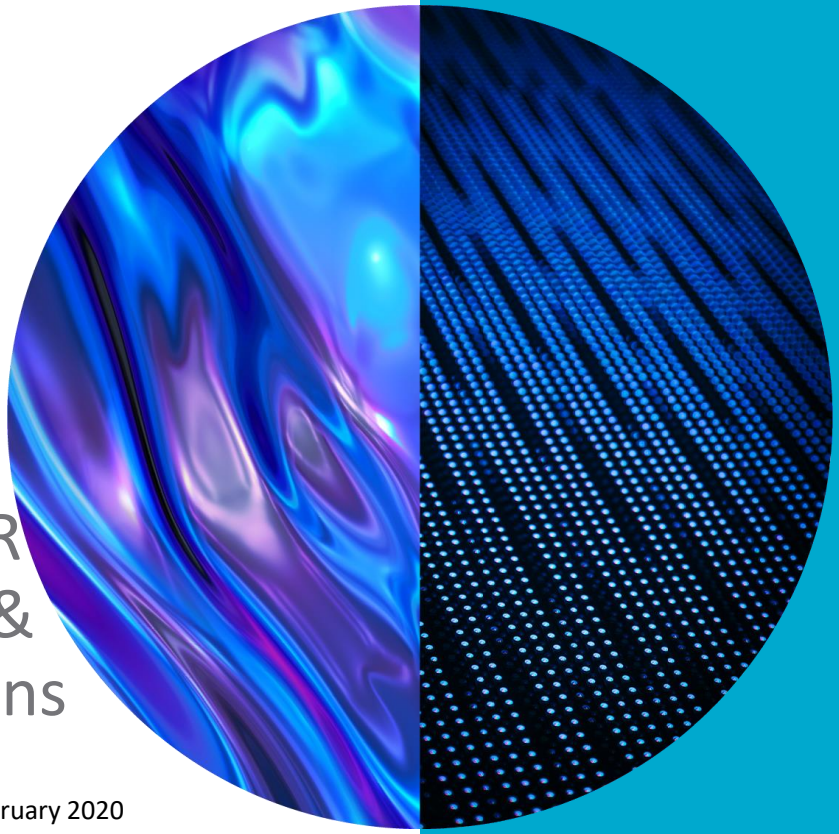


Draft DER method & projections

AEMO FRG

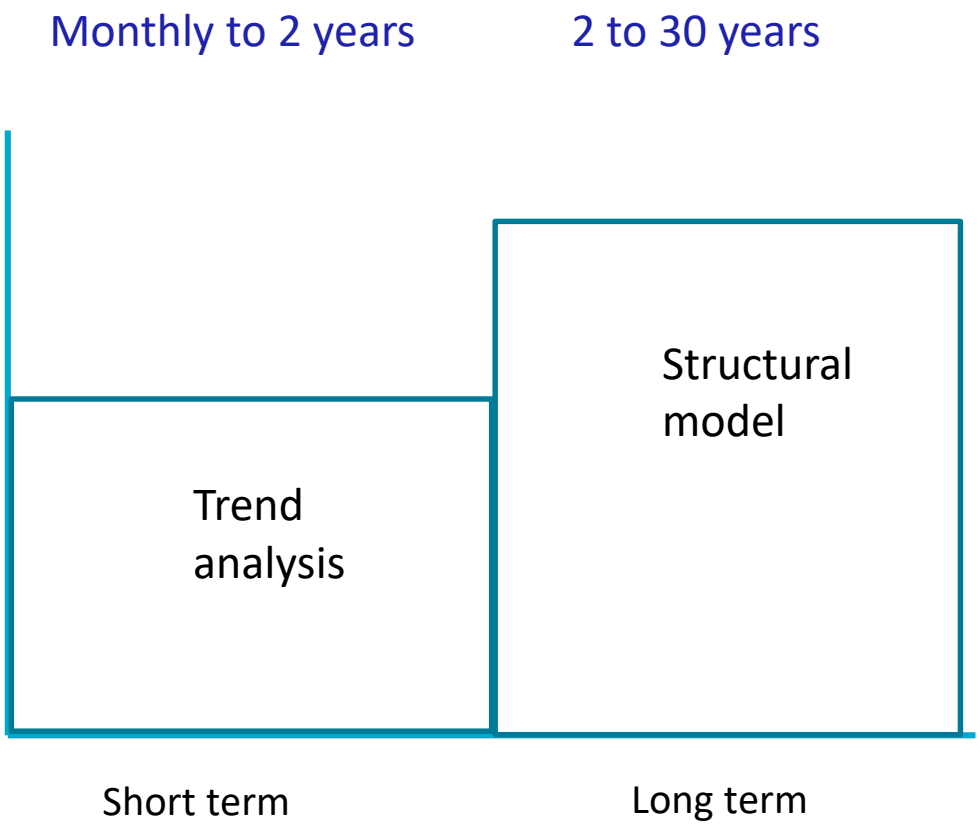
Paul Graham | 26 February 2020

Projection methodology

Focus on both short and long term outputs requires two projection methodologies

Best performance period	Method	Worst performance
Short-term	Trend extrapolation against time, regression	Beyond a few years other drivers will make continuing the trend unrealistic
Long-term	Specified theoretical relationship between social, technical and economic drivers	Short-term outcomes will diverge from theory: -Imperfect information -Delayed observations / data

Combined projection methodology



Trend analysis

Regression allows you to objectively correct in the short term for deviations from theory

- Avoids biased self-editing during period of high price / cost changes

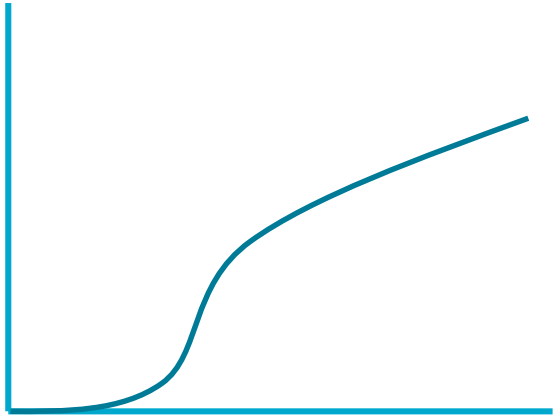
Linear regression

- $X_m = f(month\ in\ sequence, monthly\ dummy\ variable)$
- i.e. a linear annual trend with monthly variation
- Last 36 months historical data used. Some exceptions use last 24 months.
- PV under 100kW regression calculated at postcode level. PVNSG regression calculated at state level.
- Regression analysis also applied to batteries and electric vehicles on yearly basis
- Applied until June 2021-22

Adoption model

Smooth mathematical relationship imposed.
Population level emergent behaviour.

Share



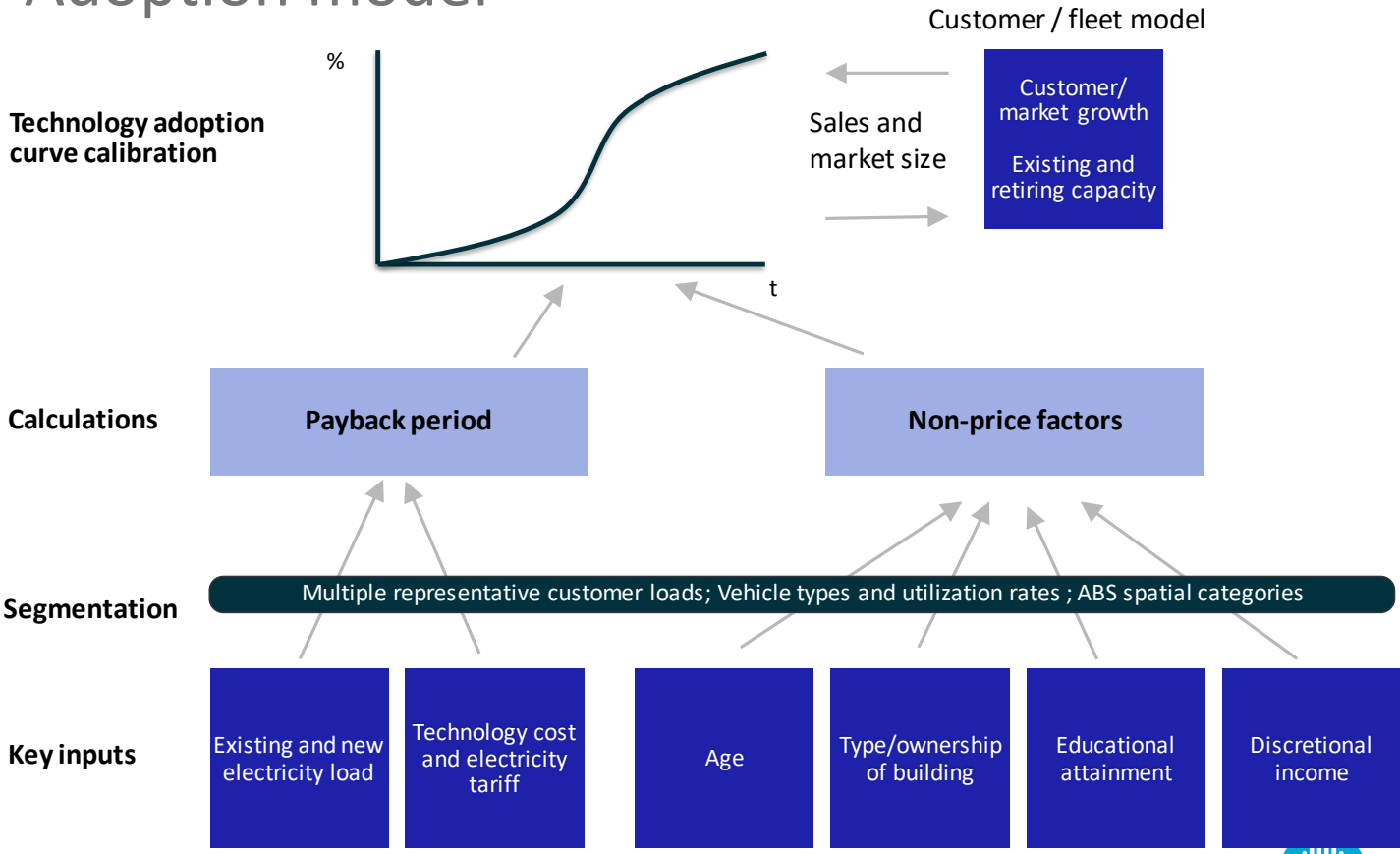
Payback

Payback is a function of costs, prices and policy which can be non-smooth.
Saturation can be reached abruptly

Share

Time

Adoption model



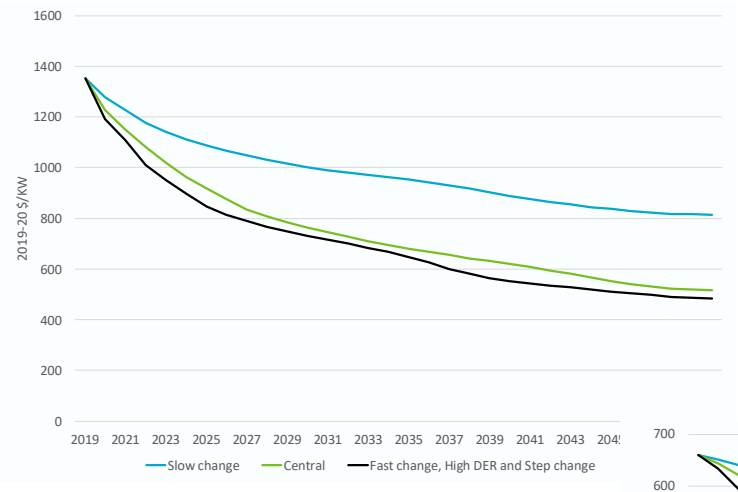
Adoption model

- There is an adoption curve for each SA2 level region
- The shape of the adoption curve is set as a function of:
  - Current market share in the SA2 region
  - Demographic characteristics of the region
  - Scenario assumptions about future market limits defined by infrastructure and business model innovation

- The saturation level of the adoption curve is only reached if the payback period is low
  - The financial assumptions therefore have a significant impact on the timing and size of adoption

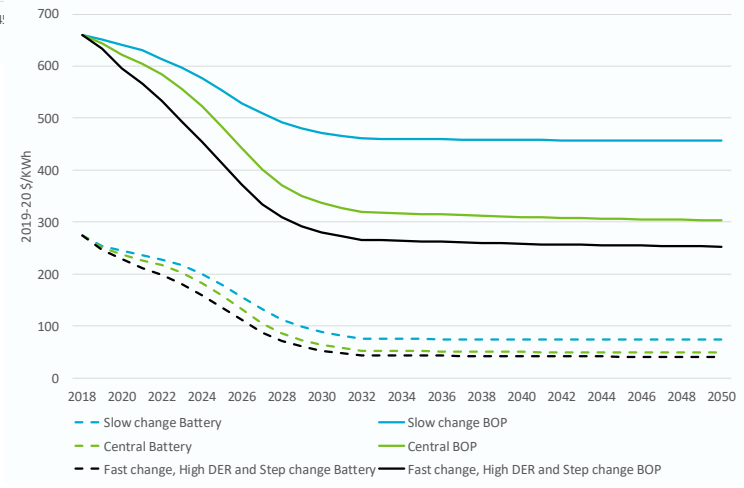
Draft assumptions and results

Cost assumptions



Rooftop PV
-Potential for payback period to keep improving through whole projection period

Batteries
- Stable after 2030s



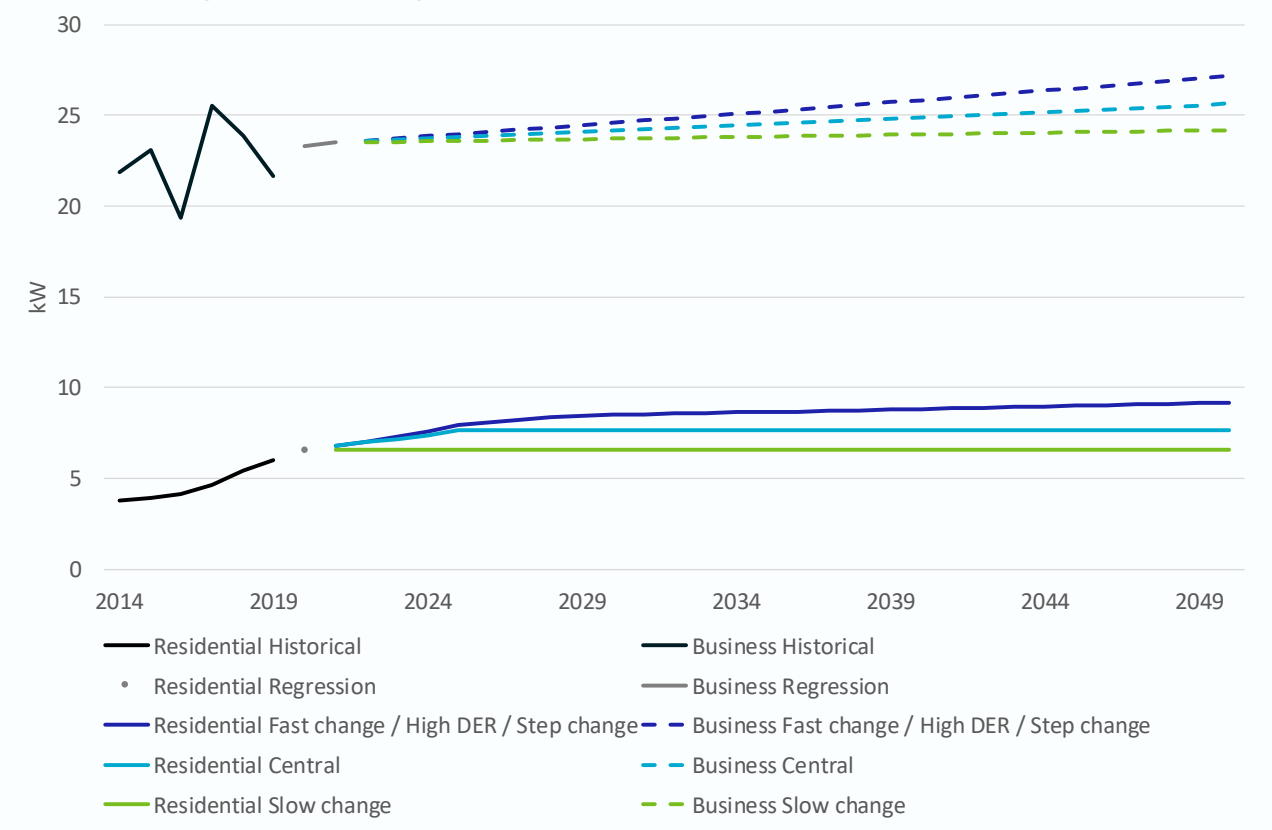
PV panel size

- CSIRO 2018 projections included increasing residential sizes of between 5kW and 7kW
- CSIRO 2019 projections assumed convergence at size of 5kW to reflect increasing constraints imposed by networks with 6.6kW units assumed to be a short term aberration

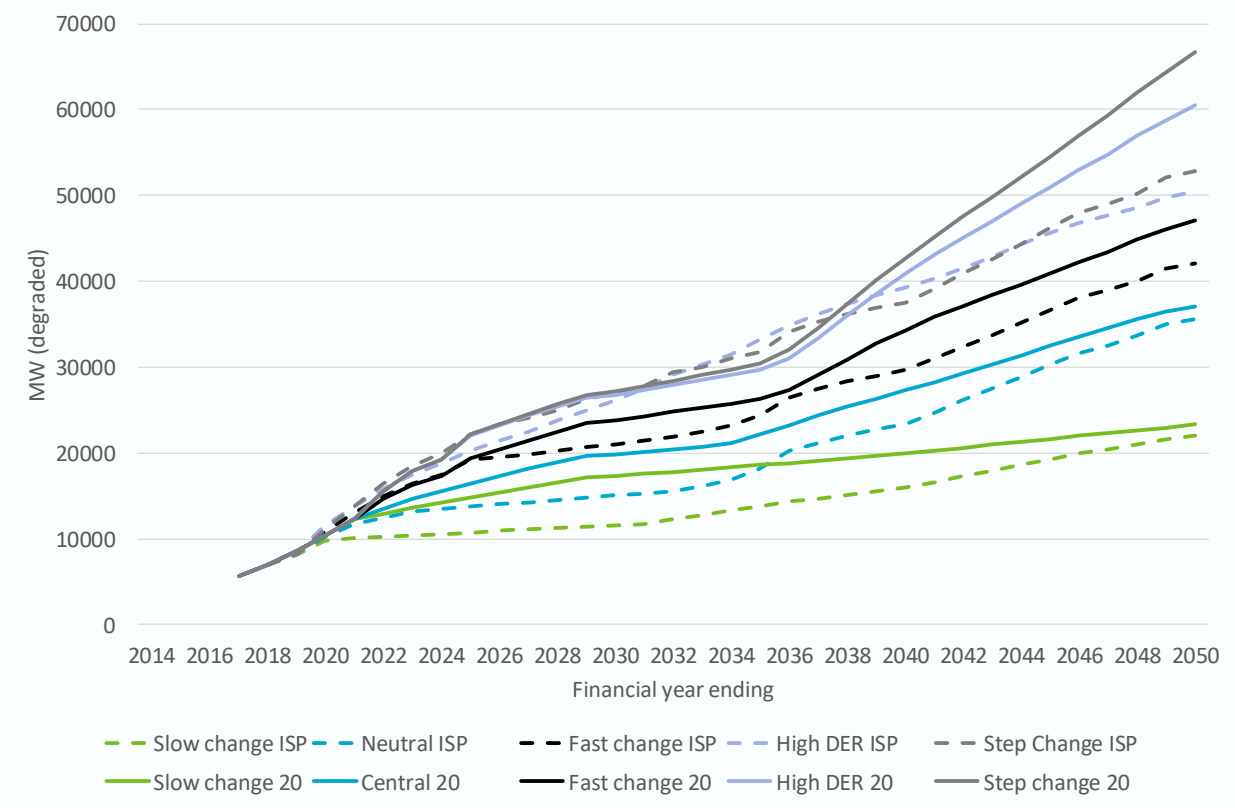
Current approach

- Trend analysis applied for 2019-20 (residential) and 2020-21 (commercial)
- Slow change: convergence to 6.6kW
- Central: convergence to 7.6kW
- Remainder: convergence to just under 10kW

Rooftop solar panel size



Preliminary results: Res & Com PV <100kW

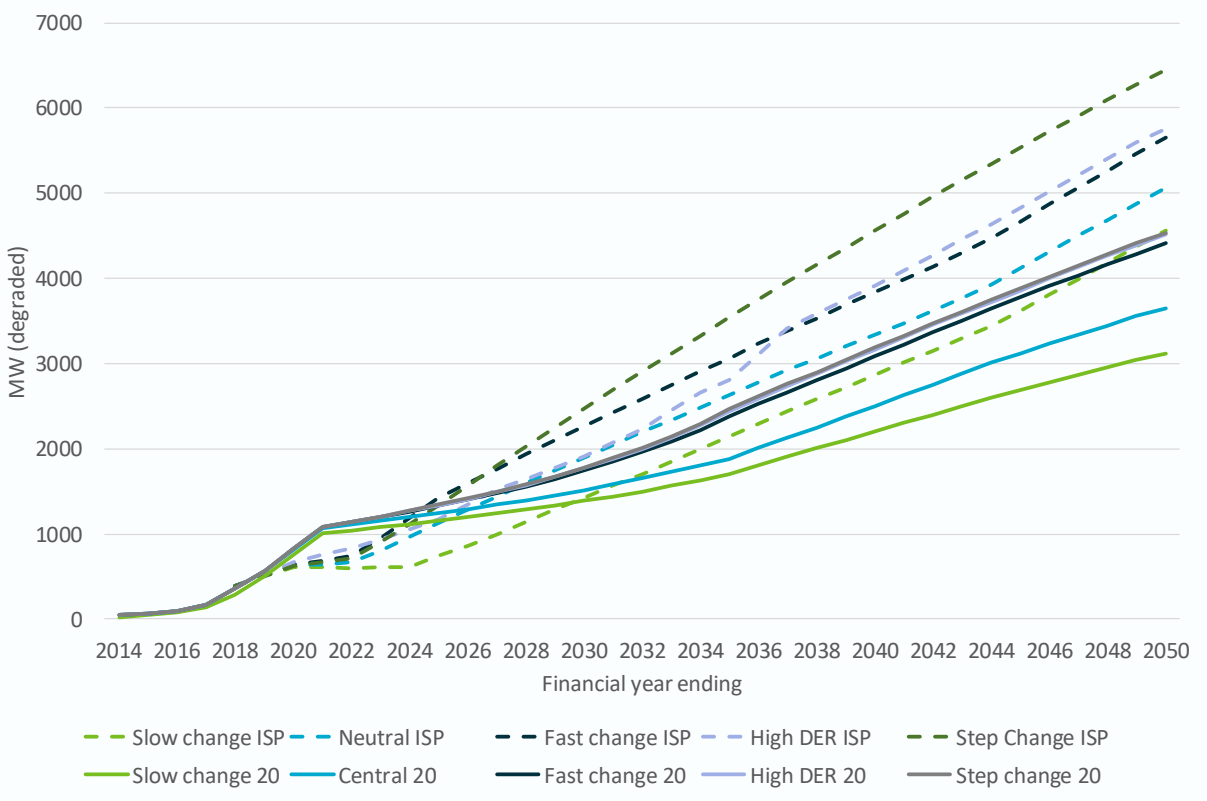


PVNSG assumptions

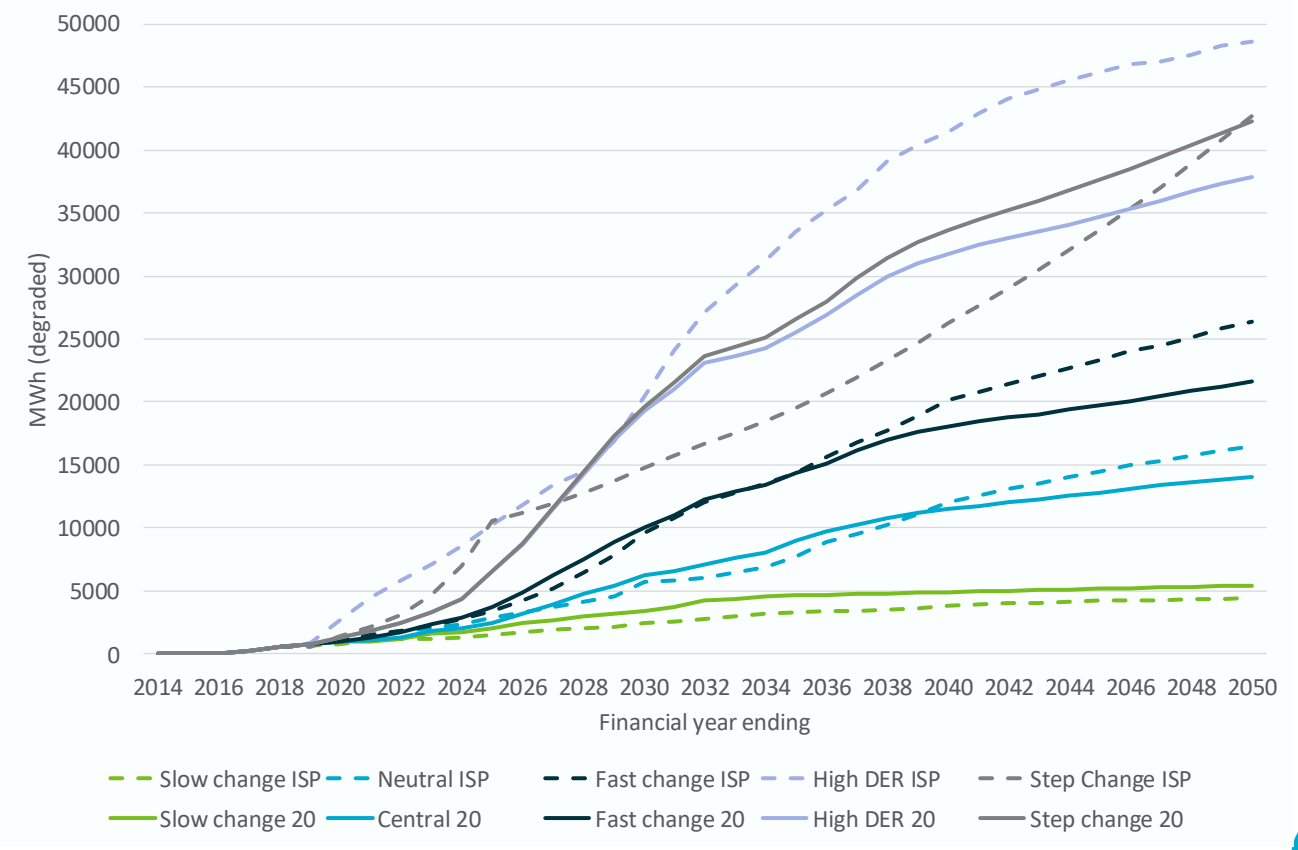
Key changes

- In 2019 we previously assumed QRET and VRET would provide a source of subsidy post the expected LGC price decline
  - We now assumed those subsidies will go to larger scale soalr farms
- New source of subsidies post LGC price decline included in the modelling
  - Emission reduction fund ACCUs at ~ $12/MWh
  - Victorian Energy Efficiency Credits at ~ $28/MWh

Preliminary results: PVNSG



Preliminary results: Res & Com batteries



Drivers of EV results

- Earlier or later arrival of upfront cost parity point
  - Slow change 2035, Central 2030, remainder 2025
  - Short range EV only. Long range is comparable on full cost of travel basis

- Maximum market share
  - Payback goes to zero after parity and so MMS assumptions hold for remaining period *[Feedback on MMS has been noted and only partially implemented]*

- Maximum import constraints also included given very low starting point

- A low new car sales rates limits ability to replace existing fleet
  - Low at present and slowed by future increase in rideshare

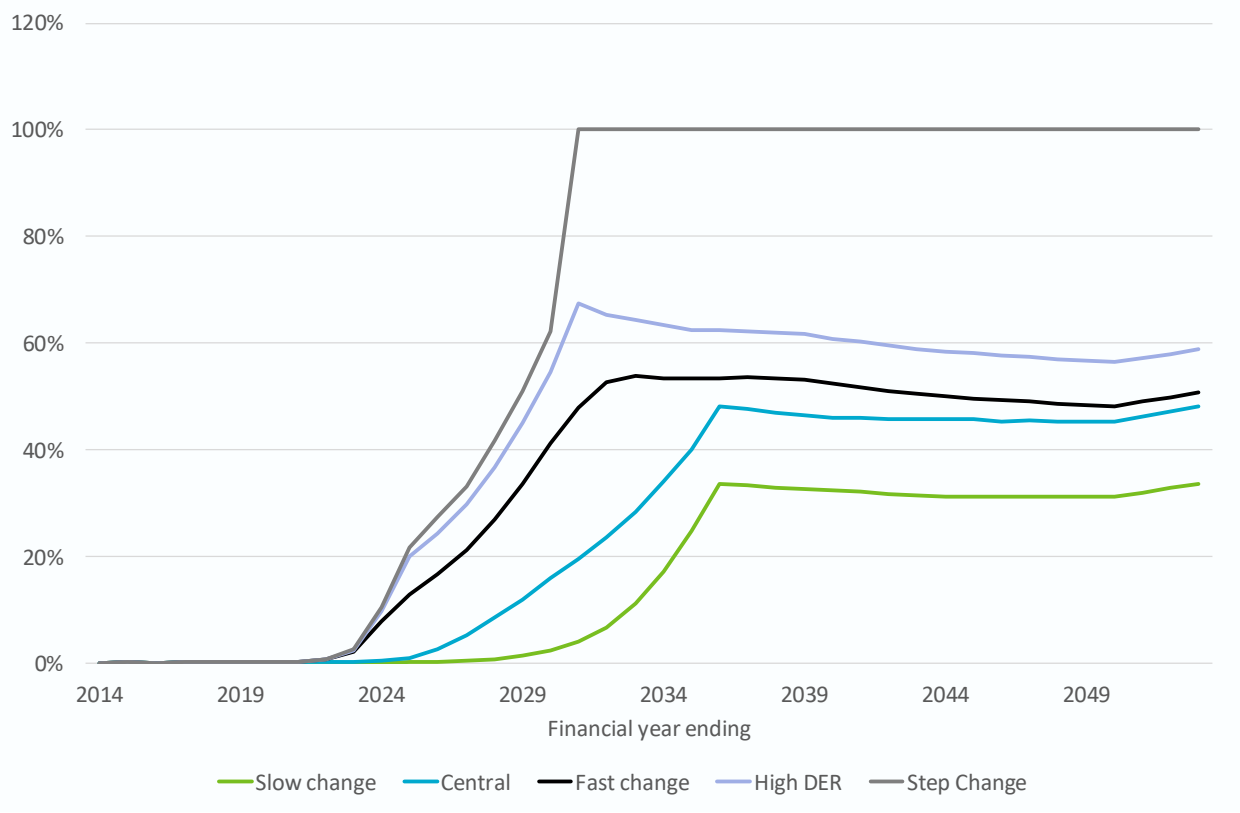
Drivers of EV results: why not 100%?

- Zero emission vehicles would be a low costs contribution to economy wide abatement.

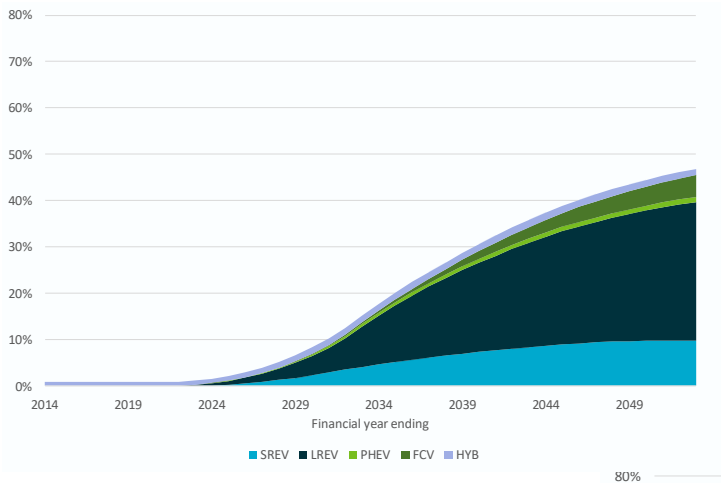
- But would require 100% sales rate from late 2020s to deplete ICE fleet
  - Implies some sort of ICE sales ban. Is that politically feasible?
  - Or some sort of forced/paid ICE scrapping scheme

- Implies no role for FCVs or biofuels

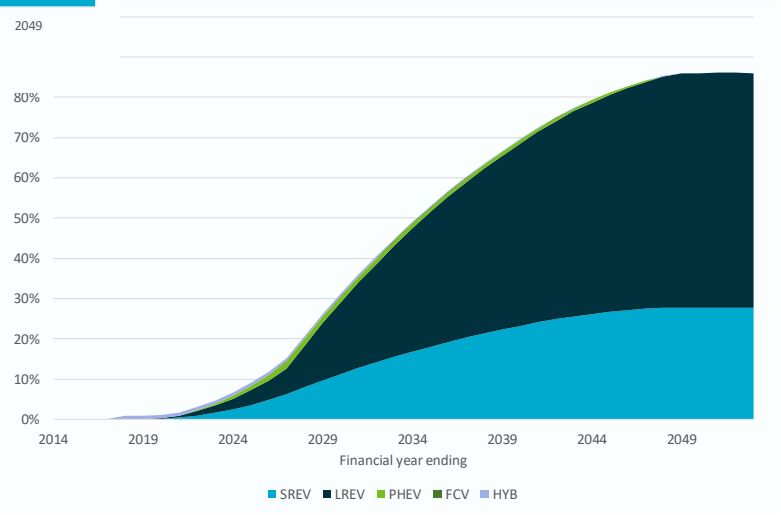
Preliminary results: EV sales share



Preliminary results: Fleet share

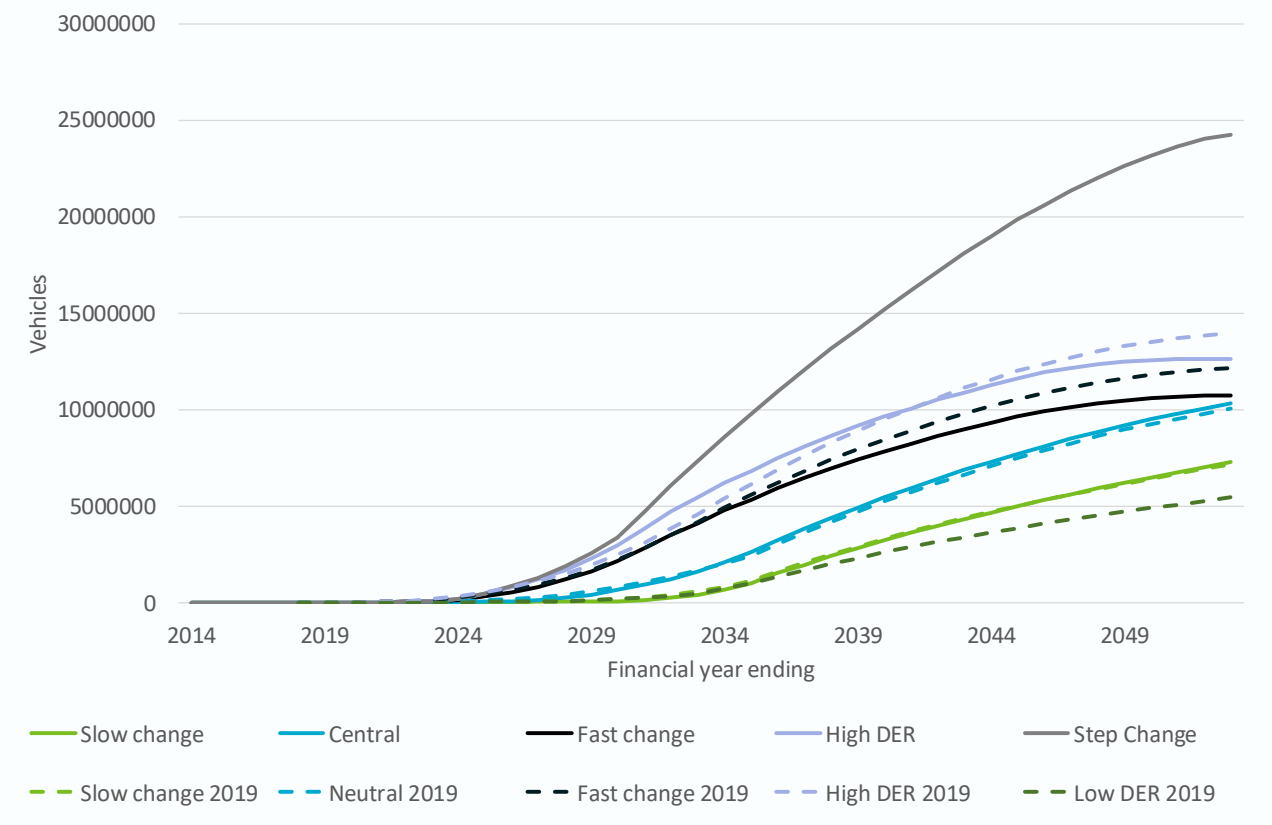


Central

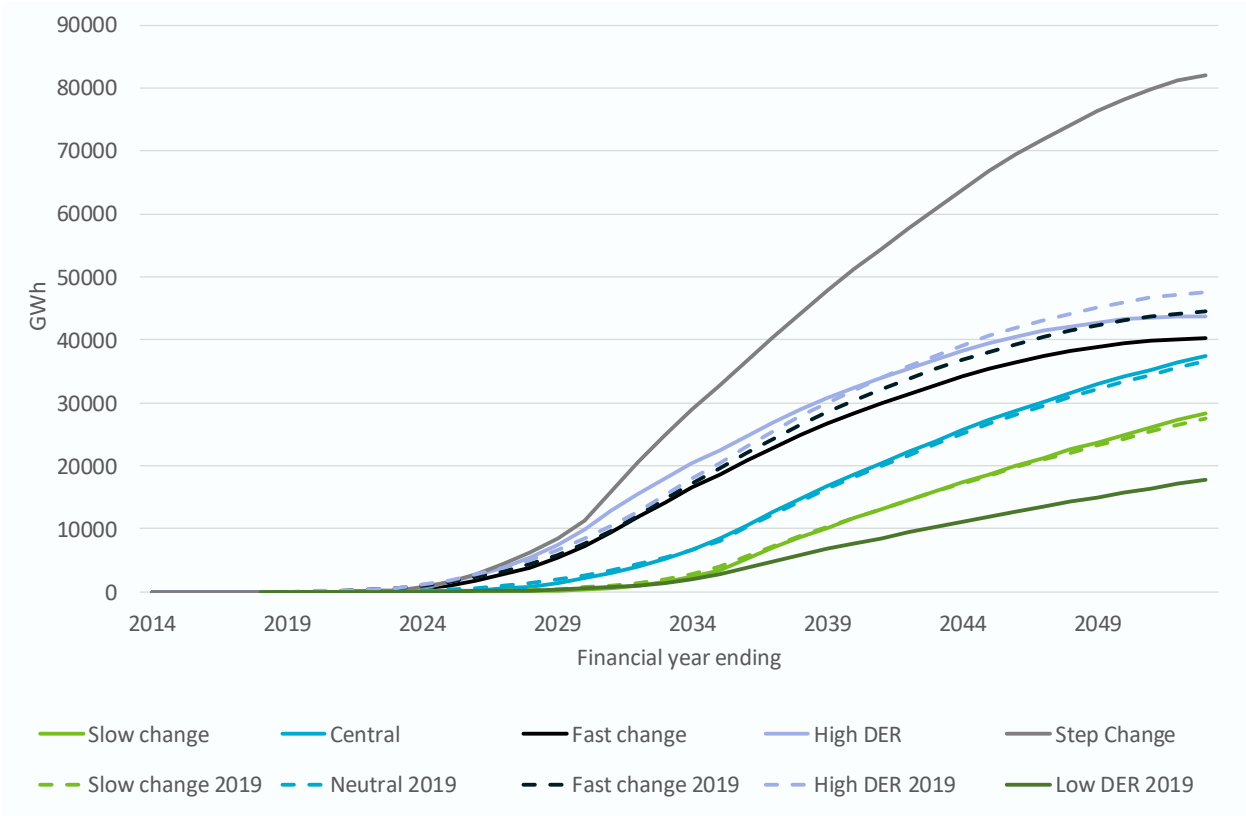


Step change

Preliminary results: EV numbers



Preliminary results: EV consumption



Thank you

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Appendix: Battery and EV profiles

Battery profiles

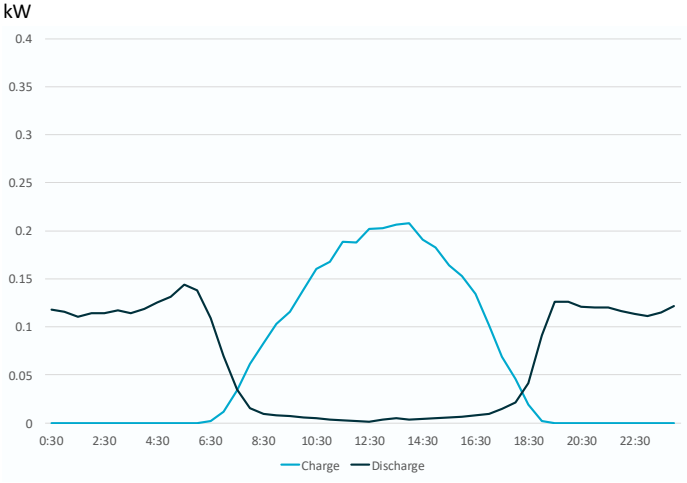
- Solar shift
  - Charge if solar generation > consumption and not full
  - Discharge if detect imports and not empty

- TOU
  - Current price structure can lead to undesirable coincident battery behaviour depending on degree of price changes, device sizes and season
  - Simulation of customers: res & com saves 6 & 8% respectively on annual bill
  - Future flexible price structure based may be based on wholesale price and converge with VPP behaviour

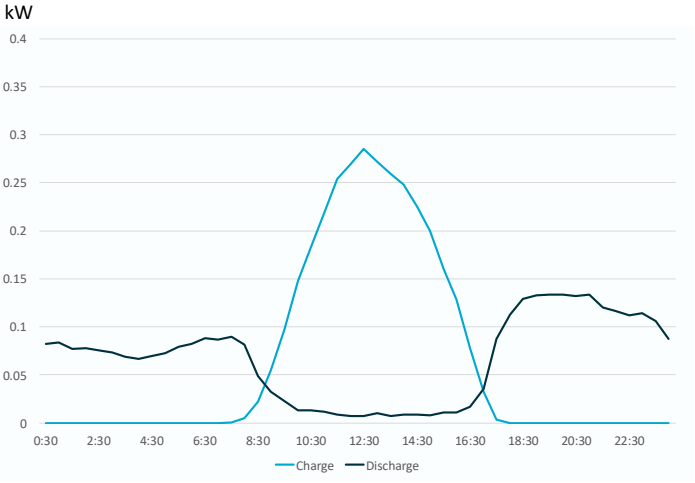
Battery profiles: Residential shift solar

Average of 45 customers, Victoria

Summer



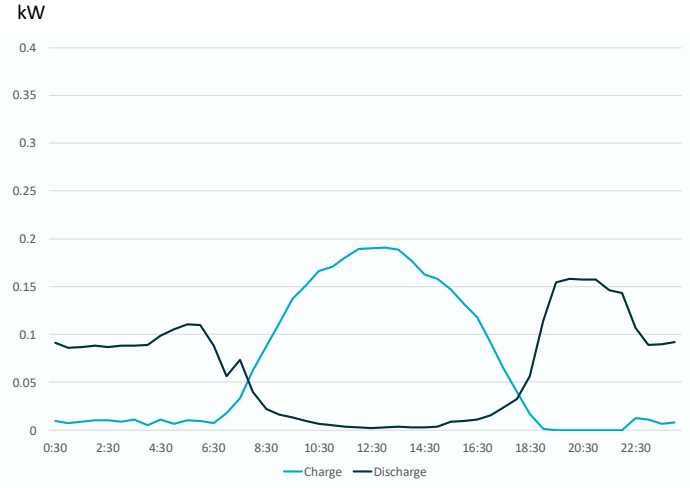
Winter



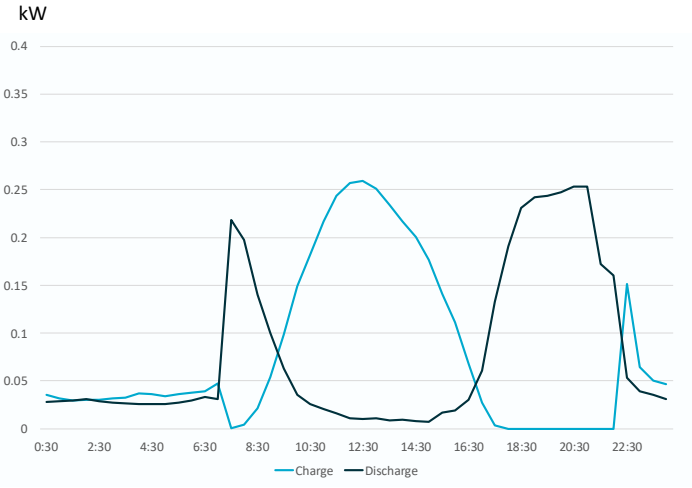
Battery profiles: Residential TOU

Average of 45 customers, Victoria

Summer



Winter

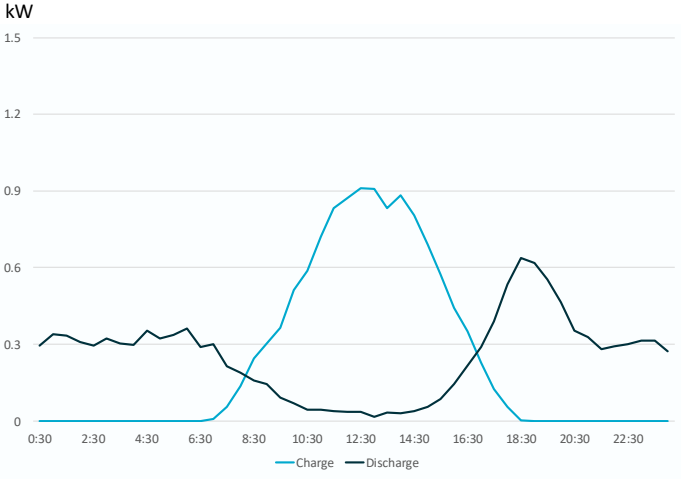


Strong discharge in early morning and evening price periods with charging to prepare for those periods

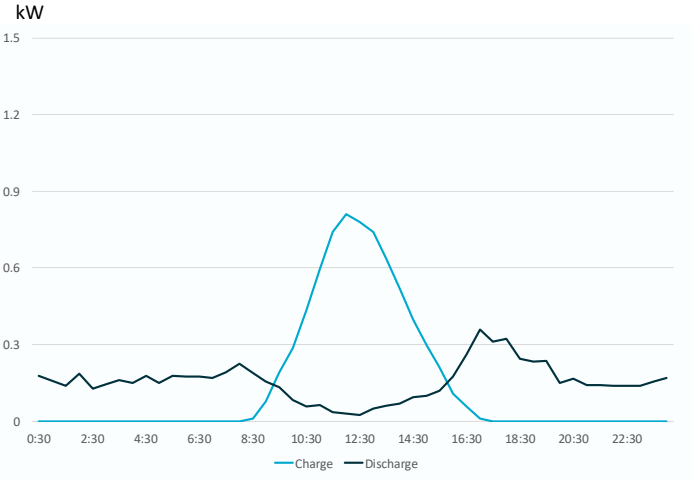
Battery profiles: Commercial shift solar

Average of 20 customers, Victoria

Summer



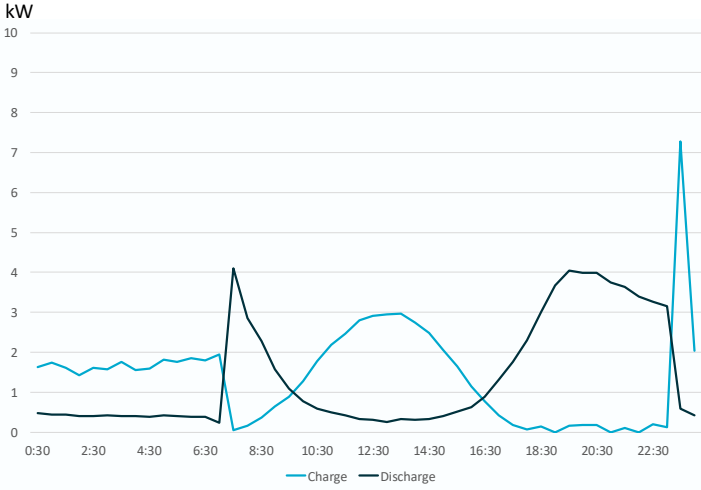
Winter



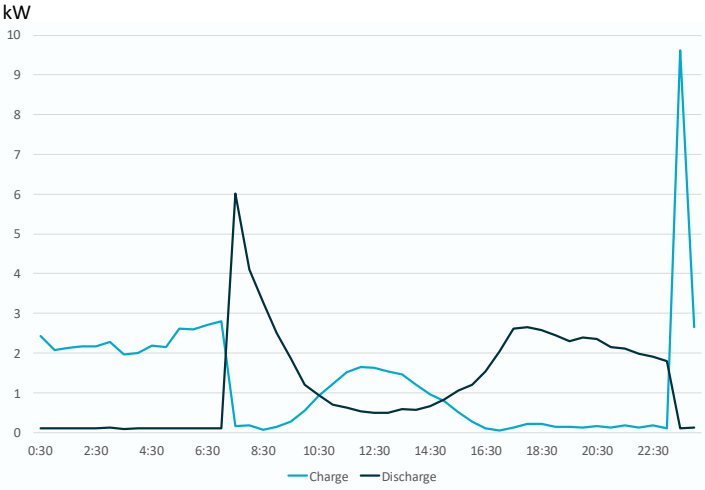
Battery profiles: Commercial TOU

Average of 20 customers, Victoria

Summer

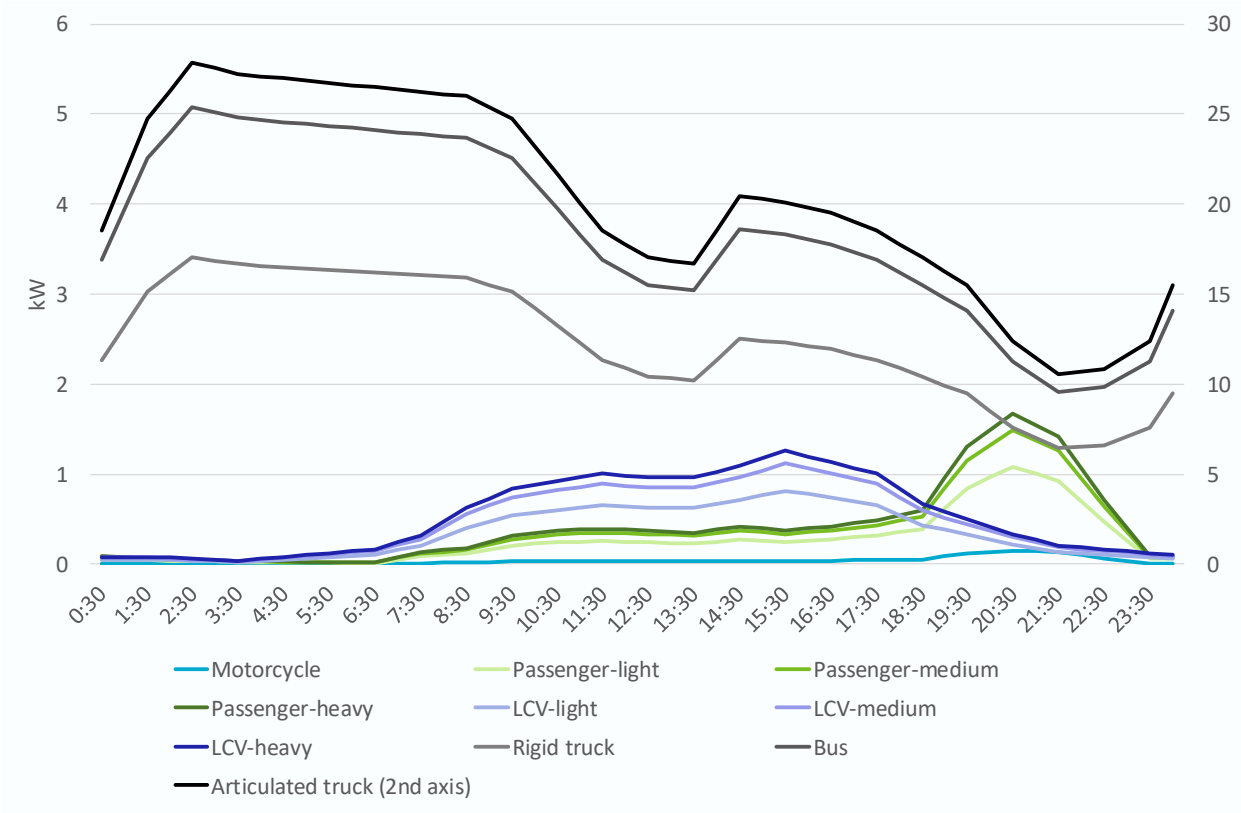


Winter

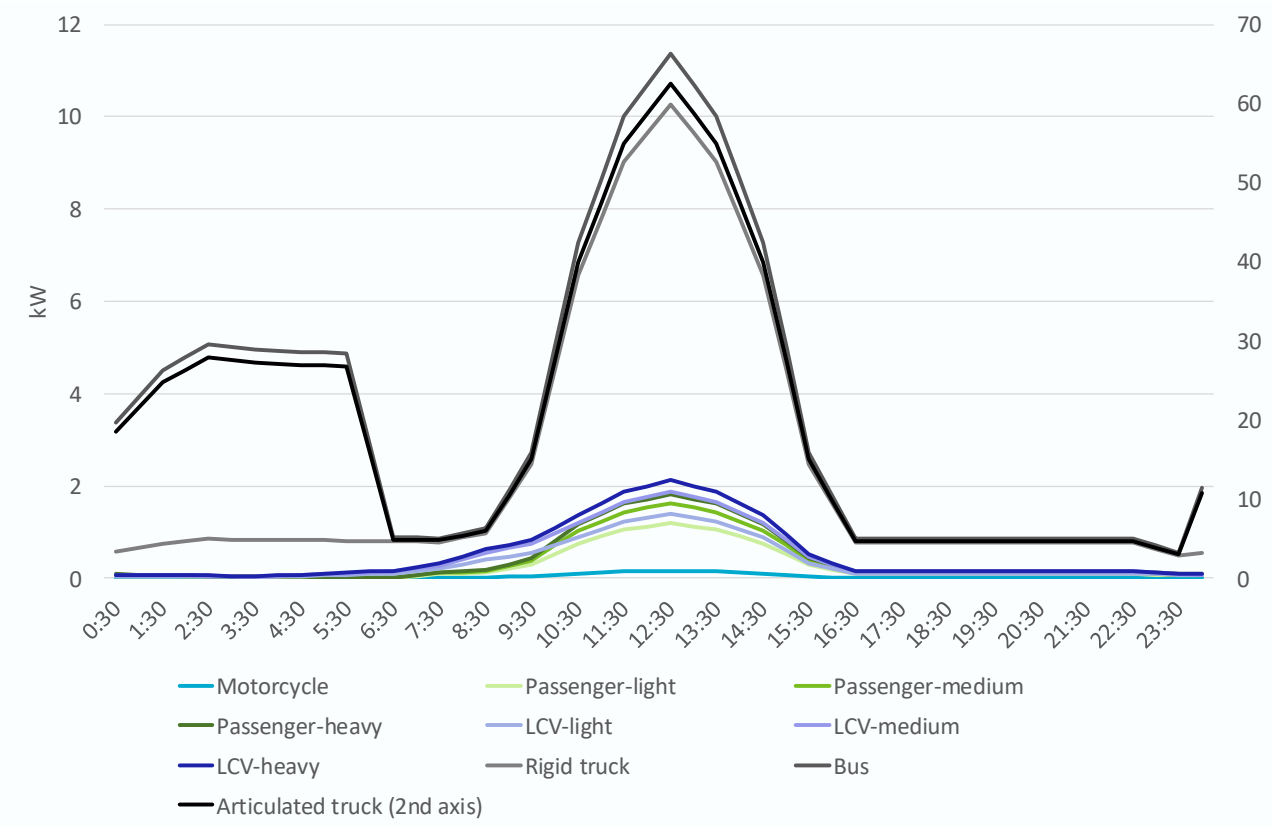


Strong discharge in early morning and evening price periods with charging to prepare for those periods

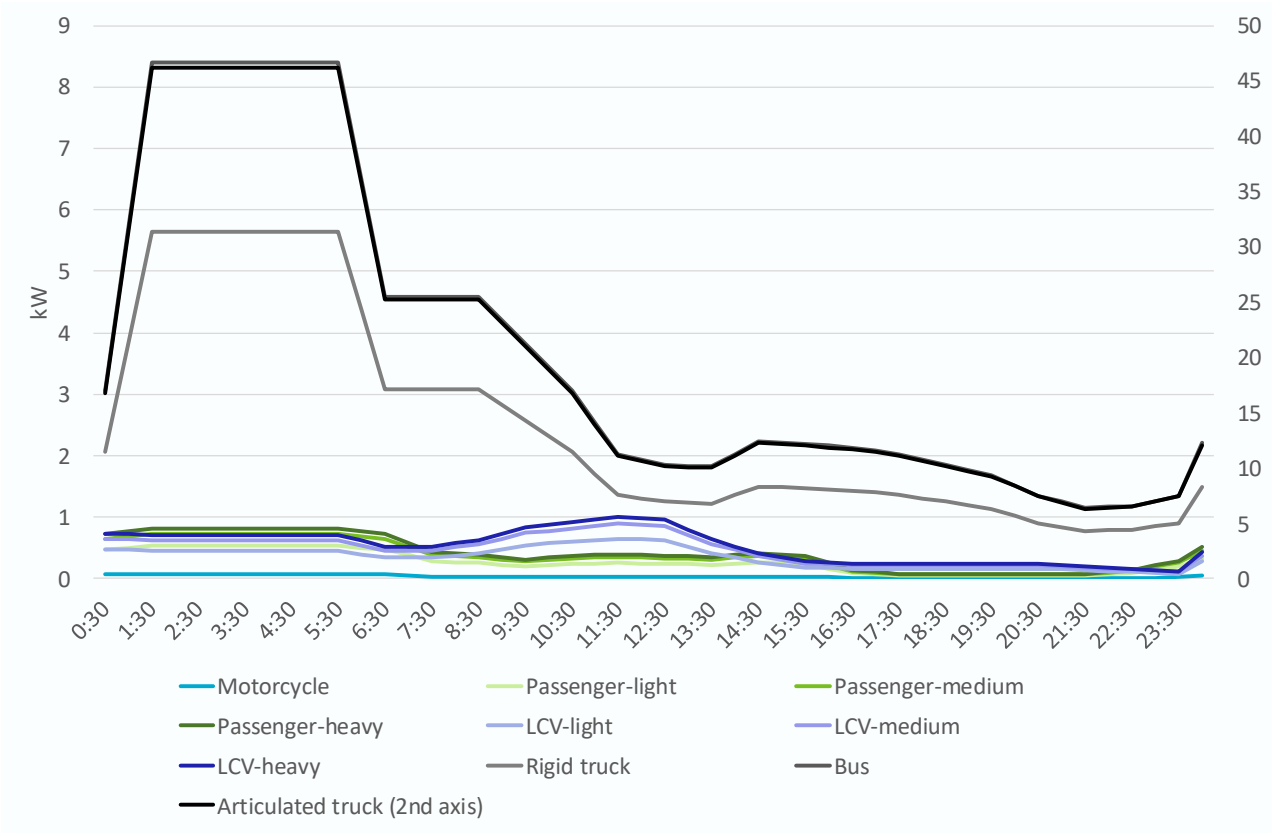
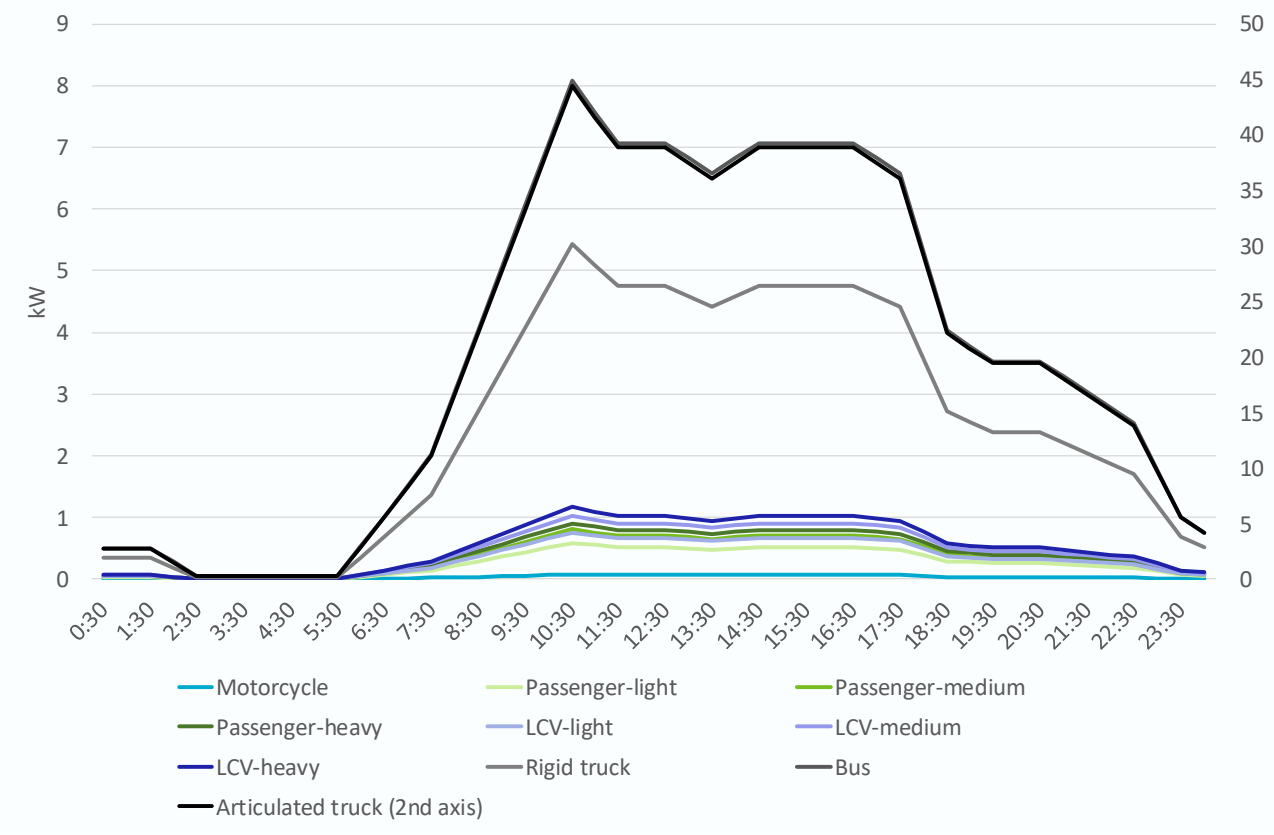
EV charge profiles: convenience



EV charge profiles: day



EV charge profiles: night



EV charge profiles: fast charge / highway