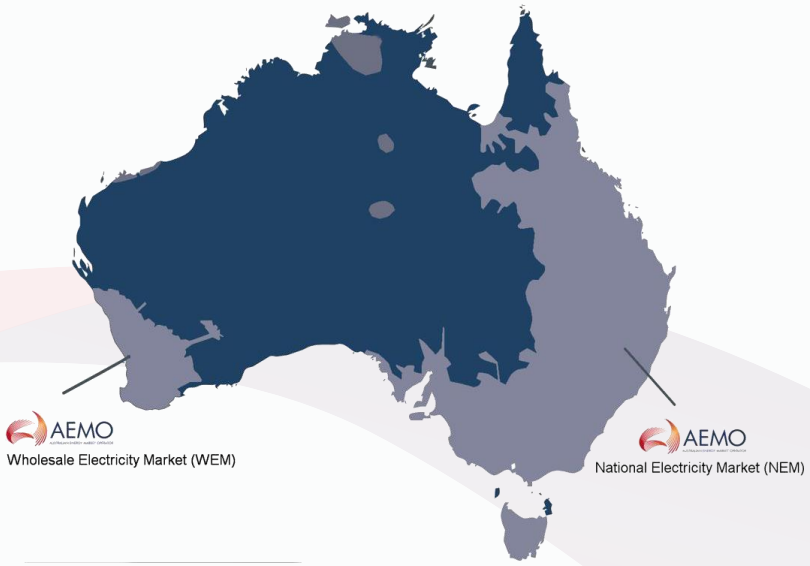
Electric Vehicle Modelling Roadmap

September 2019

About AEMO



We operate the National Electricity Market and grid, the Wholesale Electricity Market and grid, and gas system.

Both electricity markets supply more than 220 terawatt hours of electricity each year.

We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

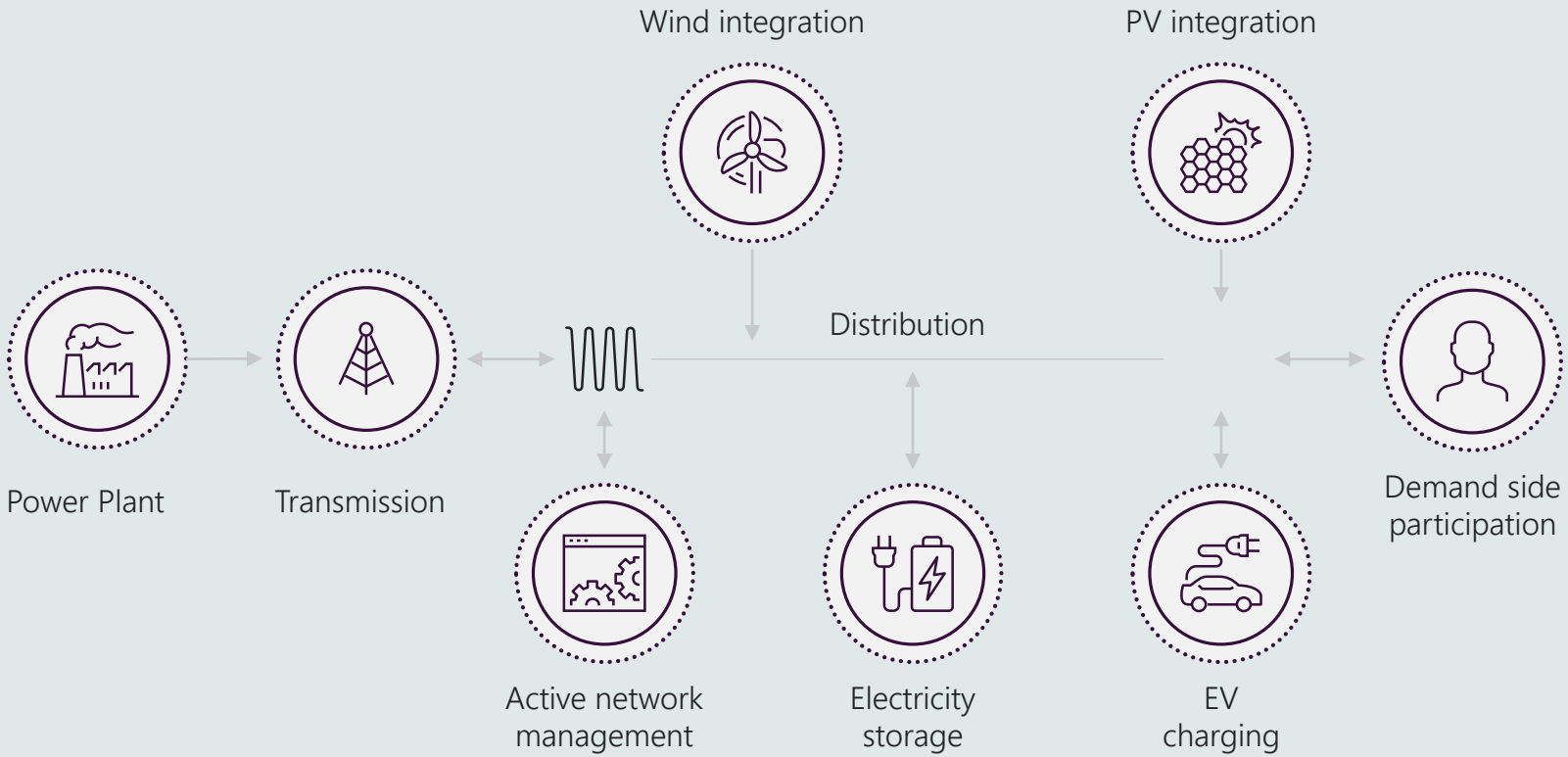
Ownership

40% Market participants

60% Governments of Australia

AEMO's role is evolving in a distributed and digital world

- Whole of system optimisation as we move to a two-way system and DER gains access to the market
- More data to run the system and market more efficiently (i.e. DER register, global settlements and meter data, 5 minute data, etc)
- Huge computational models for forecasting
- Dealing with more players and their needs – existing and new entrants
- Multiple data inputs from more sources
- Digitalisation allows value to be determined at more granular level



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Electric Vehicles, more than just the Grid

- EVs are projected to impact our transportation and energy systems in the next 20 to 30 years.
- Potential EV adoption rates and charging behaviour both have significant implications for energy networks and energy markets.
- AEMO has identified a need to improve its EV adoption and usage forecasting capability. Close coordination with the transport sector is needed to develop a common approach to forecasting the adoption and usage of EVs in Australia.
- A roadmap will set priorities for the datasets to improve EV modelling capability and actions to coordinate efforts across energy and transport.

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A roadmap is needed to guide the modelling of EV adoption and usage

- An EV Modelling Roadmap aims to:
  - identify immediate improvements to EV energy demand modelling (EV adoption and usage forecast assumptions) which will be used to inform AEMO's NEM Electricity Statement of Opportunities (ESOO) to be released in the second half of 2019 (and in subsequent years)
  - identify the key factors and trends likely to influence the adoption and usage of EVs in the medium and long term
  - outline the EV adoption and usage scenarios which will be used to inform AEMO's energy demand and supply forecasts for AEMO
  - outline an EV Modelling Framework and an implementation plan to be collaboratively taken by energy and transport sector stakeholders (public and private) to develop a common approach to forecasting the adoption and usage of EVs and re-use data, information and forecasting capabilities.

Validation of critical EV adoption and charging behaviour "drivers" into forecasts

- AEMO hosted two industry workshops, with attendees assisting AEMO to validate what was considered the most critical EV adoption and charging behaviour "drivers". These were:

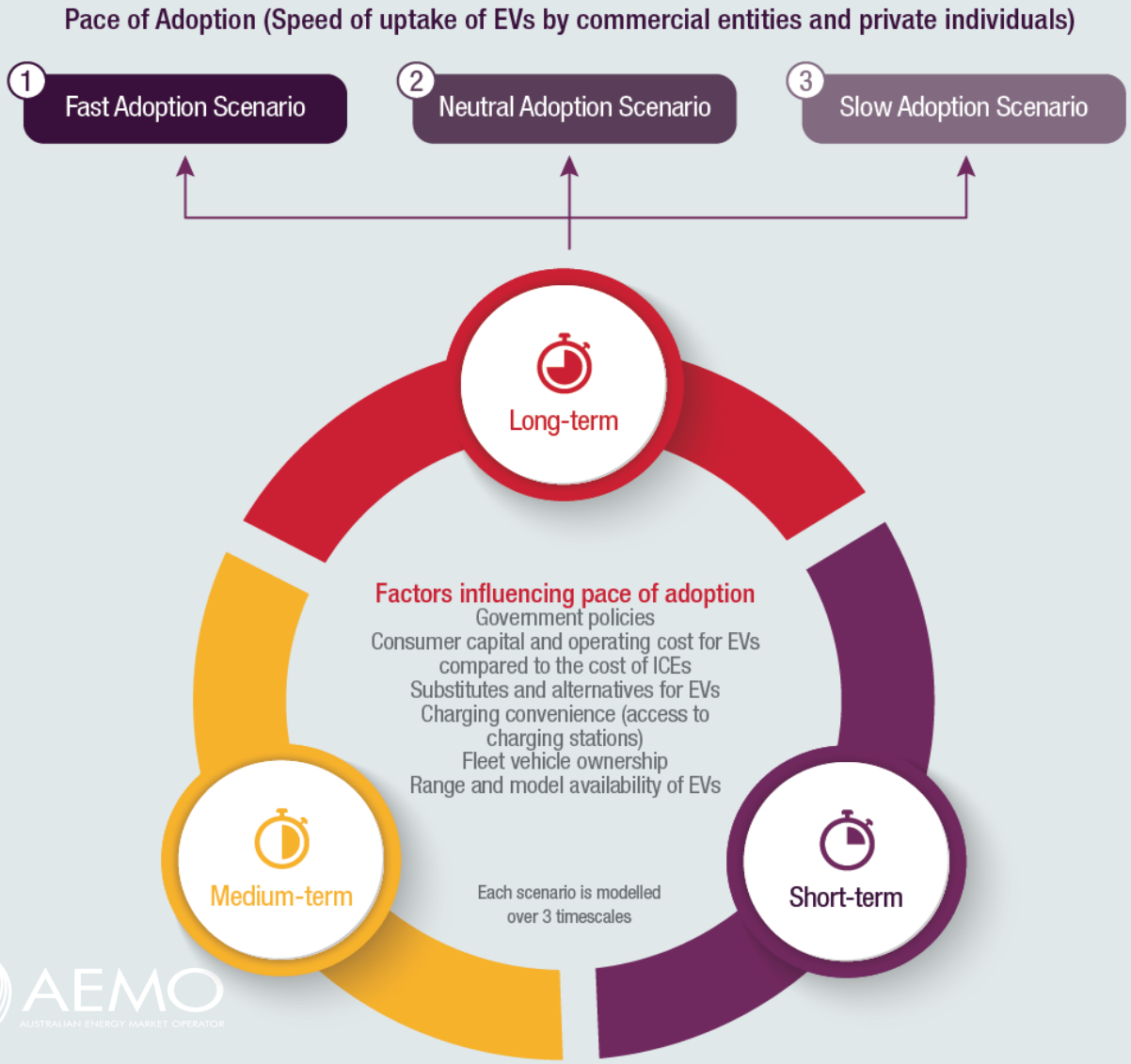
EV adoption "drivers"

- government plans and policies
- road and transport pricing
- price competitiveness of EVs versus Internal Combustion Engines (ICE)
- overall car ownership (own, leased, shared)

EV charging behaviour "drivers"

- cost of charging (wholesale and retail)
- availability and access to charging stations
- electricity tariff structures (time of day etc)
- metering and supply arrangements

EV Adoption Scenarios



This graphic illustrates the three main adoption scenarios across the three timescales and the factors influencing the adoption

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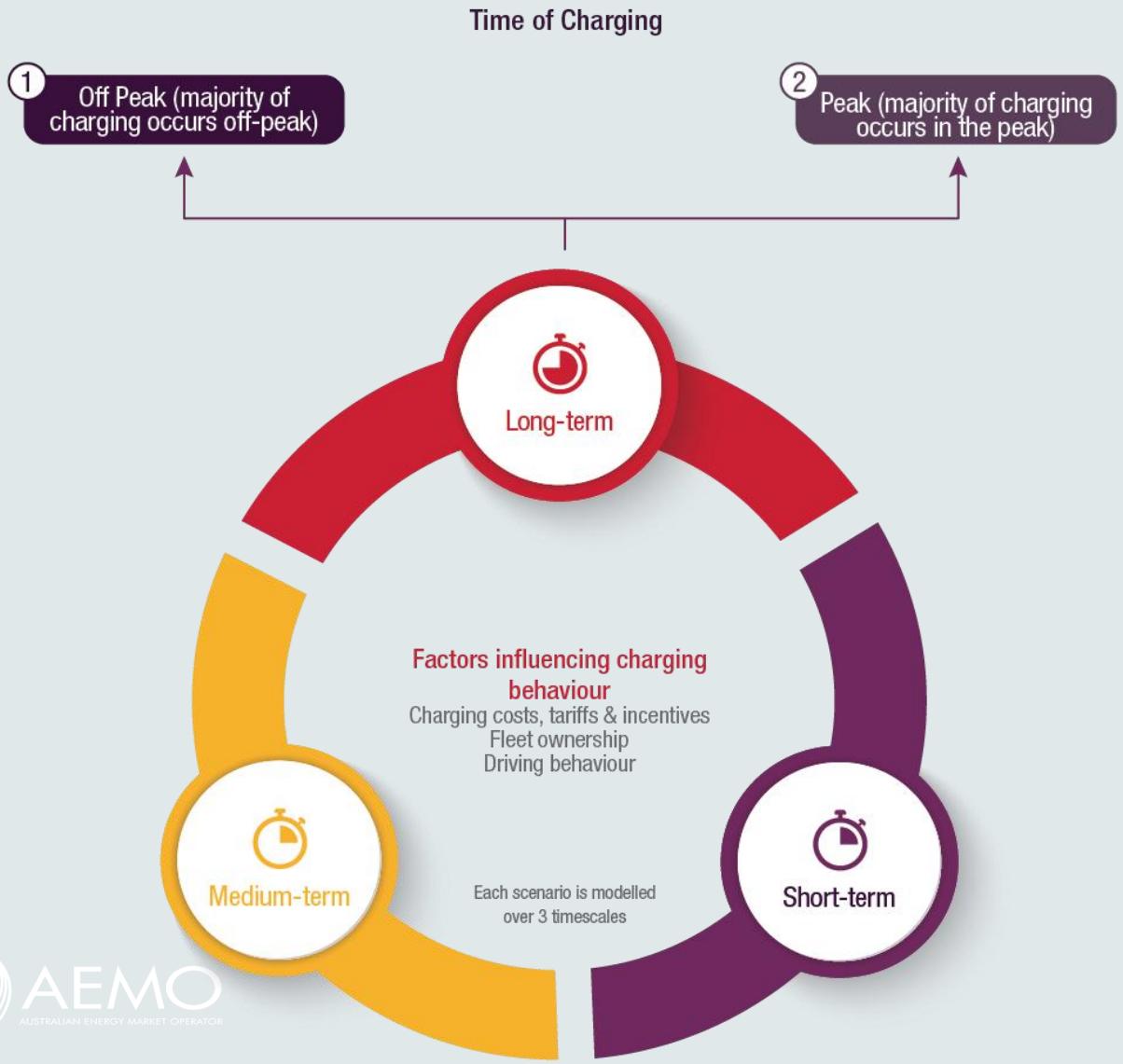
EV Charging Behaviour Scenarios



This graphic illustrates the two main charging behaviour scenarios across the three timescales and the factors influencing charging behaviour

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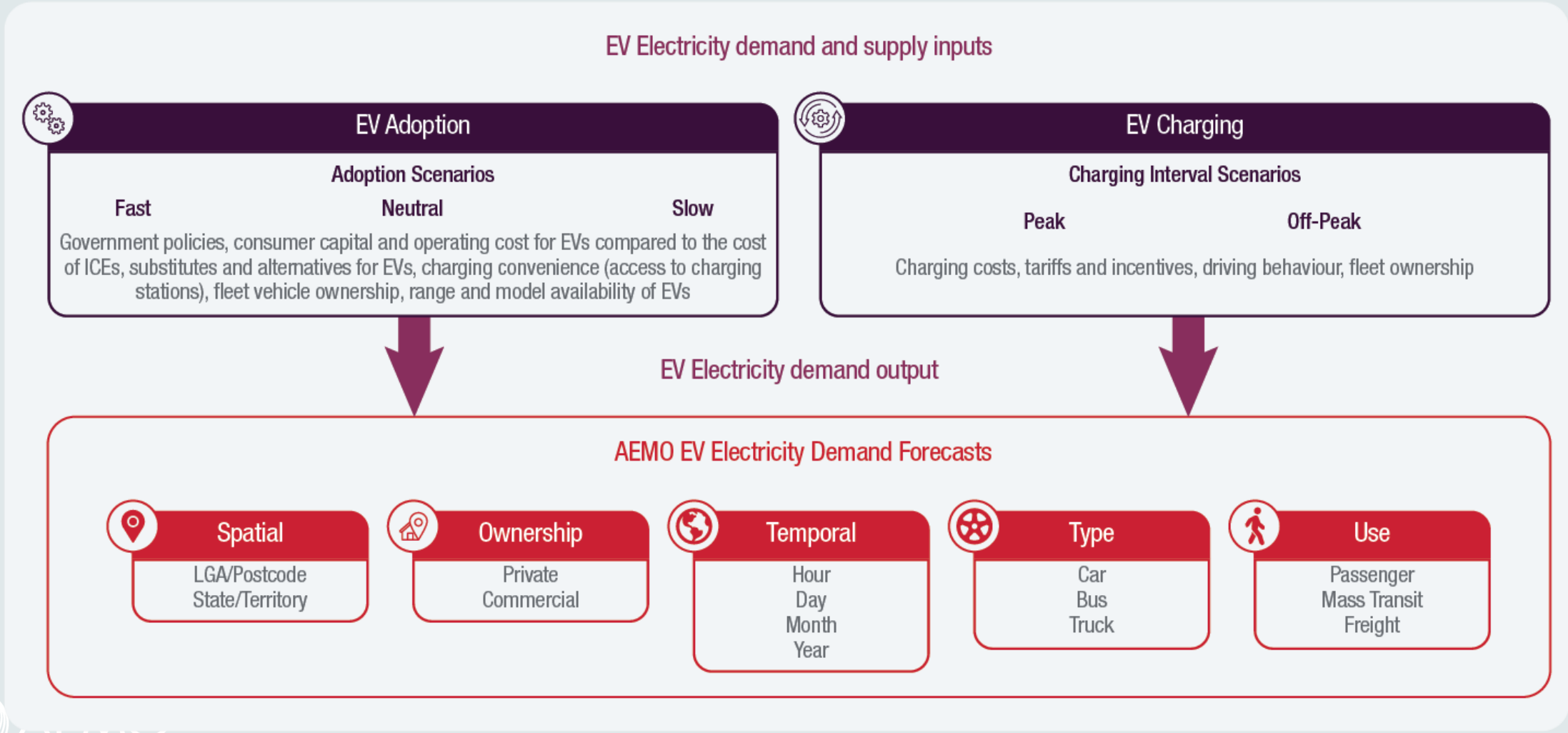
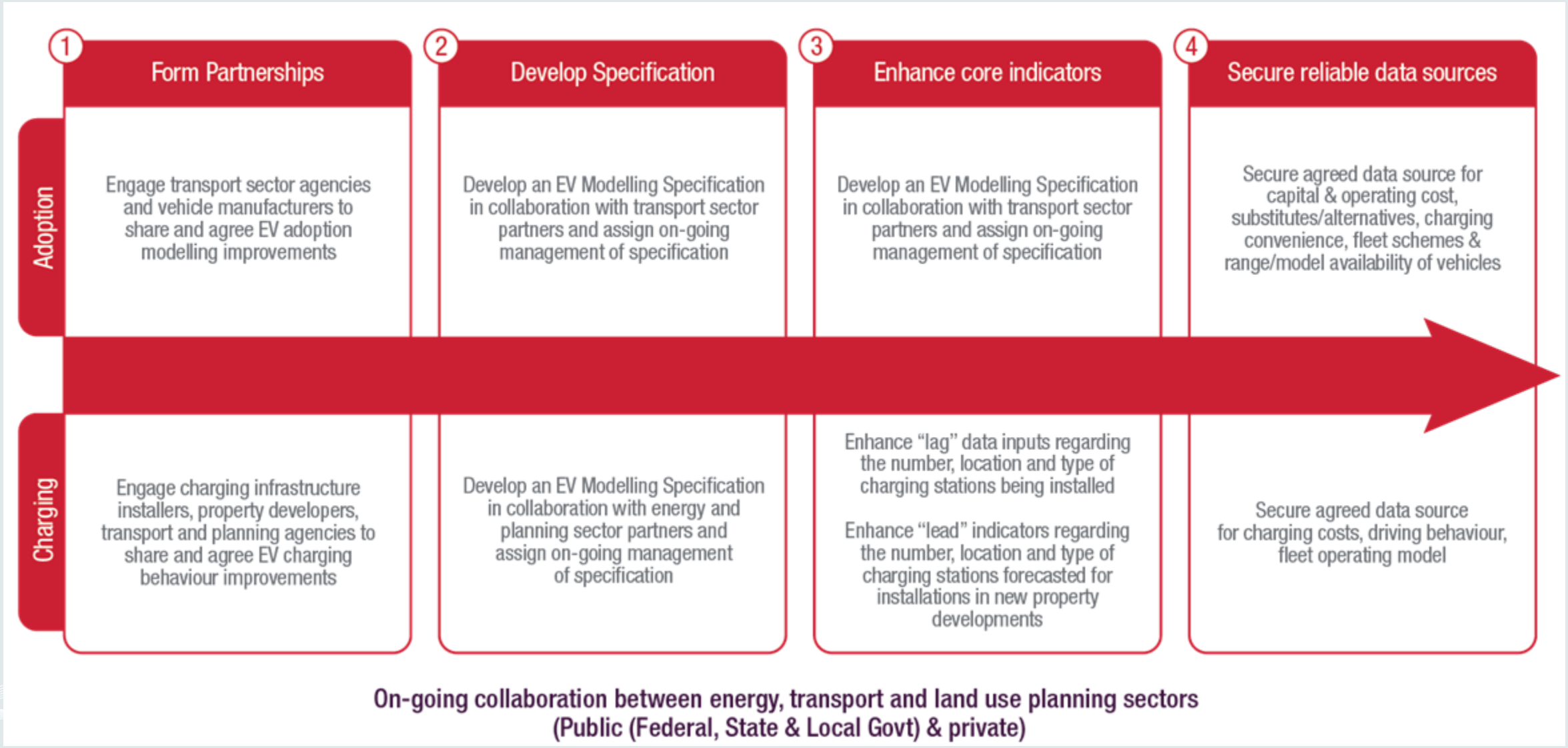
Proposed EV Modelling Approach

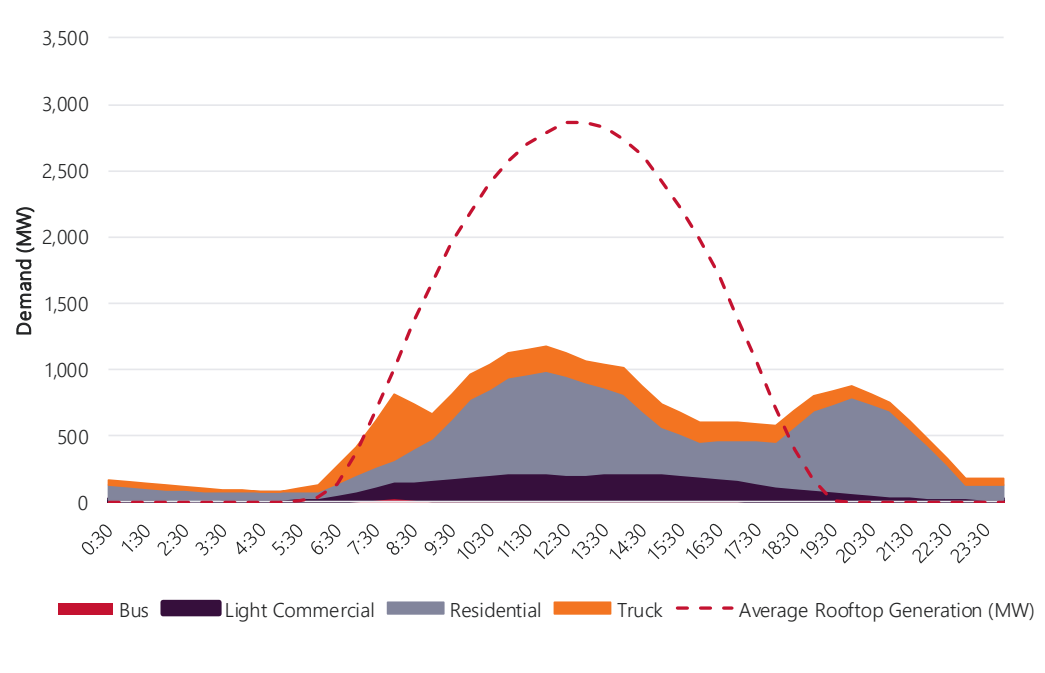


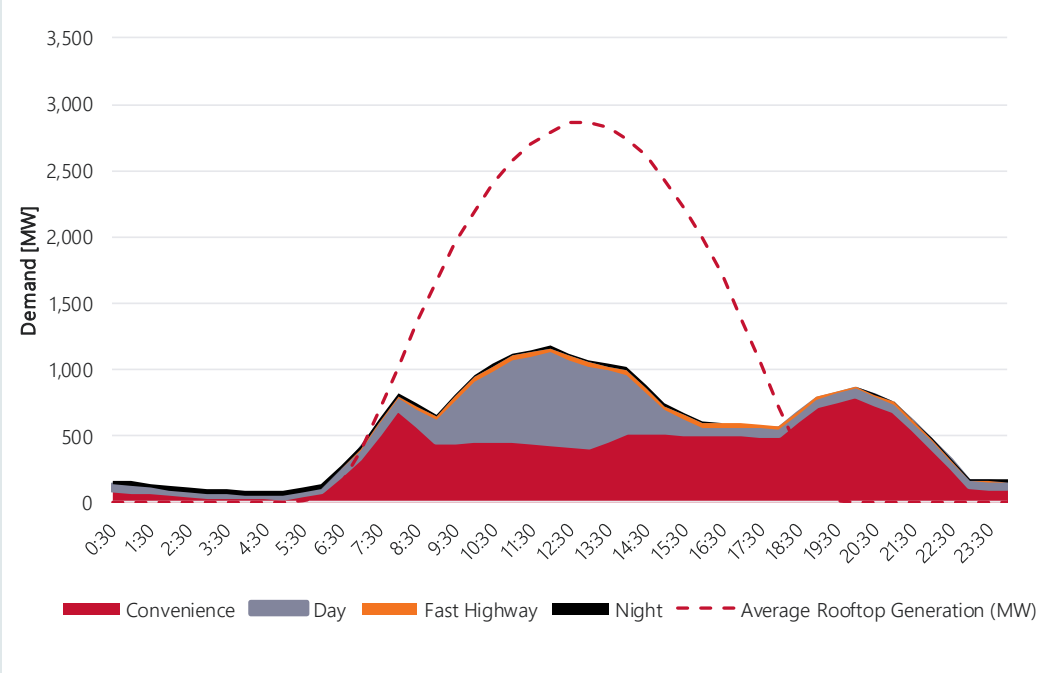
EV Modelling Roadmap



Draft Modelling Results

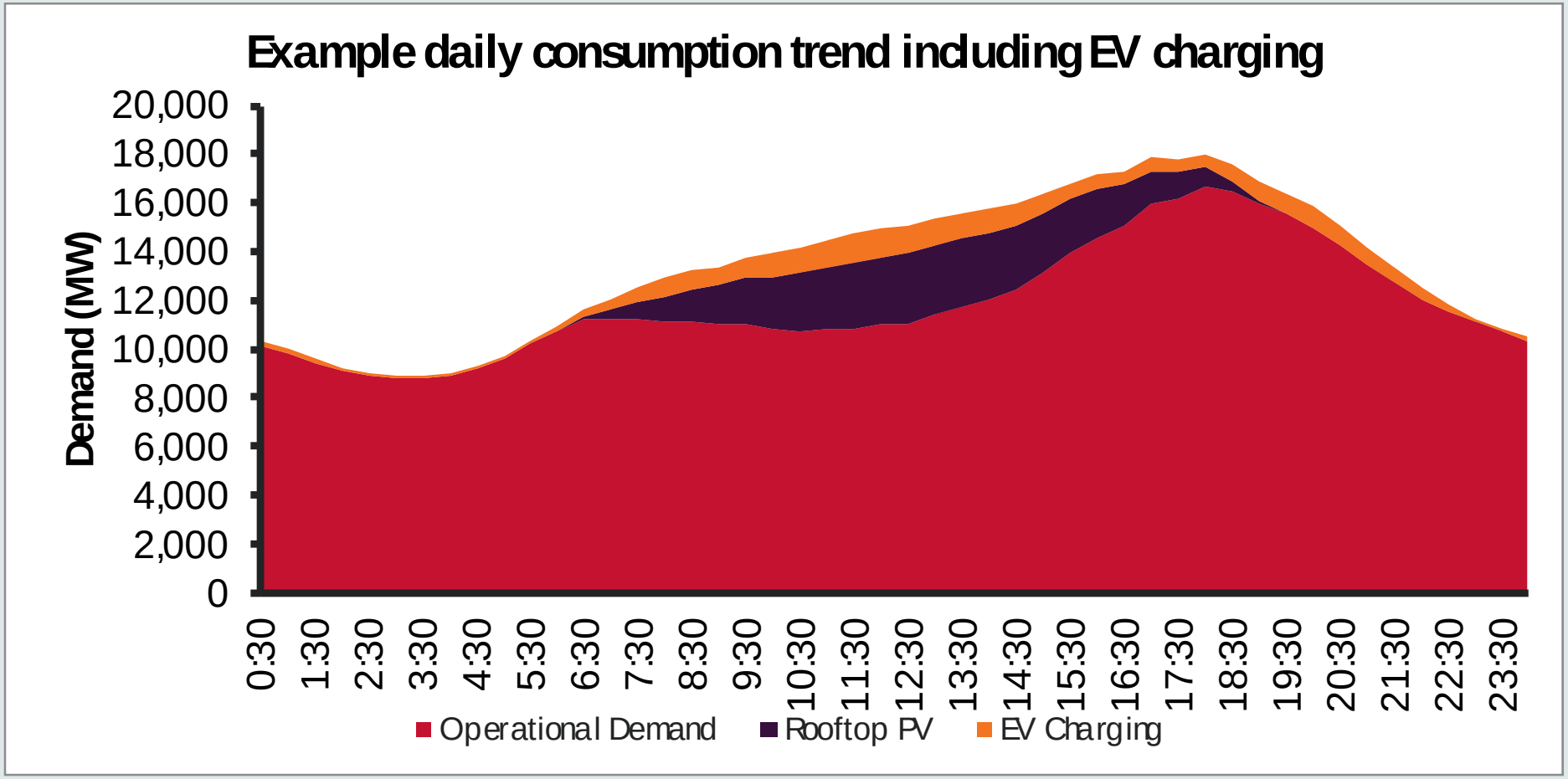
Example: Charging by type and class for NSW



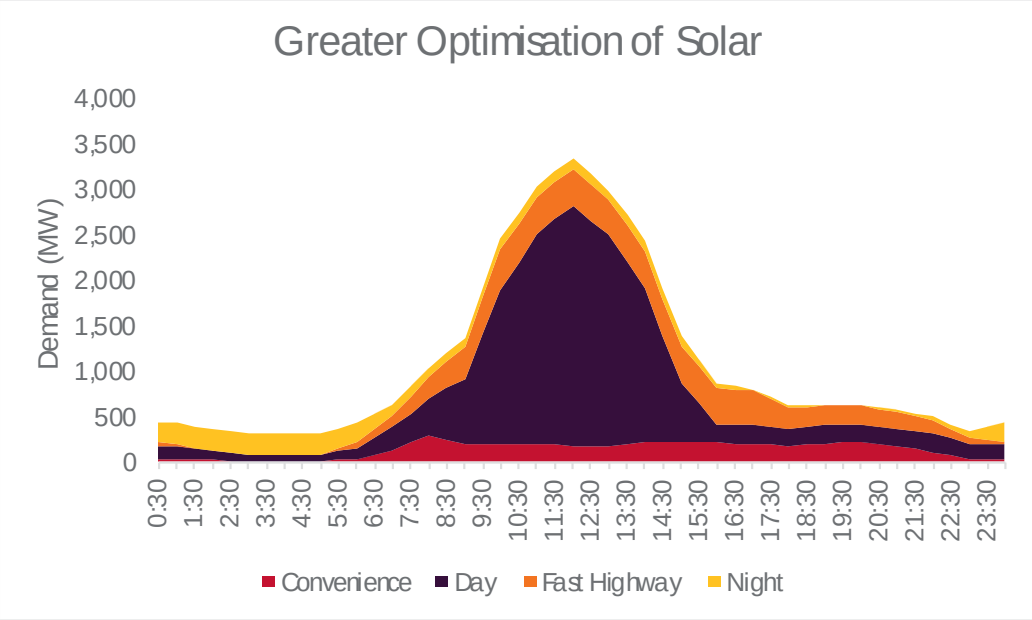


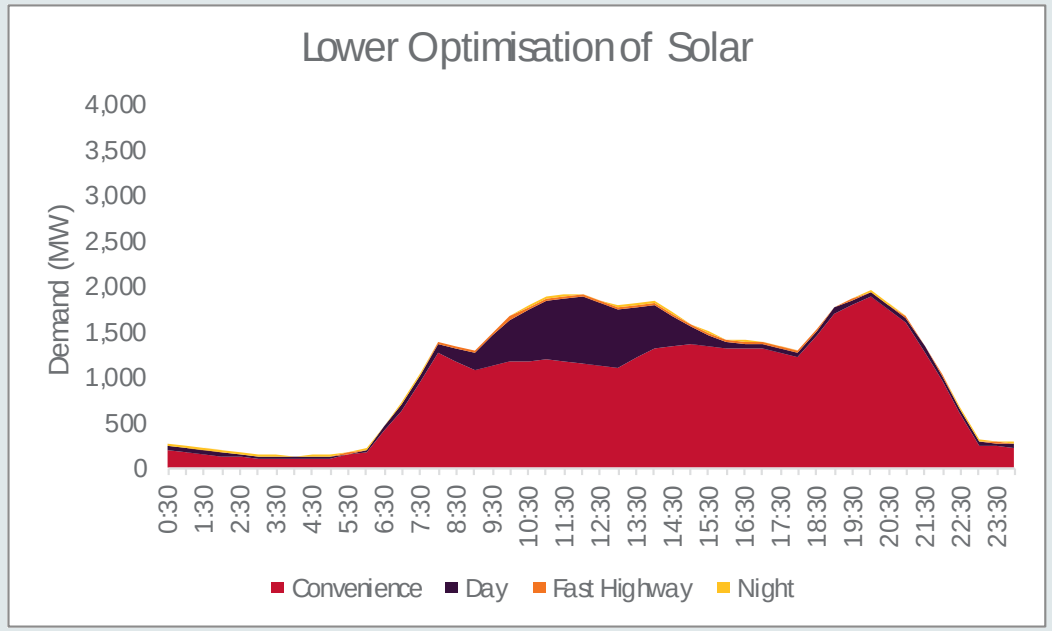
- In this example, approximately 4000 buses, 270,000 light commercial vehicles, 1,300,000 residential cars and 75,000 trucks (approximately 20% of all vehicle shares) are profiled against a possible rooftop generation forecast for NSW

Example of Applied Charge Profile



Example of Different Optimisations





- In this example, approximately 9,000 buses, 500,000 light commercial vehicles, 2,500,000 residential cars and 100,000 trucks (approximately 40% of all vehicle shares) are profiled against two charge optimisation regimes: one that has greater focus on solar utilisation and one that has a greater focus on convenience.

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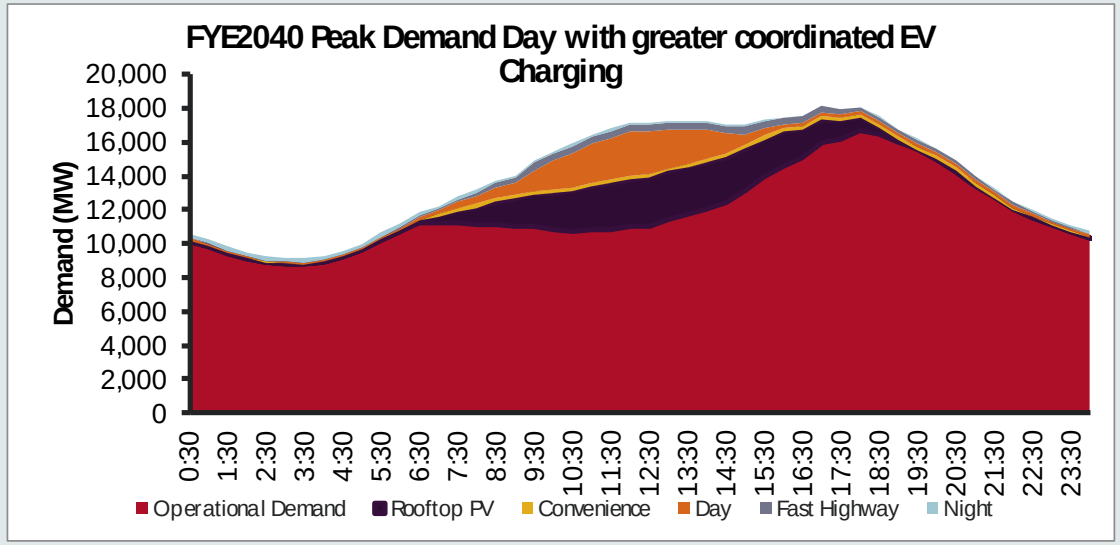
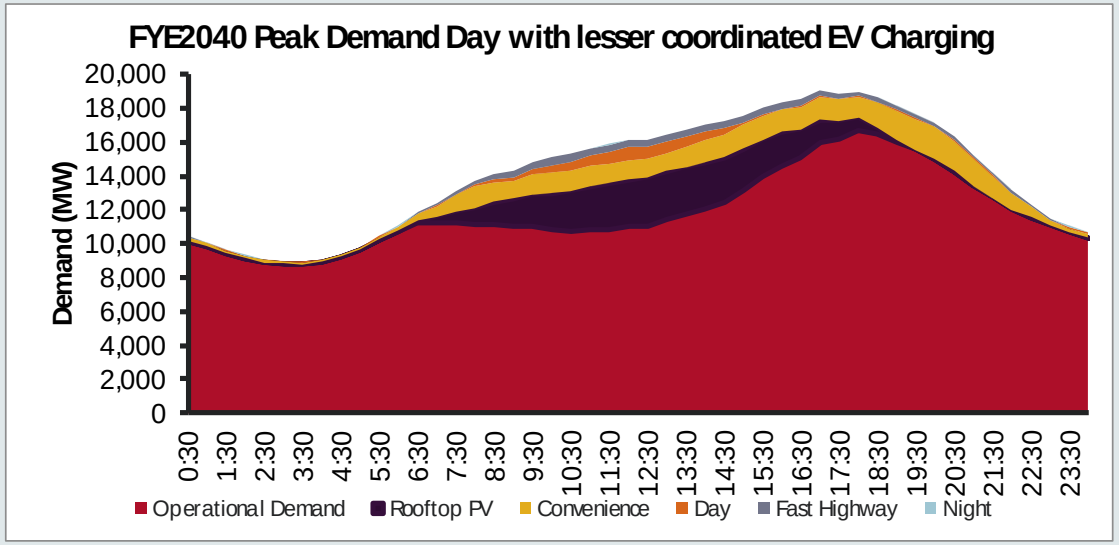
Example of Different Optimisations Applied to Day Profile





- In this simulation, trialling the two different charge regimes results in about 900 MW difference in contribution to peak demand.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