Submission No 50

INFRASTRUCTURE FOR ELECTRIC AND ALTERNATIVE ENERGY SOURCE VEHICLES IN NSW

Organisation: UNSW Energy Institute

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UNSW Energy Institute

UNSW Submission to Inquiry into Infrastructure for Electric and Alternative Energy Source Vehicles in NSW

The UNSW Energy Institute welcomes the opportunity to comment on the Committee on Transport and Infrastructure inquiry into and report on infrastructure for electric and alternative energy source vehicles in New South Wales (NSW).

Executive Summary

UNSW has deep credentials and world-leading experts in technologies related to energy and transport policy, including those relating to clean energy, electric vehicles, clean fuels and electricity and transport infrastructure. Based on an independent assessment of the terms of reference, the following key issues are put forward in this submission:

1. It is crucial that the deployment of electric vehicle (EV) chargers maximises the use of existing infrastructure.
2. It would benefit consumers and the electricity grid in the long-term if kerbside Level 1 charging was ubiquitous and accessible at every point of public parking. This is an ambitious vision and could only be achieved if capital costs were significantly reduced, for instance by leveraging the metering, control and charging systems that already or can exist within cars rather than replicating these at the charging point.
3. The placement of Level 2 and 3 charging points must strategically consider existing or emerging distribution network constraints. This could include co-locating with other forms of renewable energy generation and storage. It should also complement other competing demands at those points of connection, including energy-intensive industrial loads. This is particularly relevant when considering the electrification of heavy vehicle fleets.
4. When considering pricing, priority should always be given to achieving the best value for consumers. It is important that the price of charging is clear to consumers and reflective of the whole-of-system cost.
5. The importance of providing appropriate skills development and training for people who will support the transition towards transport decarbonisation and electrification cannot be understated. The transition will affect the entire energy value chain, thus training and education planning should be delivered holistically and prioritise safety.

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The University of NSW (UNSW) Energy Institute appreciates the opportunity to provide input to the Committee on Transport and Infrastructure's inquiry into and report on infrastructure for electric and alternative energy source vehicles in New South Wales (NSW). UNSW has deep credentials and world-leading experts in technologies related to energy and transport policy including those relating to clean energy, electric vehicles, clean fuels and electricity and transport infrastructure.

This submission aligns with the topics under the terms of reference.

Funding and location of electric vehicle chargers or infrastructure for other potential energy fuel sources

First and foremost, it is crucial that the deployment of electric vehicle (EV) chargers maximises the use of existing infrastructure including, but not exclusively, the electricity network. The UNSW Collaboration on Energy and Environmental Markets (UNSW CEEM) has significant expertise in the services and value provided by managed EV charging[1]. The effective and efficient deployment of future charging infrastructure will depend on the type (level[2]) of EV charging.

It would benefit consumers and the electricity grid if kerbside Level 1 (<3.7kW) charging was ubiquitous at every point of public and ideally private parking. If this can be achieved, the electricity grid will be able to take advantage of the load and potentially generation flexibility of every parked car . This would help alleviate the potential issue of EV charging exacerbating network issues related to both minimum and peak demand as vehicle to grid (V2G) technology evolves. It has already been demonstrated that the network can host up to 5kW of solar PV in over 4 million locations. Thus, the grid capacity and management risk can be confidently managed .

However, for this to be viable, the capital cost of deployment of charging infrastructure will need to be driven down, avoiding the high cost of complex control and metering systems that currently sit in the charger and associated network connection. There is an opportunity to leverage the metering, control devices within EVs, the functionality of which currently often sits dormant. Examples in the UK show that this is possible when a simple plug is provided on street lighting with a QR code to facilitate billing. For this to be successful, it would require a new architecture and market mechanisms and rules to be developed, and possibly mandated, in Australia to access the control and metering embedded in the vehicle.

Level 2 charging (7-22kW) will still have a role to play for consumers requiring faster charging speeds and/or where there are longer distances between charging points. However, the deployment of this infrastructure is expected to have more impact on cumulative load. Thus, it is important that the placement of these charging points strategically consider current and future network scenarios including existing or emerging network constraints. It is crucial to avoid unforeseen or unnecessary upgrades to the network, which can significantly impact the cost of electricity to consumers. The cost of the network in NSW can account for up to 50 per cent of a consumer's electricity bill.

There are strategic measures that could be implemented to reduce the impact of higher capacity charging. For example, co-locating community-scale Level 2 charging infrastructure with community-scale battery storage could better optimise the load duration curves, including avoiding charging peaks and utilising surplus solar PV generation.

The points above also apply to Level 3 charging (<350kW), which will have an even greater impact on electricity network infrastructure. High-speed charging infrastructure will be crucial to the successful deployment of EVs in Australia given our geographically dispersed population. The two key roles for high-speed charging tend to be: allowing drivers without access to Level 1 and 2 charging to continue their quickly and efficiently; and long-haul trips or "trunk" routes for freight and personal travel that necessitates a quick charging service. For long-haul and freight applications, it is important to

[1] A review of services and value provided by EV managed charging (Wang, Yildiz and Bruce, 2022)
[2] Charging an electric vehicle (Transport for NSW, 2025)

consider, and possibly prioritise, the location of charging corridors alongside other energy intensive industrial developments such as the deployment of data centres. Again, there is an opportunity to consider precinct-scale options whereby the charging loads are complemented by renewable generation and storage infrastructure.

Beyond financial impacts, it is important to consider other factors that may affect communities when rolling out faster-charging points. For example, the roll-out of some fleets of 22kW chargers has impacted the availability of on-street parking in high-density neighbourhoods. Other factors that have been raised by community groups include unattractive aesthetics or visual pollution (negative), the achievement of emission reduction goals in local government areas (positive), and equitable access to chargers (mixed). Consulting early and often is a strong approach to building community awareness and support for novel infrastructure deployment.

Finally, it is important to consider the evolution of future fuel infrastructure in long-term planning. For example, there are already thousands of battery-swapping stations in China. These types of stations could be deployed in Australia if they become an optimal or attractive option for EV owners and original equipment manufacturers (OEMs). Allowing for flexibility in policy development is crucial for a rapidly evolving sector.

Use of existing infrastructure and measures to ensure a competitive market, including 'ring fencing' policies

When considering pricing, priority should always be given to achieving the best value for consumers. This is a fruitful area of future research, which the UNSW Energy Institute would be happy to discuss.

Several business models are being proposed and tested that involve different stakeholders holding the relationship with the consumer – retailers, third-party providers and even distribution networks where ring-fencing and market regulation allows. It may well be possible to accommodate multiple models in the future, however this must be done in a transparent and equitable way. Factors that should be considered when deciding which model(s) should be pursued include:

- The total cost to consumers, including the cost of the electricity network. Thus, whether or not the distribution network is owning or operating the charging points, the cost of the electricity grid should be factored into the value assessment. These decisions should include options that have very low capital expenditure (as per the case made for Level 1 charging in the previous section), which may be difficult for distribution networks to implement under the current regulatory model.
- The long-term impacts of greater or less competition. It is important to consider whether choosing a better value option *now*, which restricts competition, would restrict the availability of a better option *later*. This also relates to situations where private providers are provided priority access to infrastructure (such as streetlights) that affect the long-term pricing options available to consumers at that charging point.
- The value of simplicity for consumers. It would be best if multiple billing arrangements were avoided and the device (car) itself became the point of retail contestability. Ideally, all charging points would be retailer agnostic and accessible to all.

In all cases, it is important that the price of charging is clear to consumers and reflective of the whole-of-system cost. For example, it should be possible to charge at public charging stations at very low costs (or even for free!) when surplus solar PV generation is being spilled locally. Many kerbside charging points have very expensive day rates (50c/kWh) that are not cost-reflective. This is an inequitable outcome given EV owners with off-street parking will have access to much lower retailer rates, which are even lower if they have rooftop solar systems installed.

Viability of alternative energy sources for freight, heavy vehicles and other licenced vehicles in regional communities

The Electric Vehicle Council and Australian Trucking Association highlight that 38 per cent of Australia's transport emissions come from the road freight sector. This is disproportionate to the number of vehicles as heavy vehicles account for only 4 per cent of the total transport fleet. This underscores the importance of finding decarbonisation solutions for this segment of the transport sector to achieve Australia's overall emissions reduction goals.

Electrifying heavy vehicle fleets is a prospective pathway to achieving these ambitions. There are already strong case studies in NSW including: Bungarribee depot in Western Sydney for Team Global Express' Volvo electric truck fleet; the development of a charging hub to support Woolworths' EV truck rollout, leveraging a novel leasing model by Zenobē; and the Zero Emissions Buses Program, which is upgrading 11 bus depots in NSW to support 1,700 electric buses by 2028.

As noted earlier in this submission, future deployments must consider the impact on the distribution network. Research undertaken by UNSW CEEM has shown that electrifying a bus depot in NSW without flexibility measures could increase the summer peak demand by up to 17% at the local zone substation and increase the evening peak by between 20-30%[3]. Most of the examples provided above included complementary infrastructure including solar (e.g. 400kW at the Bungarribee depot and 388kW at the Leichhardt bus depot), battery storage and local grid upgrades. There can also be upside to this complementary infrastructure, for instance when battery storage systems and the EVs themselves provide additional revenue streams such as frequency control ancillary services (FCAS) to the electricity market.

Measures to ensure the transition of workers from affected industries and industry standards

The importance of providing appropriate skills development and training for people who will support the transition towards EV infrastructure cannot be understated. The transition will affect the entire energy value chain, thus training and education planning should be delivered holistically.

Safety should be prioritised when delivering training programs and UNSW has already invested in developing free, open-source course content to help people work safely with lithium-ion batteries[4]. However, where concerns are raised – for instance, in relation to the safety of underground EV charging infrastructure – it is also important to gather the baseline data to understand and qualify concerns and take appropriate measures to upskill the workforce to address any concerns that are validated.

Final remarks

Thank you for the opportunity to provide this submission. We would be pleased to discuss or clarify any of the comments or recommendations.

Sincerely,

[redacted]

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[3] Impacts of electrifying public transit on the electricity grid, from regional to state level analysis (Purnell, Bruce and MacGill, 2022)
[4] UNSW Short Course: Understanding the Risks of Lithium-Ion Battery Systems