depot sizes are likely overestimated, with a single office registering vehicles that may operate out of multiple depots. This is evidenced by the 8 fleets of over 200 vehicles in the registration data. Consultation indicated a common threshold of around 80 vehicles at a single depot.

Diesel truck distribution

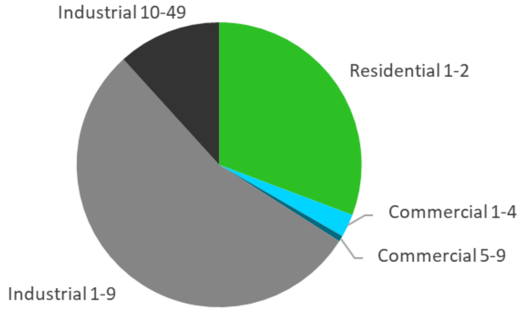


- Data also indicated the majority of fleets had fewer than 10 trucks (97.3%) with only 2.4% of fleets with 10–50 trucks and 0.3% over 50.
- Site electrical constraints and operational risks of electrifying more than half the diesel fleet are likely to support the exclusion of larger fleet sizes. Residential and commercial site constraints lead to a lower threshold again.
- The depot types considered were limited to five land use and fleet size combinations, as in the pie charts below. It was assumed that all BET trucks would be found in the five chosen depot types.
- The remainder was not covered by the land use and fleet size combinations provided by the DoT. It includes Residential depots with more than two vehicles (26%), Commercial depots with >9 vehicles (3%), and Industrial depots with >49 vehicles (5%).
- The distribution of electric trucks by land type is assumed to be the same as for diesel trucks. The BET distribution was scaled up to represent the entire truck fleet, including the remainder.

Diesel truck distribution



BET distribution

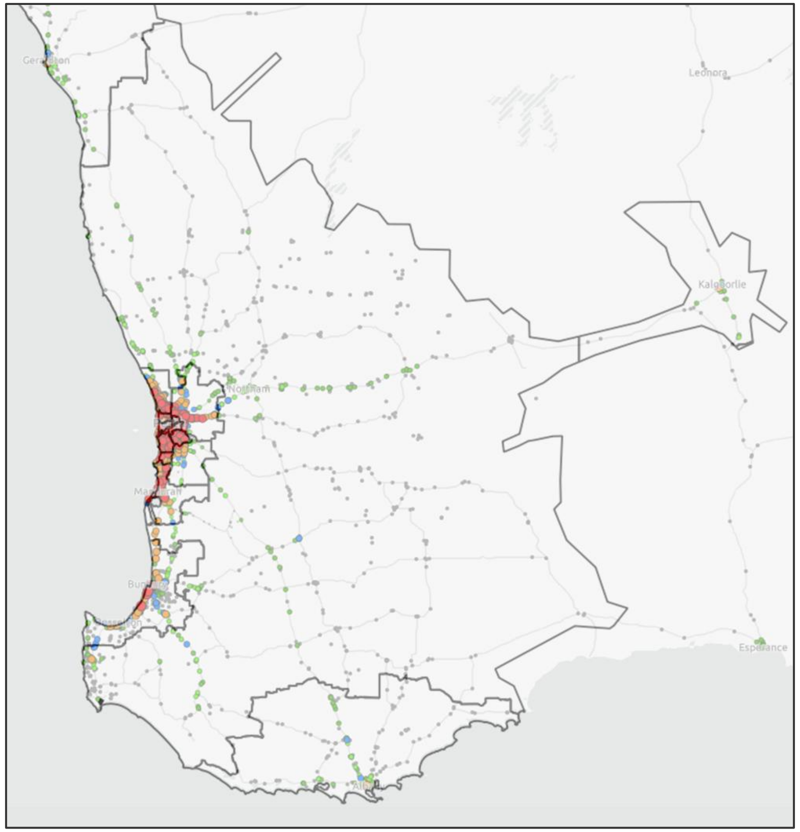


Appendix A8

Shared/public charging (“where”) – comparison to traffic data

- Overnight locations were approximated to postcodes and allocated to communities that follow boundaries established in WA’s 2024 Commercial Vehicle Study^. Four additional communities were added to cover the important regions of Geraldton, Kalgoorlie, Bunbury-Busselton and Albany.
- These communities were compared with WA transport’s TSSP traffic counts (noting these counts include all trucks, such as multi-trailers and long-haul, which are outside this project’s scope). examples below which show strong alignment between high BET adoption and high traffic in communities 3, 4 and 5.

All of SWIS



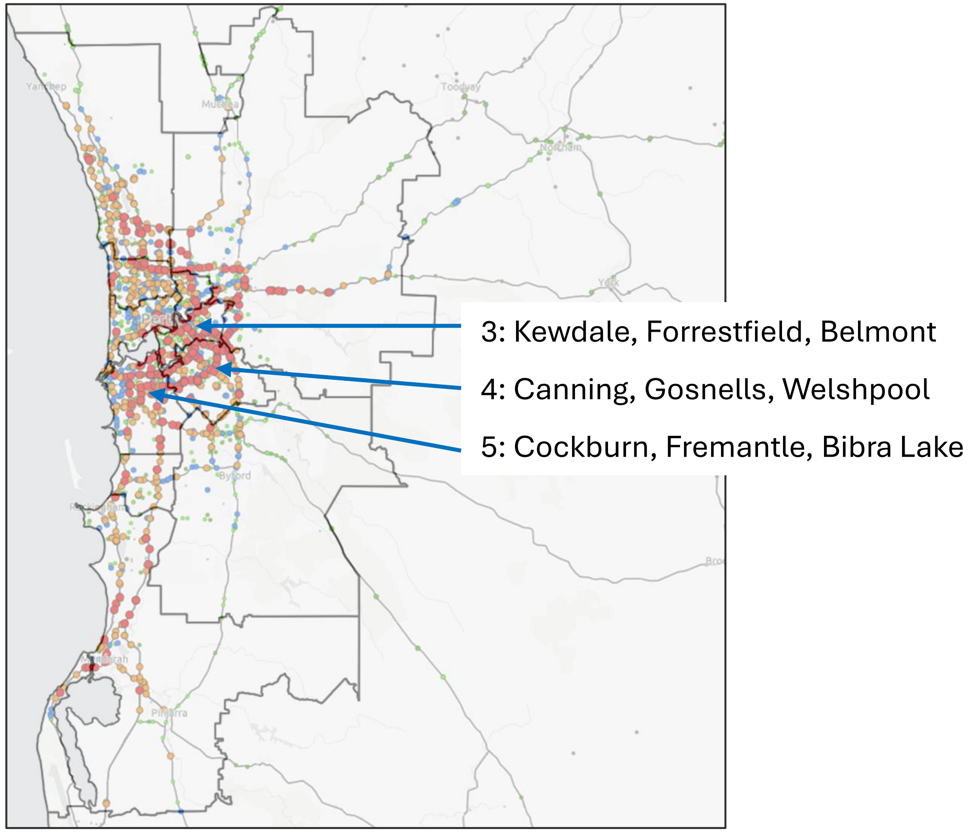
▭ Truck community boundaries

— State Road network

Trucks per day

●	5000+
●	2000-4999
●	1000-1999
●	500-999
●	250-499
●	Less than 250

Perth Metro region



3: Kewdale, Forrestfield, Belmont

4: Canning, Gosnells, Welshpool

5: Cockburn, Fremantle, Bibra Lake

^MR0CVSD20240515, Ver. 1.0

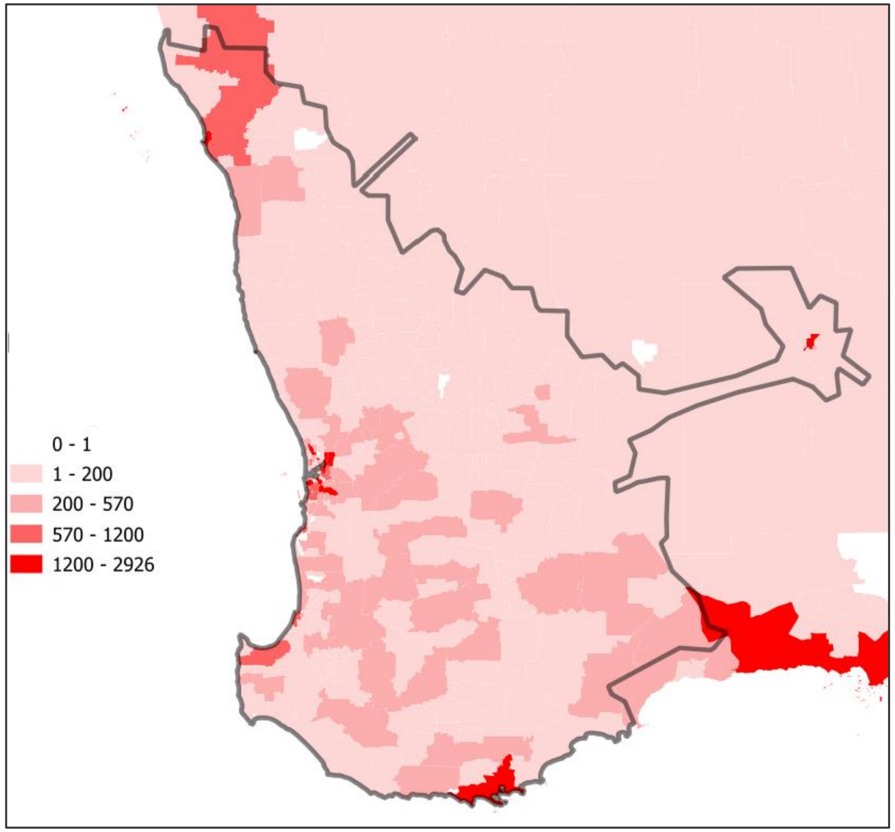
Appendix A9

Shared/public charging ("where") – influence of new truck registrations

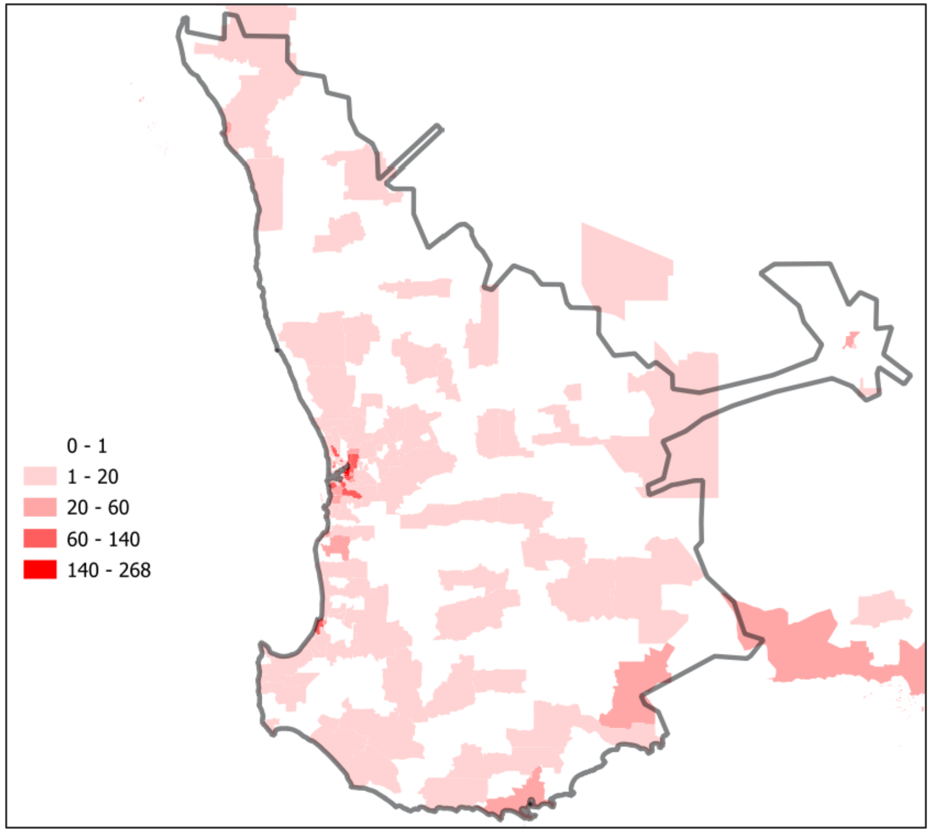
Truck age and spatial distributions

- The registration data (lefthand chart) shows diesel trucks are not uniformly distributed throughout WA. Darker colours indicate more registrations per postcode.
- All electric truck and vans are adopted as new. Around 54% will be less than three years old in 2035 with only 20 trucks expected for resale outside SWIS or scrappage.
- In 2035, electric truck and vans are assumed to be concentrated in the postcodes in the righthand chart, those which have a larger share of vehicles under three years old.

Heavy vehicles distribution – all trucks



Heavy vehicles distribution – less than 3 years old



Appendix A10

Modelling limitations

- **Historical trends:** Past adoption trends may be unreliable as a predictor of future trends due to large grant-driven purchases skewing the data (ARENA), larger fleet leadership, and recent availability of more large trucks.
- **Technology scope:** Battery Swap was not considered due to lack of OEM commitment and scalability issues. It may feature in offroad situations.
- **Exclusion of linehaul**: Prime movers over 70 t GCM were removed and may represent up to 5% (120) of electric trucks by 2035. This has minimal impact but may require ~50 high powered chargers (600 kW) in WA by 2035.
- **Battery usable capacity**: 70% of total battery capacity was assumed based on an operational buffer for battery health and OEM constraints, but larger batteries could shift charging to overnight and reduce daytime infrastructure.
- **TCO sensitivity**: Lower purchase price and higher utilisation drive improvements in the TCO but may be harder to achieve if daytime charging access is restricted (larger batteries needed or lower mileage achievable).
- **Vehicle-to-Grid (V2G):** V2G is a potential benefit to the TCO but is a limited opportunity with average small battery sizes and charger complexity.
- **Charging threshold:** The same charging electrical threshold was used (number of each type or vehicle able to charge by site type), without knowing specific site level barriers or enablers. Fleets may charge more or fewer vehicles than assumed but this will also be determined by space constraints, installation delays, short property leases, and unrecoverable capital costs.
- **Access to passenger charging**: Ad-hoc access to passenger EV chargers has been observed but modelling assumes this is limited and unsuitable by 2030 with additional dedicated infrastructure required.
- **Charging behaviour**: Small electric fleets (under four trucks) are expected to dominate and to charge at maximum rate from 10pm, whilst larger fleets over four trucks use controlled slow charging to minimise grid capacity fees. Average charging rate is 50% of installed capacity overnight.
- **Fleet composition**: The 2025 fleet is skewed by larger fleet operators and grant-funded heavy trucks, but small trucks (<8 t GVM) should rise from ~33% to >50% of fleet by 2035 based on viability and suitability factors. Customer led fleet leadership for larger trucks however may continue (e.g. food/beverage).
- **Land use categories**: Postcodes were grouped into Residential, Commercial, Industrial but anomalies exist (e.g. Balcatta classified as residential despite multiple large depots). This could cause misclassification at post code level, but it should be diluted in communities of three or more postcodes.
- **Depot modelling:** Based on the scope provided by DoT, five depot types by land use and fleet size were modelled and scaled to match diesel fleet distribution.
- **Registration data limitations**: There are many examples of trucks registered at offices or centrally to one depot in large numbers when they are actually located overnight in multiple dispersed smaller depots. This could overestimate urban BET operation, but trucks from outside urban areas are also likely to operate in urban areas so traffic count data has also been incorporated.
- **Concentration risk:** As a consequence of the limitations of registration data, charging was aggregated at a community level with reference to relevant substations. This does not highlight potential for concentration risk of ‘electrified depots’ nor highlight any possible mismatch when considered against distribution substation load capacity. Further work by Western Power is required.

Appendix A11

Glossary

Abbreviation	Description
AC	Alternative Current
AEMO	Australian Energy Market Operator
ARENA	Australian Renewable Energy Agency
BAU	Business As Usual
BESS	Battery Energy Storage System
BET	Battery Electric Truck
CCS	Combined Charging System
Charge point	Cable and connector to physically plug into the vehicle
Charger	Power conversion equipment to charge the vehicle
Charging bay	Area that a vehicle is expected to park while charging
Community	Region that is strongly interconnected by truck activity
Daytime	Charging between 9 am and 3 pm
DC	Direct Current
Depot	Private exclusive use location where truck reside when not in use
EV	Electric Vehicle
GCM	Gross Combination Mass (max. weight of vehicle, trailers and load)
GVM	Gross Vehicle Mass (max. weight of the vehicle alone with load)

Abbreviation	Description
IEA	International Energy Agency
kV	Kilovolt
kW	Kilowatt
LFP	Lithium Iron Phosphate
MCS	Megawatt Charging System
MW	Megawatt
NMC	Nickel Manganese Cobalt
OEM	Original Equipment Manufacturer
Overnight	Charging between 3 pm and 9 am (generally delayed past 10 pm peak)
Peak	Highest power demand from BET charging in a 24 h period (kW or MW)
PM	Prime Mover
PTO	Power Take-Off systems used to power onboard equipment
Public	Open access with ad-hoc/flexible use en route at major interchanges
SWIS	South-West Interconnected System
Shared	Semi-exclusive/restricted use for fleets contracted for regular access.
SoC	State of Charge
t	Tonnes
TCO	Total Cost of Ownership

WA Department of Transport

Research, Consultation and TCO Analysis

SWIS Road Freight Decarbonisation Strategy

Prepared for WA Department of Transport

4 August 2025

Appendix B:
Previous TCO report

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Executive summary

Research, Consultation and TCO Analysis

Research

1. Battery improvements

- **Prices will fall**: Battery pack prices will continue to fall 10% per year. According to the IEA, this will pass through into 15% to 35% lower Battery Electric Truck (BET) prices by 2030.
- **Dominance of LFP:** LFP (Lithium Iron Phosphate) will increase share to over ~60% with NMC (Nickel Manganese Cobalt) falling to ~30% market share in 2030. LFP's share will be driven by Chinese OEMs' preference for LFP and China's position as the largest battery producer. South Korean/US battery producers are also following suit.
- **Energy density and capacity is likely to double**, but vehicle cost and charging considerations mean only a 50% increase in vehicle range is anticipated. It will be 2030 at least before truck batteries have dedicated production, rather than relying on cells developed for cars.

2. Truck charging potential

- **Peak charge capability of Australian BETs will approx. double.** For light/medium rigids it may increase from 100 kilowatt (kW) to 250 kW and for heavier trucks ~350 kW to 600 kW+ by 2030. This will enable a shift from depot charging towards faster destination charging (up to 300 kW) and en route public charging (400 kW to megawatt) by 2035 .

3. Charging infrastructure

- In Australia, **5% of electric truck charging locations may be public.**
- In Europe, 10% of electric truck charging locations estimated to be public but could account for 45% of electricity supplied to trucks.
- Case studies highlight planned public rollout in EU, Norway, US and UK; but expected to be slower and less coordinated in Australia.

Consultation

4. Fleets

- Most fleets charge overnight at depots, with occasional top-up charging using onsite solar or customer locations. Adoption is strongest among in-house fleets (e.g., Woolworths, Centurion) due to control over freight and route flexibility.
- BETs often lack five-year payback without grants or leadership-driven investment. A green premium is emerging, but longer contracts remain the key enabler for broader fleet adoption.

5. Truck OEMs

- OEMs are ramping up light/medium rigid EVs with 4.5 to 9 tonne (t) Gross Vehicle Mass (GVM) for urban delivery and some government services. Range may grow 30% by 2030 and possibly double by 2035, though payload and cost concerns may limit this. Safety and battery standards could delay progress.
- Fleets resist paying for high energy density (NMC or larger batteries). Overnight charging under 100 kW is sufficient, but daytime needs exceed 150 kW, with linehaul possibly requiring 600 kW+ by 2030. OEMs hesitate to endorse megawatt public charging before 2030.

6. Industry perspectives

- Larger fleets are more likely to deploy electric trucks first as they purchase new, mostly own sites, and can deploy staff to manage charging preparation. Truck charging starts at depots then may expand to shared sites before en route.

TCO Analysis

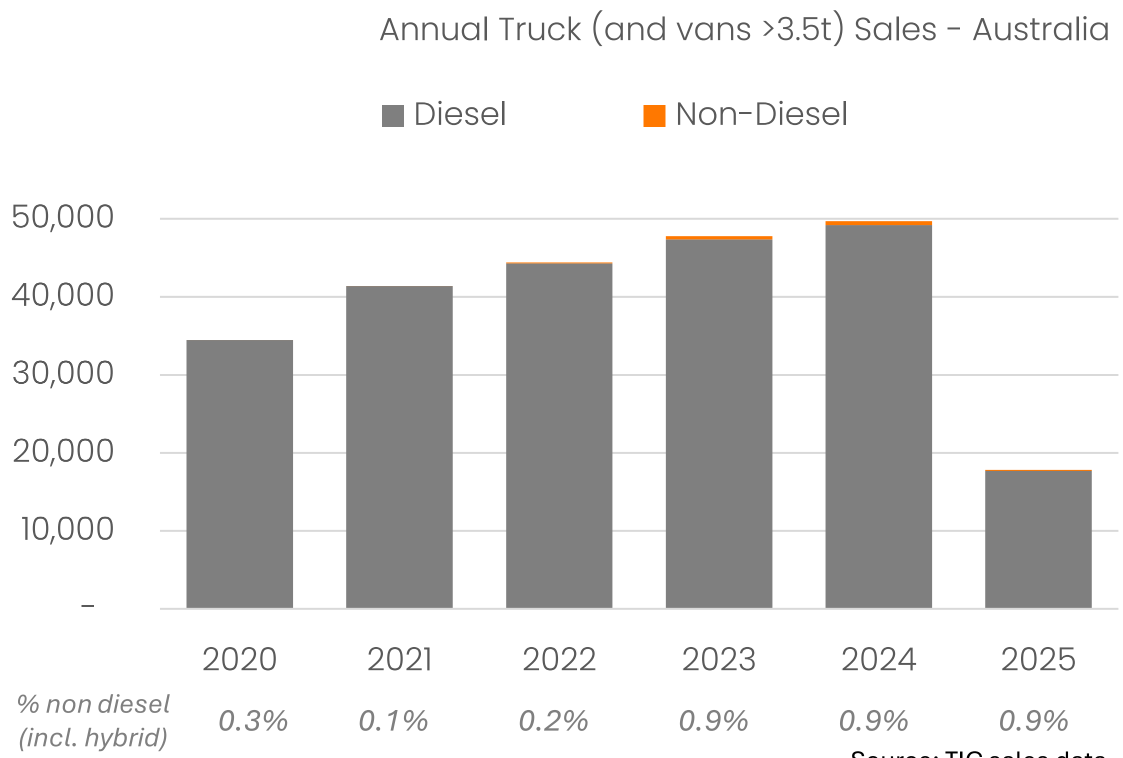
- TCO parity is likely by 2030 for light/medium rigids in urban/regional use; by 2035, most BETs outperform diesel, except site trucks and urban prime movers but price parity could be achieved with higher utilisation or availability of suitable shared charging, respectively.

Background

Global and local electric truck market

Global

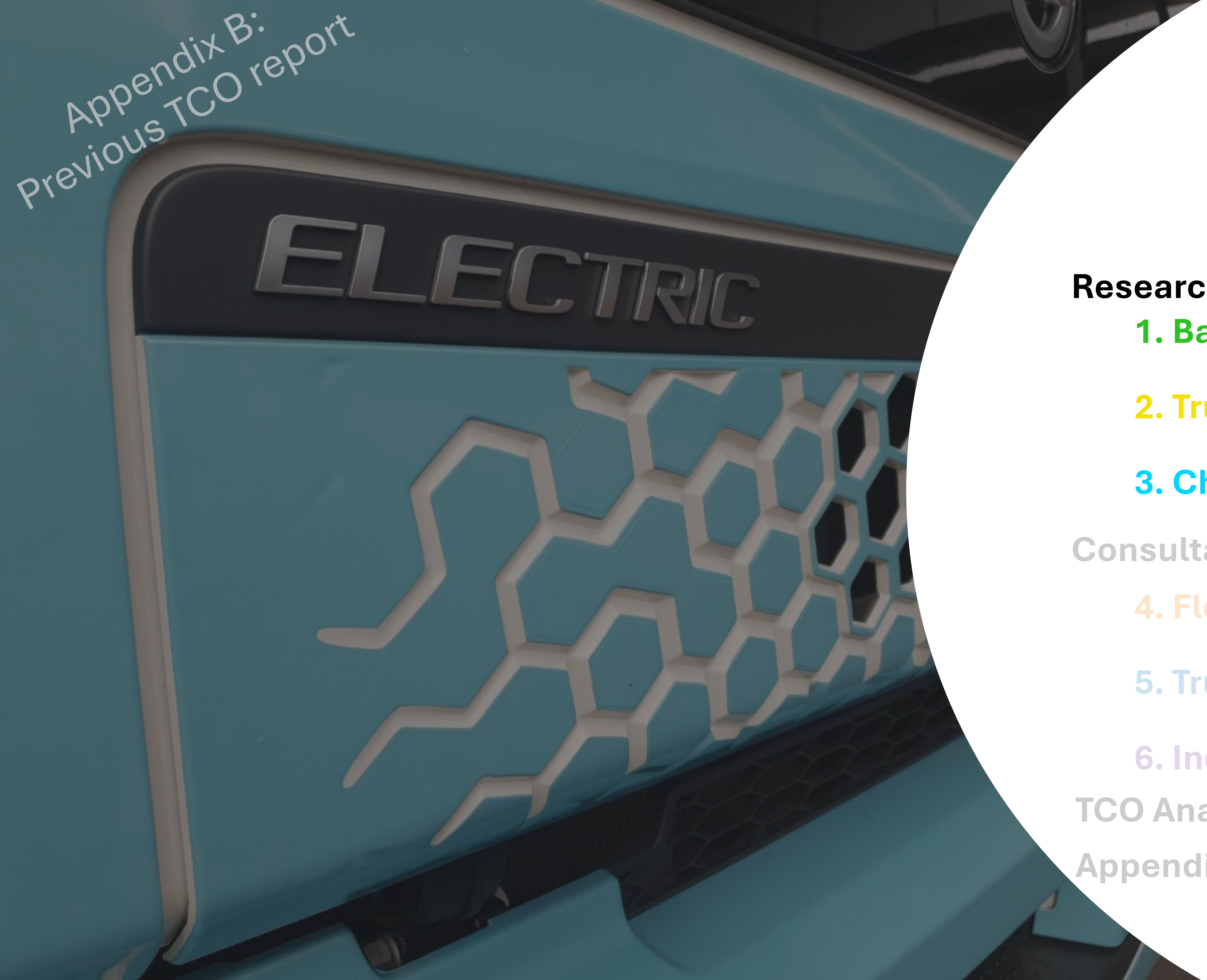
- BET sales grew by nearly 80% in 2024 to 2% of truck sales worldwide. China led the market with 75,000 sales (>80% of global), followed by the European Union (EU) with 10,000 sales and Canada and the United States (US) with almost 2,000 sales each (or close to 3% of total sales). Source: IEA Global EV Outlook 2025
- Since 2020 the number of heavy electric models has increased from under 70 in 2020 to over 400 in 2024 (mainly in China).
- The upfront cost of a BET is still two to three times a diesel truck, but total cost of ownership is lower than diesel in China and is expected to reach parity in the EU and US by 2030. In 2030, BET sales are expected to reach around 13% globally but only 3% will be electric at that point.



Source: TIC sales data

Australia

- Australian BET sales (both trucks and vans) grew in 2023 with 214 sales (+214 hybrid) and increased to over 250 sales in 2024 and may exceed 300 sales in 2025.
- BET models have grown fivefold from only three brands in early 2023 to a planned 15 brands (across 30 models) by the end of 2025 (Appendix).
- While the scale and timing of 'leadership' actions will continue to distort early uptake rates month to month, a slow upward trend in sales will continue each year.
- In Western Australia (WA), there are expected to ~60 BETs were estimated in operation by end of 2025, with Centurion accounting for half. This will represent almost 10% of the national fleet. Further announcements from Goldstar, Toll, and 3PL carriers for IKEA/Woolworths may add a dozen more BETs over the next 6 months in line with national growth.
- Electric van sales (>3.5t) are also accelerating rapidly and could overtake electric truck sales in 2025 based on competitive pricing and availability (Appendix).



Appendix B:
Previous TCO report

MOV3MENT
transport energy environment

Research

1. Battery improvements – prices will fall

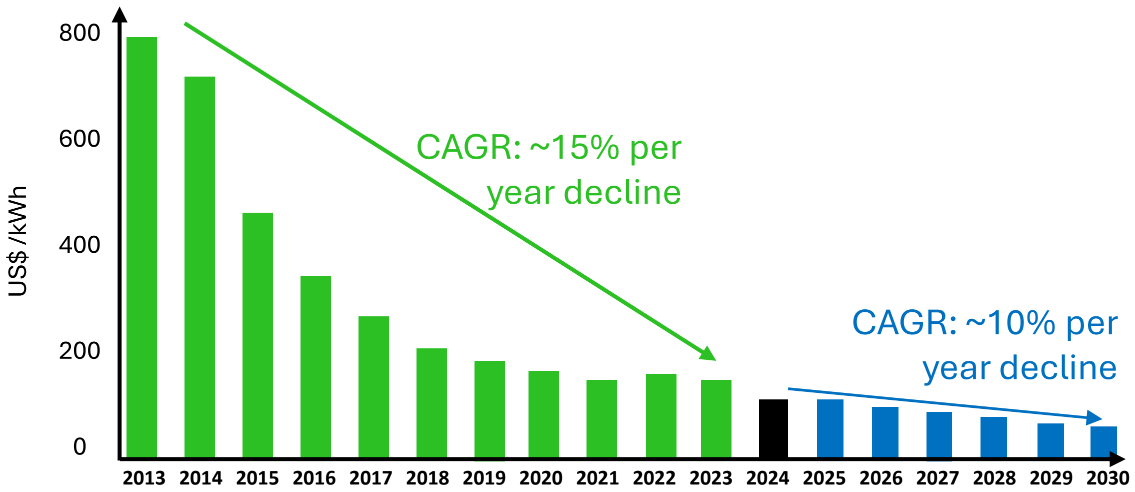
Prices will fall

- Batteries account for 30% to 50% of BET production costs.
- The cost of LFP batteries, the main choice for electric truck batteries, fell by 86% between 2013 and 2024 to US$115 /kWh, due to manufacturing overcapacity, scale, and lower input prices.
- CATL has recently achieved a battery cost of less than US$100 /kWh in 2025 with prices set to reduce 10% per year to 2030, possibly as low as $50 to $80 /kWh.
- Specifically, the International Energy Agency (IEA) claims that since 2020, battery prices for BETs have dropped 30% and enabled manufacturers to extend range at minimal cost, below:

2020 - 2024	Medium-duty BET	Heavy-duty BET
Battery size	+60%	+70%
BET purchase price	+15%	+20%

- Today, for a truck with an 800 kWh battery (500 km range), the battery would represent almost half of the upfront cost of a battery electric truck, but this is expected to fall to around 35% in 2030.
- The IEA predicts the implications in the next 5 years could be a reduction in the price of a BET by around 15% to 35%, although Goldman Sachs indicates "We still significant price premiums (two times) for EV trucks ..despite battery cost advancements"
- Small and medium rigid trucks in China are already cheaper over their lifetime. In other regions, cost parity is expected before 2033.

Average battery pack prices: IEA historical and Goldman Sachs forecast



Sources: IEA Global EV Outlook 2025, Goldman Sachs Research

Successive heavy duty battery pack forecast prices: ICCT/BNEF/Goldman Sachs

Source (year of forecast*)	2030 – US$ /kWh	2035 – US$ /kWh
ICCT (2023)	123	
BNEF (2024)	85	65
Goldman Sachs (2025)	64	40

^Note the "year of forecast" indicates a lower 2030 price forecast the later predictions are made.

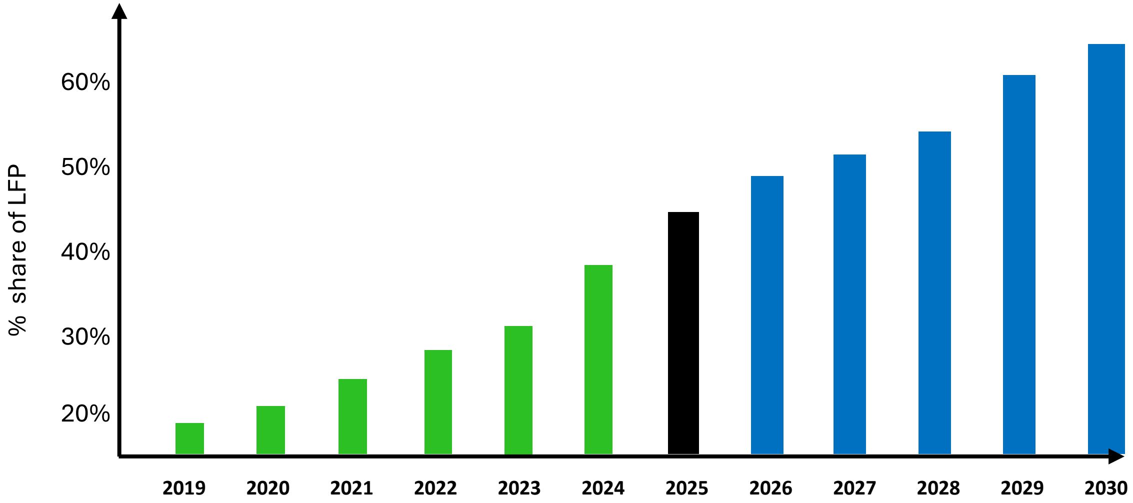
Research

1. Battery improvements – LFP will dominate

LFP will dominate

- LFP's share has increased from less than 20% in 2019, to 50% today, driven by Chinese OEMs' (95% of heavy-duty trucks in China equipped with LFP) and China's position (two thirds of market).
- The other third of battery production is dominated by Samsung and LG who recently announced their first LFP production plans.
- LFP has gained traction in electric trucks due to thermal stability and lower cost. Cummins, Daimler and PACCAR have also formed a joint venture with EVE energy to make LFP batteries, and Mercedes' latest truck model the eActros 600 is equipped with LFP.
- LFP batteries will exceed 60% market share by 2030, but NMC may remain important in long-haul trucks due to higher energy density.
- Longer term, Lithium Manganese Rich batteries are expected to be "comparable" in cost with 33% more energy density achieved. Sodium-ion batteries (SIBs) may also be adopted for hybrid truck or small vans due to low cost but are unlikely to be widespread.

Increased share of LFP heavy duty batteries: Historical IEA and forecast Fraunhofer



EVE energy - LFP improvements at the inaugural Commercial Vehicle Battery Tech Day on 20 May 2025, developments include:

- **Light trucks:**160 kWh LFP battery (180 Wh/kg offering a 400 km range)
- **Medium trucks:** 453 kWh LFP battery (0% to 80% charging in 18 mins)
- **Heavy trucks:** 851kWh LFP battery (170 Wh/kg offering 700 km range).

CATL plans and perspectives on LFP in electric trucks, 21 May 2025

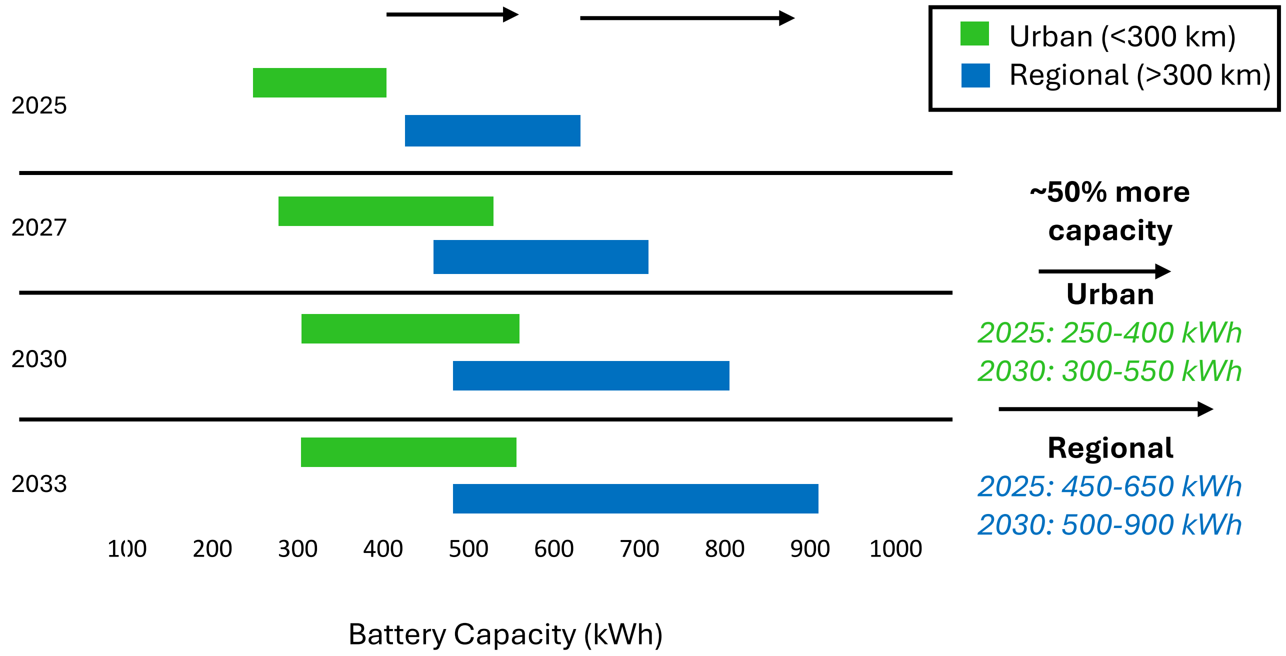
- CATL has signed up more than a dozen Chinese truck OEMs, which produce 30 electric trucks models, to use a LFP battery it calls "#75"
- Following the collapse of Northvolt which aimed to supply electric truck batteries focused on NMC, CATL is in talks with European truck OEMs to "help them change the wrong technology roadmap to the right one".

1. Battery improvements – energy density and capacity will increase

Energy density and capacity will increase

- Research suggests a doubling of battery energy density by 2030, with 75% to 90% improvement possible based on Lithium Manganese Rich chemistry:
    - **2025:** 160 to 240 Wh/kg
    - **2030:** 350 to 400 Wh/kg
- IEA EV Outlook 2025 also predicts energy density improvements for trucks from ~250 Wh/kg to over 350 Wh/kg by 2030.
- CATL's recent IPO prospectus indicates the global average battery energy capacity per truck was 349 kWh in 2024 but is expected to increase 15-20% across all makes and models to 410 kWh in 2030.
- For long haul trucks, projected battery capacity is expected to increase with deployment of the Windrose at 729 kWh, superseded globally by the Tesla Semi at 900 kWh (not available in Australia):
    - **2025:** 480 to 729 kWh
    - **2030:** 900 kWh
- *Strategy&* suggests truck-specific battery development/production will occur only after 2030 once BET reaches a relevant market share of ~13% of automotive battery cell demand in 2030 (25% in 2040).

Predicted battery capacity for heavy battery-electric vehicles (>12t)



~50% more capacity

Urban

2025: 250-400 kWh

2030: 300-550 kWh

Regional

2025: 450-650 kWh

2030: 500-900 kWh

Adapted from: Market Development of Technologies in Heavy-duty Road Freight Transport In Germany And Europe

What does this mean for range?

- Improvements will not be achieved without cost, so energy density improvement is unlikely to translate to more than a 50% increase in range. What is likely to have a greater benefit may be the evolution of purpose-built electric trucks with integrated designs (2nd gen) and fewer constraints than those based on diesel base trucks.
- OEMs predict an 8% to 12% reduction in average energy consumption for BETs from 2025 to 2035 with the arrival of second-generation electric truck designs allowing better aerodynamic efficiency with electric axles to replace the traditional power train. Overall, lower weight and more space can also allow more battery capacity.

Research

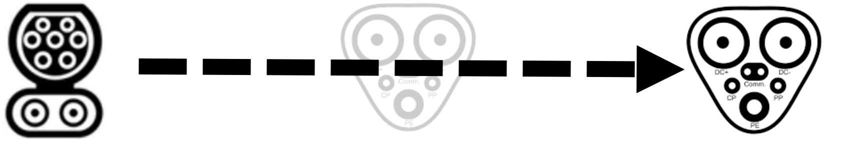
2. Truck charging potential – peak charge power doubles with range

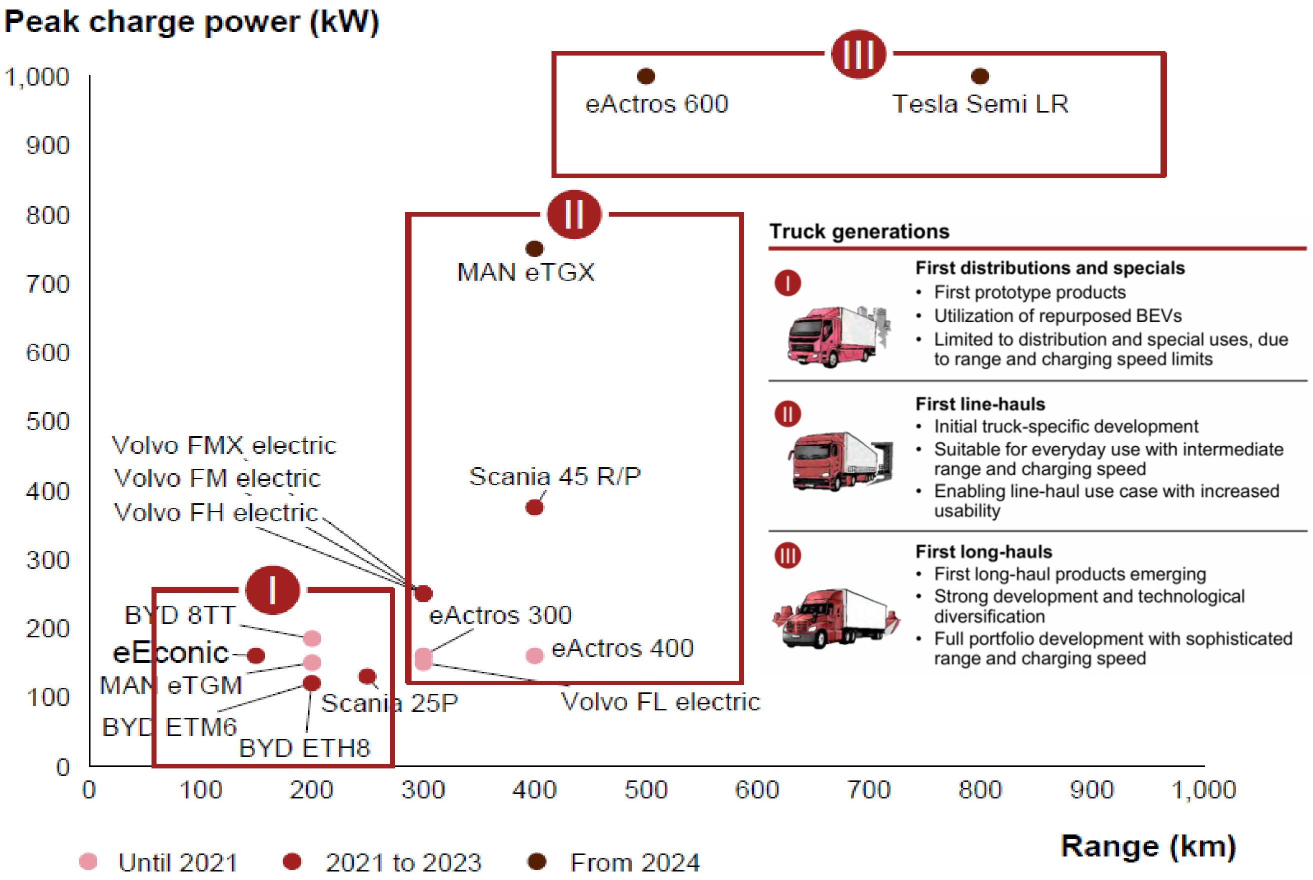
Evolution of global truck charging

- Charging rates are usually described by the peak DC charge power (kW).
- The diagram opposite illustrates the evolution of global truck charging technology with doubling in DC charge rates and range over time from models before 2021 to more recent models from 2024 onwards.

Implications for BET models in Australia

- Australian charging speeds lag global technology trends observed with later arrival of new models (e.g. eActross 600/Tesla Semi) bringing faster charging in larger trucks.
- Australia is still awaiting higher voltage architectures (+800 V) required to support Megawatt Charging Standard (MCS).
- Truck charging may also transition to faster speeds without MCS. For example, multiple CCS charging couplers can be used at lower rates (e.g. 4 x 150 kW DC chargers) to achieve 'megawatt' speeds, which is a capability provided in BYD truck models.
- At the lower end there is also a possibility that Australia may move to DC only without AC, based on Chinese electric truck OEM trends.





Truck generations

I **First distributions and specials**
- First prototype products
- Utilization of repurposed BEVs
- Limited to distribution and special uses, due to range and charging speed limits

II **First line-hauls**
- Initial truck-specific development
- Suitable for everyday use with intermediate range and charging speed
- Enabling line-haul use case with increased usability

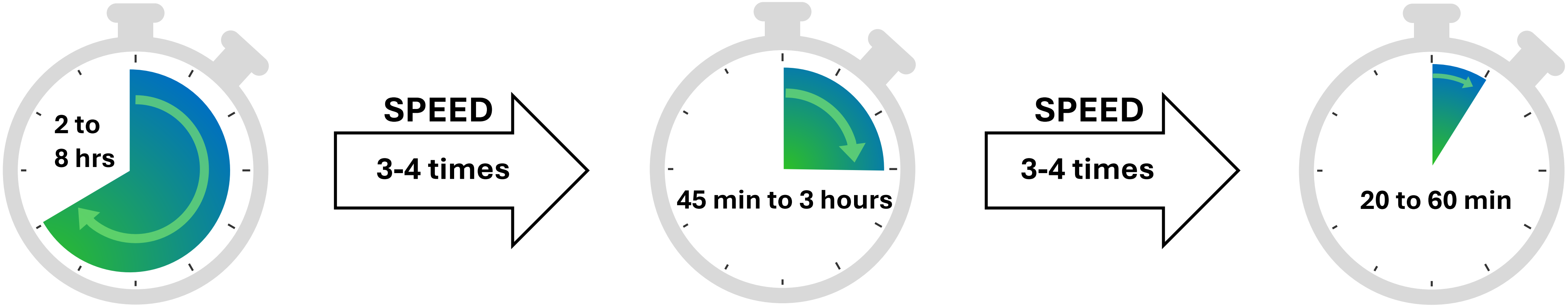
III **First long-hauls**
- First long-haul products emerging
- Strong development and technological diversification
- Full portfolio development with sophisticated range and charging speed

Research

2. Truck charging potential – three common types of charging

Three common types of charging expected based on battery capacity, location and dwell time which affects required charging speeds. **These categories are not discrete** (e.g. overnight 'slow/fast' charging may occur at customer, or 'ultra fast' charging in the daytime at a depot for top up). Whilst faster speeds may m optimal, they are only necessary for particularly short dwell times or large charge requirements. Costs increase for faster charging (e.g. destination charging may cost $0.40/kWh vs public at AU$0.70/kWh) but depot charging may also increase from small to larger fleets (depending on site electrical capacity constraints)

Charging speed based on dwell



'SLOW/FAST' CCS^
<50 kW

2 to 8 hrs

SPEED
3-4 times

'ULTRA' FAST CCS
150 to 300 kW

45 min to 3 hours

SPEED
3-4 times

CCS/MCS*
400 to 1,000+ kW

20 to 60 min

Depot/overnight:
Works well for most trucks that remain at depots overnight up to 10 hours for charging. Generally used to fully charge.

Customer/destination:
Only required if trucks need to recharge during idle times at depot or loading and unloading in the daytime. Mostly used to top up (e.g. from 30-60%) to return to base.

Public/En route:
Will be necessary for long-distance or highly utilised operations along highways or at key freight hubs, possibly within regulatory driver breaks.

Vehicle charging requirements (based on 20-80% charge)

Light rigid/van (80-120 kWh) *May access daytime 'top-up'*

Medium rigid (150-300 kWh) *More likely to charge at customer overnight*

Heavy rigid/prime mover (400-800 kWh) *Linehaul duty cycles will require en route*

^AC or low-power DC chargers

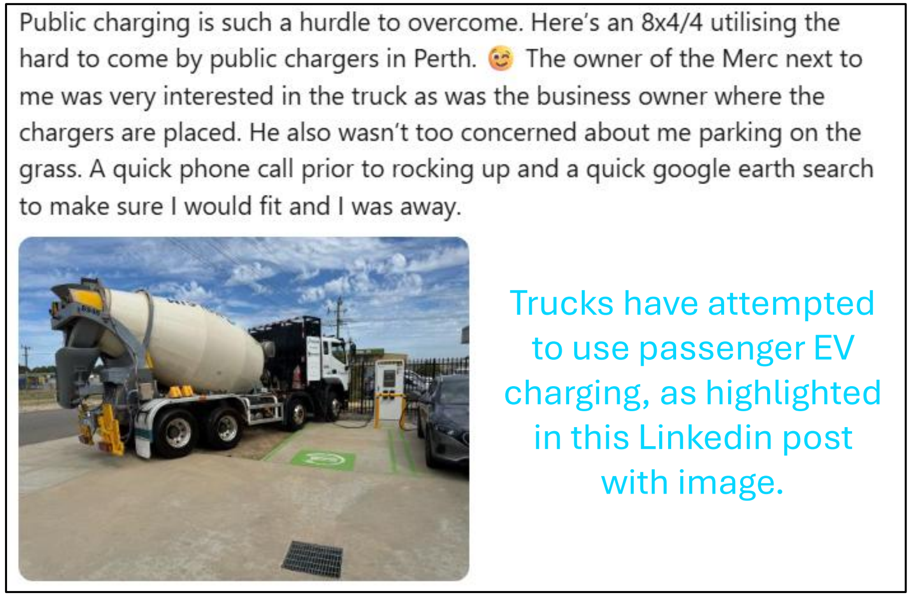
*Most truck unable to charge at these speeds yet and CCS at 1x850 kW and 2 x 400 kW, so only largest batteries over 500 kWh likely to require MCS.

Research

3. Charging infrastructure – Australia

Requirements for public truck charging are different to cars

- Passenger EVs generally have a battery capacity of 50 kWh to 80 kWh and mostly charge overnight at <7 kW AC unless traveling long distances where they access public charging (mostly <100 kW but one third now >100 kW).
- While there is some overlap with electric vans (>70 kWh), most electric trucks have battery capacity from 100 kWh to 500 kWh currently.
- Due to larger batteries and higher rates of utilisation that often depletes the battery each day, trucks also need a higher capacity charger (and suitable space to park) if public charging is required.

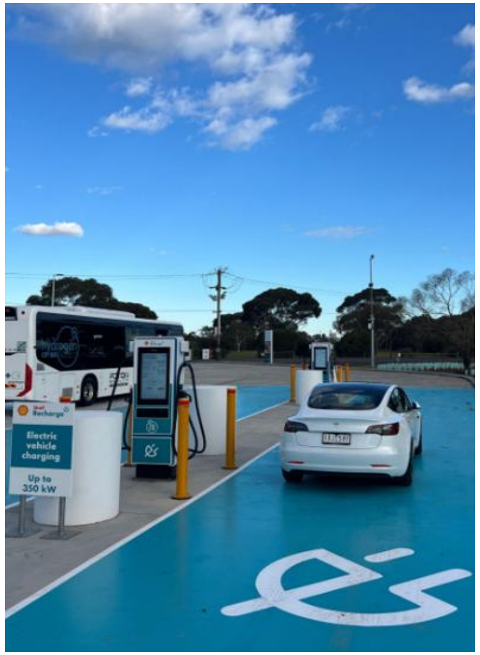


Public charging is such a hurdle to overcome. Here's an 8x4/4 utilising the hard to come by public chargers in Perth. 😉 The owner of the Merc next to me was very interested in the truck as was the business owner where the chargers are placed. He also wasn't too concerned about me parking on the grass. A quick phone call prior to rocking up and a quick google earth search to make sure I would fit and I was away.

Trucks have attempted to use passenger EV charging, as highlighted in this Linkedin post with image.

Plans and progress for (dedicated) public truck charging in Australia

- Viva Energy has deployed Australia's first publicly accessible electric truck charging (and hydrogen refueling) in Geelong with two chargers, each with two 350 kW DC charging points (4 x 350 kW). From 1 July 2025 onwards the site will be open as an unattended service station at a cost of $0.70 /kWh. image below.
- Ampol will launch 4 x 300 kW truck charging points at Wyong later this year. It also offers drive through bays at passenger EV chargers at Derrimut/Pheasant's Nest.
- Truck specific Charge Point Operators (CPOs) also have competing proposals for public truck charging from Melbourne to Sydney:
- NewVolt plans to launch three 'city hub' charging hubs in Melbourne freight corridors of the Inner West, Dandenong South, and Somerton before connecting to highway sites to Sydney.
- New Energy Transport aims to be operational in early 2026 in the Sydney and Wollongong region, before the full east coast network is developed.
- Zenobe is building a charging hub servicing Woolworth's electric trucks offsite but aims to contract other fleets when chargers are not used.
- Mondo is building an EV charging hub dedicated to heavy vehicles in Laverton (Melb), due Q1 2026.



Research

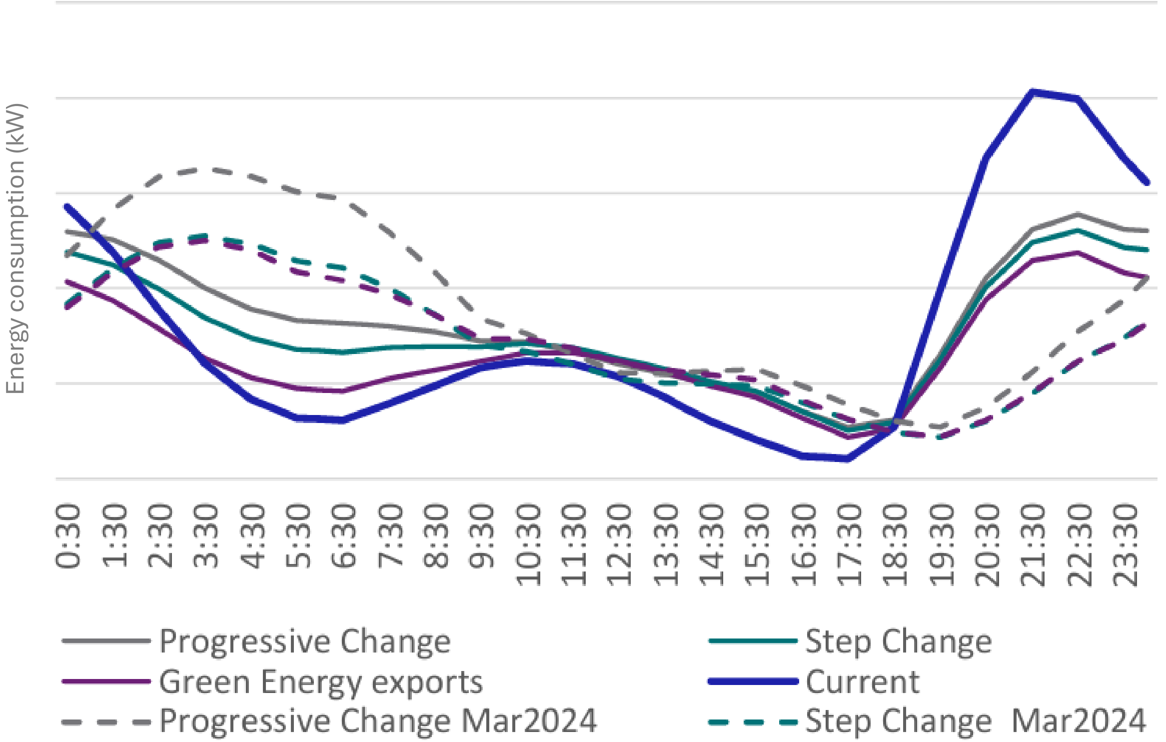
3. Charging infrastructure – Australia

In Australia, research indicates a prevalence of depot charging

- By 2050, AEMO predicts 2-6% of electric truck charging will be public, with more than 75% at depots overnight (and ~20% in daytime).
- Depot charging will dominate for urban trucks whilst public fast charging is critical for mainly long-haul segments, requiring corridor-based planning beyond 2030. This contrasts with European public charging which is expected to be used on across the fleet more often.
- Recent updates provided by AEMO for trucks and buses indicate a narrower period of overnight charging, starting earlier with a stronger charge once the off-peak period begins before tapering off, as illustrated in graph opposite. Over time a flatter profile may emerge with larger trucks charging in the day in public and longer overnight.
- Depot charging has led the initial phase of electric truck deployment in Australia. However, expanded fleets and scaling up from 150 kW may require charging at customer sites. This is based on local evidence related to grid upgrades required unless a suitable battery storage microgrid (with solar) can be established.
- Scania, who declined to participate in consultation "due to the uncertainty around future product availability and performance“ has an [Australian website](#)which proposes the following charging ratio:

Type	Depot/Overnight	Destination/Customer	Public/En route
Urban	80%	10%	10%
Regional	60%	20%	20%
Long Haul	55%	15%	30%

Aggregated electric vehicle charging profile for trucks (and buses)



Current charging profiles were assessed and projections developed to 2050 (by scenario) relative to prior March 2024 projections (dashed line). The AEMO projections support MOV3MENT experience with real commercial EV fleets with charging as soon as possible in the evening with cost as a secondary driver (delay until 9pm). Source: [Electric vehicle projections 2024](#). AEMO’s draft 2025 Input, Assumptions and Scenarios Report (February 2025).

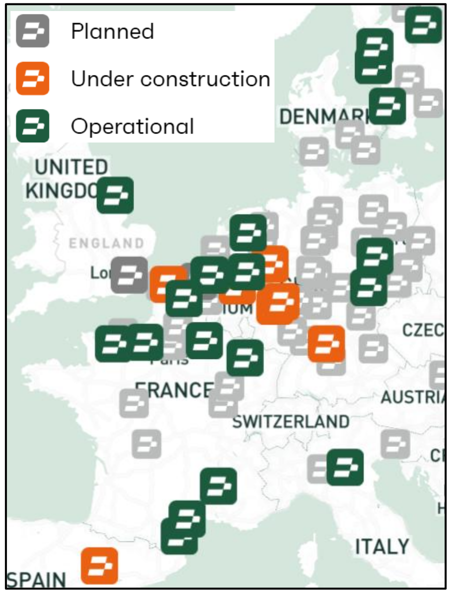
Research

3. Charging infrastructure – Global/Europe

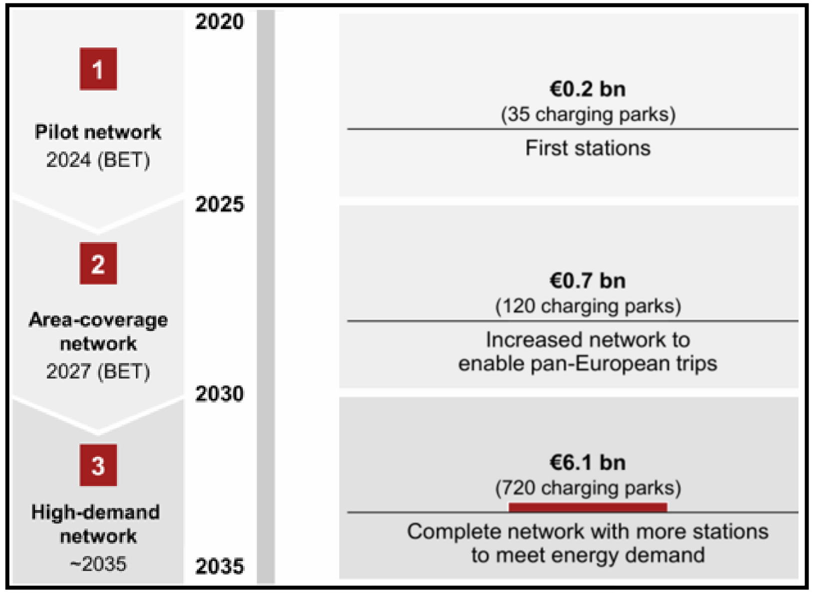
Globally, public charging numbers are increasing

- Based on global sales IEA estimates that there are over 300,000 electric truck charging points and this will expand tenfold to 3 million by 2030.
- While national statistics on truck-specific public chargers 'are not readily available' for most countries, there is some evidence emerging that there are **around 8,000 public truck charging points in 2025**, including:
- **China:** an estimated **6,500** installed for electric trucks based on 20% growth from 5,500 installed by late 2024 (>320 kW).
- **US:** an estimated **1,000** installed for electric trucks based on over 150 in late 2024 with 850 more planned.
- **EU/UK:** around **500** installed for trucks based on progress by major operators such as Milence, E.ON Drive, Gridserve, and BP as part of initial phase of first pan-European MCS corridor. case studies in next pages.

Public truck charging plans



Source: Milence



Stages	Outcomes
1 Pilot network 2024 (BET)	€0.2 bn (35 charging parks) First stations
2 Area-coverage network 2027 (BET)	€0.7 bn (120 charging parks) Increased network to enable pan-European trips
3 High-demand network ~2035	€6.1 bn (720 charging parks) Complete network with more stations to meet energy demand

Source: *Strategy&*

Faster charging is likely to target rest breaks en route.

- Public charging will depend on regulations for truck driver rest periods, as they play a role in determining the “cost of the dwell time for recharging”.
- In Australia, the EU and China; a 15 to 45-minute break is required every 4.5 to 5.25 hours. This is frequent compared to the US (30 min after every 8 hours).
- A Windrose E1400 with a single trailer may have a minimum range of 400 km every five hours, assuming consumption of 1.2 kWh/km with a charge from 15% to 85%.
- At 300 kW the 480 kWh of energy required will take over 90 minutes, but this could take around 45 minutes at MCS speeds.
- As a result, the EU, China and Australia may require minimal additional dwell in addition to the driver rest period to charge without payload losses incurred by larger batteries.
- Milence is building charging hubs that scale from 400 kW speeds to above 1 MW. It recently opened its first MCS charger at the Landvetter hub in Sweden (1440 kW).

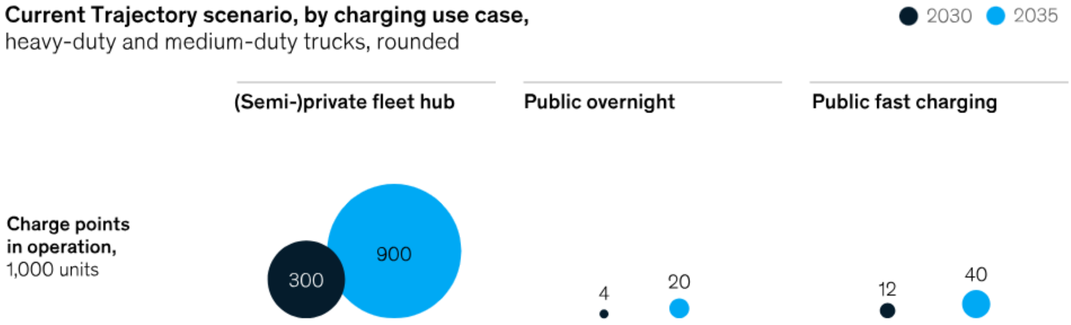
Research

3. Charging infrastructure – Europe

Research indicates greater need for public charging

- Before 2030, McKinsey expects the majority of electric trucks will charge overnight at their depot (or semi-private fleet hub) with a low-power charger or to top up with a fast charger during, for instance, loading or unloading at a customer site.
- Most electric trucks will not necessarily require public charging as they will not travel further than 250 km before returning to depot.
- In 2030, it is estimated that there will be more than 300,000 private charge points, 4,000 overnight public charging points (overnight), and 12,000 daytime public charging points, compared to 10,000 public and private charging points today. This will require 20 terawatt-hours (TWh) of electricity annually by 2030, roughly 0.5% of Europe's total electricity demand.
- By 2035, it is estimated that depot-based charge points could treble, and public charge points increase three to five times or 60,000 in total.
- Faster charging requirements will be heavily dependent on truck battery costs as battery size/cost can be reduced with faster and more available charging whilst still meeting daily range requirements.
- A key factor in the cost of public fast charging will also be a tradeoff as CPOs k to access cheap land whilst increasing utilisation with proximity to freight hubs or major motorway interchanges.

Number of charge points in Europe (2030 and 2035)



Source: [Building Europe's electric-truck charging infrastructure, 2025]

- In 2040 it is estimated there will be from 100,000 public charging points compared to one million depot-based charge points (not shown above).
- Critically, whilst public charging may represent 10% of charging locations in 2040, it is projected to account for 45% of electricity used by electric trucks.
- This compares to expectations that only 5% of electric trucks will be mainly reliant on public charging in 2030 with up to 40% supplementing their depot charging on an ad hoc basis with stops at public charging to extend range.
- Public charging will initially develop from around 300 kW to 400 kW
- The IEA indicates megawatt charging may not be viable until 2035 in many cases until utilisation above 20% provides a return on investment.

Research

3. Charging infrastructure – Europe

Targets and plans for publicly-accessible charging

The Alternative Fuels Infrastructure Regulation (AFIR) sets legally binding infrastructure targets for public truck charging to be completed by 2030 based on the TEN-T (Trans-European Transport Network). The table below describes the specific requirements for the distance between charging locations, minimum output per location, and number/type of chargers.

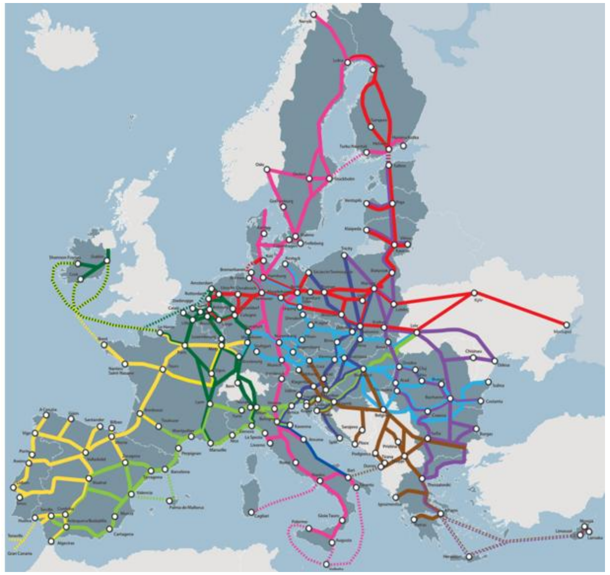
- The **CORE** network connects *major urban nodes*, ports, airports, *designated truck rest areas* and border crossing points.
- The **COMPREHENSIVE** network provides local and regional access.

Location/Network	Maximum distance between locations	Minimum output per location^	Minimum speed	Minimum number
CORE	60 km	3,600 kW	Min 400 kW, increasing to 600 kW by the end of 2027.	2
COMPREHENSIVE	100 km	1,500 kW		1
Major urban nodes	Each node	1,800 kW	150 kW	Not specified
Designated *truck rest areas*	Each area	400 kW	100 kW	4 per area

The table below provides commitments from major charge point operators who have received AU$330m in AFIR funding.

Charge Point Operator	Total funding (AU$m)	Locations	Charge points	Charger speed	Country (Glossary for abbreviations)	Average cost per MW installed (AU$m)
Milence	154.8 58.4	64 7	492 56	256 x 1 MW, 236 x 400 kW 28 x 1 MW, 28 x 400 kW	AT, BE, DE, DK, ES, FR, IT, NL, SE PL	0.4 1.5
E.ON Drive	47.5 27.2	170 HDV	126 301	400 kW	CZ, HU, PL, RO, BG, SK AT, DE, DK, IT, NL, SE, LT	0.5
BP	43.0	29	230	218 x 1 MW, 12 x 350 kW	DE, FR, AT, NL	0.2

Trans-European Transport Network



^ Minimum output per location ensures that multiple trucks can charge simultaneously at high speeds (i.e. not just having enough chargers but enough power to meet their needs)

Source: [Alternative Fuels Infrastructure - European Commission]

Research

3. Charging infrastructure – Norway

Enova – ultra-fast charging hub network companies

- Norway has set an ambitious target for all new trucks sold by 2030 must be zero-emission.

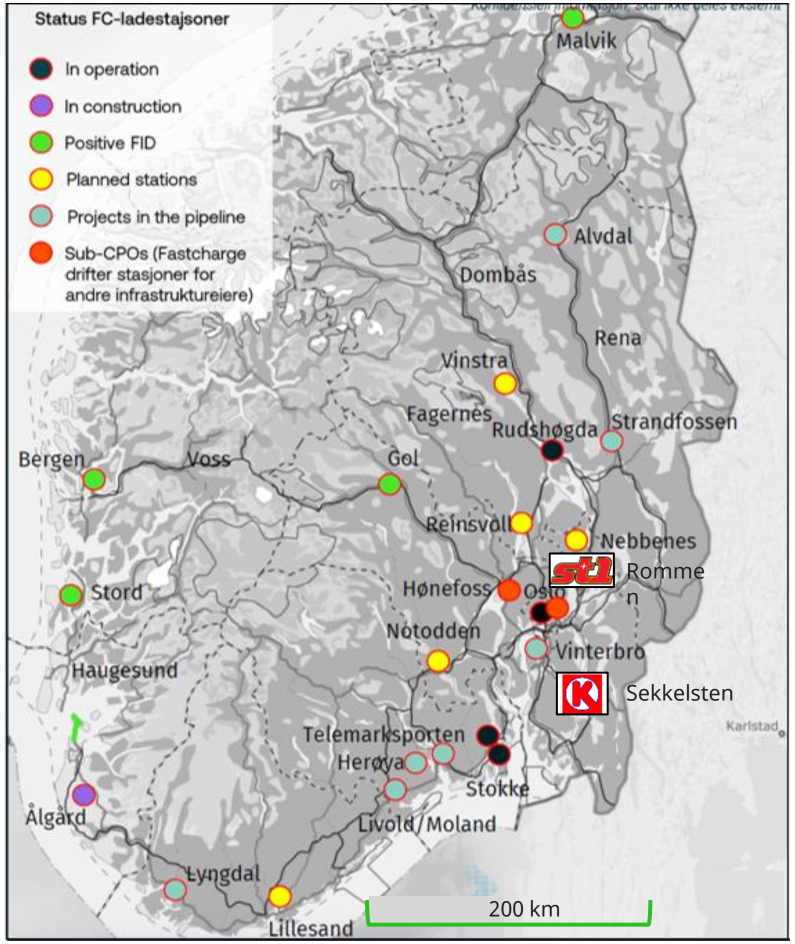
To support this transition, the government has allocated AU$9.3 million across five companies, via Enova, to install 19 charging locations with 108 chargers for trucks along four key freight corridors, they include:

1. Mer which is aiming to locate truck chargers at existing passenger charging sites;
2. Circle K has 4 x 400 kW chargers at Sekkelsten with plans for 10-15 sites and 400-50 chargers in 2025
3. St1 operates Shell stations and has 3 x 400 kW truck chargers at an existing fuel station in Rommen;
4. Tungbil Lading is focused exclusively on tailored solutions for depot-based and shared charging hubs.
5. Fastcharge has built and operates Norway's first public charging site dedicated to electric trucks, in Oslo. Since then, it has launched three additional public truck charging hubs, with more in various stages of planning and development. A typical Fastcharge configuration has:

Charge point power	No. of charge points per hub	Site power	Megawatt charging	Max. distance
400 – 600 kW	4 - 16	3 – 5 MW	From 2026	200 km

- Fastcharge plans to introduce megawatt charging (up to 1,000 kW) to enable full charges in 30 to 45 minutes from 2026 and has driver-friendly amenities such as lounges, rest areas, food and beverage options, and clean facilities to support rest breaks during charging.
- Fastcharge is providing charging every 200 km along Norway's main long-haul freight routes with real-time charger availability and booking by time or energy (kWh). It is also recruiting independently owned hubs and private logistics depots into its network to add shared charging to public charging availability.

Existing and planned locations



Research

3. Charging infrastructure – UK

Public truck charging developments

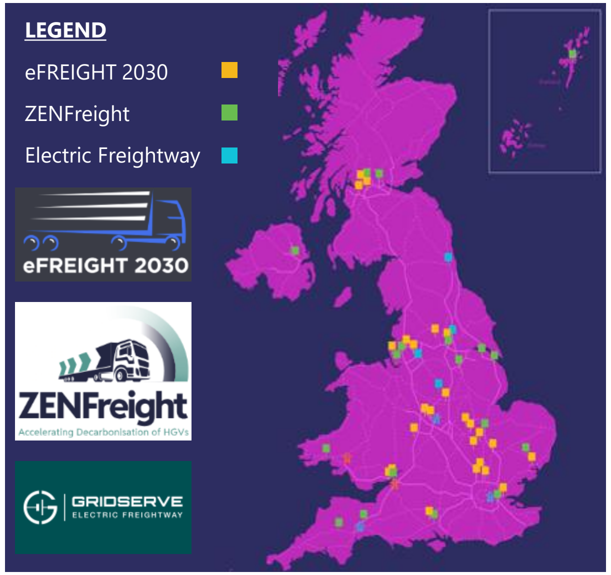
- The Zero Emissions HGV and Infrastructure Demonstrator Program (ZEHID) is backed by ~AU$400m in government funding.
- It will deliver over 70 public and depot-based charging locations by 2030. In March 2025, locations were announced under three major schemes. These locations are presented opposite and schemes described below:
- **eFREIGHT 2030:** Led by Voltempo, ~AU$140m (AU$100m public support), 32 MW charging hubs with 6 bays each.
- **ZENFreight:** Led by Dynamon , ~AU$83m to demonstrate 60 BETs with nationwide network of charging at 25 depots/7 fleets.
- **Electric Freightway:** Led by GRIDSERVE, AU$200m project (AU$120m public), 200 x 350 kW chargers (2 MCS ready) to support 140 BETs across motorway services, truck stops, and depots. Involves 33 partners, including 17 fleets and OEMs.

Scheme (developer)	Funding (AU$m)	Locations	Charge points	Charger speed	Country	Average cost per MW installed (AU$m)
eFREIGHT 2030 (Voltempo)	140	32	192	192 MCS (1 MW)	ENG, SC, WA	1.4
ZENFreight (Dynamon)	83	25	~100	100 kW-800 kW	ENG, SC, WA	1-1.5
Electric Freightway (GRIDSERVE)	200	NA	200	200 x 350 kW (2 MCS ready)	ENG	1

Other public truck charging providers

- Milence launched the UK's first truck charging hub in Immingham (4 x 400 kW) at AU$0.80 /kWh
- Moto plans 300 electric truck points bays across 23 locations by 2030, servicing up to 5,300 trucks.
- BP Pulse acquired Dover truck stop with specific plans for 20 x 1 MW, 10 x 400 kW and 125 x 100 kW truck chargers.
- First Bus offers freight vehicle access to its UK bus depot-based network of rapid chargers (up to 150 kW).
- Shell has also opened its first electric truck charging station in Nottinghamshire (2 x 400 kW)
- Instavolt has its Winchester superhub with 44 charger points up to 160 kW including four drive-through bays for larger vehicles with trailers and extra-long vans

Map of ZEHID locations planned



Sources:

- ZEHID
- GRIDSERVE
- eFREIGHT 2030
- ZENFreight

Research

3. Charging infrastructure – USA

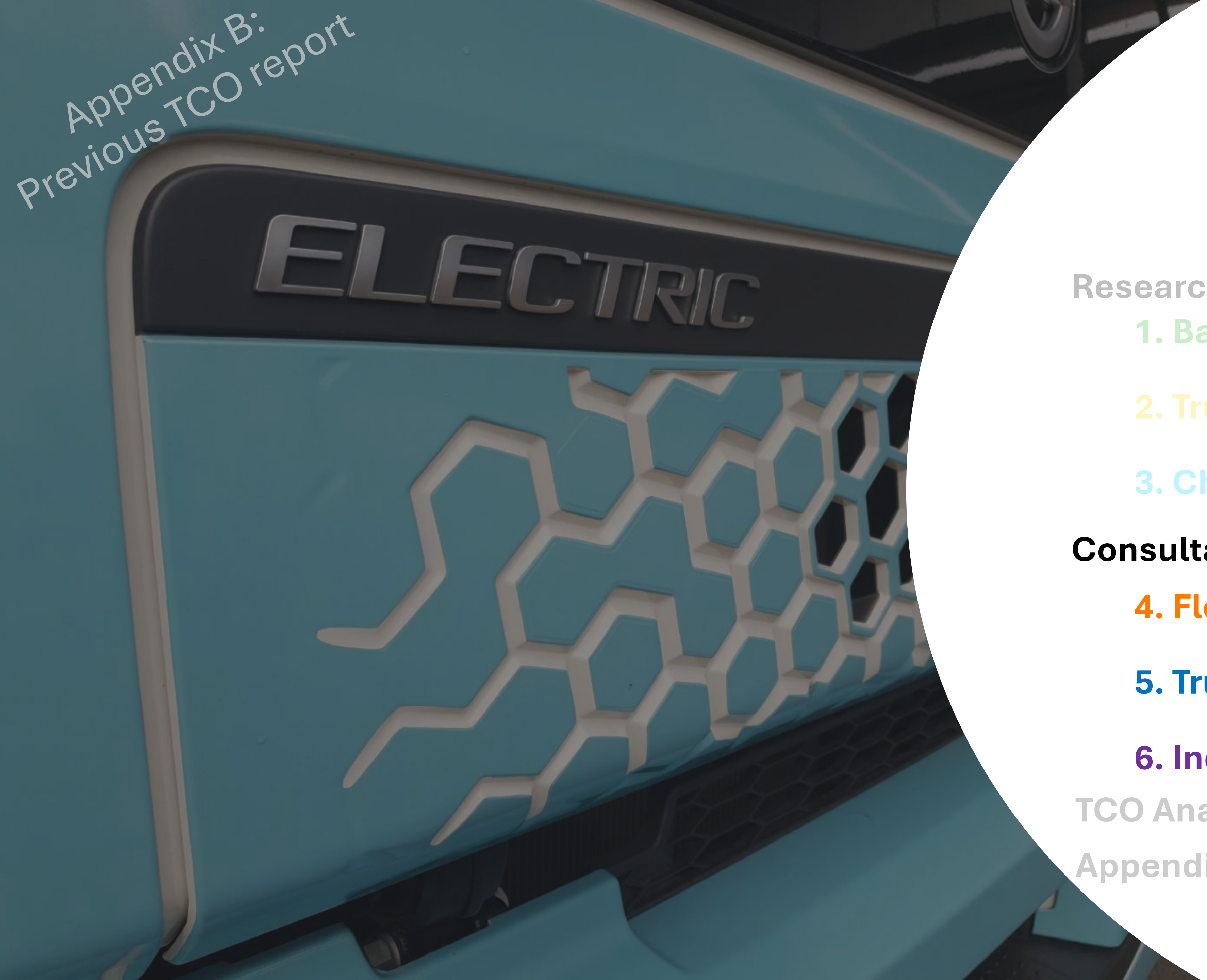
U.S. National Zero-Emission Freight Corridor Strategy (NZEFCS)

- Whilst no longer current policy, the prior Biden Administration had a goal to deploy 100,000+ public truck chargers by 2035 focusing on high-volume freight hubs prior to 2027, then connecting hubs via corridors to support 500,000 electric trucks by 2030. The country is significantly behind on this target and many programs supporting the targets have been scrapped. Nevertheless, truck charging hubs are being established with progress outlined below:

- Tesla: plans to roll out 46 charger stations by 2027, every 200–250 miles between California and Texas, aligning with the Semi's 300–500 mile range.
- WattEV has public truck megawatt charging in Bakersfield and freight hubs in Long Beach, Gardena and San Bernardino forming an electrified freight corridor in California.
- One Energy: Developing a 30 MW capacity hub in Ohio that charges 90 trucks at once.
- Forum Mobility: Building public and depot fast charging in California up to 480 kW.
- Terawatt: Developing 14 truck charging sites between California and New Mexico, with access shared between contracted fleets (a participant in the GGRC, box).
- Greenlane: Joint venture of an OEM (Daimler), investor (BlackRock) and energy provider (NextEra) planning a national public truck charging network, first site opened 2025.
- Prologis Mobility - subscription-based fleet charging at dedicated sites along common routes with options to reserve charging bays. It's first site in Los Angeles will have 32 chargers at 150 kW to 600 kW (with a total 4.8 MW capacity). It is planning more than 10 hubs in its network by 2026 (bottom right)

Case study: Interstate Highway #10 (I-10)

- The I-10 freight route is the first pilot under the Global Green Road Corridors Initiative (GGRC) which includes 10 priority road corridors globally (opposite).
- An early lesson is the importance of committing freight volumes to underpin investments by fleets and charging providers.



Appendix B: Previous TCO report

Research

1. Battery improvements
2. Truck charging potential
3. Charging infrastructure

Consultation

4. Fleets
5. Truck OEMs
6. Industry perspectives

TCO Analysis

Appendix

Consultation

Fleets and OEMs identification and engagement

Consultation process

- MOV3MENT worked closely with the SteerCo to draft a Consultation Plan for **Fleets** and **OEMs** through February. The main considerations were ‘*who*’, ‘*how*’ and ‘*what*’ we would k to discover to inform the charging analysis.
- The final Consultation Plan was submitted, with the list of proposed participants, questions and processes, in mid March. Invitations were emailed to participants in early April for discussion through to end of May.
- This is illustrated in the diagram below with approximate timeframes.
- **For fleets**, selected for diversity in range, size, duty cycles, locations and freight types. Preference was for fleets with electric trucks, which were predominantly larger. Proactive selection of some smaller local/regional fleets that do not operate electric trucks to ensure coverage of duty cycles.
- **For OEMs**, traditional and new/future entrants were consulted who covered a range of electric truck sizes and battery types that could be sold in Australia.
- The following pages outline the outcomes of this process. The Appendix outlines further details on the list of consultees invited to participate.

A. Participant selection:

- Who do we engage with?

12 x **Truck user groups:** who could utilise electric trucks by 2035

8 x **Truck OEMs:** who sell or plan to sell electric trucks by 2035

B. Consultation process

- How do we engage?

Confirm participants	Agree/send invitations	Follow up /agree time	Meet or substitute
February	Late March	Early April	Late April/May

C. Information required

- What information is required?

Fleet	Max/avg. distances	Fleet size per depot	Location overnight	Barriers to adoption
OEM	Model availability	Battery type/size	Energy density/vol	Rate of charge

Consultation

4. Fleets – summary responses

Consultation was conducted via 1:1 interviews of **30-60 minutes** duration. In some circumstances this was substituted or supplemented with emailed responses. The following questions were consistently used with a summary of responses below and detailed responses in the Appendix.

QUESTIONS	SUMMARY RESPONSES
1. What is your average fleet size? Number of depots in SWIS?	• The average fleet size per depot varied from 20 to 80 trucks. National fleets were more likely to have trucks located at customer sites overnight. • Councils/specialised fleet were smaller but more concentrated into one depot compared to larger general freight and postal.
2. What truck types/sizes do you operate and for what purpose (e.g. general freight/specialised)?	• Large fleets had a dominance of long-haul and regional freight trucks (larger combination over 40 t) that made up over three quarters of their fleet. • Medium duty trucks above 20 t were more common for utilities and some council operations. These trucks used cranes and specialized equipment. • Urban delivery trucks (15–20 t rigids) were generally a minority of large fleets/depot operation except Australia Post. • Councils operated the most diverse fleets with waste collection, tippers with trailers, and transport of plant and equipment.
3. What is your average & max daily driving distance?	• Short-haul fleets (e.g. waste collection/council) currently are underutilized, travelling 50-100 km/day or ~25,000 km/year. • Medium-haul fleets (e.g. metro delivery, local freight) are ideally suited to electrify in size and distance, travelling 150-250 km/day or ~60,000 km/year. • Long-haul Fleets (e.g. regional/linehaul freight) travel over 400 km/day or 100,000 km/year and are less likely to be suitable without daytime charging.
4. Where are trucks located at night? what is the average dwell time?	• Most trucks are located at depots overnight for up to 12 hours but may be customer locations during the day for 30-45 minutes or overnight. • Some trucks, on night shifts (Main Roads) or long-distance jobs, may stay out on the road overnight. • Trucks with Power Take-Off (PTO) systems (e.g. for cranes or equipment) may idle off-site during operations

Consultation

4. Fleets – summary responses

Consultation was conducted via 1:1 interviews of **30-60 minutes** duration. In some circumstances this was substituted or supplemented with emailed responses. The following questions were consistently used with a summary of responses below and detailed responses in the Appendix.

QUESTIONS	SUMMARY RESPONSES
5. Do you purchase or lease new trucks? Is your depot leased or owned?	• Most trucks are purchased and held for three to seven years with some up to 15 years (but Main Roads lease for five years). • A few fleets leased depots and others were uncertain about future operations, preventing investment in many cases.
6. Do you have plans to operate electric trucks? What are the barriers? What would enable a switch?	• A few fleets were proactive and planned further adoption following successful trials pending access to charging. • Main Roads has no plans to electrify leased fleet but will use a battery on board as part of an electric power take off trial. • High upfront costs is preventing adoption without grants. Electric trucks may not be able to carry hazardous goods. • Battery weight and payload limits are concerns—fleets want more efficient trucks that can carry more not less.
7. Do you have any plans/thoughts on depot charging, or public charging access (e.g. existing fuel locations)?	• Fleets are using overnight depot charging up to 150 kW but can charge faster at midday with solar and battery. • Solar + battery storage is the key as network upgrades for charging infrastructure takes too long (18-24 months) unless battery and solar is employed. • Passenger EV public charging is unreliable with access issues (e.g. underground parking/queues) but Ampol is allowing Toll access at Wyong in NSW. • Ideal dedicated truck charging would be 50/150 kW DC at customer sites night/day; or at fuel stops like Muchea, Baldivis, or roadhouses.
8. Have you encountered site level energy constraints? (e.g. issues with electric forklifts/refrig. etc)	• Depot charging often requires switchboard upgrades, load management systems, and demand response to avoid peak. • Energy constraints are common, especially alongside passenger EV or electric forklift charging needs. • Delays from Western Power mean upgrades can take 18–24 months and cost up to $500,000 (even with subsidies), with some fleets going “off-grid”. • Western Power delayed construction of south metro hub as original plan didn’t include charging for 32 passenger EVs.

Consultation

5. Truck OEMs - technology summary

During April/May 2025, MOV3MENT held 30-40 min consultations with 8 global truck OEMs about battery and truck technology to 2035. Overall, their focus on the Australian market remains small with limitations to translate overseas models based on local limits on axle load and requirement for right hand drive. The following page provides the list of questions consistently used with a summary of responses below and detailed response in the Appendix.

Summary

By 2035, Truck OEMs expect the following advancements in battery technology:

Faster charging (and no AC): Under 50 kW is considered sufficient for most vehicles overnight, but increased charging for larger and/or high km vehicles will require a shift towards daytime charging at 300 kW by 2027 and over 600 kW by 2030. OEMs were reluctant to recommend the need for megawatt charging for en route public charging until 2030 in Australia. BYD indicated multiple CCS ports could achieve 600 kW with 4 x 150 kW charger points, so infrastructure needs to be scaled appropriately. Onboard AC charging capability may also be removed over time.

Increased range: Some OEMs anticipate **50% more range could be achieved without weight penalty**. This would require purpose-built BET models with more battery capacity (due to higher energy density) and operation with less energy per km (lighter weight and E-axle efficiency). Whilst some OEMs spoke about doubling range to enable line haul over 60t or 600 km this could impose a payload penalty or exceed axle limits.

Potentially lower costs: Battery improvements will come at a cost. New standards to improve safety and reduce battery degradation will also limit price declines. Overall, a 50% reduction in battery prices to 2030 may translate into a 30% reduction in the BET prices by 2030. OEMs stated urban applications accept limited increases in range for larger price reductions whilst others maintain pricing with better performance.

Less weight and volume: Technology improvement will allow more distance for same volume/weight. For example, Foton is expected to get 15% battery improvement with second generation T5 or 30 km more range with same 80 kWh battery in just three years from first release.

Enhanced safety and durability: BYD indicated that new battery systems would allow a much greater range of operational temperatures and would delay and limit potential thermal runaway. Similarly the rate of battery degradation is reducing greatly from 2.3% to 1.8% per annum in new batteries which may enable a doubling of useful battery life (16 years vs eight years) with over 5,000 charge and discharge cycles.

Improved sustainability: Nickel, manganese and cobalt (NMC) or Nickel Cobalt Aluminium oxide (NCA) batteries both have supply chain risks based on the human and environmental impacts of their extraction in Central Africa. Concentration of supply also impacts the price volatility.

Consultation

5. Truck OEMs – summary responses

QUESTIONS	SUMMARY RESPONSES
1. What types of fleet operators are being targeted in Australia/WA? What are the biggest barriers?	• Urban/last-mile (back-to-base) is a primary focus, especially 4.5–9 t GVM (e.g. home delivery and furniture/appliances). • Heavier rigids and refrigerated vehicles are being offered for council waste collection and concrete. • Big fleets are the focus (with ability to access grants and scale discounts). Small couriers limited by charging infrastructure.
2. What truck models are planned for Australia by 2030? Can you discuss any sales in WA to date?	• More 4.5–9t GVM light/medium rigid trucks planned and up to 18 t by 2027 (Right-hand drive challenges). • Trucks/vans now supporting electric PTO (Power Take-Off) and electrical outlets to be more suitable for council and trades. • Heavier trucks (above 23 t) are a lower priority due to payload penalty, so most plans consider 2027 to 2030 availability. • ~60 BETs in WA by end of 2025 including 30 eActros (Centurion), 10 Foton (Qube, Capital, Mainfreight, Bunnings), three Volvo (CD Dodd, Marley, Matic) and two eCanter (Goldstar). Further announcements from Toll, and 3PL carriers for IKEA/Woolworths may add a dozen more electric trucks over the next 6 months.
3. What advancements in battery technology/chemistry are expected by 2030?	• Most OEMs rely on third-party batteries (e.g. CATL). Innovation is dependent on external partners. No truck-specific cells yet. • Transition to LFP is occurring for cost, stability and sustainability but heavier trucks use NMC if higher energy density needed. • More energy-efficient cells allow greater range without increasing battery size or weight. • Medium rigids 3–4 packs (280–375 kWh) and Prime movers: 5–6 packs (470–565 kWh), may be maintained for less weight. • Solid-state batteries not expected due to complexity and cost, but dual-fuel range extenders being looked at for range.
4. What do you expect will be the likely rate of charge for each BET model by 2030?	• Under 100 kW DC considered sufficient with 11-22 kW AC feasible overnight up to 9 t electric truck (140 kWh to 180 kWh). • 350 kW needed by 2027, 600 kW DC by 2030 and megawatt by 2035 for daytime charging for larger and/or high km vehicles. • OEMs eliminating AC charging (Farizon no AC in 9 t, BYD no AC in 4.5 t) and supporting simultaneous charging (up to 4 ports).

Consultation

5. Truck OEMs – summary responses

QUESTIONS	SUMMARY RESPONSES
5. What do you expect will be the improvement in battery capacity in kWh/battery energy density by 2030?	• 15–25% increase in battery capacity is expected with each new model generation every 3-5 years (based on Fuso eCanter and Foton experience). • Some manufacturers anticipate up to more battery capacity with purpose build BET models that increase range 50%. • Daytime charging (at loading docks) could reduce battery size 25%. Hydrogen expected >400 km or 40 t+ applications, reducing need for battery size. • Degradation rates are improving from 2.3% to 1.8% annually but safety regulations and power density limits may slow the pace of capacity increases.
6. What is your expectation for decline in battery costs and impact on BET prices by 2030?	• OEMs have mixed expectations about battery cost declines and their impact on vehicle prices by 2030 due to continued high demand in the EU and critical mineral supply constraints. • Cost of electric truck batteries high (e.g. IVECO and Fuso batteries cost at ~$1,000 per kWh is three times passenger EV) • In-house battery production and economies of scale may further reduce costs. • New 4.5 t GVM electric trucks are approximately $15,000 or 10% cheaper than existing models in 2025 based on anecdotes.
7. How are you expecting electric trucks to charge? Any offers to support private/public charging with BET sale?	• OEMs expect charging at depots, with limited reliance on public infrastructure by 2030 due to need to control infrastructure and avoid competition. • Third-party partnerships are being developed to support customer depot charging installations, but OEMs were not aware of public truck EV charging planned (as highlighted three charging locations may come online in the next 6 months). • Passenger EV public charging is possible but impractical for trucks due to low roof clearance, small bays, turning path clearance, and waiting times. • OEMs hope for up to 350 kW DC charging within 5 years for daytime charging during driver breaks (1 hour). Portable DC chargers are being explored.

Consultation

6. Industry perspectives

The NSW Government invited public submissions in May 2025 for infrastructure needs for electric vehicles, focusing on freight, regional access, funding, and fair market access. The following submissions were identified as having relevance to public truck charging.

Submissions

Ampol

- High cost/ long timelines (18–24 months) for deployment, especially rural.
- Need for reliable/accessible infrastructure at depots in public.

ALC (Australian Logistics Council)

- Focus on depots, intermodal terminals, logistics hubs, and rest areas on Tier 1 corridors. Minimum 200 kW per bay (1 MW+ at high-volume sites).
- Infrastructure must support future trucks with 500 kWh+ batteries.

HVIA (Heavy Vehicle Industry Australia)

- Prioritise key freight routes, depot hubs and shopping centres.
- Support for “EV-ready” site preparation at depots with focus on back-to-base operations at ports and industrial areas (4.5t to 40t trucks <200 km).
- Expand to more nodes to increase vehicle range and task scope and accommodate for trailers turning/queueing.

NatRoad

- Electric truck chargers non-existent outside of depot-based systems.
- Light vehicle charging infrastructure lacks vehicle accessibility.
- US infrastructure strategy to accelerate the deployment is relevant with deployment in stages but there should be an Australian based strategy based on local considerations.

NewVolt

- 400 kW to start but short sighted unless scalable to 800 kW. Hubs first for larger vehicles.
- Some truck chargers more suitable for BETs if manufactured in same region (i.e. Kempower and Volvo made in EU vs Sinexcel and Windrose from China).

NSW government

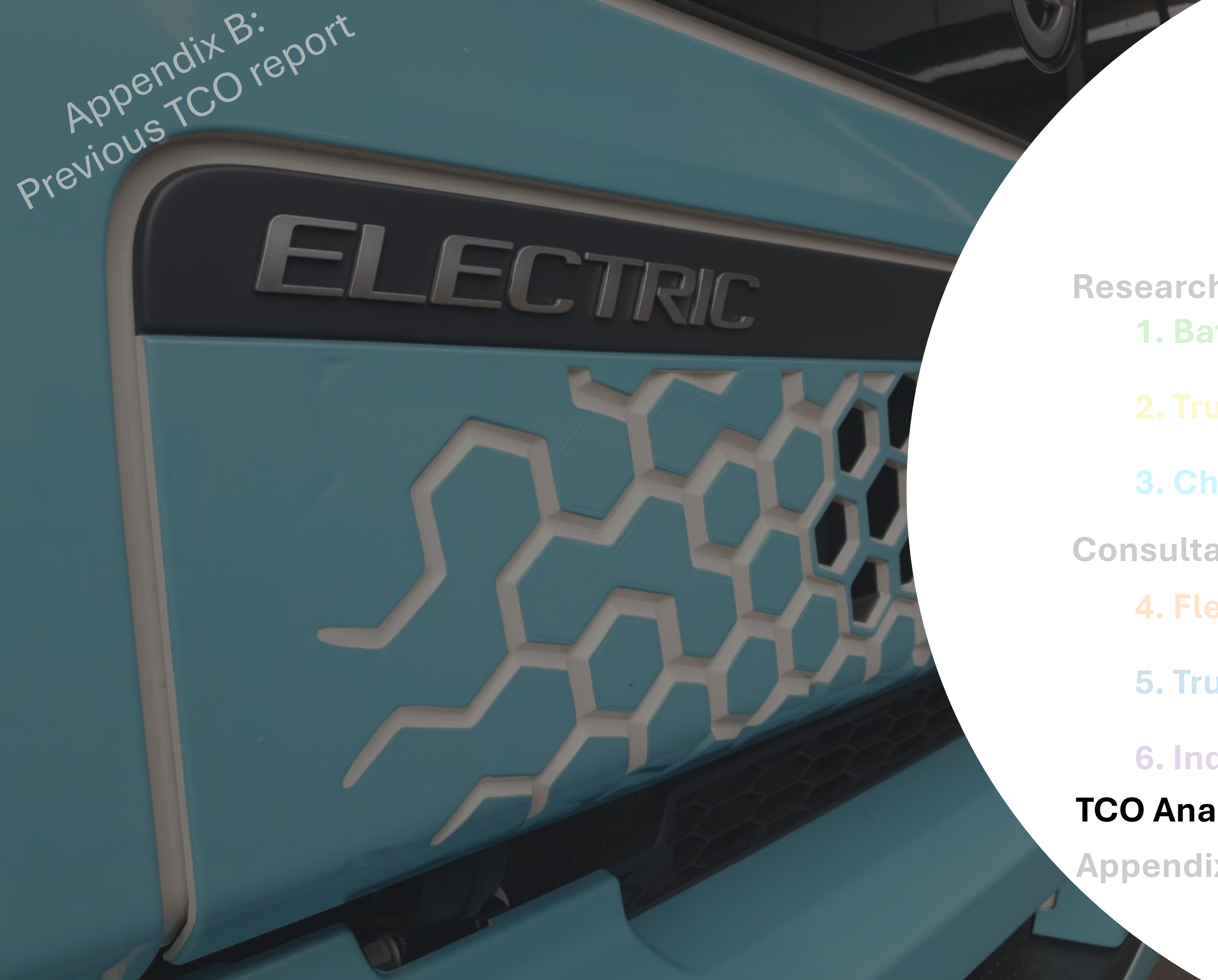
- Urban short-haul suits due to ability to be charged intermittently at depots.
- Dedicated, fit-for-purpose charging infrastructure for freight is crucial but requires careful planning at intermodal freight hubs, ports and airports

Road Freight NSW

- Prioritise container trucks, cement agitators and last-mile delivery.
- Range needs to account for terrain (e.g. Blue Mountains, Southern Highlands) with charging prioritised in areas with frequent ascents.
- Advocates for fast chargers at depots and customer locations during loading/unloading but eventually at every truck stop.

Source: Infrastructure for electric and alternative energy source vehicles in NSW and private discussions

Appendix B: Previous TCO report



Preliminary duty cycle assumptions

To assess the potential of purchase price parity for BET trucks (Task 3), Total Cost of Ownership analysis was conducted across a range of vehicle types, models and duty cycles in 2025, 2030 and 2035. More detail is shown on the following pages for each profile with a summary of key descriptors below:

Profile	GVM (t)	Duty	Location^	Depot size (vehicles)	Daily distance (km per day)*	Depot charger (kW)	Depot charging (kWh day / night)	Shared Charging (kWh/day)	Shared charger use
1	3.5 - 4.5	Site truck (e.g. trades)	Residential	1-2	70	11	0 / 36	0	Convenience only
2	4.5 – 8	Urban delivery (e.g. grocery delivery)	Industrial	10-49	120	22	0 / 70	5	On longer days
3	8 – 15	Regional haul (e.g. furniture delivery)	Commercial	1-4	250	22	0 / 120	150	Essential
4	15 – 23	Regional haul (e.g. supermarket /build. materials)	Industrial	1-9	250	60	0 / 230	130	Essential
5	>23	High frequency compactor (e.g. residential waste)	Industrial	1-9	100	60	60 / 90	0	None
6	>23	Specialised (e.g. concrete)	Commercial	5-9	150	60	0 / 200	30	On longer days
7	Prime mover	Urban delivery (e.g. retail distribution)	Industrial	10-49	250	150	100 / 65	0	None

^ Allocation land use categories to residential (with ‘parkland’ added), industrial (with ‘transport’, ‘water’, ‘primary production’ and ‘other’ added) and commercial (with ‘hospital/medical’ and ‘education’ added) lands, according to [ABS definition of land use category](#) *Utilisation is expected to increase in line with BET capability and customer confidence.

TCO Analysis

Profile 1 – Site Truck: 3.5 to 4.5t; utilisation 10,000 to 20,000 km pa

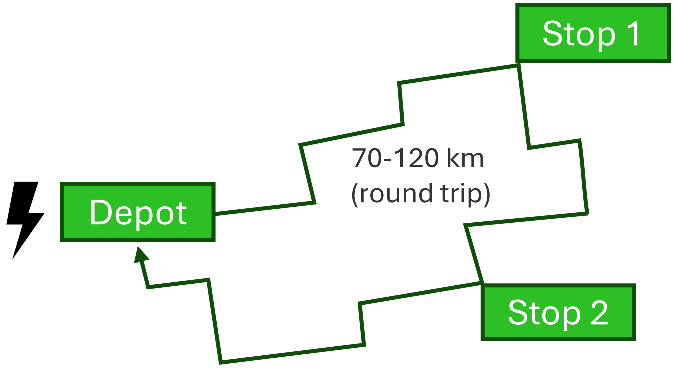
Key descriptors

Example – City of Stirling

Location – Residential, 1-2 vehicles

- **Start**: 6 am / **Operation**: 10 hours / **End**: 4 pm
- **Duty:** Site Truck
- **Battery:** ~90 kWh (up to 200 km)
- **Energy required:** 36 kWh (120 km)
- **Charging (duration):** Depot @ 11 kW (3-4 hrs)

Example – Parks & Maintenance



Example – Hyundai Mighty (4.5t GVM)

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life)	Variable costs	BEV TCO premium
2025	Diesel	$79,000	$12,900 pa	$7,100 pa	$7,500 pa
	BEV	$133,000	$24,100 pa	$3,300 pa	
2030	Diesel	$79,000	$13,100 pa	$7,000 pa	$5,400 pa
	BEV	$126,000	$22,400 pa	$3,200 pa	
2035	Diesel	$79,000	$14,000 pa	$6,900 pa	$3,900 pa
	BEV	$119,000	$21,500 pa	$3,100 pa	

BEV TCO unfavourable due to low utilisation and high BET price.

TCO improves over time with reducing vehicle price.

All charging occurs in the depot.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 2 – Urban delivery: 4.5 to 8t; utilisation 30,000 to 50,000 km pa

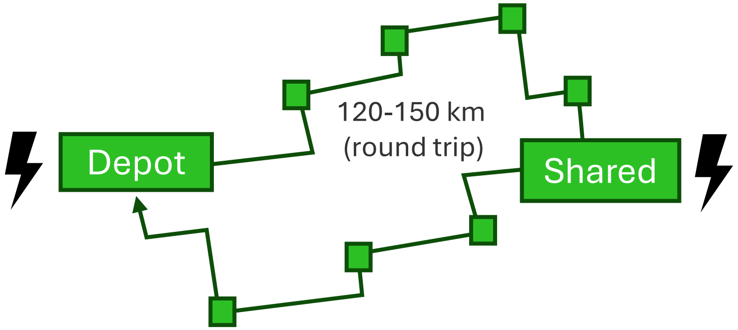
Key descriptors

Example – Woolworths

Location – Industrial, 10-49 vehicles

- **Two shifts**: 5 am – 12 and 1 pm to 11 pm
- **Duty:** Urban delivery
- **Battery:** ~100 kWh (up to 245 km)
- **Energy required:** 75 kWh (150 km)
- **Charging (duration):** Depot @ 22 kW (3-4 hrs)
  Public @ 150 kW (½ hr)

Example – Home delivery



Example – Foton T5 (6t GVM)

Average values for this type of operation:		**Vehicle cost**	**Fixed costs (7 yr life)**	**Variable costs**	**BEV TCO premium**
2025	Diesel	$84,000	$13,700 pa	$16,900 pa	$6,100 pa
	BEV	$154,000	$28,100 pa	$8,500 pa	
2030	Diesel	$84,000	$14,000 pa	$19,400 pa	$1,400 pa
	BEV	$143,000	$25,600 pa	$9,100 pa	
2035	Diesel	$84,000	$14,800 pa	$21,800 pa	-$3,100 pa (BEV cheaper)
	BEV	$126,000	$23,300 pa	$10,200 pa	

BEV TCO unfavourable due to high BET price.

TCO improves over time with reducing vehicle price. BEV cheaper by 2035.

Woolworths is not charging its trucks outside the depot, but others running this kind of duty may need shared charging on longer days.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 3 – Regional haul: 8 to 15t; utilisation 60,000 to 100,000 km pa

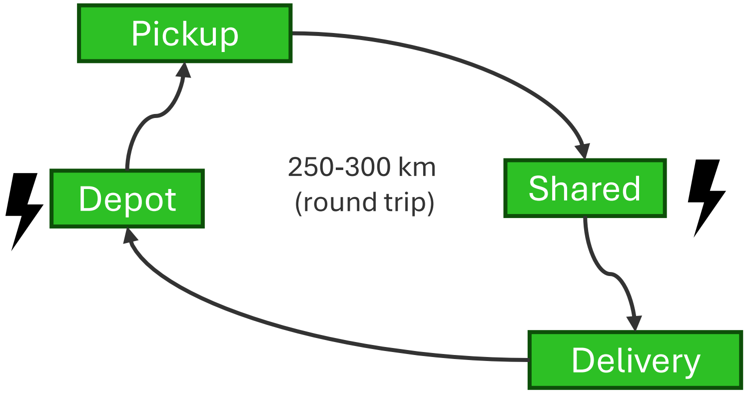
Key descriptors

Example – ANC

Location – Commercial, 1-4 vehicles

- **Start**: 6 am / **Operation**: 14 hours / **End**: 8 pm
- **Duty:** Regional haul
- **Battery:** ~170 kWh (up to 270 km)
- **Energy required:** 270 kWh (300 km)
- **Charging (duration):** Depot @ 22 kW (5-6 hrs)
  Public @ 150 kW (1-2 hrs)

Example – Regional haul



Example – JAC N90 (9t GVM)

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life) (pa)	Variable costs (pa)	BEV TCO premium (pa)
2025	Diesel	$110,000	$17,900	$50,700	$11,000
	BEV	$230,000	$40,600	$39,100	
2030	Diesel	$110,000	$18,300	$56,400	-$1,000 (BEV cheaper)
	BEV	$198,000	$34,400	$39,600	
2035	Diesel	$110,000	$19,400	$61,400	-$9,600 (BEV cheaper)
	BEV	$165,000	$29,400	$41,800	

High utilisation helps overcome high BET price.

Increasing range over time improves confidence and allows BEV to compete with diesel trucks in higher km duties, further improving BET TCO advantage in later years.

Vehicle range being pushed to limits in 2025, necessitating shared charging, possibly even twice a day on longer trips.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 4 – Regional haul: 15 to 23t; utilisation 60,000 to 100,000 km pa

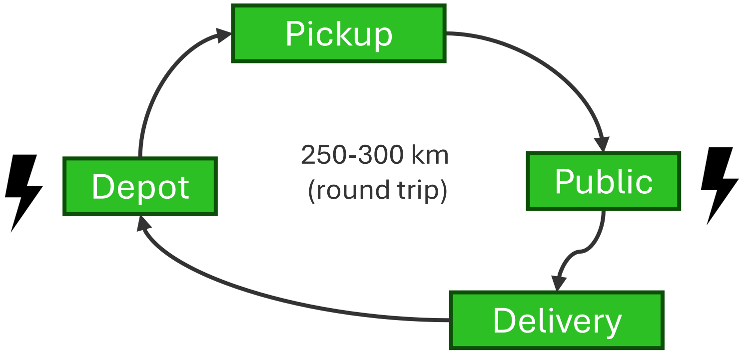
Key descriptors

Example – Typical regional haul (Geodis)

Location – Industrial, 1-9 vehicles

- **Start**: 6 am / **Operation**: 14 hours / **End**: 8 pm
- **Duty:** Regional haul
- **Battery:** ~330 kWh (up to 270 km)
- **Energy required:** 360 kWh (300 km)
- **Charging (duration):** Depot @ 60 kW (3-4 hrs)
  Public @ 400 kW (½ -1 hr)

Example – Regional haul



Example – Volvo FE electric

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life)	Variable costs	BEV TCO premium
2025	Diesel	$157,000	$27,000 pa	$61,000 pa	$55,000 pa
	BEV	$440,000	$93,000 pa	$50,000 pa	
2030	Diesel	$157,000	$28,000 pa	$67,000 pa	$27,000 pa
	BEV	$337,000	$73.000 pa	$48,000 pa	
2035	Diesel	$157,000	$29,000 pa	$73,000 pa	$1,000 pa
	BEV	$195,000	$49,000 pa	$55,000 pa	

High utilisation helps but is not enough to overcome very high BET costs, a combination of high purchase price and heavy reliance on expensive shared charging (70 c/kWh).

Gets close to parity by 2035, where it is possible to reduce the battery capacity, improving overall TCO in spite of this increasing shared charging needs.

Daytime charging will be essential to cover the mileage, either at a public or customer site.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 5 – High frequency compactor: >23t; utilisation 20,000 to 30,000 km pa

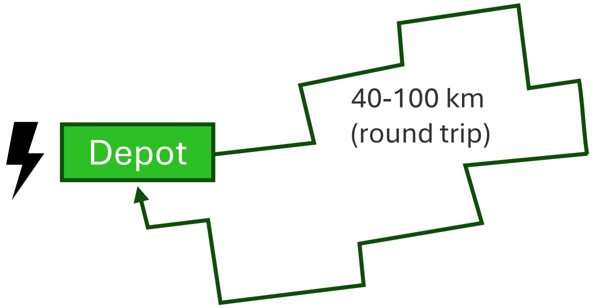
Key descriptors

Example – Council Waste (Typical Council)

Location – Industrial, 1-9 vehicles

- **Two shifts**: 4:30 am – 12 and 4:30pm to 10 pm
- **Duty:** Waste
- **Battery:** ~350 kWh (up to 230 km)
- **Energy required:** 225 kWh (150 km)
- **Charging (duration):** Depot @ 60 kW (3-4 hrs)

Example – High frequency compactor



Example – Volvo FE electric

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life)	Variable costs	BEV TCO premium
2025	Diesel	$191,000	$39,000 pa	$68,000 pa	$34,000 pa
	BEV	$454,000	$117,000 pa	$25,000 pa	
2030	Diesel	$191,000	$40,000 pa	$67,000 pa	-$2,000 pa (BEV cheaper)
	BEV	$311,000	$81.000 pa	$24,000 pa	
2035	Diesel	$191,000	$42,000 pa	$66,000 pa	-$18,000 pa (BEV cheaper)
	BEV	$248,000	$66,000 pa	$23,000 pa	

"Ideal" start/stop duty cycle for BET, but lower utilisation and high price differential in 2025.

Gets to parity by 2030, where battery size is matched to the duty.

All charging occurs in the depot between shifts.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 6 – Specialised: >23t ; utilisation 20,000 to 40,000 km pa

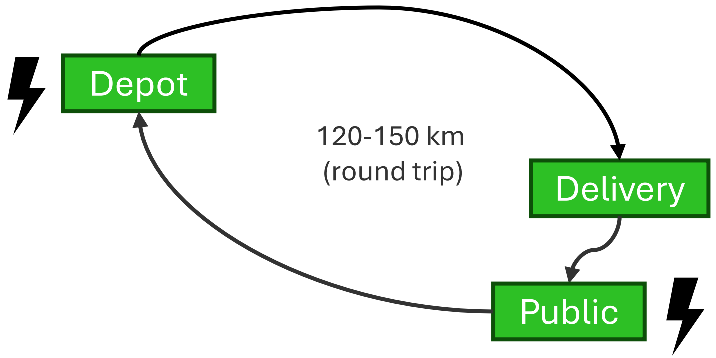
Key descriptors

Example – HOLCIM

Location – Commercial, 5-9 vehicles

- **Start**: 6 am / **Operation**: 12 hours / **End**: 6 pm
- **Duty:** Specialised
- **Battery:** ~280 kWh (up to 180 km)
- **Energy required:** 225 kWh (150 km)
- **Charging (duration):** Depot @ 60 kW (3-4 hrs)
  Public @ 400 kW (½ -1 hr)

Example – Concrete agitator


Depot

120-150 km
(round trip)

Delivery

Public

Example – Foton E-Auman C

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life)	Variable costs	BEV TCO premium
2025	Diesel	$191,000	$36,000 pa	$54,000 pa	$45,000 pa
	BEV	$454,000	$107,000 pa	$28,000 pa	
2030	Diesel	$191,000	$37,000 pa	$60,000 pa	$19,000 pa
	BEV	$371,000	$87,000 pa	$28,000 pa	
2035	Diesel	$191,000	$39,000 pa	$65,000 pa	-$3,000 pa (BEV cheaper)
	BEV	$288,000	$70,000 pa	$31,000 pa	

Increasing range over time improves confidence and allows BEV to compete with diesel trucks in higher km duties, helping improving BET TCO advantage by 2035.

Daytime charging will be needed on longer days, either at a public, or customer site.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

Profile 7 – Urban Prime mover; utilisation 30,000 to 70,000 km pa

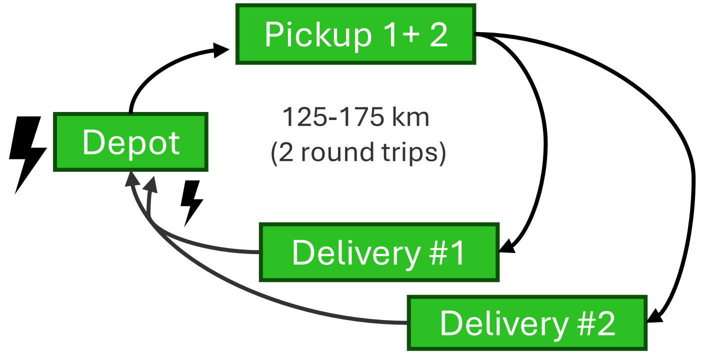
Key descriptors

Example – Centurion

Location – Industrial, 10-49 vehicles

- **Two shifts**: 4 am – 12 and 2 pm to 8 pm
- **Duty:** Regional haul
- **Battery:** ~330 kWh (up to 300 km)
- **Energy required:** 148 kWh (150 km)
- **Charging (duration):** Depot @ 150 kW (1-2 hrs)

Example – Urban delivery



Example – Mercedes-Benz e-Actros 300

Average values for this type of operation:		Vehicle cost	Fixed costs (7 yr life)	Variable costs	BEV TCO premium
2025	Diesel	$290,000	$50,000 pa	$76,000 pa	$44,000 pa
	BEV	$550,000	$131,000 pa	$39,000 pa	
2030	Diesel	$290,000	$51,000 pa	$76,000 pa	$24,000 pa
	BEV	$462,000	$113,000 pa	$38,000 pa	
2035	Diesel	$290,000	$54,000 pa	$75,000 pa	$11,000 pa
	BEV	$395,000	$102,000 pa	$37,000 pa	

High utilisation helps overcome high BET price, but parity is not expected by 2035 without use of shared charging facilities.

Daytime charging occurs at the depot between shifts. Depot has 150 kW chargers to facilitate this during their lunch break.

If shared charging becomes available, other fleets could rely on this for daytime top-ups, reducing their depot charging infrastructure costs, bringing parity closer.

*Where possible values are based on consultation, some values have had to be estimated

TCO Analysis

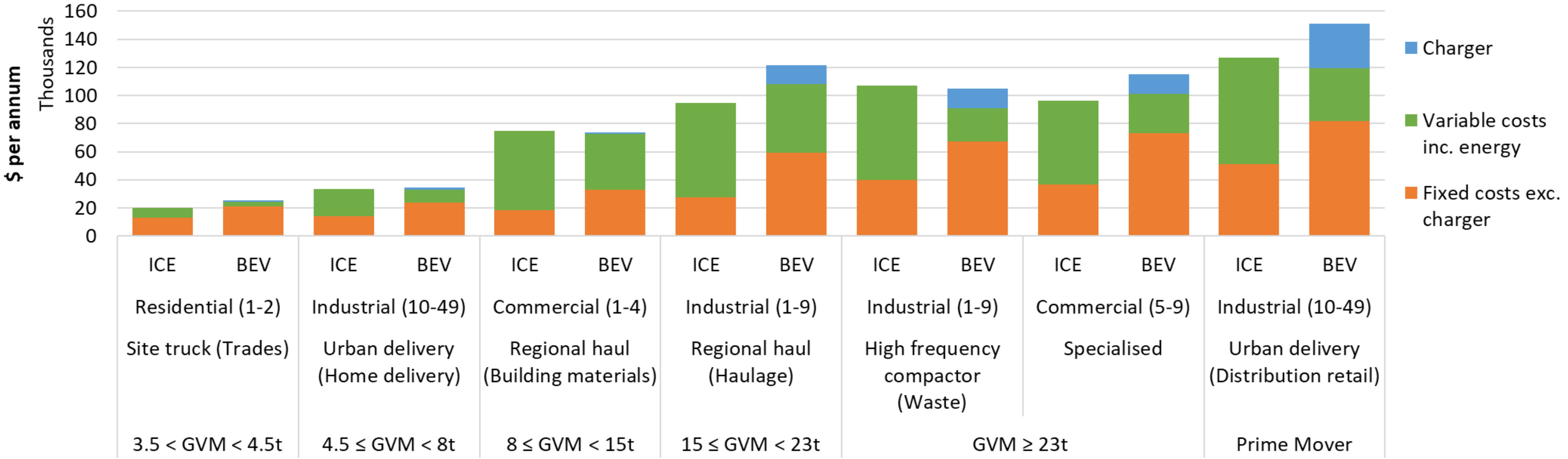
Five-year horizon for price parity in some segments

- In the near term to 2030, price premium reductions, improved range and energy efficiency will reduce the TCO gap in light/medium rigids. Depending on exact details of utilisation, pricing etc, parity is foreable in:
  - 4.5-8t GVM urban delivery where most models are currently available.
  - 8-15t GVM, regional haul with higher utilization.
  - >23t GVM, high frequency compactors, which have the ideal duty cycle to benefit from electrification.

- **Fixed costs** include upfront BET cost (depreciation and finance over 7 years), upfront charger installation amortized over 8 years and charger maintenance.
- CTP and rego costs are assumed to be similar between BET and diesel.

- **Variable costs** include fuel/electricity, servicing and maintenance.
- Driver labour costs are assumed to similar between BET and diesel.

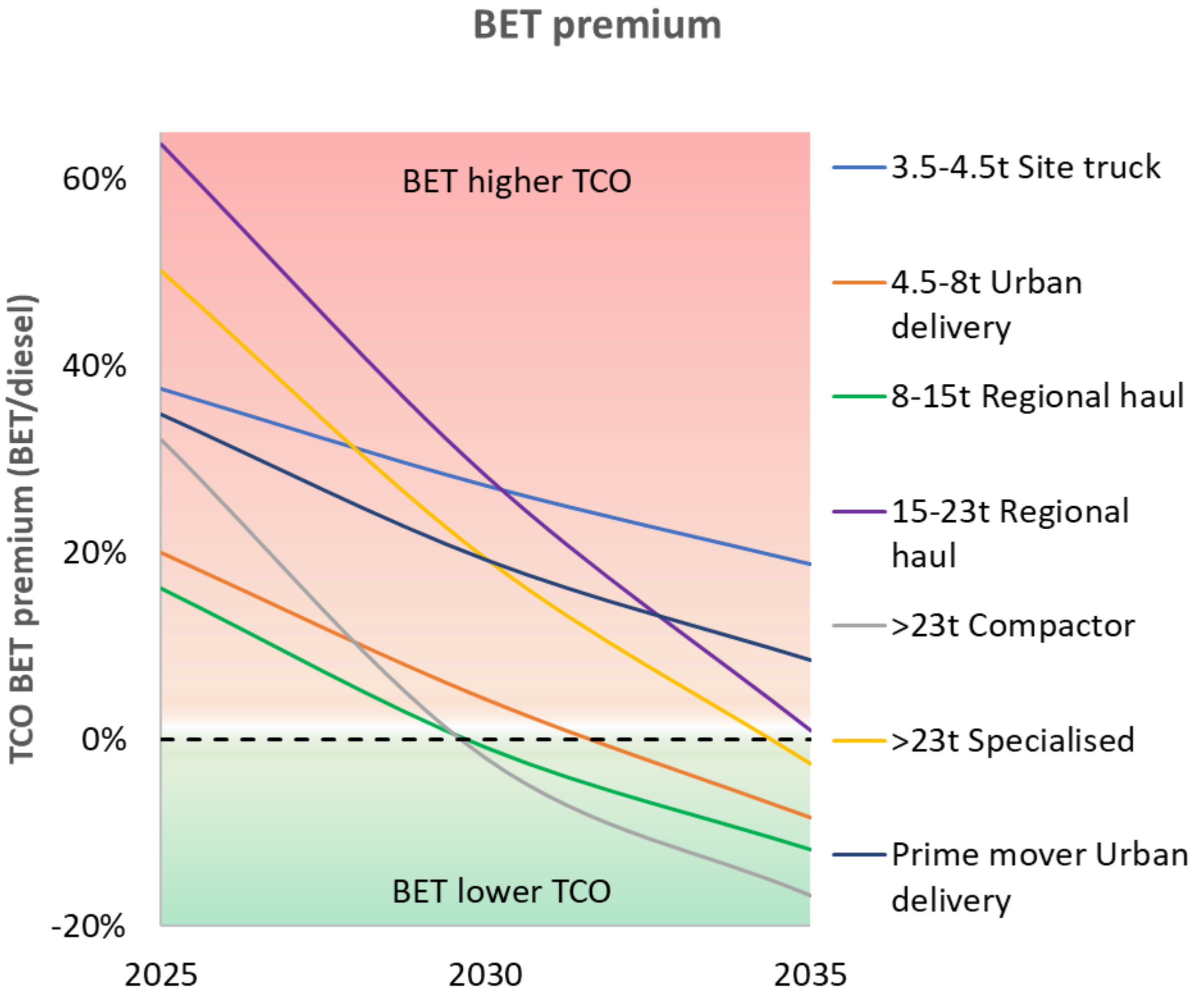
Total cost of ownership with typical usage - 2030



TCO Analysis

Trend over time

- In 2025, all owners pay a premium to run BETs (without subsidy).
- By 2035, this significantly reduces. All BETs are likely to have a lower TCO than diesel except:
  - **Site trucks**, which have very low utilization (low diesel usage to offset upfront costs). This may improve with extended vehicle life beyond 7 years.
  - **Prime mover urban delivery**, where this example is heavily influenced by Centurion's need to install 150 kW chargers for daytime top-ups. Future availability of suitable shared charging could reduce overall costs.
- Results for individual trucks will vary, primarily depending on:
  - Actual purchase prices (noting averages are used in TCO)
  - Utilisation, with higher km pa strongly favouring BEV TCO if fleets can access daytime charging.
  - Longer periods of dwell in the depot can lead to lower cost charging infrastructure.
  - Better access to shared charging infrastructure that is more utilised can also lower cost of daytime charging .



TCO Analysis

Truck assumptions

Item	Units	Key assumption (2025)
Electricity price	c/kWh	**30 c/kWh** based on average retail tariffs without allowance for load-based tariffs. Does not apply to shared/public charging.
Diesel price	$/L	$**1.60/L** (180 c/L less the fuel tax credit of ~20 c/L from ATO for a business fleet with a vehicle over 4.5t GVM)
Ownership period	Years	TCO calculations are based on **7 years** (first life) for vehicles
Annual Mileage	km pa	2025 values are guided by consultation - our experience of what early adopters are actually using BETs for. Due to lacking range, confidence, or other reasons, fleets that have adopted BETs in 2025 are often putting them in less demanding applications, replacing diesels that are doing lower km work.
Operation	days pa	**250 days per year**. This is also consistent with Monday - Friday operation (with some downtime for servicing). Regional Haul is assumed to operate 275 days per year (5.5 days per week).
Insurance	c/$	**5%** of purchase price.
Depreciation	%	Two step model was used, depending on duty cycle. **10%-20% upon sale, plus 4% to 7% pa**. BETs have a higher depreciation rate than ICE for 2025 following a similar path to light vehicles. A combination of a lack of confidence in the technology, rapidly reducing prices and increasing capability of new BETs impacts their resale. It is expected that the situation will stabilise by 2035 with BEV trucks having the same depreciation as ICE trucks.
Finance Cost	$	**5.85%,** based on current RBA cash rate **of 3.85% plus 200 basis points in 2025.** CEFC offers discounted finance **of 0.7%** which has been applied across the forecast period to BETs.

Item	Units	Changes in assumptions
2025-2035 changes	All	• Electricity price (c/kWh): **No real change**, assumed to nominally increase in line with broader price rises. • Diesel price ($/L): **No real change**. Over the last 18 years on average annual diesel prices have increased at inflation. • Annual mileage: 2035 = typical values for diesel vehicles . It is assumed that by 2035, BET usage will be the same as typical diesel usage with linear progression from 2025. • Fuel efficiency (L/100 km): Efficiency **improves 2% by 2030 and 5% by 2035**, mostly as a result of trickle-down changes from European and American CO2 legislation. Vehicles under 4.5t GVM may be affected by NVES. • Electricity Consumption (Wh/km): Efficiency **improves 8% by 2030 and 12% by 2035.** • Battery capacity: **improves 30% by 2030 and 50% by 2035** • Price - ICE: **no increase** assumed for transition to Euro 6. • Price - BEV: Expected to stabilize at ~150% of equivalent diesel truck prices by 2035, driven by battery cost reductions. Some operators accept less than 50% increase in battery capacity and lower BET price to achieve price parity. • PTO cost ($): In 2025 the cost of a PTO for a BEV truck is higher than the equivalent diesel. It is assumed that PTO prices for BEVs will **reduce 30% by 2030** (getting closer to, but not matching, diesel price). • Insurance ramping to 7% in 2035 • **No Road user charge before 2030** • Reduction in Finance costs to **5.2%** based on latest RBA forecast of cash rate at 3.2% to Jun 2027. • **No Change** to Planned Servicing (c/km), ICE Depreciation (%), Tyres (c/km), Brakes (c/km) & Unplanned Servicing (c/km).

TCO Analysis

Charging operational assumptions

<table>
<tr><th>Item</th><th>Units</th><th>Assumption</th></tr>
<tr><td>Min Dwell</td><td>hours</td><td>6 to 14 hours per day. Operation capped at up to 12 hours each day for single driver fatigue management but some vehicles in waste and concrete segments may have double shifts of 5-8 hours with the expectation that the vehicle is parked overnight for a minimum of 6 hours (i.e. 11pm to 5am).</td></tr>
<tr><td>Depot charge rate</td><td>kW</td><td>Set by amount of dwell time available to charge in depot, and amount of energy needed. Duration of charging could be reduced in some cases to avoid peak/shoulder.

No vehicles are expected to be limited by charge rate. If battery limits prevent sufficient charging overnight, then daytime charging is necessary. If duty cycle allows, this daytime charge is done in the depot, otherwise en route charging is used, at a charger capable of delivering the maximum rate that the truck can accept (below).</td></tr>
<tr><td>En route charging</td><td>kW</td><td>To minimise downtime, trucks will use chargers rated at or above the trucks maximum charge rate. Although vehicle charging capability will increase over time, the change in peak rate is not expected to be significant enough to justify a different charger;
<table>
<tr><th>Truck type</th><th>2025</th><th>2035</th></tr>
<tr><td>3.5 < GVM < 4.5t</td><td>60-120</td><td>Up to 180</td></tr>
<tr><td>4.5 ≤ GVM < 8t</td><td>80-120</td><td>Up to 180</td></tr>
<tr><td>8 ≤ GVM < 15t</td><td>100-150</td><td>Up to 180</td></tr>
<tr><td>15 ≤ GVM < 23t</td><td>130-150</td><td>Up to 180</td></tr>
<tr><td>≥ 23t</td><td>150-350</td><td>Up to 1000</td></tr>
<tr><td>Prime mover</td><td>150-350</td><td>Up to 1000</td></tr>
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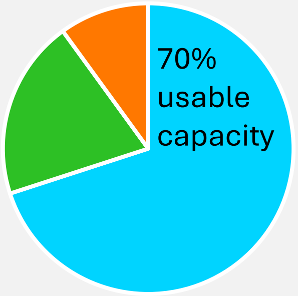
Usable battery capacity

- **70% of the total battery capacity** of electric trucks is usable for operational planning on average.
- This reflects a conservative approach based on the following factors:



- **Operational buffer**: To maintain battery health and ensure consistent performance, we assume a 20% buffer—keeping SoC between 10% and 90%—which aligns with best practices in fleet management and battery safety protocols. This also gives drivers confidence to return to base.
- **Additional OEM imposed limits and degradation**: Some Truck OEMs restrict charging. For example, Volvo limits usable SoC to a maximum of 70% for rigids and 80% for prime movers. Over a typical seven-year life, batteries may also lose up to 10% of their original capacity due to regular cycling and aging.
- As a result, a Fuso eCanter with a nominal 124 kWh battery may have an effective usable energy of only 87 kWh, translating to an operational range of approximately 140 km, depending on vehicle type and load.

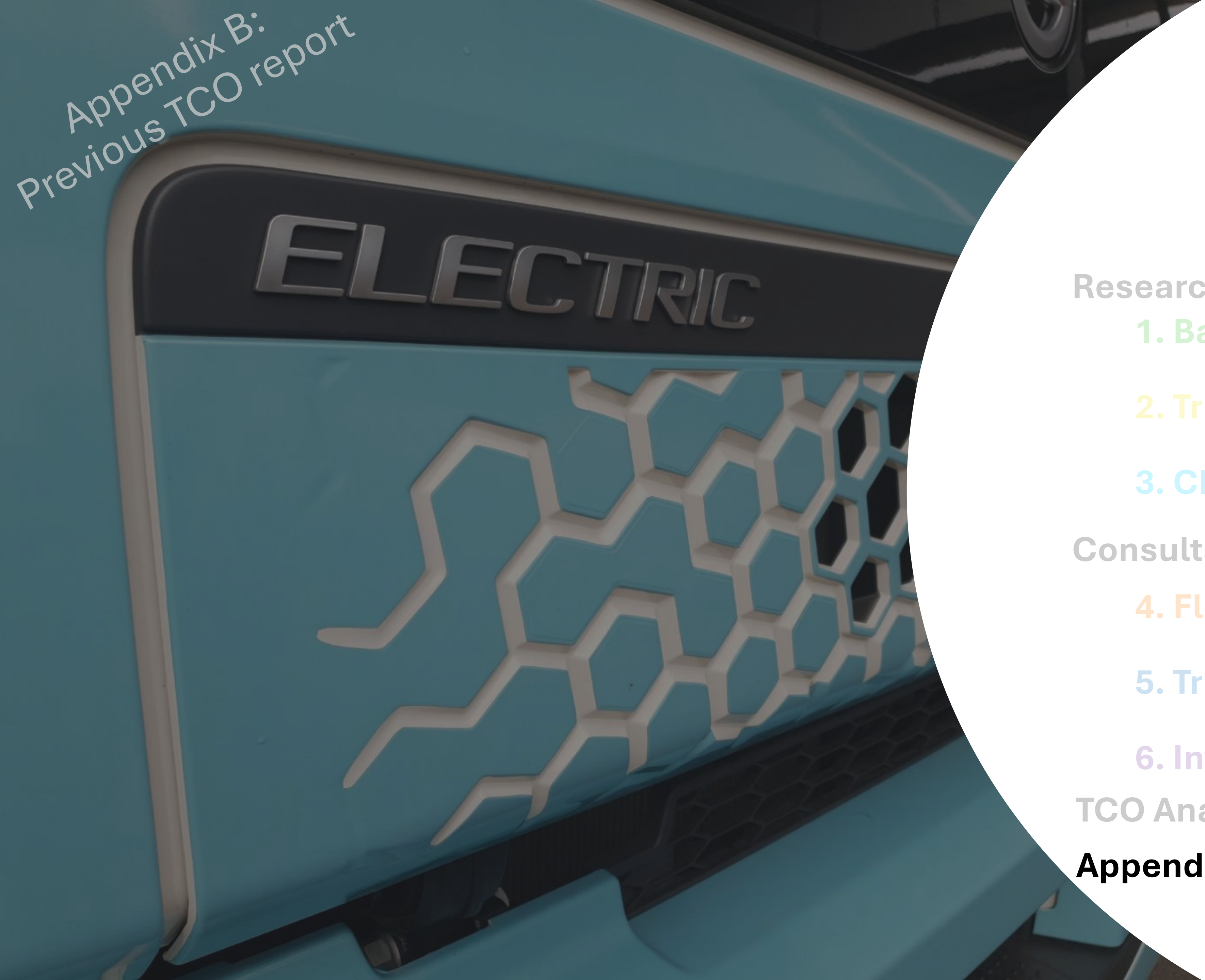
Item	Units	Assumption
Charger costs	Per vehicle cost pa	The **following page** presents the detailed costing of charging based on different fleet sizes, charger types and locations based on a range of industry quotes. Confidence around hardware cost is greatest but may only account for ~20% of total installation cost, depending on the extent of existing infrastructure and electrical capacity. EVSE/JET Charge/CPO developers have validated this approach.

TCO Analysis

Charging cost assumptions

Charging installation type	**1-4 @ 11-22 kW**	**5-9 @ 22 kW**	**5-9 @ 60 kW**	**10-49 @ 22 kW**	**5-9 @ 150 kW**	**10-24 @ 400 kW**
Site type	Depot (Residential)	Depot (Commercial)	Depot (Commercial)	Depot (Industrial)	Shared (Industrial)	Public (Industrial)
Number of electric trucks/vans	4	9	9	49	9	24
Ratio EVs to chargers	1	1	~2	~2	~2	3
Total number of chargers	4	9	5	25	5	8
Type of chargers (kW)	11-22	22	60	22	150	400
Charger hardware cost (each)	$2,500	$3,500	$35,000	$3,500	$85,000	$240,000
Total costs (per item)						
Total hardware cost	$10,000	$31,500	$175,000	$87,500	$425,000	$1,920,000
Software CPO services ($1k charger)	$4,000	$9,000	$5,000	$25,000	$5,000	$8,000
Installation (civil)#	$20,000	$50,000	$350,000	$180,000	$850,000	$4,800,000
Reticulation (electrical) #	$5,000	$16,000	$175,000	$88,000	$213,000	$1,920,000
Distribution/switchboard upgrades	$1,760	$3,960	$6,000	$11,000	$15,000	$64,000
Electrical capacity upgrade^	Assume not required	$8,797	$136,680	$250,580	$341,700	$1,457,920
Project management (15% of capex)	$4,014	$11,814	$100,152	$79,437	$212,955	$1,236,288
Total infrastructure cost	**$44,774**	**$131,071**	**$947,832**	**$721,517**	**$2,062,655**	**$11,406,208**
Per vehicle cost pa *	**$1,469**	**$1,911**	**$13,823**	**$1,933**	**$31,513 (*60c/kWh*)**	**$65,348 (*70c/kWh*)**

#Installation/reticulation costs estimated as a multiple (0.5 to 2.5 times) of the total hardware cost based on a range of quotes assuming existing hard standing and no new parking bays.
^Over 200 kVa a site upgrade is assumed at a cost of $496 per kVA+ 13.9% based on Western Power website and industry consensus ($400 to $600 per kVA)
* Based on total infrastructure cost divided by total number of trucks and amortised over 8 years. Shared/public sites based on dispensed cost (*in brackets*) which includes 5-20% margin.



Appendix B:
Previous TCO report

Research

1. Battery improvements
2. Truck charging potential
3. Charging infrastructure

Consultation

4. Fleets
5. Truck OEMs
6. Industry perspectives

TCO Analysis

Appendix

MOV3MENT
transport energy environment

Appendix

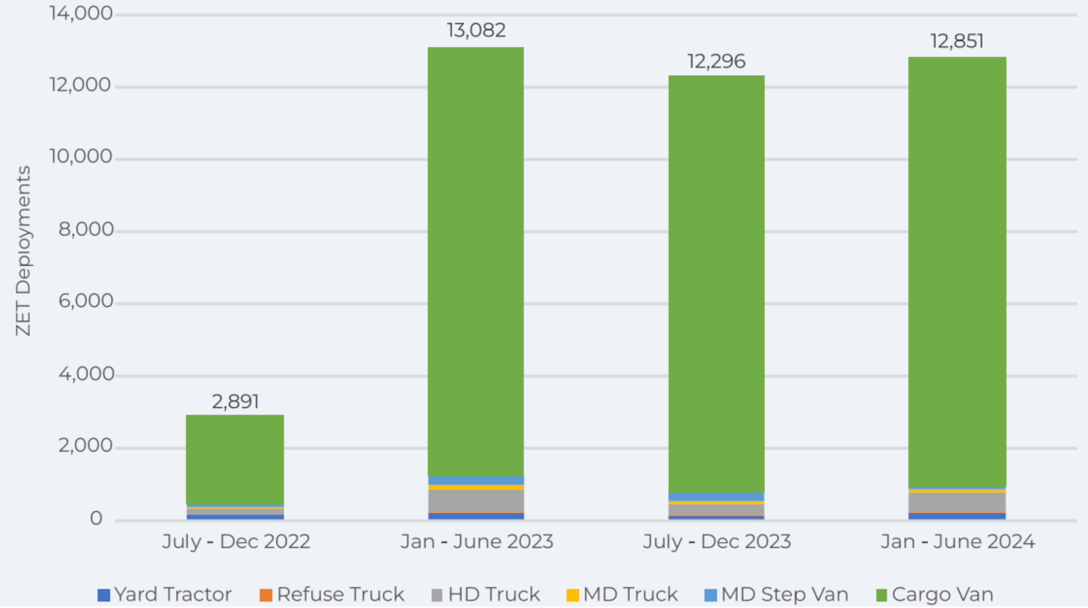
Global and local electric van market (>3.5 t)

- The focus of this research and consultation paper is on light-to-medium rigid trucks but also covers vans with a gross weight of more than 3.5 t, including those with a ‘cab chassis’ (similar to a light truck), pictured opposite.
- Electric vans were slower to take off due to model availability (Ford eTransit: May 2023 and LDV eDeliver9: May 2024). But recent sales of electric vans above 3.5 t overtook sales of electric trucks over the 12 months to 31 May 2025 for the first time. This pattern has also been shown in the US and EU (below).

Image: Branded LDV EV Truck

US

- Over 42,500 electric trucks and vans have been deployed in the U.S. as of June 2024 with 90% electric cargo vans (38,000) and over half of all electric vans deployed are operated by Amazon (these vans are commonly 4.2 t GVM with 200 km of range but newer versions are up to 6.4 t GVM).
- Electric truck deployment growth has stagnated over the past 18 months.



EU

- In Europe, electric van sales dominate based on incoming urban emissions regulations, however sales of zero-emission trucks are still rising (up 45% to 4,100 in Q1 2025).

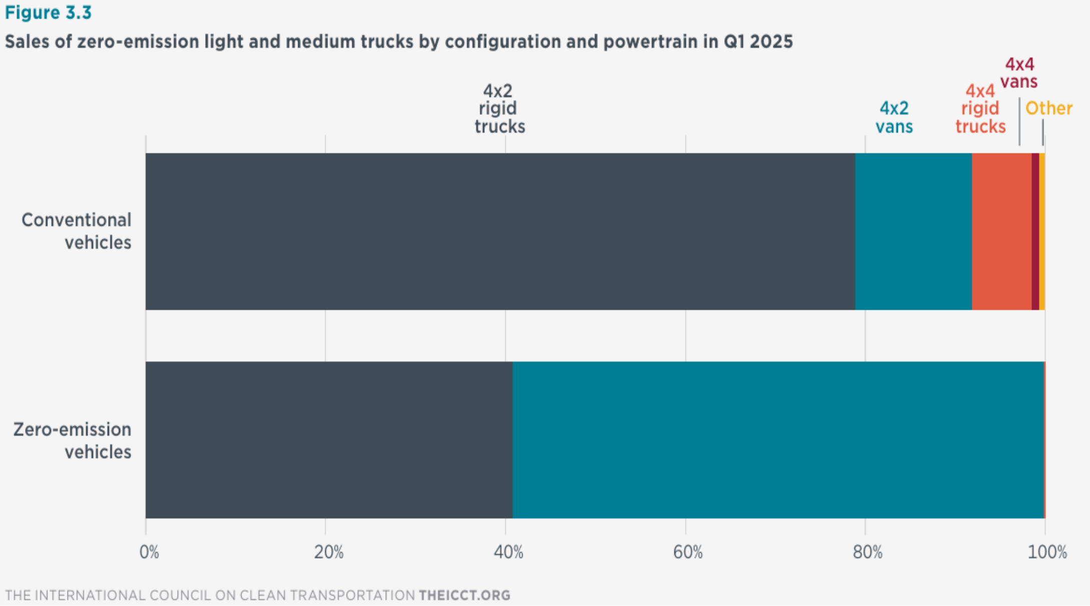


Figure 3.3

Sales of zero-emission light and medium trucks by configuration and powertrain in Q1 2025

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION THEICCT.ORG

Appendix

1. Battery improvements – LFP will dominate

Additional research

Sources: McKinsey (2024)

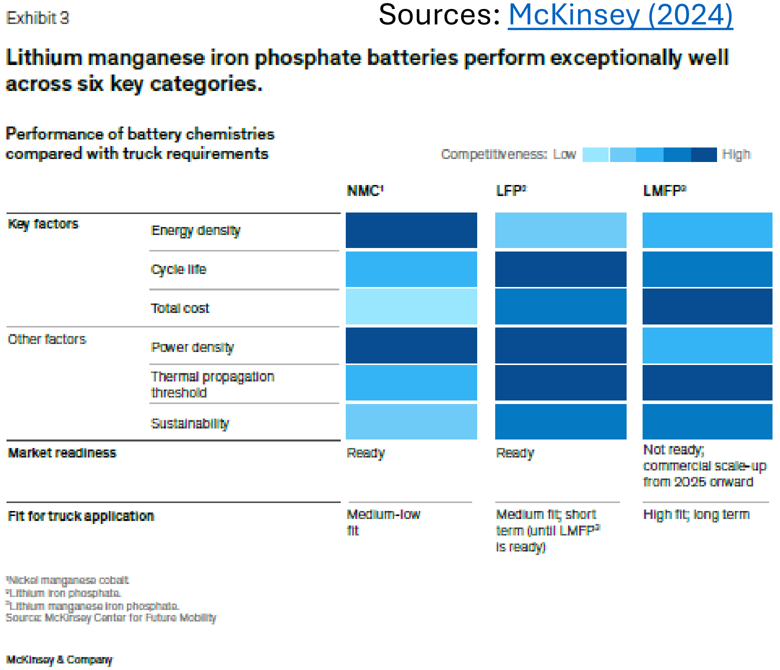


Exhibit 3

Lithium manganese iron phosphate batteries perform exceptionally well across six key categories.

Performance of battery chemistries compared with truck requirements

Competitiveness: Low – High

		NMC[1]	LFP[2]	LMFP[3]
Key factors	Energy density			
	Cycle life			
	Total cost			
Other factors	Power density			
	Thermal propagation threshold			
	Sustainability			
Market readiness		Ready	Ready	Not ready; commercial scale-up from 2025 onward
Fit for truck application		Medium-low fit	Medium fit; short term (until LMFP[3] is ready)	High fit; long term

[1] Nickel manganese cobalt.

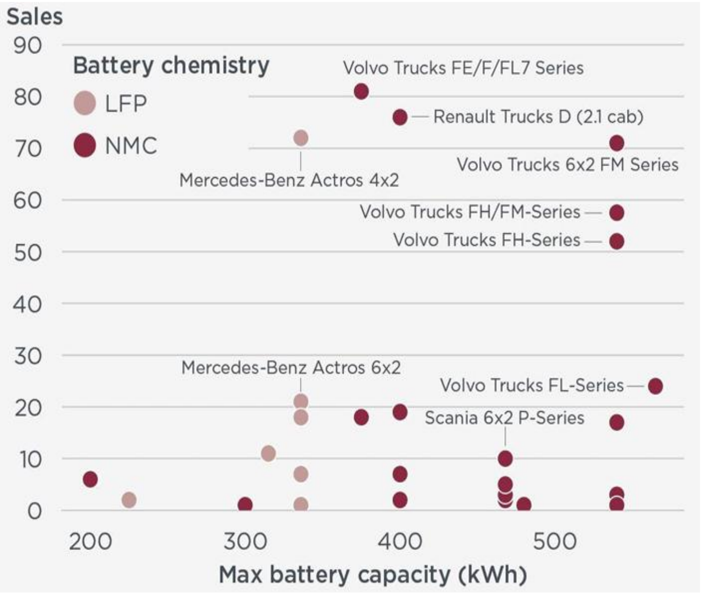
[2] Lithium iron phosphate.

[3] Lithium manganese iron phosphate.

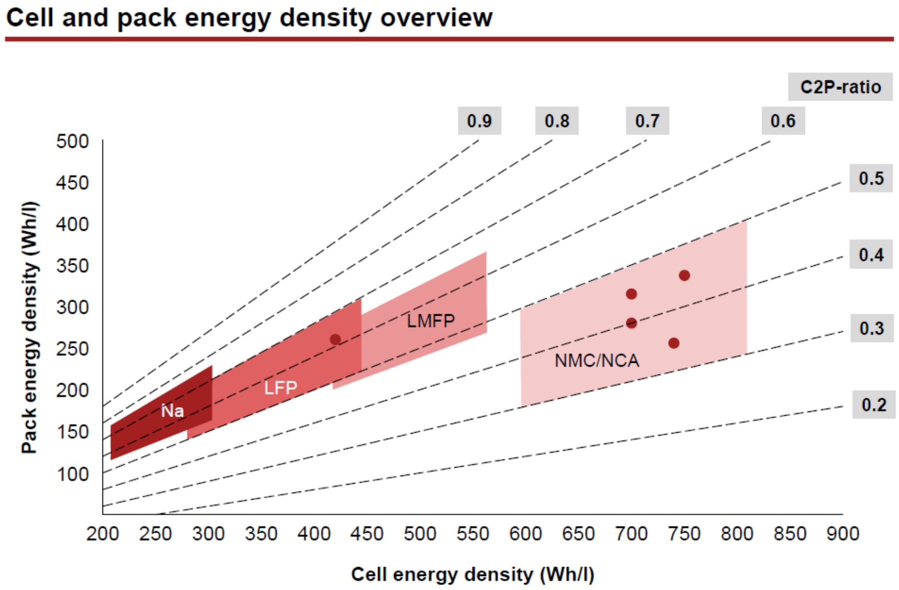
Source: McKinsey Center for Future Mobility

McKinsey & Company

Source: IEA Global EV Outlook 2025



Source: *Strategy& (2024)*

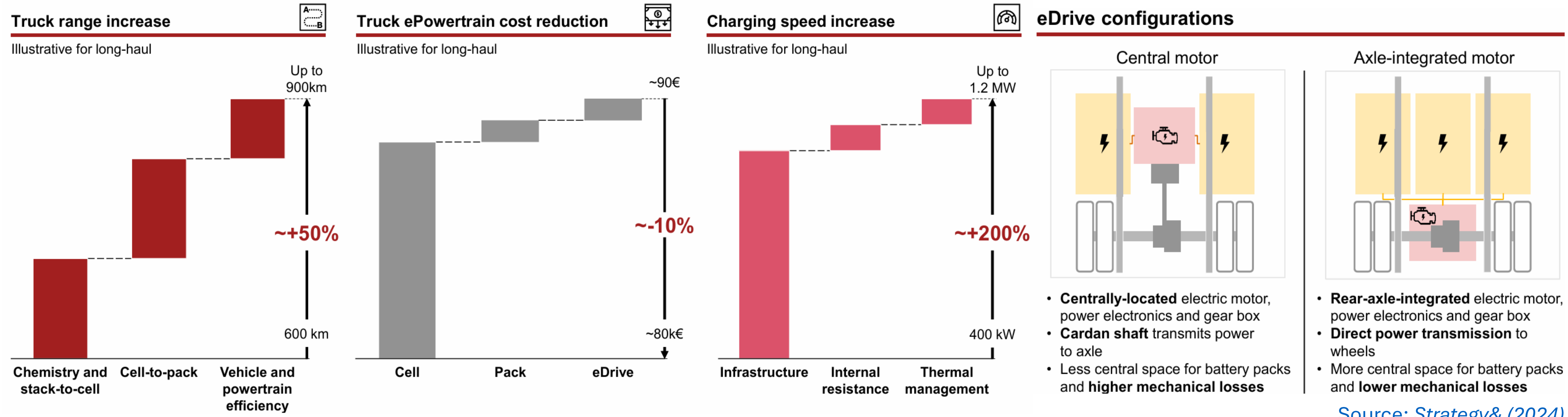


Cell and pack energy density overview

Appendix

1. Battery improvements – energy density and capacity will increase

Additional research



Truck range increase

Illustrative for long-haul

Truck ePowertrain cost reduction

Illustrative for long-haul

Charging speed increase

Illustrative for long-haul

eDrive configurations

Central motor

- **Centrally-located** electric motor, power electronics and gear box
- **Cardan shaft** transmits power to axle
- Less central space for battery packs and **higher mechanical losses**

Axle-integrated motor

- **Rear-axle-integrated** electric motor, power electronics and gear box
- **Direct power transmission** to wheels
- More central space for battery packs and **lower mechanical losses**

Source: *Strategy& (2024)*

^Innovation extends beyond range and cost. Additional attributes being developed include superfast charging and batteries with no degradation in the first five years.

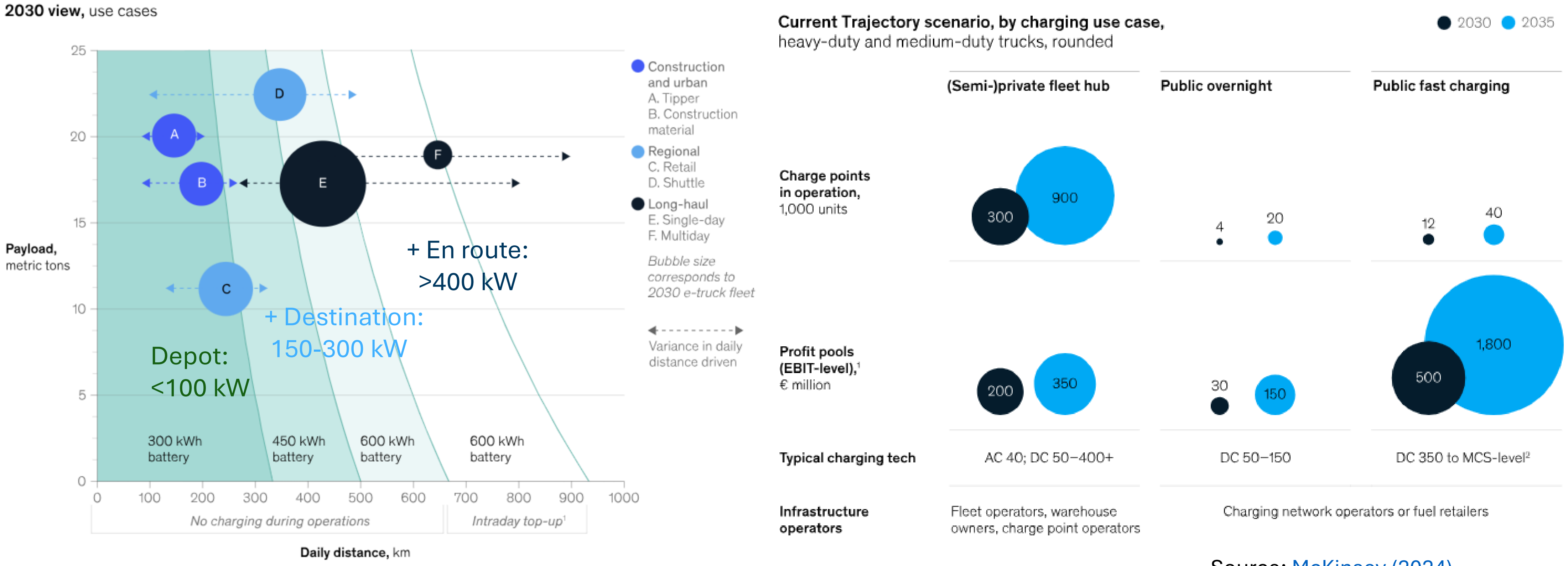
Appendix

2. Truck charging potential – public charging over 500 km

As battery technology provides range over 500 km a public charging requirement will emerge and necessitate charging of 350 kW to 600 kW.
50 kW to 150 kW will still be suitable for overnight charging.

Additional research

Charging infrastructure, driving patterns, and battery sizes have to be optimized in concert to efficiently electrify truck operations.



Source: McKinsey (2024)

Appendix

3. Charging infrastructure – Australia

In the absence of truck-specific public charging sites, trucks are using passenger EV charging with associated risks/challenges

Whilst examples provided in the UK, EU and US provide a reference point, for how public truck charging may emerge in Australia, there are a lot of factors to consider, including:

- **Higher cost per kWh vs benefit of more range**: Trucks and infrastructure are significantly more expensive to enable megawatt charging standard (MCS). For example, 600 kW CCS2 may offer ~80% of daily range at ~40% of MCS cost. OEMs charge more for MCS-capable trucks due to expensive components like liquid cooling and Charging Point Operators may face double the infrastructure costs and demand tariffs for MCS compared to a similar number of CCS 2 chargers at 40-60% of the peak charge capability.
- **Route and truck size relevance**: European long-haul models don't directly apply to Australia—MCS alone won't solve challenges on corridors to Kalgoorlie operated by B doubles. The battery size requirements require higher charge speeds but the distances and energy requirements per km are much greater.

4. Fleets – detailed responses (first 6 of 12)

Participant	1.What is your average **fleet size**?	2.What truck **types/sizes** do you operate and for what purpose?	3.What is your average & max daily driving **distance**?	4.Where are trucks **located** at night? what is the average **dwell** time?	5.Do you purchase or lease **new trucks/**depot?	6.Do you have plans to operate electric trucks? What are the **barriers**? Why would you **switch**?	7.Do you have any plans/thoughts on **depot charging**, or **public charging** access?	8.Have you encountered **site level energy constraints**?
Centurion	~1000 trucks nationally (863 prime movers and 191 rigids) ~500 trucks in WA (404 prime movers and 100 rigids) ~150 trucks in South-West WA (104 prime movers, including 5 electric, and 46 rigids, including 25 electric)	80% regional/linhaul B-doubles/triples and 20% local pick up and delivery. Local mainly 15-20 t rigid/PM that were electrified	Local/urban 200-250 km. Linehaul ~1000 km	Mainly at depot except linehaul which can be en route 50% of time	Purchase	20 e actross 300 used to collect deliveries from mining customers to centralize and send north - this was outsourced to https://peptransport.com.au/ but now inhouse (200-250 km max) but say range over 300 km. 15-20 t mainly. 10 e actros 600 likely to be picking up 2 trailers from Coles DC each day and droping at stores then charging on 75-150 kW in middle of day for 2 hours between shifts, PUBLIC: BP at Muchea 50 km north of Perth - changeover for Dbouble to B triples No green premium from any customers- even Coles and FMG. Depot insurance has increased $100 k based on 30 vehicles and new BESS. Electric will hold twice as long. Long distances and varied locations are a challenge. Total capital spend was 15% more than expected. Future plans reliant on grants, customers and partners.	Charge overnight on 50 kW from 6.8WWh battery charged by 2.2MW of solar Other side of road charge 150 kW to allow daytime charge from solar with smaller battery	Main reason to go off grid was delay from Western Power and possible limitations on time of charging. If they were to look at more range they might put a 5MWh battery on a diesel truck and send out of Perth to charge! In winter they have a genset with HVO just in case solar does not generate enough.
Goldstar Transport	257 trucks spread across various sites from Kwinana to Wangara around 50-60 in Kewdale daily depending on servicing, the rest are based at the customers sites. • Airliquide Henderson/Kwinan • Bluescope Wanagara • Capral Caningvale • Coca-Cola Kewdale/Bunbury • Western Power/Trade Link in Jandakot • Woolworths at the Airport • Various smaller sites with 2 to 3 trucks	85% Daimler; 100 Actros Prime movers, around 30 Freightliners, and 80 Fuso between Shogun and Fighter the balance is MAN, Volvo Iveco and Hino etc	Statewide - max distance 1000 kilometers up to 12 hours but lots of <8 hour round trips. Distribution Centres trips to south side towards Bunbury to deliver to Coca Cola, Woolworths, BWS and Dan Murphys - 350-400 km round trip	Most vehicles on customer's sites but driving around up to 18 hours per day. The dwell times during the day are around waiting times for customers and or on delivery sites	Always buy trcuks but lease the Kewdale depot	Received e Actross 300 and also purchsed e Tergberg yard tractor - not road registered _(tookl 18 months from no one wanting to drive to everyone wanting to drive) and awaiting eActross prime mover late in year) Many adoption barriers: availability, cost, weight issue, charging has to be solar BTM. Wanted to by eCascadia but too expensive with USD:AUD exchange rate. Also hard to get suppliers to make right hand drive. Getting eCanter from 2022 upgraded with new e axle and removing transmission will likely double kms from 100-115km to 200-230 km also with bigger battery. Hired a sustainability advisor for 18 months and she worked on ARENA submission but could not progress -too hard need a simple grant with little admin. Current eCanter can only do 100-115km but likely to double to 200-230 km with bigger battery pack - first eCanters 81kWh but will get 50% more battery and 100% more range with replacement of transmission with e-axle. Difficulty with regional haul to Bunbury as there is no stopping so no regen benefits on highway. Repurposed batteries also available	Tried to use public electric charger - advised by customer of Chargefox charger but turned up and it was in underground parking and had to use 'turtle mode' to limp home. Weight is an issue above 10 pallets. If new trucks could get to 14 pallets that would allow 30 mins charging at customer (2 mins per pallet). New Woolworth DC at Bullsbrook ideal location for medium truck charging (near Muchea) need to avoid heavy charging – 100 kW DC for 30 mins ideal 30 - 80%. BP at Baldivis good location (50 km south of Kewdale) but need to avoid queue (3 hour over long weekend for passenger EVs).	"Yes right now we have a limit with our power". Utilities need to catch up - took a truck to Western Power and unable to connect. "Electric trucks in California also waiting 2 years to connect" to charging so not alone. Overnight hard - trying to put charging along fence line for every truck expensive and went to western power with one truck and found issues.
TGE	100s of trucks but key project in Sydney focused on 35% of local fleet 60 out of 180 trucks, specifically light rigid and medium rigid trucks at Bungarribee depot in Sydney. Similar sixed operation in Perth near airport/	Mainly light and medium rigid used for urban and metropolitan freight delivery, supporting general freight logistics. Linehaul and prime movers between capital cities	Urban delivery trucks typically operate within 100–200 km/day. BEVs struggling to get more than 120 km based on range restriction placed on them by OEMs to preserve battery.	Trucks are parked and charged at the Bungarribee depot. Overnight charging of 6–10 hours of dwell time. Urban delivery routes may include brief stops at customer sites or logistics hubs and occasionally charge at depot	Bought electric and leased sites mainly	Barriers: High upfront cost, charging infrastructure complexity and grid connection delays. Enablers: government funding (e.g., ARENA support), renewable energy integration and Battery Energy Storage Systems (BESS) to manage peak loads.	Depot Charging: 47 AC slow chargers and 16 DC fast chargers installed at the depot.	Grid integration challenges so BESS was installed to mitigate peak demand and support grid stability.
Australia Post	Now looking at vans with AC overnight. 100 vehicles across Auspost and StarTrack at Perth airport	Mainly 8t trucks and 4t vans	200 km and 8 hours	Melbourne truck project funded under the Victorian Department of Transport and Planning's CSIF grants program, two years in the making. Invested in Fuso eCanters.	Mixed	Australia Post has 11 small electric trucks in use and is testing vans and trucks for use in deliveries and logistics. But it is yet to find a vehicle that can do up to eight hours of constant use for up to 200 kilometres, while constantly stopping and starting to unload and reload. Ecanter used in Sunshine and Dandenong locations with JET Charge charging capacity of 200 kW with four single port satellites and provision for an additional four ports on the same system. In the future it might be a 600 kW facility with ten outlets. Australia Post is introducing some Mercedes-Benz eVito vans into the fleet.	"Ultimately, for Australia Post as a whole, the question is whether we need chargers at all depot sites or whether we can rely on a central model, which is effectively how the current diesel re-fuelling works today" Two different approaches are likely; utilise the 300amps the depots now have available in the short-term, with a longer-term view of upgrading switchboards and electrical capacity to support bigger electric vehicle projects	>5000 electric delivery bikes and 3-wheel trikes cover 50% of last mile.
Toll	4 sites are being electrified in WA with up to 20 trucks per customer site. Nationally Toll have 1,500 vehicles.	90% prime movers and 10% rigid vehicles. General freight but some sites (e.g. Arndell Park) are used for steel transport, but the fleet on site is chemical transport, indicating specialised freight as well. In WA, Toll haulage is about one third hazardous materials like fuels, gases, and ammonium nitrate which makes it hard to electrify,	Lots of diversity – 200-300 km	Trucks are located at customer sites overnight (likely 8–12 hours). Charging during breaks or loading/unloading is considered ideal, but most customers prefer charging to be separate from their buildings not at loading dock.	Purchase trucks but leased customer sites a barrier. 18 months of negotiation required with customers/leaseholders for site access.	Due to Volvo's battery charge limits (70% for rigids, 80% for prime movers), the effective range with a 540 kWh battery is only 200 km.	Moorebank has a large-scale setup (900 kW, 5–16 bays) as the grid set up is new. Wyong (Ampol) public chargers planned for Woolies fleet (20 trucks max), but issues with reservation and load management. Perth Airport n as a good location for fast charging. Need less than 30 min charge in daytime to avoid cost to driver time. break ideal and possible loading/unload but most customers want charging separate from their buildings. Daytime charging would work for auto parts, steel, beverages and grocery as trucks cycle to depot and back	Toll Kewdale had insufficient power, so little power it was described as "not enough to charge a toaster." Future tech like relocatable charging (Kwetta) and longer-range EVs will assist charging at leased sites. Many sites have also failed due to distance to switchboards or lack of space. Botany, NSW site could only install 2 EV bays instead of 4 due to $250 k upgrade cost.
Western Power	400 trucks - main base at South Metro with 80 trucks	Manly 20t 6x6 (fixed load at max weight) rigids to carry 10t crane and borers, other plant and lighting equipment. Carrying plant not goods	50-150 km/day or 20,000 km/y over 10-15 yrs	Always overnight except and few emergency response. Lots of idling in operation to drive PTO for cranes and equipment but move small distance	buy new trucks and hold 10-15 years - electric trucks may take 10 years and need to transition plan toi electri ctoo	At axle limit to battery weight not possible, especalit as cran hang over from t axle.. UK company looking at options. Triallin ePTo with small battery for air quiatliy and noic beneift allow engine off.	Asked BP as their bulk fuel supplier but unable to help. Had to delay build of new hub at Forestfield to install chargers as design 5 years ago did not include. Lot of new depots with solar will need battery for BTM and charging.	Head office install 15 chargers for passenger EVs but lack of capacity means lots of load management and expensive

4. Fleets – detailed responses (last 6 of 12)

Participant	1. What is your average **fleet size**?	2. What truck **types/sizes** do you operate and for what purpose (e.g. general freight/specialised)?	3. What is your average & max daily driving **distance**?	4. Where are trucks **located** at night? what is the average **dwell** time? Any **other dwell locations**?	5. Do you purchase or lease **new trucks**? Is your depot **leased or owned**?	6. Do you have plans to operate electric trucks? What are the **barriers**? Why would you **switch**?	7. Do you have any plans/thoughts on **depot charging**, or **public charging** access?	8. Have you encountered site level **energy constraints**? (e.g. issues with electric forklifts/refrig. etc)
Main Roads WA	10 routine maintenance trucks and 3 response trucks. Also have 5 Mercedes sprinter	Most under 12t. Most are dump trucks with toming of plant.	5-7 years trucks expect over 50,000 km/year	Trucks at depots but 2 night crews in metro can be on the road. 2 depots in Jandikot and Mirabooka (1 more in 2 years in Midland)	lease (5-7 years)	Looking at e sprinter sign truck. Aux power needs with 8 hours ideling requires $30 k spend on battery to keep engine off.	Need to charge fast as require on short notice.	
Roberts Tilt Tray	20 11 x Prime Movers. 7 x Tilt Tray trucks capable of towing 4 x Hiab trucks	Haul containers/mobile buildings/P&E Some general freight (timber for bunnings). Run semis that pull drop decks and flat tops, pull road trains as well (2 x 40ft flat tops)	Most trucks are doing around 500 km a day up to 1000 km a day. Only 5% of trips within 100 km."Anywhere and everywhere" except for a couple of trucks. During meeting one truck. Coates hire and Bunnings client 'keen on green' but Kalgoorlie ad Esperance too far.	Most of the trucks are locate at 53 Coleman Turn Picton East, when they have jobs that are a decent distance away they obvoiusly stay out on the road. 6pm to 6pm overnight and out all day or a mot back 20 mins at depot but some also overnight.	We purchase all our trucks	Yes - interested, but not set up for electric charging, also not certain the electric trucks will be ok with line of work. We travel long distances every day to different locations. "If an electric truck doesnt have the kms in it before it needs charging it won't work". "Would be ok if it was just a 'town truck' and went to Perth and back or something".	If i decide to go electric would definitely need depot charging. Id say Muchea, Coolgardie, Carnarvon Newman, Meekatharra, Billabong roadhouse, all these spots would be great charge stations	Not atm we dont have any electric devices but hanve 10 kW solar.
City of Stirling	The City owns 75 trucks, varying from light to heavy.	Waste collection trucks - Domestic and Commercial Services Heavy Rigid • Sweeper trucks - Path & road cleaning - Heavy Rigid Water trucks (used by Parks & Engineering) - Heavy Rigid Vacuum/eductor trucks (Drain\pit cleaning - Engineering) - Heavy Rigid Tipper trucks (Parks & Engineering) - Heavy Rigid Flatbed trucks (Parks & Engineering) - Light to Heavy Rigid Waste collection trucks are the largest size truck the city owns. They vary in size depending on model and waste body and fall under the Heavy Rigid category, with GVM ranging between 16-26T. An example model is a Volvo FE8 6x4 Rigid or Isuzu FVY 240-300.	Travelling 50 kms daily across the truck classes in not uncommon. Waste trucks could travel 80-100 kms per day depending on their run and would be the highest distance travelled by class.	All trucks are located in our Balcatta Depot overnight. Average dwell time ~14 hours. Other dwell locations would include where the asset is performing daily work within our service area.	All of our trucks are purchased and owned by the City of Stirling. We are frequently purchasing trucks, which is in line with our fleet replacement program. The Balcatta Depot is State Government (Crown) land, under management order to the city, so neither leased nor owned.	Our current EV fleet size is 47, including cars, vans, utes and 3 trucks: 2 x Hyundai Mighty Electric QTC.V1's (Parks and Environment) 1 x Hino SEA EV 300-85 (Waste Services) Current EV adoptions barriers (Heavy) would include: • Revision\upgrades to current depot charging stations. • EV battery capacity on heavy waste collection vehicles is limited and currently not viable due to factors such as daily distance travelled and excessive cycle times of hydraulic\air systems (side loaders specifically). • Pricing and whole of life costs • Downtime on warranty\breakdown work- this is a big risk for most local governments and combining aftermarket systems such as waste bodies on EV trucks increases this risk. • OEM turnaround times on repairs are excessive • Required skills and support for new technology & systems are limited within the current work force	The city has a climbing total of 19 charge stations located at our Balcatta Depot & Admin building on Cedric Street	Currently our EV infrastructure exceeds our requirements and is intended for future EV rollouts across our fleet.
City of Melville	56 Trucks	23 waste collection trucks "heavy" (16 have 24m3 compactors, and 7 are rear loaders) the balance are parks and works trucks of various sizes for parks & construction maintenance (reserves, roads footpaths etc). Remainder tippers and vehicles to carry contruciton materials and tow trailers with equipment	Waste collection average 60 - 80 km per day, max 80-100 km. Other trucks for parks/maintenacne even lower, 50 km day	All trucks are located at the Operations centre in Murdoch = overnight dwell period, 6am to 3pm for waste and other trucks can be longer 5am to 4pm	All vehicles are purchased. depots are owned.	Our new EV transition plan does include EV trucks however availability, operational capacity and expected high costs are the barriers, nb; there are some small EV trucks entering the market however we have no charging infrastructure. Veolia electric waste truck not successsful (need servicing, range and payload) and for their size they are cost prohibitive, a trigger to enable a switch would be lower cost and operationally effective new EV trucks that were supported locally..	For trucks I'm not aware we have plans for depot or public charging at this stage. However, we already have charge hubs and some public charging stations for light vehicles only. . Dorian may want to comment on this as well.., Ops centre likely to be where most chargin is located but no capacity so need solar and BESS. Many grants unsuccessful as could not get grid upgrade	To increase amperage and have a dedicated circuit for the chargers we had to upgrade some switchboards mainly at the operations centre, civic and a few remote locations (library, leisure fit). 18-24 months to get transformer upgrade.
City of Joondalup	45	4.5t to 23t. Lots of tippers with trailers doing plant/gardeing activity and some constrution with sand/concrete	40 km average but up to 200 km one day per week	922 Ocean Reef Rd Craigie 6025, 14hrs	Purchase trucks. We are on a leased site from Watercorp with an unknown duration. This would affect our appetite on expenses to upgrade power and charger hardware installation.	Power consumption and range capability will limit. Funds via WALGA ARENA grant and state govt - 11 BYD Attos	We currently have onsite depot charging (6x 22 kW AC) and 9 bays at admin buidling (7 x 22kW AC and 2 x 50DC). Dual port Range anxiety is an issue with the tech so far on truck batteries, obviously there is a risk if vehicles are not charged over night by error or fault, these vehicles would not be available for use most or all of the next day. (outside my area of responsibility) Re public charging – this is outside the responsibility of my role. During day very hard as not consistent locations and only 30 mins downtime. BP Beldon on Ocean Reef Rd &, Eddystone Ave has roof height for larger trucks	Yes . system at capacity (day ime) with these units requiring power derating with fully optimised power consumption onsite. Power is available overnight, but obviously we would need to avoid peak load times preferably. Was an option to upgrade transformer at $500 k cost with $200 k subsidy but still too expensive and had to negotiate with WaterCorp. Site neightbours n Winton rod include WaterCorp and Trasnperth - could work together
City of Belmont	17	All council tasks – • Tar patching Tipper Parks maintenance Road and road verge maintenance Sweeper Tree maintenance	Metropolitan 200 k	Operations centre	Premises owned Yes we buy our trucks	Under assessment Commercial viability Infrastructure to recharge economically All vehicles are scored on a number of criteria to find the ideal item, Petrol , Diesel, service location, running cost, whole of life cost etc Infrastructure cost for in depot charging system is a large Investment	Under assessment financial and operational	Not that far in progress

The following page provides further details on the list on consultees invited to participate

4. Fleets – consultation process

The majority of effort was focused towards identification of fleets with contact via email or phone call failing to achieve a lot of fleet involvement. Small fleets were most difficult.

Limitations to consultation and implications

The majority of effort was focused towards identification of fleets with contact via email or phone call failing to achieve a lot of fleet involvement. Small fleets were most difficult. Fleets were prioritised based on electric truck operation but also included other channels:

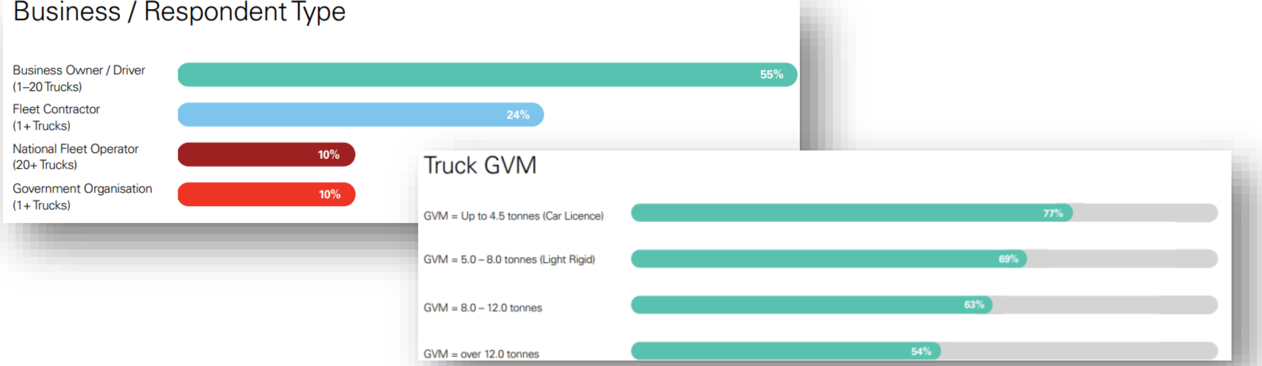
- Trade and business associations (e.g. CCIWA)
- Contacts from DoT Regional Freight Strategy workshops
- Input gathered from JTSI input on potential fleet participants
- Visual surveys at two key freight interchanges (Drew Gaynor)

Initial attempts were made to contact fleets via email and or LinkedIn. MOV3MENT's subcontractor; Drew Gaynor, reached out via the telephone to additional fleets (opposite).

There was a clear gap in the data related to small fleets, but the key finding experienced was the lack of appetite to consult may also be linked to low likelihood to adopt electric trucks.

As secondhand electric vehicles become available these are more likely for SME fleets. Isuzu is the most engaged Truck OEM with SME fleets with a lot of small operators with light/medium rigids (Isuzu survey below) yet Isuzu has no electric truck availability.

Isuzu survey - The Future of Trucking, 2024



Initial invitee examples (emailed)

Invites	Status	Actions
Mainfreight	Declined to participate	LinkedIn message. Responded 'not interested'
Holcim Australia	No response	Contacted via OEM (Foton). No response
QUBE	Declined due to change of roles	Emailed and followed up with another contact
Woolworths	No response	Emailed and followed up
Pacific National	No response	Emailed and followed up with another contact
Capital Transport	No response	Sent introductory email
CD Dodd	No response	Sent introductory email
Matic Group	No response	Sent introductory email
CTI Express	No response	Sent introductory email
City of Perth	No response	Sent introductory email and followed up

Additional invitees (phone call)

Company	Activity	Fleet Description	Vehicle (Tonnes)	Web page	Phone
Pezzano Industries	Fresh fruit and vegetable wholesaler	24 refrigerated trucks	4.5+	https://pezzano.com.au/	08 94563677
Direct Express Freight	National Freight delivery company	Wide range of HVs from 4.5 t rigid to B-Doubles.	10 +	https://www.directfreight.com.au/	1300347397
WA Sand Supply	Sand supply	70+ prime movers as well as various tipper trailers and loaders	10+	https://wasand.com.au/	08 9353 1771
The Plant Supply Company	Provide weekly delivery services to the South West and Albany	Fixed rigid. Fleet size unknown	10+	https://www.plantsupply.com.au/	08 93317066
FoxLine express and Taxi Trucks	Perth metropolitan based transport and logistics company,	70 vehicles from 1t vans and flat tops to 8t trucks	4.5+	https://www.foxline.com.au/	93779377
GBI Logistics	Warehousing and time-sensitive delivery services.	25 service vehicles, 14-tonne trucks with Hiab cranes to 3-tonne trucks	4.5+	https://www.gbi.com.au/gbsite1/gbi-logistics/	08 9478 0400

5. Truck OEMs – detailed responses

Participant	Current/ future models	1. What types of fleet operators are being targeted? What are the biggest barriers?	2. What truck models are planned by 2030? Can do discuss any sales in WA to date?	3. What advancements in battery technology are you expected to make by 2030?	4. What do you expect will be the likely rate of charge for each model by 2030?	5. What do you expect will be the improvement in battery capacity by 2030?	6. What is your expectation for declines in battery costs and impact on prices by 2030?	7. How are you expecting your electric trucks to charge? Do you support private/public charging?
DAIMLER FUSO	eActros, eEconic eCanter	• Mainly last mile and back to base. • Prime mover single now possible suits supermarkets - DC to store and back • No Bdouble task likely by 2030	• e600 but not here yet. • More 4x2 rigids on the way	• Transition to LFP: stable, cheaper and don't need energy density plus avoids 'conflict minerals' vs NMC • Current tech for trucks with 150L fuel tank. Unlikely to suit more than 400L truck with payload penalty	• 50 to 100 kW DW at present is enough.	• May not be needed as most trucks up to 250 km and not double shift. • E600 ing significant improvement with e axle but not allowed on roads. • >400 km or 40t will be hydrogen.	• No major changes in price as EU will still demand	• Some carriers come back mid day to charge 33% to 66% at the moment • MCS would 'muddy water' • Need to focus on 150 kW to 300 kW in next 5 years

FOTON	T5
	e AUMAN
	TBC:
	8.5 t/100 kWh
	18 t/281 kWh
		• Woolworths 50% of sales but also Bunnings and Council/trades.
		• Woolworths has 100, with 60 more ordered and 1000 out of 1250 by 2030.
		• Lots of council waste tippers expected at 8t and appliance/furniture delivery (Wining Appliances 100 nationally and capital transport 5 in WA for IKEA).
			• 9t truck mid 2025 and 18t in 2026.
			• Prime mover 2027 to 2030
			• Trial 32t mixer in WA.
			• Sold 140 T5s and 8 so far in WA:
			  • 1 Qube and 1 Holcim
			  • 2 Mainfreight
			  • 2 Bunnings
			  • 2 Mining services
				• More energy efficiency of cells will allow more distance for same volume/weight	• Most 11kW AC even 9t truck as many only need 150 km of range
					• Possible to charge 65% of 140 kWh at 11kW overnight in under 10 hours.
						• Likely to get 15% battery improvement with next generation T5
						• 30 km more range with same 80 kWh battery (from 200 km)
							• "I cannot forecast battery price decreases I am afraid"	• T5 can access some passenger charging but Evie $3k credit offered for 2 years with new trucks was not used
								• No interest from master plumbers Issues with customers investing in infrastructure on leased sites with alternatives with mobile battery or portable DC charger.

VOLVO VOLVO TRUCKS	eFL, eFE, eFH, eFM	• Big fleet focus • At most 1 electric for every 10-diesel sold means most fleets only 10% electric by 2030 as further penetration difficult.	• New models planned could double range but weight penalty would apply. • Local production from 2027 at Wacol eFM and eFH - no difference to global. • Rigids 3/4 battery packs: 280/375 kWh • PMs 5/6 battery packs: 470/565 kWh	• Two new battery production factories may lead to more capacity. • NMC for medium and NCA for heavy	• 350 kW DC by 2027 • 600 kW DC by 2030 • Megawatt by 2035. • Fleets do 60 kW DC at customer. • 43 kW AC expensive vs 50 kW DC	• Consumer of cells Samsung cells: NMC/NCA • Doubling of range expected with 50% more battery capacity. • If trucks charge at loading dock they can have 25% less battery	• Cheaper if battery produced in house and consumer of cells so benefit from market scale	• Establishing public in Europe and North America. • Developed Volvo PU500 BESS is mobile battery to charge trucks in Scandinavian market. • Likely customer to organize some charging at their sites as power available already for refrigerated trailers • Leaser needs to remove or give for free on exit.
HYUNDAI	Mighty 114 kWh	• Councils • Back to base logistics • Utility companies • Supermarkets home delivery • Not for profits • State and territory governments	• More zero emission commercial vehicles in the planning for Australia • Cannot discuss at this stage. • Launched XCIENT Hydrogen truck at the Brisbane truck show.	• Working on a number of new battery innovations with partners but are not able to mention the technology as yet	• Charge rates for trucks will exceed current passenger vehicle (800v and 350 kw) but not able to comment when	• Will transition to larger capacities to meet the expectations of fleets that want diesel range with an EV • Similar to passenger EV- 38.3kWH batteries in first gen IONIQ and now 110.3kWh in IONIQ 9 = 2.5saf times more and 2 times range (heavier)	• Dollar cost per kWh has not declined at the extent the market expected due to the supply demands on critical minerals.	• Massive lack of public charging locations for trucks • No knowledge of any public truck EV charging • During testing as they needed to park across 2-3 passenger bays and that upset passenger EV drivers. • In the interim, most charged at logistics centers and council depots.
IVECO	eDaily van, SEA ACCO for waste	4.5-7t now • Refrigeration • Urban delivery • Councils. Heavier rigids soon • SEA supplied retrofit for 23t waste truck • waste (low speed/high stop intensity)	• eDaily truck: one battery range of 180 km with electric PTO • eDaily van: three battery range of 300 kms. No sales nationally. • eCargo may arrive with 12-18t next year • Heavy prime mover in 2027 to 2030 but EU competes for supply	• Battery production in China moving from NMC to LiFe and LFP	• Now 80 kW DC. • 44t rigid will have 350 kW charge	• More scalable batteries possible. • Battery 3x37 but 4x37 needed if can't charge at customer. • Build ground up allows extra battery units - maybe 25% more.	• IVECO battery at least 3 times more expensive at $35k for an extra 37kWH at battery $1,000/kWH for another 100 km of range • Industry average of $350/kWh for 60 kWh tesla model 3 at $17k:	• No need for public charging yet
JAC	N55, N75, N90	• Exited <4.5t (hire companies/fleet leasing) no car license vehicle available. • Focus on >4.5t middle & last mile logistics, retail, metro delivery • Future focus on civil engineering, road & infrastructure companies, parks & gardens departments and council.	• Current models are 7.5T & 9T. • Coming soon will be 4.5T & 16T • Future up to 68T and plug in hybrid • Small segment of fast adopters and "rest of the industry watching". • JAC models will increase with market demand, up to 18T max (incl. T9 ute)	• Like most others they buy batteries from a 3rd party (CATL) so direct development is out of their control. • Big three issues are capacity / size / weight, this affects range / payload capabilities / price	• Need minimum 75kW DC per gun, 100 kW DC would be ideal • Current trucks 97kW /DC and 11kW/AC inbound charging rate • AC will move to 22kW inbound • DC will continue to improve. Final number on DC will be ultra-fast	• Batteries increase capacity 20% each model update • Improving the rate of battery degradation as well so the technology around a batteries capacity improves about 5% each year and degradation has lowered from 2.3% to 1.8% rate.	• Unable to comment - next 12 months may stable of continued fall.	• Need to enable charging for 1hr during driver break to top-up. • Need higher roof clearances and bigger parking bays for public charging for trucks. • Working with 3rd party companies for depot charging.
FARIZON	SuperVan H9E	• Home delivery and trades up to 9t. • Mainly East Coast	• Need big enough right-hand drive market to justify development for here. • Possibly PMs ('Homtruck') in 3 years	• LFP CATL - will piggyback improvements • Some dual fuel range extended trucks may appear (e.g. methanol)	• Unlikely much need to increase	• Unknown • Homtruck - 660 kWh battery enabling over 600 k range, with ultra-efficient consumption of 1–1.2 kWh/km	• Already $15k cheaper than competitors arriving 2 years later	• Public unlikely. Unknown height of parking to charge • Focus on depot but truck only DC up to 100 kW • Take home vans 11kW enough
BYD	ETM6/ 8TT	• Logistics • Mining • Couriers but need large/high-capacity charging stations	• BYD truck range is from 3.5t right through to 6x4 and 8x4 prime movers. • Intend to start releasing these gradually from Q4 2025 • Would have been this year but supplier would not build cab for right hand drive so had to make in house.	• 2nd largest battery manufacturer. • Currently introducing blade battery technology to commercial vehicles. • Blade battery high power density while increasing safety. • New gen solid state and also sodium batteries release yet to be announced. Trucks to be last.	• Trucks general can charge from 30%~80% in around 30min. • Highly dependent on availability of high-powered chargers	• Battery technology is advancing at a great pace. However, the increasing focus on safety and introduction of new regulatory requirements will slow the increase in power density	• Expect the price of batteries to remain stable, due to increased regulatory requirements.	• Due to the lack of public charging operator will need to invest in the installation on their sites. • Some trucks support multiple charging (2 or 4 ports) • BYD not interested in charging - exited hardware

OTHER OEMs: Scania declined to participate and other OEMs yet to supply to Australia include: **DFAC**, **Windrose** and **Sitrak**