EVC response to the AEMO DRAFT 2024 Integrated System Plan

February 2024

With reference to:

AEMO | Draft 2024 ISP Consultation

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Preamble

The Electric Vehicle Council (EVC) is the national body representing the electric vehicle industry in Australia. As the market is emerging in Australia, our work is particularly aimed at increasing certainty for investment through policy, knowledge sharing and education.

The Australian Energy Market Operator (AEMO) started producing Integrated System Plans (ISPs) on a two-yearly basis in 2018. The ISP is a 'whole of system plan' that offers a roadmap for development in eastern Australia's electricity system.

Our previous submission to the Inputs, Assumptions and Scenarios report (IASR) can be found here.

EVC submission to AEMO IASR - Electric Vehicle Council

The EVC has also made a submission to the AEMO DRAFT 2024 Forecasting, Assumptions update which can be read in conjunction with this submission.

EVC response to the AEMO DRAFT 2024 Forecasting Assumptions Update - Electric Vehicle Council

Introduction

The EVC understands that developing the ISP and it's IASR are extended pieces of work. Some of the industries it concerns are moving at such a rate that the inputs and assumption for the 2 years prior are no longer serving by the time the ISP is finally published. Therefore, it is important to update the inputs wherever possible as closely to publication as possible and use actual data when it is in hand.

EV uptake

Underlying consumption in the NEM is forecast to be about 200TWh in 2030. The 2023 EV workbook[1] states about 8.2TWh of this will be from EVs under the step change scenario. A 4% increase in required generation for EVs alone over the next 6 years is a not insignificant feat to try to achieve, and therefore requires careful consideration to ensure it's accurate.

The ISP appears to be forecasting about 3.7 million[RR1] EVs to be on the road by 2030-31 for the NEM in the step change scenario. Given EV sales nationally were around 33,400 in 2022 and 87,400 in 2023 for a total of around 180,000 by year's end, an increase of this magnitude is very unlikely. The assumptions employed appear to be that EV uptake will emulate solar uptake in Australia, which proved very difficult to forecast accurately. This caused problems for AEMO through underestimates of new generation not allowing for proper network planning. Solar uptake proceeded in Australia at such a rate off the back of heavily subsidised PV modules from the large- and small-scale renewable energy target schemes (up to 100% of the wholesale cost of the modules) and China's government subsidising manufacturers of PV modules and inverters. Compounded with increasing costs of electricity, gas and electricity price volatility, state based solar rebates, the collapse of poly-silicon prices and strong solar resources in Australia, growth has been at times

[1] AEMO | 2023 - 24 inputs, assumptions and scenarios

exponential.[2]

The concern appears to be that the same problems could arise around EV uptake. EVs do not enjoy the same level of support (some states have rebates up to 5% of the purchase price, Qld, SA, Tas, WA), and it can reasonably be assumed they will continue not to have the same level of support – state government programs in Victoria and NSW to subsidise purchase have been wound back, rather than extended.

Assuming option B in the proposed NVES[3] is effectively implemented, EVs at the more affordable end of the market are not predicted to reach price parity with fossil fuel cars until 2028, though there may be some price wars yet to play out, pushing parity further into the future.[4]

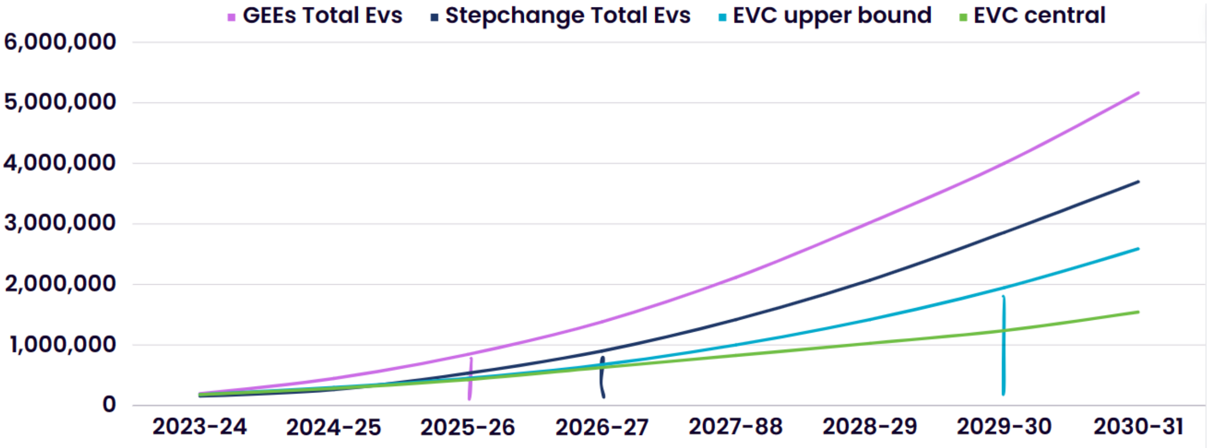

Fig 1: IASR EV workbook vs. EVC expectation with 50% EV uptake markers.

EV uptake is currently exponential, but we expect it to taper as an S-curve.

If in addition to the effective implementation of the NVES at federal level, we assume that announced state government electric vehicle uptake targets are met, there may be up to 2.5 million EVs on the nation's roads by the end of 2030. This is our upper bound case. If we assumed incomplete success of these measures in bringing about EV uptake (for example, large auto OEMs meeting the requirements in the NVES by increasing the supply of mild-hybrid vehicles to Australia, rather than battery electric vehicles), we would expect around 1.5 million EVs on road in Australia at the end of 2030, with approximately 1.35 million in the NEM. This is our central case today, subject to change as the details of the NVES are implemented.

EV sales to date nationally align with the midpoint between the 'no intervention' and 'moderate intervention' scenarios in the ARENA[5] report. The most populous states in Australia (NSW, QLD, VIC, SA) all have EV uptake targets of 50% by 230. The marks on the graph show when that target would have to be met in order to meet the projected total by 2030. As can be seen, for the step change case to be true, 50% EV sales would have to be met in 2-3 years' time, 3-4 years ahead of state government targets. We do not expect 3.7 million[RR2] EVs nationally in 2030-31, let alone in the NEM regions.

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[2] Australia: installed capacity of rooftop solar PV 2022 | Statista

[3] Cleaner, Cheaper to Run Cars: The Australian New Vehicle Efficiency Standard—Consultation Impact Analysis (infrastructure.gov.au)

[4] Raising standards, cutting costs (electricvehiclecouncil.com.au) p 14.

[5] australian-ev-market-study-report.pdf (arena.gov.au)

PHEVs

Whilst PHEVs have smaller batteries than BEVs, many modern day PHEVs have battery sizes around 13-20kWh, with electric driving range on the order of 80km. Overall, a PHEV will on average use less electricity per year than a BEV travelling the same distance, nevertheless it's worth getting the assumptions and figures as close to accurate as possible. Particularly when there are and will be PHEVs with V2G, which as described below, will have a profound impact on the grid.

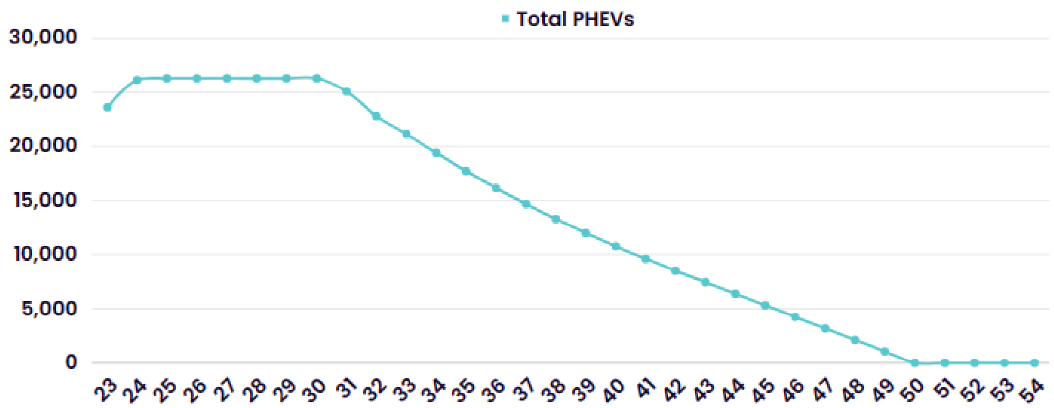

Fig 2. Total PHEVs in EV workbook

The modelling projects PHEVs to peak at 26,300 PHEVs. We would counter that the top 3 highest selling vehicles in Australia were Utes in 2023 (~155,000 vehicles).[6] This cohort which features a broad demographic of owners from inner-city tradespeople, fleet operators, weekend campers to farmers, have not yet been given a viable alternative to fossil fuel only driven vehicles. For this vehicle type, PHEVs are likely to make up a considerable component of future sales, to enable towing, four-wheel driving in remote locations or that edge use case that many Australians perceive that they the need capability. This is also a cohort resistant to change and will likely need a stepping stone technology before they fully transition to BEVs.

It is desirable that the last of these types of vehicles will be sold by 2030 or 2035 at the latest in order to meet the net zero by 2050 target, this would likely require a ban on fossil fuel cars and vans, such as in the UK, notwithstanding that the ban was recently wound back from 2030 to 2035. A ban of this nature is unlikely for Australia in this time frame, therefore our expectation is for PHEV numbers to increase out to at least 2035.

Expected grid impacts

The consequences of over estimating EV uptake in the integrated system plan is to inflate the amount of energy that existing generation will need to provide, as well as the network capacity required to maintain system security during peak demand events. Artificially inflated projected energy requirements could lead to fossil fuel generators planning to stay online longer than they otherwise would, leading to slower decarbonisation and elevated electricity prices.

The 2023 EV workbook appears to be at times representing EV contribution to peak demand (4pm – 9pm) at between 680W/large residential EV convenience charging in Victoria and

[6] Australia breaks all-time new vehicle sales in 2023 | Federal Chamber of Automotive Industries (fcai.com.au)

280W/small residential EV. Unfortunately, the figures do not represent how users will charge certain types of vehicles.

There have been studies carried out in Australia that show contribution to peak demand is actually about 250W/EV.[7] This is before improvements in TOU tariffs take effect. As an example, if networks were to follow the numbers presented in the ISP, 3.7 million vehicles by step change 2030 multiplied by 480W (the midpoint between 280 and 680) would have them preparing for a 1.78GW increase to peak demand. Whereas if you take the more likely number of 1.5 million EVs, multiplied by 250W, then networks will be preparing for a 375MW increase, nearly a 5-fold reduction. The EVC understands ISP numbers are conservative, but augmenting the regulated asset base to 'deal with EVs', at a projected level of impact 5 times higher than is plausible, is not a good outcome for consumers.

The 2023 EV workbook is showing residential convenience charging at 66% in Victoria for 2022-23, with higher percentages in other states. We already know from studies in hand that this is not the case, in fact convenience charging can be seen to be between 6% for owners with time of use tariffs and 30% for owners with "no incentive on EV charging time".[8] Biasing expected EV charging times towards when many people generally get home from work will skew the predicted impact EV load will have on the network as it coincides with existing peak demand. This will lead to networks building higher capital expenditure into their regulatory resets to handle higher load, resulting in unnecessarily increased prices for all consumers.

There are electricity retailers today, such as Amber, that are offering variable rates for export depending on what is happening in the wholesale market. Normally between 4pm and 9pm, demand is high and cheap renewable energy has reduced, spiking wholesale prices, this incentivises consumers not to charge their EV/s at this time. There are also savvy time of use retail plans coming to market such as the AGL night saver plan, Powershop's electric vehicle tariff, Ovo Energy's EV plan, and simply energy's simply EV plan.

These offer easy to follow tariff structures with competitive day time rates and really cheap offpeak rates, encouraging EV owners to charge at night, or during the day if they have excess solar. We anticipate the same types of offerings will come about for export tariffs, like that in the WA distributed energy buyback scheme where export between 9pm and 3pm earns 2.25c/kWh and export between 3pm and 9pm earns 10c/kWh. This will encourage V2G owners to export during peak times.

Studies in Australia have indicated that EV targeted time of use tariffs can reduce peak demand contribution to 100W/EV in residential settings[9],[10]. The EVC has substantial additional data around this point that it does not have permission to share in this public submission but would be happy to present to AEMO.

Buses, trucks and commercial vehicles are projected to use convenience charging 81% of the time in NSW, 23-24 step change. This tapers down to 79% each by 30-31. Vehicles like this operated in fleets will be highly scheduled, because failure to schedule them will create

[7] Home-EV-charging-2030.pdf (electricvehiclecouncil.com.au)
[8] 2206.03277.pdf (arxiv.org)

[9] AGL Electric Vehicle Orchestration Trial - Australian Renewable Energy Agency (ARENA)
[10] Origin Energy Smart Charging Trial - Final report - Australian Renewable Energy Agency (ARENA)

massive capex requirements for electrical infrastructure in their depots. A suggestion that 90%+ of bus charging (for example) will not be scheduled is not remotely credible.

Compounding this, many buses and trucks will be in operation during network peak demand times and so won't contribute to it. These vehicle types are not given a category for V2G whereas we expect these fleets will find extra revenue opportunities in exporting power when the vehicles don't need it. Depots will be built especially for managing the charging of these fleets at great expense, to assume that effort will not be made to save money on fuel costs and make money by selling energy to the grid is likely to be incorrect.

V2G uptake

The EV workbook has vehicle to grid (V2G) in the step change scenario at 0% until 2030-31 for most states (Fig 3).

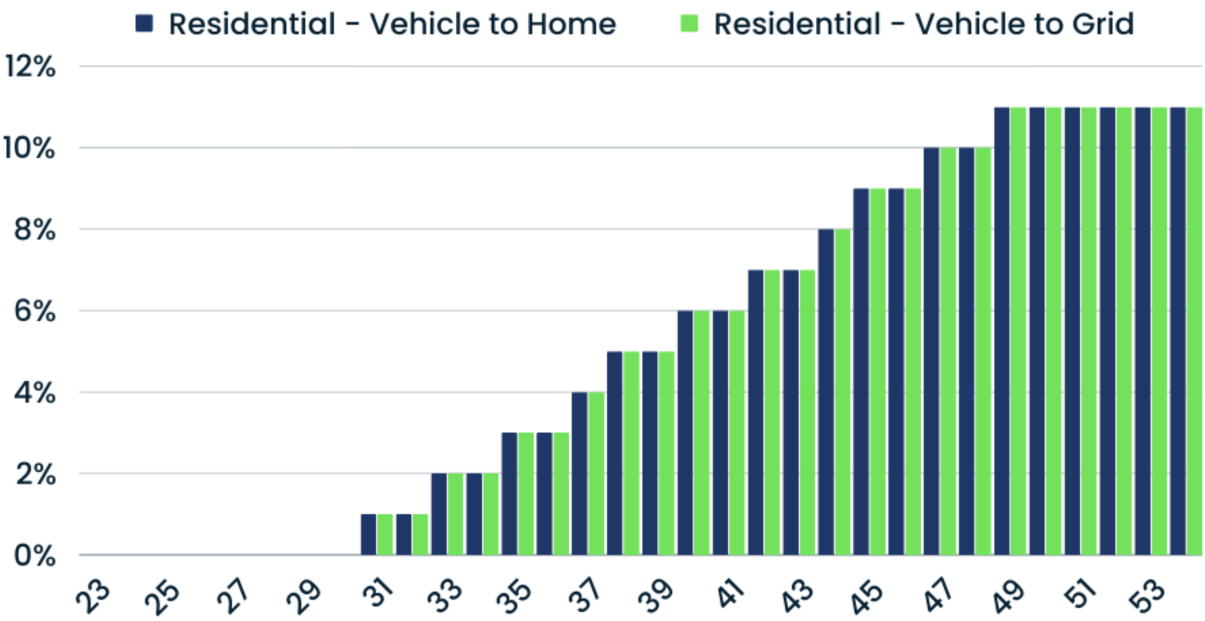

Fig 3: EV workbook expected V2H and V2G uptake.

V2G is already being used in SA and will start in earnest from late 2024. There are a handful of V2G inverters already connected in SA outside of trials[11] and about 50 connected as part of trials around the country. The reasons there are so few in the country today include;

- There was only one V2G inverter product in market, priced at about $10,000, which has since been withdrawn from sale,
- Only one state (SA) permitted the use of the product (through an exemption provided by the DNSP, SAPN). This state accounts for about 6% of new vehicle sales.
- The product only worked with Chademo compatible vehicles, which is about 3% of the EV fleet.

This speaks to a huge pent-up demand for the technology that will certainly make its presence felt when CCS2 compatible V2G vehicles arrive in Australia later this year, and

[11] EV owners could save $2000 a year charging vehicle-to-grid and help reduce the risk of blackouts (afr.com)
Winemaker among first in SA to use V2G | Autotalk Australia

regulatory changes enable V2G in the other states and territories.

The standard AS/NZS4777.1 that will allow for the connection of V2G and V2H inverters is currently at public comment stage and will be published by mid-year. AS/NZS4777.2 has already had the necessary changes made and the Clean Energy Council are looking at the detail of the changes they'll need to make to their inverter categories, in order to list V2G/H inverters.

Small numbers of V2G connected inverters have a large impact. When diversified contribution to peak demand is 250W per EV, one V2G connected EV exporting 5kW can offset 20 EVs. It is not wise to express the number of V2G inverters as a percentage which is rounded to the nearest whole number. Actual figures based on what we know so far should be expressed so that networks may plan accordingly.

If we assume that 60,000 of the 1.5 million EVs in 2030 (a conservative 4%) will be connected for export at peak times via V2G inverters, and they're exporting on average 5kW, 5 days per week, during the evening peak, the feed-in to the grid is approximately 215MW. This is sufficient to offset approximately 60% of the 375MW contribution to evening peak demand that EVs will create, if we assume 1.5 million vehicles, and the 250W/EV contribution that is typical driver EV charging behaviour *without* the effects of tariff-based incentives.

If the 1.5 million EVs in the EVC central case were drawing 100W per EV on average (per above), then a contribution of 150MW of load would be expected to be presented to the grid at peak time from the vehicles charging at home. Per above, if 4% of these vehicles are engaging in V2G, exporting at 5kW, 5 days per week, then 215MW of supply would be fed back into the grid, more than cancelling out the 150MW EV load.

The EV workbook also has vehicle to home (V2H) in the step change scenario at 0% until 2030-31 in all NEM states, which is not realistic, given the underpinning technology is already here, in active use, and being covered in the media[12].

Section 6.1 states "While the combined installed capacity of these batteries is large, they can only dispatch electricity for about two hours at full discharge, so their energy storage capacity is relatively small, and deeper, utility-scale storage is needed", this is not an accurate representation of EVs, an average EV battery by then could conservatively be 75kWh. At full discharge of say 7kW for a standard single phase residential connection, export from a full battery could be up to 10 hours if the customer so wished.

Section 8.2 suggests that net market benefits of CER are maximised through coordination of CER as virtual power plants (VPPs), which in turn are ultimately controlled by the market operator. There will be huge costs in setting up and operating VPPs, just like there will be huge costs in 'orchestrating' VPPs and CER not operating as part of a VPP. Most of the benefit of EVs are actually derived through clever TOU tariffs and export tariffs as described above, which is achieved with very low added cost. Any attempt to initiate control of EV charging or indeed discharging V2G by the market operator should first be subject to a rigorous cost-benefit analysis to assure that the residual benefit can be attained at a reasonable price, and consumers are willing to give up that control of when they fill up or discharge their EVs.

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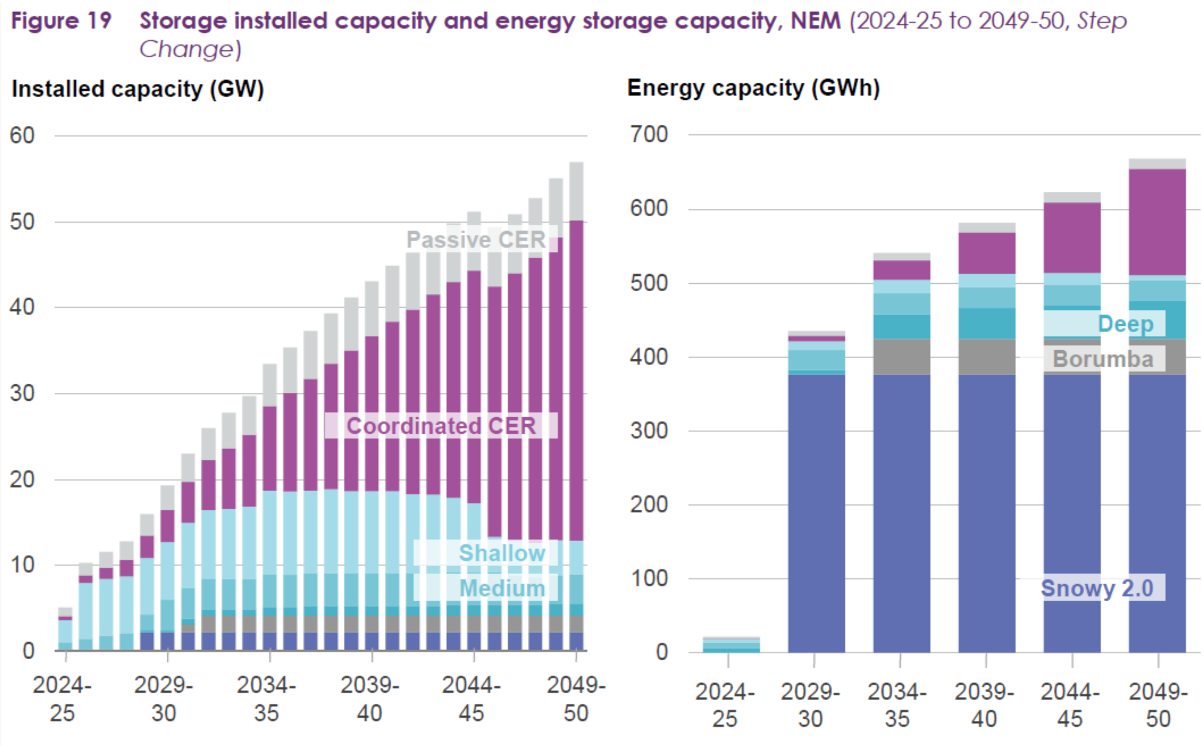
[12] Queensland woman uses electric car to run her son's dialysis machine during power cut | Electric vehicles | The Guardian

It is unclear from the documents what proportion of 'coordinated CER storage' is expected to be provided by V2G in 2050, see Figure 19 from the ISP below. At around 57GW/160GWh, a ratio around 1:3, it could be assumed the proportion of 'coordinated CER storage' made up by V2G is quite small, when V2G can easily have a ratio of between 1:7 and 1:10 for a passenger vehicle. It would be useful to know this figure so that we can easily continue to monitor real and projected uptake rates, in order to properly plan for 2050. If the EVC expects V2G utilisation rates of about 10% during peak times, but the ISP is only projecting say, 1%, that is information the networks should really have.



ISP Fig 19. Storage installed capacity and energy storage capacity, NEM

Recommendations

AEMO should;

- Revise down the expected EV uptake to credible figures.
- Revise the projected EV charging profiles, based on the results of ARENA studies and consumer uptake of EV-driver-targeted ToU retail products.
- Revise up the level of V2G participation expected from 2025.
- Factor in the effect V2G participation will have in offsetting EV charging load.

The EVC is happy to discuss any of the above and contact can be made at office@evc.org.au