EVC submission to the AEMO draft 2023 Inputs, Assumptions, and Scenarios report.

February 2023

With reference to:

Draft IASR report:
https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/draft-2023-inputs-assumptions-and-scenarios-report.pdf?la=en

Detailed EV workbook:
https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/aemo-detailed-electric-vehicle-workbook---draft-2023-iasr.xlsx?la=en

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Preamble:

The Electric Vehicle Council (EVC) is the national peak 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.

AEMO is the Australian Energy Market Operator. AEMO regularly prepare content to support forecasting and planning in the energy sector, inclusive of modelling loads and generation with up to a 30 year outlook.

Over this multi-decadal time horizon, the electrification of road transport is going to have a significant impact on the energy system. We presently use about 30 billion litres per annum of imported liquid hydrocarbon fuels to power the internal combustion engines used in Australia for road transport.

Assuming a full transition to EVs in road transport, the equivalent electrical energy requirement based on the current vehicle fleet size is on the close order of 100TWh – a ~40% increase on total annual electrical energy generation, transmission, distribution and consumption.

The EVC welcomes ongoing discussion on this matter, and can be reached at office@evc.org.au

Executive summary:

We will need substantial investment in new generation and transmission assets to support the electrification of our road transport sector, per the recent ISPs (integrated system plans) and the 'rewiring the nation' plan. We will need some investment at the distribution level as well. The key question is how much distribution system investment we'll need in which locations over what time frames, and to what extent EVs will contribute to the need for that investment.

The most significant aspect of EV charging from the point of view of distribution network impact will be the impact of home charging. Public fast charging deployments will require localised network augmentation, which will typically be paid for by those deploying the charging locations through the usual connection processes, but home charging is expected to account for 80% or more of total energy delivered to EVs.

Home charging is the most variable in terms of when it is likely to occur, and it also does not include a practical requirement for the energy retailer or the energy network to be involved on a case-by-case basis. The consumer can buy an EV today and charge it by plugging in to the existing outlet on the garage wall.

If we take the number of EVs predicted to be on the road in a given future year and multiply it by the expected average at-home charging profile, we can estimate to what degree EVs will assist with soaking up excess solar, and to what degree they will contribute to maximum demand, over time.

Recent work done of this nature by CSIRO and AEMO has leaned towards assumptions that EV uptake may be rapid, and that at-home EV charging will principally occur co-incident with the evening electrical energy usage peak. While not in keeping with real world data and experience, this combination of assumptions has been used by various parties to attempt to justify significant near-term distribution network buildout.

It is forecasting work of this type that lead to the Western Australian government identifying a potential need to invest $650 million in augmentation in the SWIS, specifically to support EV uptake out to 2030. For the avoidance of doubt, this is how we end up with over-investment in the RAB (colloquially known as gold plating of the networks), and consequent unnecessarily high consumer electricity bills. By the same token, if we under-estimate the impact of the uptake of EVs in the energy system, and therefore under-invest in the distribution networks, we run the potential risk of reliability problems. Getting the inputs and assumptions right, with a high degree of confidence, is important to ensure that we have a reliable electricity system, without over-paying for it.

The Draft 2023 IASR is a moderate improvement over previous work but remains significantly flawed. If it were used to inform planning, we expect that the inputs, assumptions and scenarios contained within it could reasonably be expected to lead to significant over-building of the distribution networks in the near term.

The EVC calls on AEMO to review this work closely, and specifically strongly recommends that substantially more real world data of Australian EV charging behaviour be incorporated in the models.

Commentary to the report, and the detailed EV workbook, with reference to questions on page 57:

Matters for consultation
• Do you consider the methods and assumptions described in this section regarding transport electrification are reasonable and provide appropriately for each scenario?
• Do you consider the change in vehicle charging load profiles (compared in Figure 10) are appropriate than the 2021 IASR profiles given they are developed from trial data, particularly for the reduced peak demand from 'convenience' charging?
• Should other factors regarding electrification be considered that may impact the consumer electricity load shape?

Our responses to these questions fall into two broad categories, one related to the forecast vehicle numbers, and the other to charging behaviour. For ease of reading, we have separated these out.

Numbers and types of vehicles:

All workbook scenarios provided in the detailed electric vehicle workbook contain bullish forecasts on EV uptake. For the purposes of this response, we will focus on the period to 2030-31.

Out to 2030-31, the least bullish forecasts (2.6C and 1.8C orchestrated) assume a light vehicle fleet in 2030-31 that has achieved a 12-17% on-road transition to BEV, with 35-60% of new vehicle sales being BEV.

Some current state government targets are for 50% new vehicle sales being a combination of BEV and PHEV in this timeframe, with other states and the federal government yet to take positions on this matter, and policy, legislation, and regulations critical to the enablement of these targets yet to be drafted or implemented. In particular, if we do not achieve rapid implementation of robust and ambitious fuel efficiency standards for light vehicles at a federal level, we would not expect to achieve the levels of EV uptake noted in these low-end forecasts.

Assuming robust and ambitious fuel efficiency standards are achieved at a federal level and promptly and effectively implemented, and the expected increase in global manufacturing volumes of EVs occurs, these two 'less bullish' scenarios are plausible in terms of total number of EVs. This said, they won't be all BEV as presented in the workbook, they'll be a mix of BEV and PHEV, as discussed below.

The more bullish forecasts (1.8C diverse, and 1.5C) assume near-100% transition to BEV sales in the light vehicle fleet by 2030. These scenarios are unlikely in the extreme in Australia. We are global laggards in the federal policy settings that could lead to this type of outcome, and global EV manufacturing volumes aren't going to reach a level where markets with laggard policies are allocated EVs by global automotive OEMs at these levels.

Near-100% transition to new vehicle sales being BEV ***may*** occur in countries which have announced 2030 or pre-2030 dates at which the sales of new petrol vehicles will not be legal – the UK and Norway, for example.

The last ESOO (August 2022) had a range of EV fleet size projections at 2030-31 of 615,000 to 4,500,000, based in part on policy uncertainty:

https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2022/2022-electricity-statement-of-opportunities.pdf?la=en

https://aemo.com.au/-/media/files/major-publications/isp/2022-forecasting-assumptions-update/forecasting-assumptions-update-workbook.xlsx?la=en

If (for example) our federal government fails to promptly implement robust fuel efficiency standards, 615,000 EVs on-road in Australia in 2030-31 would not be an unreasonable forecast, because supply of EVS to the local market would remain constrained.

It appears based on the more recent work that the bottom end of this estimated range from August 2022 has been discarded, with the new minimum estimate being on the order of 1.5m.

The PHEV worksheet demonstrates a lack of understanding of local and global motor vehicle markets and consumer vehicle purchasing behaviour. In every model provided in the worksheet, the number of PHEVs on road is expected to decline to about 12,000 units on the road in Australia by 2030. In Western Europe, which is the type of market effective policy intervention has the potential to create in Australia over the period to 2030, BEVs make up about 12% of new car sales, and PHEVs make up about 9%.

In Australia, mild hybrids have proven very popular, and the PHEV is a middle ground between the mild hybrid and the BEV. An assumption that we will achieve ~35-60% new car sales being EV, without a substantial fraction of those new cars being PHEV as distinct from BEV, is almost certainly unsupportable. We can expect to have increasing numbers of PHEVs in Australia through to 2030, because global car makers will be building them, and Australians will want to buy them. Ultimately, the share of PHEVs in the Australian market will fall in favour of BEV, but it will rise for years first.

The FCEV worksheet correctly identifies that in the near term at least, FCEV will be largely irrelevant to the energy system, especially in the light vehicle segment.

Charging behaviour:

The methods and assumptions are inadequate, given the scale of investment that hinges on getting this data correct. The changes from the 2021 IASR to the current IASR reflect the inclusion of a small amount of actual user data, rather than estimates based on the size of charging equipment commonly available to consumers, without reference to actual consumer behaviour. The inclusion of real world consumer data is welcome, but it is far from sufficiently robust. The work references two small trials, out of over 80,000 consumers with EVs currently in the Australian market. Other factors should definitely be considered.

The BEV_PHEV charge type worksheet assumes that over the next 10 years, 50-80% of drivers will ‘convenience charge’, with a bias towards consuming energy at peak times, and only 10-30% of drivers will adjust their charging behaviour to the ‘night-time charging’ profile to take advantage of off-peak electricity rates. Daytime charging, which would include a bias from consumers towards charging their cars from their own solar panels, is consistently indicated as comprising less than 10% of charging activity.

These assumptions are out of step with reality today and can reasonably be expected to remain incorrect in future. More and more retailers can be expected to target the growing EV-owner segment with retail offers designed to appeal to drivers, and financially reward

solar-soak and off-peak charging. The EVC has collected and reported data on this topic, here, drawing on local and international experience:

https://electricvehiclecouncil.com.au/wp-content/uploads/2022/08/Home-EV-charging-2030.pdf

Worthy of noting is that the Draft 2023 IASR workbook references data from Energy Queensland, and data from the Origin trials. The EVC reviewed published data from those two trials as well, in the preparation of our report. What we found was that typical contribution per EV at home at time of the evening peak was consistently on the order of 250W/vehicle, as distinct from the ~600W/vehicle figure referenced in the Draft 2023 IASR workbook.

Adoption of EVs to 2030 will be biased towards people who live in standalone homes with solar on the roof. Standalone homes are the dominant housing type in the country, and the people who acquire EVs are typically the same ones who have already chosen to install solar. This cohort is significantly financially incentivised to charge their cars during the day where possible through low (and falling) FiT rates, in addition to being personally biased towards doing the right thing environmentally.

Where the consumer is unable to charge during the day, night-time charging offers significant annual financial savings, with negligible amenity impact. Dedicated charging infrastructure in the home is not required to manage charging time – preferred charging times can easily be set via the car, in the same way that the driver can set their preferred radio stations. Surveys have been done by DNSPs in Australia, specifically investigating this question – for example:

https://qhes.com.au/survey-results-2022/electric-vehicles-2022/

In this example, consumers report five distinct methods they use to avoid charging their cars at peak time, with only 16% refraining from actively managing their charging time.

In summary, we note the change in the predicted contribution to peak demand associated with the revised convenience charging profile. We note that this was informed by a limited amount of real world data. This is a step in the right direction but does not go anywhere near far enough. Specifically, AEMO should source substantially more real world data from a representative sample of Australian EV drivers, rather than relying on an analysis of small numbers of trial participants, and use this as the basis for the inputs and assumptions work.

There are now over 80,000 EV drivers in Australia. Modelling projected behaviour across millions of vehicles, using as data sets a few hundred drivers participating in two pilot programs, is not appropriate, given that the these models will be used as the basis for investment decisions at the level of hundreds of millions to billions of dollars.

We've seen that the inclusion of a small amount of real world data, even though the overall work remains flawed in many ways, has substantially changed the conclusion in terms of predicted impacts from 2021 to 2023. More data should be collected and used, to enable more robust conclusions, for the benefit of the Australian consumers who will carry the costs associated with investment decisions based on this work.