EV fast charging profile

Project update

27 July 2022

Forecasting Reference Group Meeting

Purpose and agenda

The purpose of this presentation is to *consult* the FRG about AEMO's EV fast charging profile initiative and the how this could inform future demand forecasts.

Today's agenda includes:

- Components of AEMO's EV forecast
- Purpose of study
- Methodology
- Aggregated fast charging profiles
- Next steps

Timing	Relevant topic	Responsible
Oct 2021	2021 Forecast Improvement Plan (FIP) presented at FRG	AEMO
Nov 2021 – Feb 2022	2021 FIP consultation	Stakeholders
Today	**FRG presentation and discussion on EV charging profiles**	**AEMO**
Sep 2022	Draft 2023 EV demand forecasts	AEMO

The fourth wave of EVs

1880: Gustave Trouvé's tricycle, was the world's first electric car

1974: The Citycar was the most sold EV in the US till Tesla S

1996: GM produces EV1, its first purpose designed EV

2017: Tesla starts production of its more affordable Tesla 3

1900: EVs makes up 28% of the cars on the road.

1920: EVs disappears as no longer competitive

1973: Oil Crisis prompts new interest in EVs

1990: California passes its Zero Emission Vehicle (ZEV) Mandate

2035: EU-wide ban of new ICEs

1880 1900 1920 1940 1960 1980 2000 2020 2040

Performance/cost

Fuel security

Environment

Performance/cost
Environment
Fuel security

AEMO's EV forecast provides four key components to forecast electricity demand

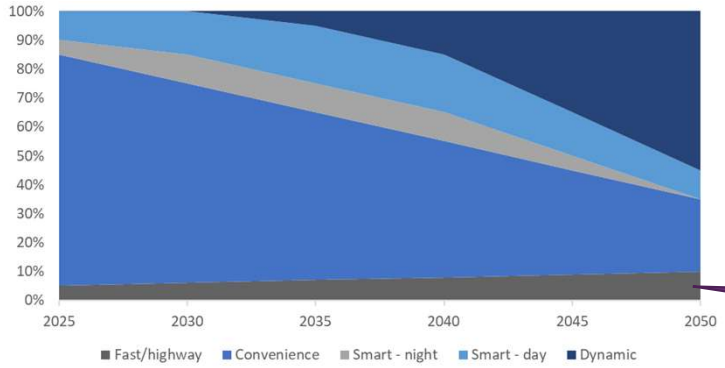
Number of vehicles

Energy use per vehicle

Nominal charging type profiles

- Fast/highway charging
- Convenience
- Smart – fixed (day time or night time)
- Smart – dynamic (Coordinated, V2H, V2G)

Charging type percentage split



Half-hourly charging profile → Impact on max/min demand

Fast charging: focus of this presentation

Influence on network and generation investments

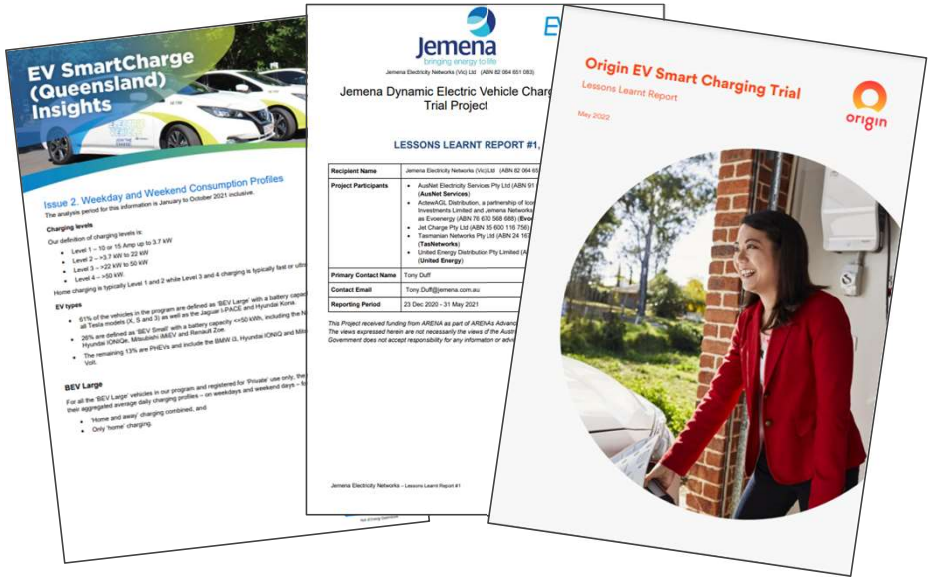
Data from Australian EV charging behaviour is increasingly available to inform forecasts

Charging types considered in AEMO's forecast:

- Fast/highway charging → AEMO analysis
- Convenience
- Smart – fixed (day time or night time)
- Smart – dynamic

Focus of today's presentation

Leveraging of research undertaken by Australian organisations:

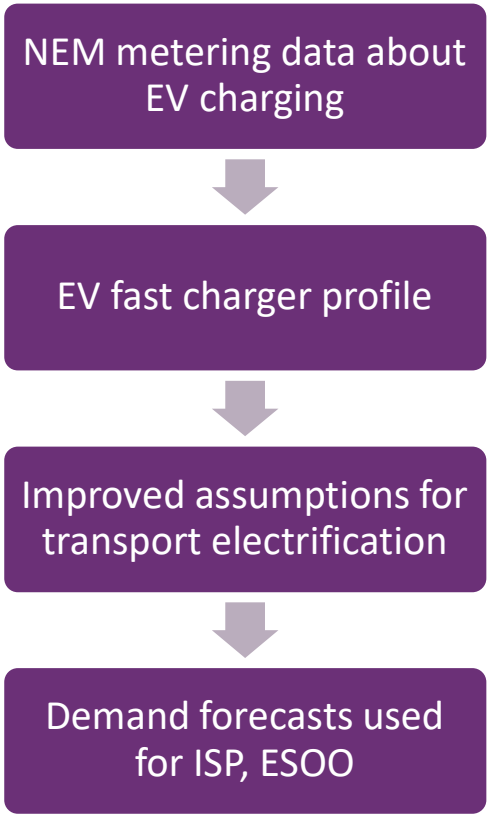


EV charging profiles initiative

What are the objectives of this study?

Study: Use NEM data to gain insight into EV fast charging profiles

Aim: To improve assumptions for electrification of transport sector, used for demand forecasting as part of the Integrated System Plan and the Electricity Statement of Opportunities.

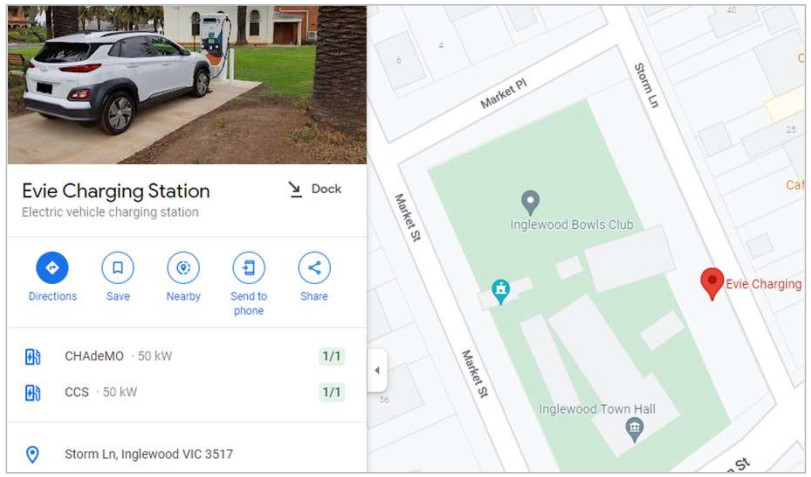


Identification of fast charging behaviour is based on four steps

1. Obtain addresses of locations of interest (e.g. fast charging stations)
2. Look-up addresses in the register for standing data for each metering point, NMI
3. Look-up metering data for address-matched NMIs in AEMO's metering database
4. Analyse aggregate load profile

Address matching challenges

- May not have a street number (or listed as a corner)



From ~900 fast charger addresses, ~570 active NMIs could be identified.

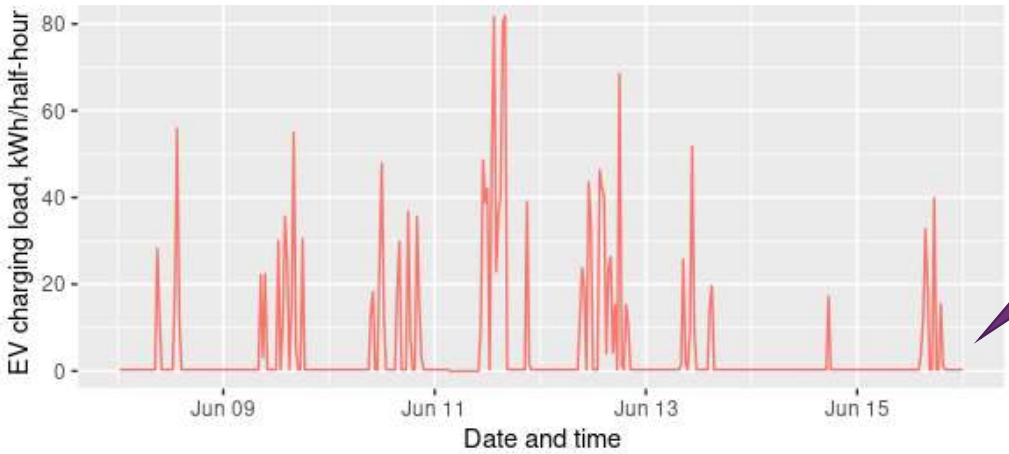
- May be at a location with other load(s), like a shopping centre, or installed with solar PV

Filtering process removed NMIs with EV charger co-located with other loads or DER equipment.

Removed > 250 NMIs with co-located loads.

Selecting for NMIs that belong exclusively to fast charging stations

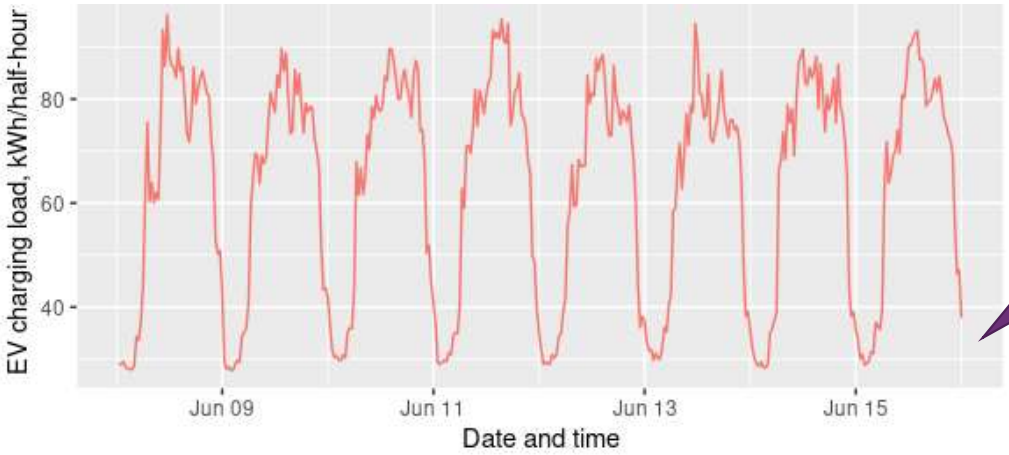
Expected isolated EV fast charging consumption



Short, sporadic charging

Periods of almost no consumption

Expected EV fast charging consumption with embedded loads



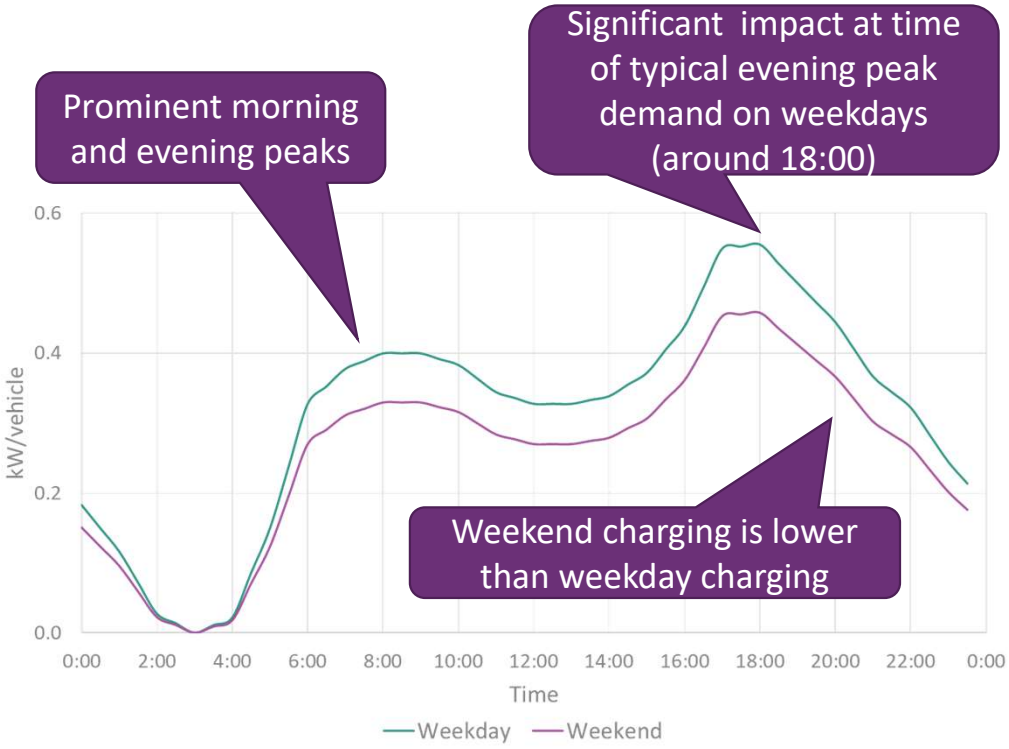
Long periods of consumption

Consumption always stays significantly above 0 kWh

EV fast charging load profile shape has been updated

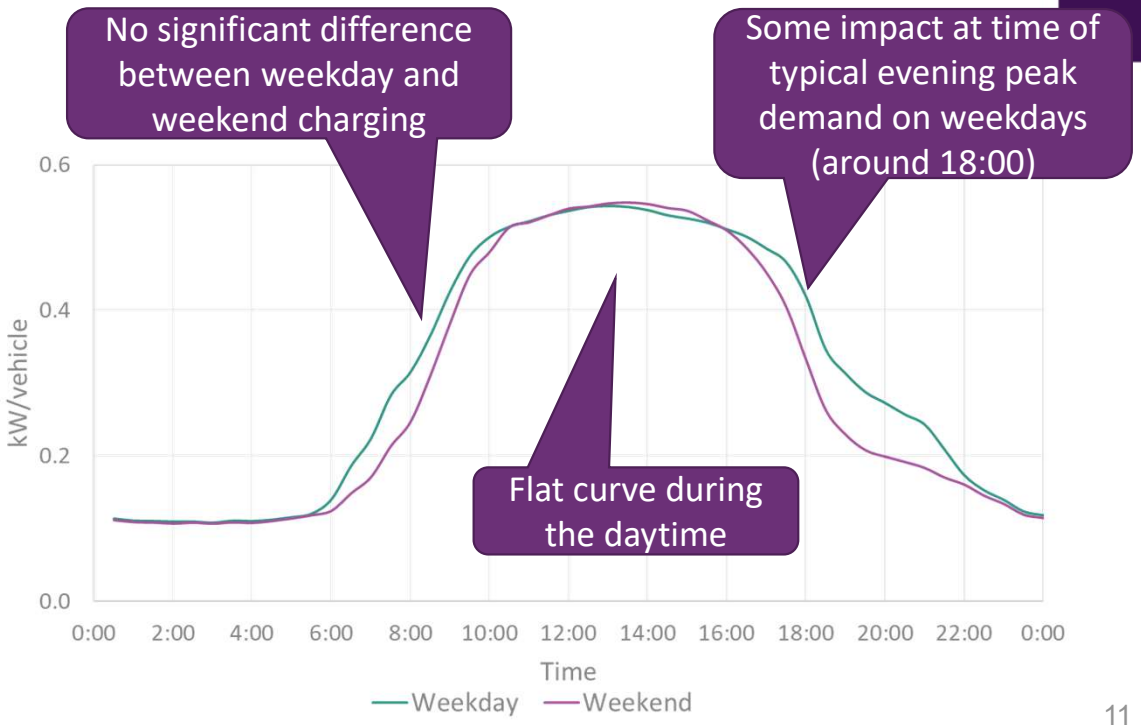
Previous: average daily assumed fast charging profile for light passenger vehicles, based on traffic data

People fast charge during their morning/evening commutes



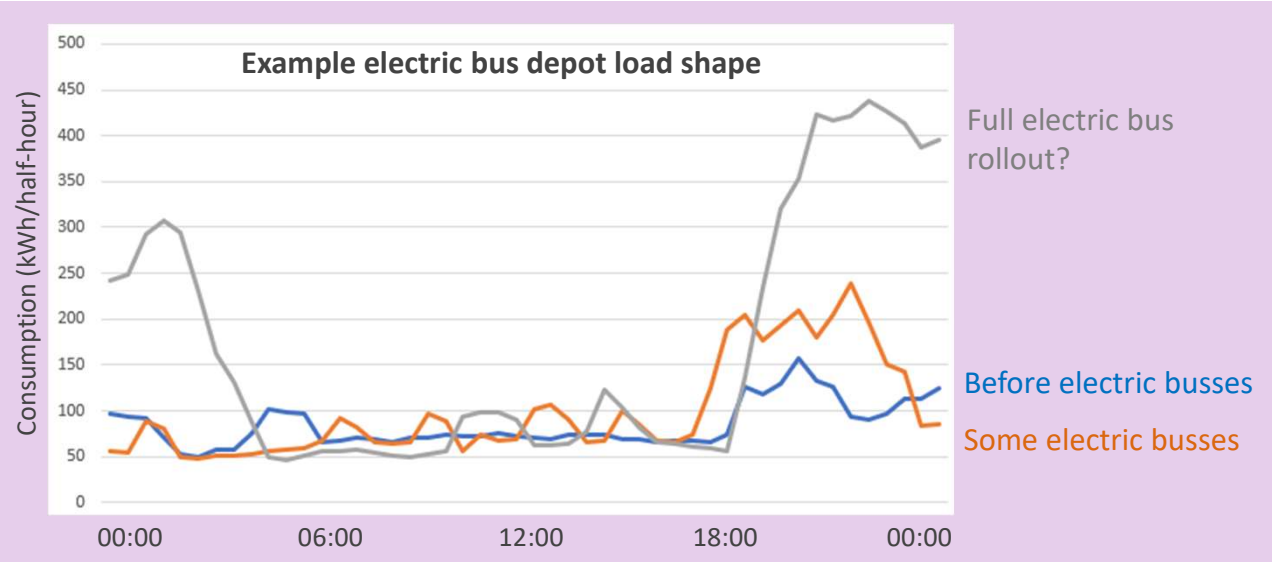
Revised: average daily fast charging profile, based on over 190 fast charger NMIs, for calendar year 2021

People fast charge as part of long travel journeys (highway charging), or between/during other activities (e.g. shopping)



The data analysis approach (slide 8) can be applied to other EV charge types, or loads in general

- Already used to analyse load from data centres
- In transportation, example future use include:
  - Electrolysers for hydrogen refuelling stations
  - Electric bus depots
- Home EV charging behaviour requires a modified approach because charger loads are coupled with other household loads. May require a control group without EVs to isolate household load impact from EVs alone.



Next Steps

Short term:

- Incorporate revised fast charging profile in the 2023 EV demand forecasts (draft to be presented in September FRG)

Potential future activities:

- Improve filtering methodology and grow dataset
- Investigate whether seasonal and public holidays show a significant change to EV fast charging
- Gain more information about the EV Charging Station at each identified NMI to improve scalability of results, including:
  - The number of stations and plugs at each connection point
  - The number of cars that are charging simultaneously
  - The installed capacity at each fast charging station
- Apply data analysis approach to other EV charging and load types

Questions for stakeholders

- Does the new average charge profile look reasonable?
- What other applications could this methodology apply to?
- Do you recommend any other sources of relevant information for this analysis?