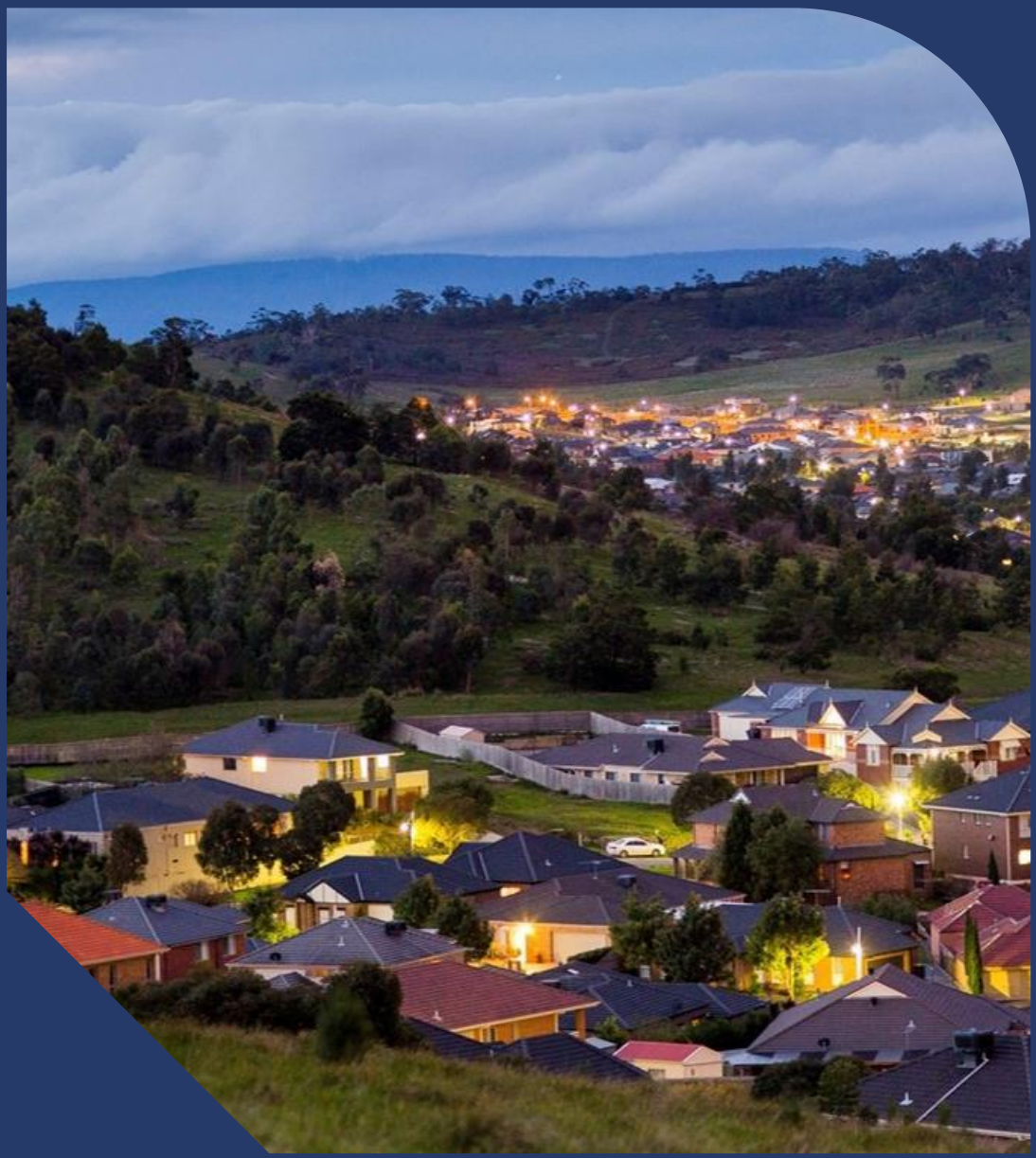
AusNet

Electric Vehicle Strategy

2026 to 2031

Friday, 31 January 2025



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Executive Summary

While the uptake of electric vehicles (EVs) has been slower in Australia than in many other countries, it is expected that the number of EVs in Australia will accelerate rapidly over the next five years. In Victoria, the Victorian Government's Zero Emissions Vehicles Roadmap[1] sets out a target of 50 per cent of light vehicle sales to be zero emissions vehicles by 2030.[2] AusNet has a critical role to enable this electrification of Australia's transport fleet and bring about the customer and Victorian Government outcomes as electrification accelerates over the period 2026 to 2031.

Widespread adoption of EVs in Victoria will have a significant impact on electricity distribution networks. EV charging will result in load growth in different magnitudes, locations and load shapes according to the types of vehicles, applications, and usage cases.

AusNet's EV growth forecasts for its distribution network indicate there will be 245,000 EVs by 2031, rising from 11,000 in 2024. This will result in an increase of three per cent of peak operational demand by 2031, which is driving the need for investment.

AusNet's investment proposal to meet increased demand, which is partly driven by EVs, includes $120m in network capital investment which includes:

- Augmentation of the existing low voltage (LV) including upgrades to distribution substations; and
- Augmentation of existing at-risk medium voltage (MV) single wire earth return (SWER) lines.

AusNet's proposal has been developed using key assumptions consistent with industry best practices and committed Victorian policy targets. Sources for key forecasting inputs include the Australian Energy Market Operator (AEMO) step change scenario from Draft Forecasting Assumptions Update 2024, Commonwealth Scientific and Industrial Research Organisation (CSIRO) data and EV customer daily charging behaviour insights.

There has been significant year-on-year movements in some relevant external forecasts (e.g. AEMO's EV uptake projections) which highlights the uncertainty over the pace of electrification. Our forecasts were based on AEMO's Draft Forecasting Assumptions Update 2024, but the regular changes in external forecasts highlights the case for more flexibility in the regulatory framework, so networks are able to accommodate EV uptake and continue to provide customers with a good level of service.

As part of its regulatory proposal, AusNet has also developed a Consumer Energy Resources (CER) Integration Strategy which outlines AusNet's investments to enable the rapidly growing size of CER assets on our network.

This EV strategy aligns to the overall CER Integration Strategy and outlines the required actions for the business to align with government policies (such as the national EV strategy) and meet customer needs.

[1] https://www.energy.vic.gov.au/__data/assets/pdf_file/0036/575676/Zero-Emission-Vehicle-ZEV-Roadmap.pdf

[2] Zero emission vehicles are defined in the strategy as those vehicles which produce no 'tailpipe emissions', including include battery electric vehicles and hydrogen fuel cell vehicles.

1. Context and key drivers of EV uptake

AusNet's EV strategy has been shaped by a rapidly transforming landscape and the Victorian Government's ambitious renewable energy and decarbonisation goals.

AusNet is operating in an energy landscape with several clear and ambitious emissions reductions targets and electrification policies. The Victorian Government is committed to achieving net zero by 2045, with a target of 95% renewable electricity generation by 2035. The Australian Government has also introduced several energy strategies since 2022, which are driving key practical reforms in the energy sector, and this includes policies targeted at increasing the penetration of electric vehicles (EVs).

The over-arching net zero target in Victoria is legislated by 2045, set five years ahead of the national target. Aligned to its net zero target, Victoria has complementary renewable energy generation and storage targets and zero emission vehicle targets in the next regulatory period.

1.1. Victoria's Zero Emissions Vehicle roadmap

Aligned to the overall net zero target, in May 2021 the Victorian Government published its Zero Emissions Vehicle Roadmap (VZEVR).

The VZEVR notes Victoria's transport sector accounts for 25 per cent of Victoria's carbon emissions and transitioning to zero emissions vehicles (ZEVs) will help Victoria reach net-zero emissions. The Victorian Government has determined that action is required now to fully transition to ZEVs before 2050. With that in mind, the VZEVR has set sustainable targets for:

- 400 vehicles in the Victorian Government Fleet ("VicFleet") to be replaced by ZEVs by 2023;
- EV charging stations to be installed across regional Victoria by 2024;
- All public transport bus purchases to be ZEVs from 2025; and
- 50 per cent of light vehicle sales to be ZEVs by 2030.

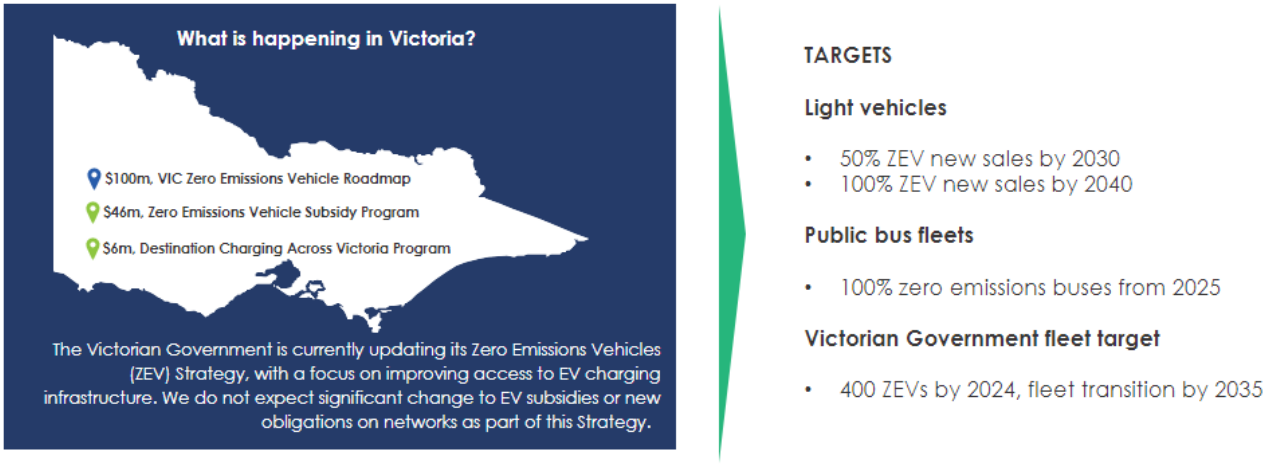


Figure 1: Victoria's EV targets

The VZEVR highlights optimising integration of ZEVs into Victoria's energy networks as one of the key priority policy challenges for Victoria in the early transition to zero emission vehicles. AusNet's proposal has been designed to support growth in the electrification of transport, enable customer reliance on EVs and ensure its network is ready for the significant increase in EVs based on the Victorian government's targets.

2. Preparing for EV growth on the network

Since 2019, AusNet has embarked on a range of trials and initiatives which cumulatively have informed this EV strategy for the 2026 to 2031 regulatory period.

This is summarised in Figure 2 below, which shows completed and in-flight initiatives. All of these trials and programs have advanced AusNet's insights and knowledge in relation to integrating EVs onto the network and are summarised below.

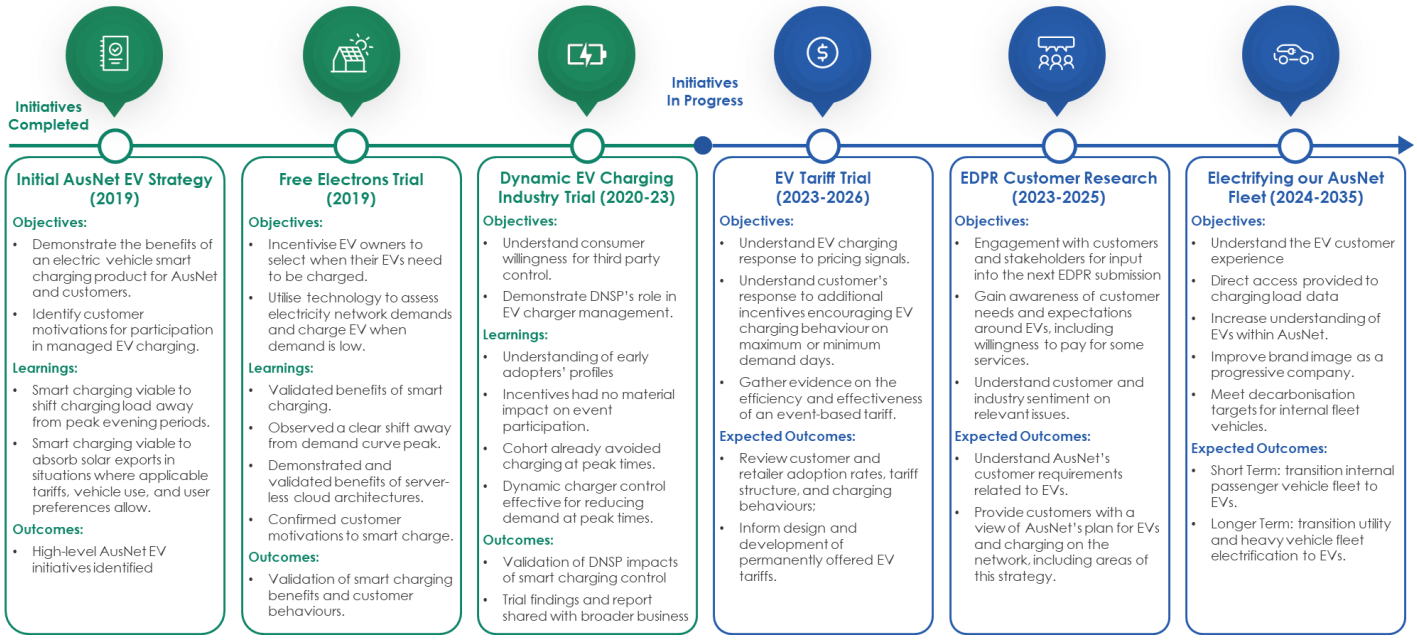


Figure 2: AusNet EV trials and initiatives

2.1. Innovation Program

The objective of our innovation program with respect to EVs is to better understand how to leverage new technology to ensure the integration of EVs is both cost effective and aligned with customer preferences.

Our Innovation proposal includes the following projects associated with EVs:

- **Flexible demand trials for residential customers** – this project aims to test the use of controllable loads including EV chargers, for network management and to improve network utilisation. By collaborating with universities and technology providers, the project aims to leverage cutting-edge research and expertise to develop and implement innovative solutions to support demand flexibility.

- **Vehicle to Grid for outage management** – trialling vehicle to grid (V2G) and vehicle to home (V2H) services from EVs. We intend to partner with EV charging and technology providers, communities and other relevant stakeholders to trial and test the feasibility of using V2G to reduce outages, including in major events. The trial will consider using the energy stored in EVs as a back-up power to supply critical infrastructure and community hubs.

  This is transformative innovation as V2G and its capabilities are at early stages of development and more research and innovation is needed to understand and capabilities of EVs and available chargers as backup power. It also requires testing of ability of AusNet's control room to have visibility and control of the V2G for outage management.

- **CER and electrification toolbox -** This project aims to develop online tools for customers to support their electrification and adoption of CERs. The tools will provide customers with an economic assessment of CERs including solar PV, electric hot water, energy storage, and EVs considering various mechanisms such as flexible export and new tariffs.

This trial will assess customer appetite to take up such toolboxes and their benefits. If successful, this could improve utilisation by increasing customer understanding and acceptability of flexible demand including EVs.

3. Customer perspectives

AusNet undertakes ongoing research and analysis to understand customer preferences and insights. This material is then included in our various strategies and plans, especially for increasingly popular technologies such as EVs.

As part of this work, customer segmentation analysis has identified 4 broad categories of residential customers – High Exporters, Medium Exporters, Night-time Water Warmers and Time Surfers. These profiles are described and shown below.

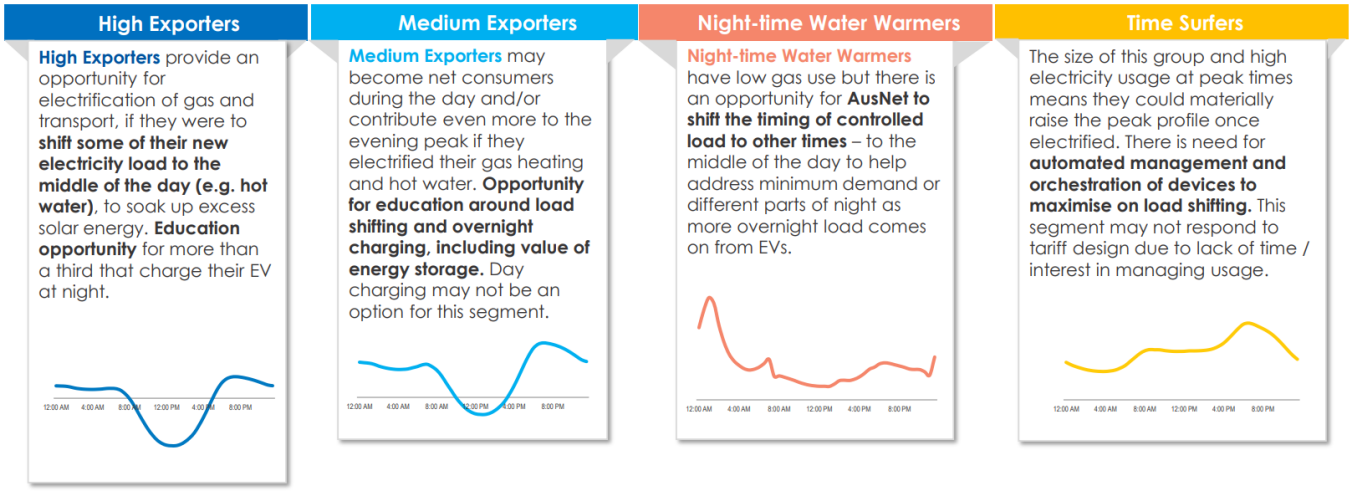
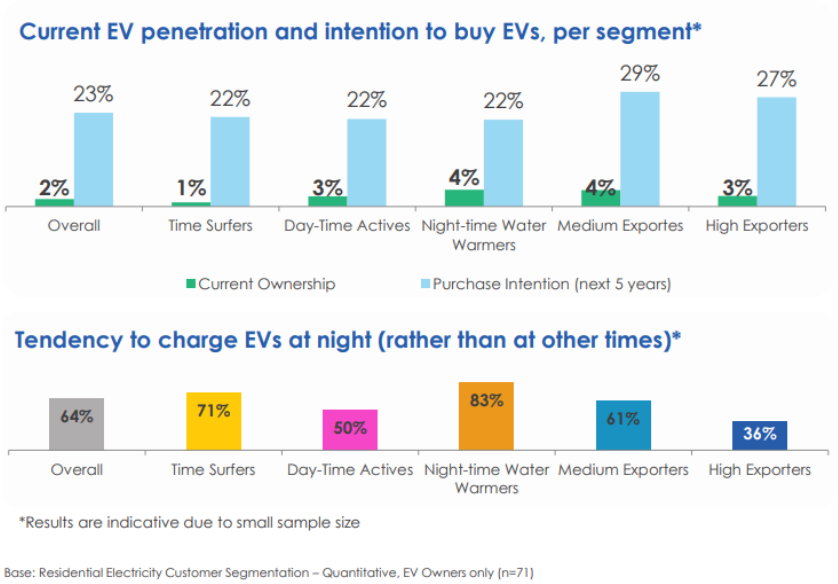


Figure 3: AusNet residential customer segments

In June 2023, AusNet hosted a public webinar to share insights on EV charging from its customer segmentation analysis[3] and the summary of this work is shown below.

One of the key insights from this was that more than 20% of all households intend to purchase an EV in the next 5 years, with residential solar customers who are exporting energy into the distribution network more likely to purchase an EV. This "early adopter" cohort of customers is leading the growth in EVs on the AusNet distribution network and this will continue to expand as the Victorian Government target and policies continue to drive growth of EVs in Victoria. Another key conclusion from the analysis is that based on existing charging patterns, most customers are likely to charge overnight. Charging profiles will continue to be monitored to understand the impact that, for example, cheaper energy in the middle of the day may have on customers' charging preferences.

[3] See https://communityhub.ausnetservices.com.au/research/Customer-segments-research



Key insight

More than 20% of all households intend to purchase an EV in the next 5 years. The exporter segments are more likely to purchase an EV. Time Surfers are showing the least interest. Based on existing charging patterns, most customers are likely to charge overnight.

Myth buster – do solar customers charge their EV during the day?

High Exporters tend to charge less during the night (and presumably charge during the day), but Medium Exporters mostly charge during the night, likely due to less flexible routines.

Figure 4: EV customer behaviours and motivations

4. EV forecasts

AusNet's overall modelling approach is based on a forecasting methodology developed by Monash University in 2015. Since then, AusNet has adapted the methodology so that it also produces minimum demand forecasts and accounts for the impact of rooftop solar, EVs and gas-electrification.

Ten-year forward-looking demand forecasts are prepared annually for AusNet transmission connection assets, zone substations and distribution feeders. The forecasts are prepared for 10%, 50% and 90% Probability of Exceedance (POE) conditions, for both maximum and minimum demands, at different seasons during the year.

4.1. EV forecasting methodology

Specifically, EV forecast levels are developed as per below:

- The forecast number of EVs for each network asset (Feeders, Zone Substations, Transmission Connection Point and the Distribution Network) is produced for each customer type (Residential, Small and Medium Business, and Large Business).
- AusNet's starts with the best available historical data of number of EVs, disaggregated to postcodes to determine the current level of EV penetration across our network.
- Comparing the EV numbers to the total number of customers provides AusNet with EV penetration ratios, which form the basis for projecting future EV load. The penetration ratios are forecast using data from AEMO's Electricity Statement of Opportunities (ESOO) which outlines projected penetration ratios for Victoria. AusNet's existing EV penetration ratios are increased at the same growth rate as AEMO's forecast. For instance, if AEMO's Victorian EV penetration rate is growing from 2% to 10% over 5 years, which is 5 times growth; we grow asset "A" with initial EV penetration rate of 3% to 15% and asset "B" with initial EV penetration rate of 1% to 5%. This way we account for differences between high-potential and low-potential regions. At an aggregated level, AusNet adopts the same growth rate as AEMO's forecast for Victoria.
- This method also maintains the difference in EV penetration between the AusNet distribution region and Victoria, which is less than the Victoria-wide rate. However, AusNet's forecasting approach must also reconcile with AEMO's base assumption that the EV penetration will be 100% by 2050. To account for this, AusNet applies a linear adjustment to the AusNet EV penetration rate, so that, by 2050, the fleet is fully EV.
- To produce a demand forecast, the number of EVs are combined with EV charging profiles, obtained from AEMO's ESOO EV workbook, to estimate the EV load for each half-hour interval.

- For each year, AusNet has:
    - EV Load (kW) = Number of EVs * share (%) in each charging profile * Load (kW) per EV in each charging profile
    - The resulting EV Load (kW) for each half-hour interval for each year is adopted in the demand forecasting process.

A detailed description of AusNet's approach is outlined in AusNet's demand forecasting methodology document which forms part of the suite of documents prepared for the regulatory submission.

4.2. AusNet distribution network EV forecast

Based on the methodology summarised in the previous section, AusNet's network-wide EV forecast is provided below. Across the network, EVs are expected to rise from 11,000 in 2024 to 245,000 in 2031, aligned to the Victorian government target. The chart shows the split between residential EVs and commercial EVs (such as buses). It also shows the EV volume forecast is aligned to the growth in EVs driven by the Victorian Government targets, for scenarios where the total population of vehicles grow at 2% and 4% per annum respectively[4].

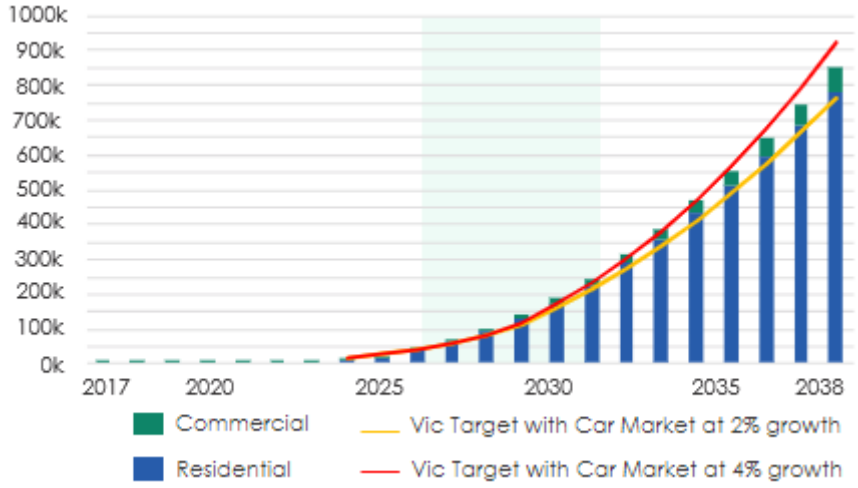
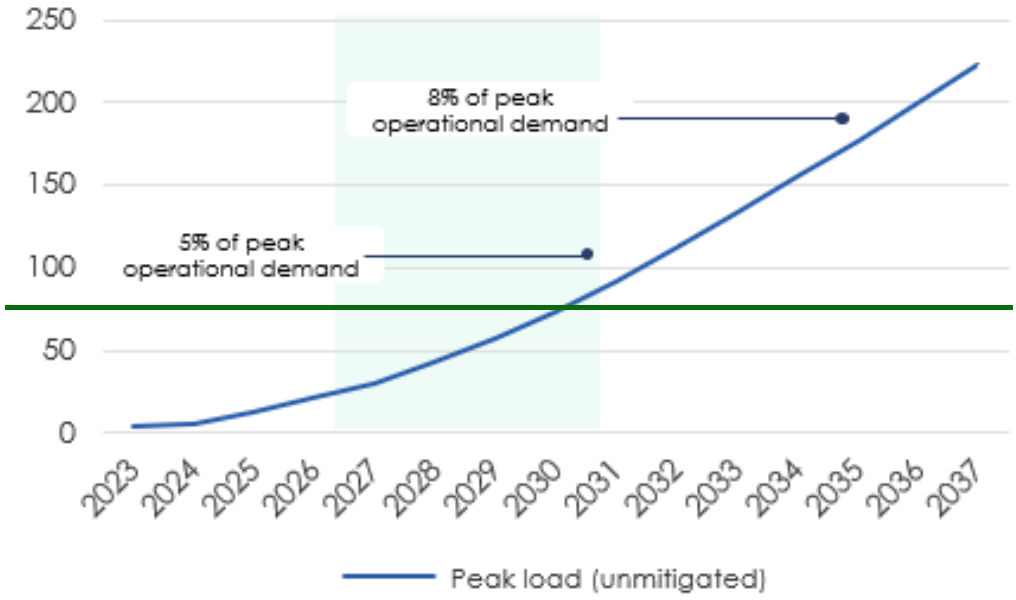


Figure 5: Victoria's EV targets

The anticipated growth in demand from EVs will lead to capacity and reliability constraints at all voltage levels on the network. By the end of the 2026 to 2031 regulatory period, the expected increase to maximum demand driven by all forms of electrification is 110MW, with 60MW due to EVs and 50MW due to electrification of gas load. This result also assumes that 5% of the total EV fleet will be under some form of management or "orchestration." This assumption reflects customer feedback indicating a reluctance for wide-spread third party management of their EV charging.

AusNet has also forecast the impact that EVs will have on network peak demand where 3% of the total network peak demand is due to EVs in 2031, growing to 5% of the total network peak demand in 2035. This is shown in the chart below.

[4] To determine this, the following assumptions were made: 1. Victorian car market is 27.5% of Australian car market (based on data from 2024)and this remains steady; the proportion of total Victorian car growth that occurs in the AusNet network is equivalent to the proportion of total Victorian electricity distribution customers served by AusNet (25.3%); the current EV car sales as a proportion of all car sales in Victoria is 7.2% (in 2024) and this grows to 50% by 2030 (to meet the first Victorian ZEV target) and then linearly to 100% by 2040 (to meet the second Victorian ZEV target).



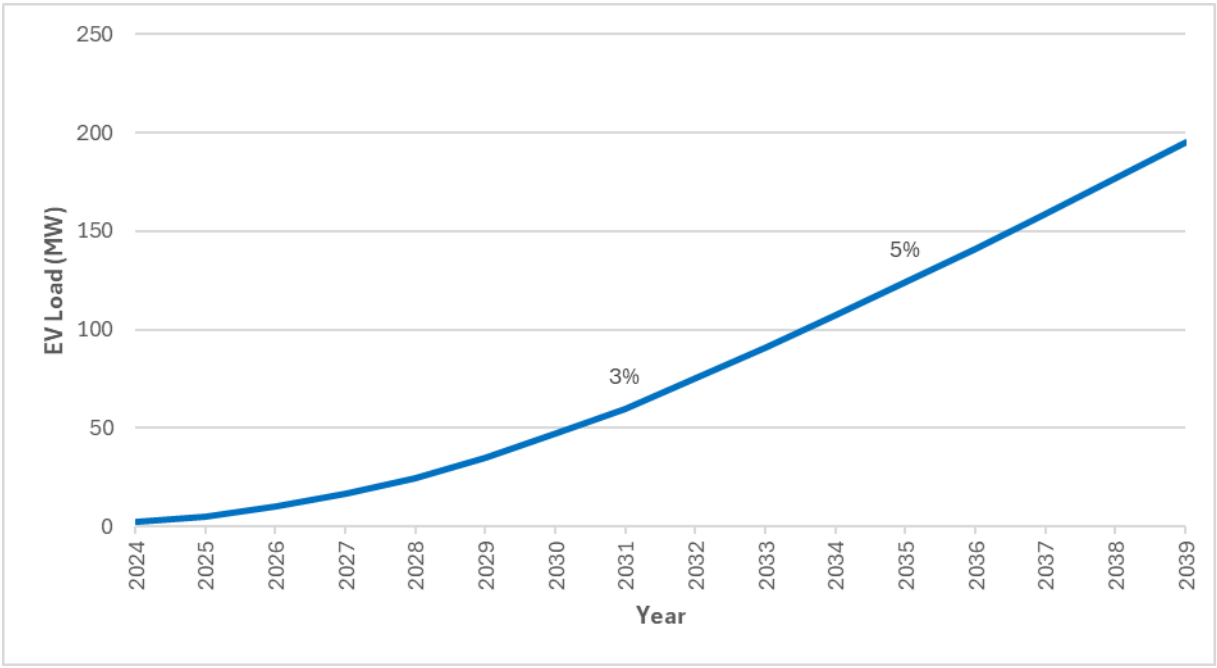


Figure 6: Forecast peak load (MW) due to EV charging

4.2.1. Optimal integration of EVs onto the network

AusNet has modelled the impact of increased network loading across its network, including due to the impact of EVs. This analysis has shown unacceptable levels of unserved energy have been forecast across:

- 1,200 distribution substations;
- 95 single-wire earth return (SWER) lines;
- Eight zone substations; and
- Four 66kV sub-transmission lines.

It is important to note that constraints on zone substations and sub-transmission lines are being addressed through AusNet's demand-driven network augmentation program.

AusNet's investment proposal to meet the increased demand, partly driven by EVs, includes approximately $120m of network capital investment which includes:

- Augmentation of the existing low voltage (LV) including upgrades to distribution substations; and
- Augmentation of existing at-risk medium voltage (MV) SWER lines.

Augmentation of the regional high voltage network has also considered the impact of EVs.

Risks to not investing sufficiently to enable the electrification of transport include:

- Delays in delivering necessary network and customer upgrades, resulting in impacts to electricity supply and delays in customer ability to buy or charge and EV, which causes reputational damage and loss of social licence;
- Customer dissatisfaction with their ability to charge when and how they wish, also causing reputational damage and loss of social licence for AusNet and the energy transition overall;
- Growing inequalities between regional and urban customers, particularly with regards to the level of electricity supply service, disproportionately affecting AusNet's customer base as a highly residential and regional network;
- Insufficient funding to manage future network operations and provide network upgrades to enable the additional load growth from EVs; and
- Failure to realise stated policy targets and goals.

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