DER projections

AEMO FRG

Paul Graham | 29 April 2020

Changes

- COVID-19 pandemic impacts
- Updated historical data – CER, FCAI, SunWiz
- Some registered SWIS solar <30MW removed from NSG forecast
- Projection approach modified to all for large one-off NSG projects as the norm
- Redesign of implementation of Step Change electric vehicle scenario to achieve zero internal combustion vehicles by 2050

COVID-19 pandemic impacts

Monthly to 2 years

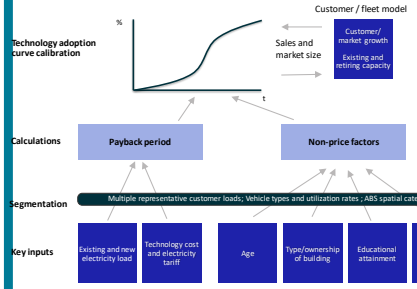
2 to 30 years

Long term model partially impacted by new starting point fading to no impact long term

Impacts imposed on trend

Trend analysis
X=f(X,Y,Z)

Structural model



Short term

Long term

COVID-19 pandemic impacts: solar and batteries

Scenario	Period	Change in installations/sales relative to trend		Comment/rationale
		Residential	Commercial	
Slow change	Q4 2019-20	-65%	-75%	Most planned installations are cancelled, deposit or not
	Q1 2020-21	-65%	-75%	Lack of interest continues because of persistent bans on economic activity and virus second round
	Remainder to June 2021-22	-10%	-20%	Slow recovery due to persistence of virus and economic impacts
Central, Fast change and High DER	Q4 2019-20	-50%	-60%	Some of planned installations are cancelled, deposit or not
	Q1 2020-21	-40%	-50%	Post-virus peak sees some recovery relative to trend
	Remainder to June 2021-22	-5%	-10%	Slight persistence of economic impacts
Step change	Q4 2019-20	-40%	-50%	Some of planned installations are cancelled, deposit or not
	Q1 2020-21	-30%	-40%	Post-virus peak sees some recovery relative to trend
	Remainder to June 2021-22	0%	0%	No persistence of economic impacts

COVID-19 pandemic impacts: electric vehicles

Scenario	Period	Change in installations/sales relative to trend		Comment/rationale
		Residential	Commercial	
Slow change	Q4 2019-20	-10%	-15%	Most orders (established up to year earlier) go ahead
	Q1 2020-21	-75%	-85%	Peak of sales impacts, strong decline
	Remainder to June 2021-22	-10%	-20%	Slow recovery due to persistence of virus and economic impacts
Central, Fast change and High DER	Q4 2019-20	-5%	-10%	Marginal impact due to orders delay
	Q1 2020-21	-60%	-50%	Peak of sales impacts, medium-strong decline
	Remainder to June 2021-22	-5%	-10%	Slight persistence of economic impacts
Step change	Q4 2019-20	-5%	-10%	Marginal impact due to orders delay
	Q1 2020-21	-40%	-50%	Peak of sales impacts, medium decline
	Remainder to June 2021-22	0%	5%	Little to no persistence of economic impacts

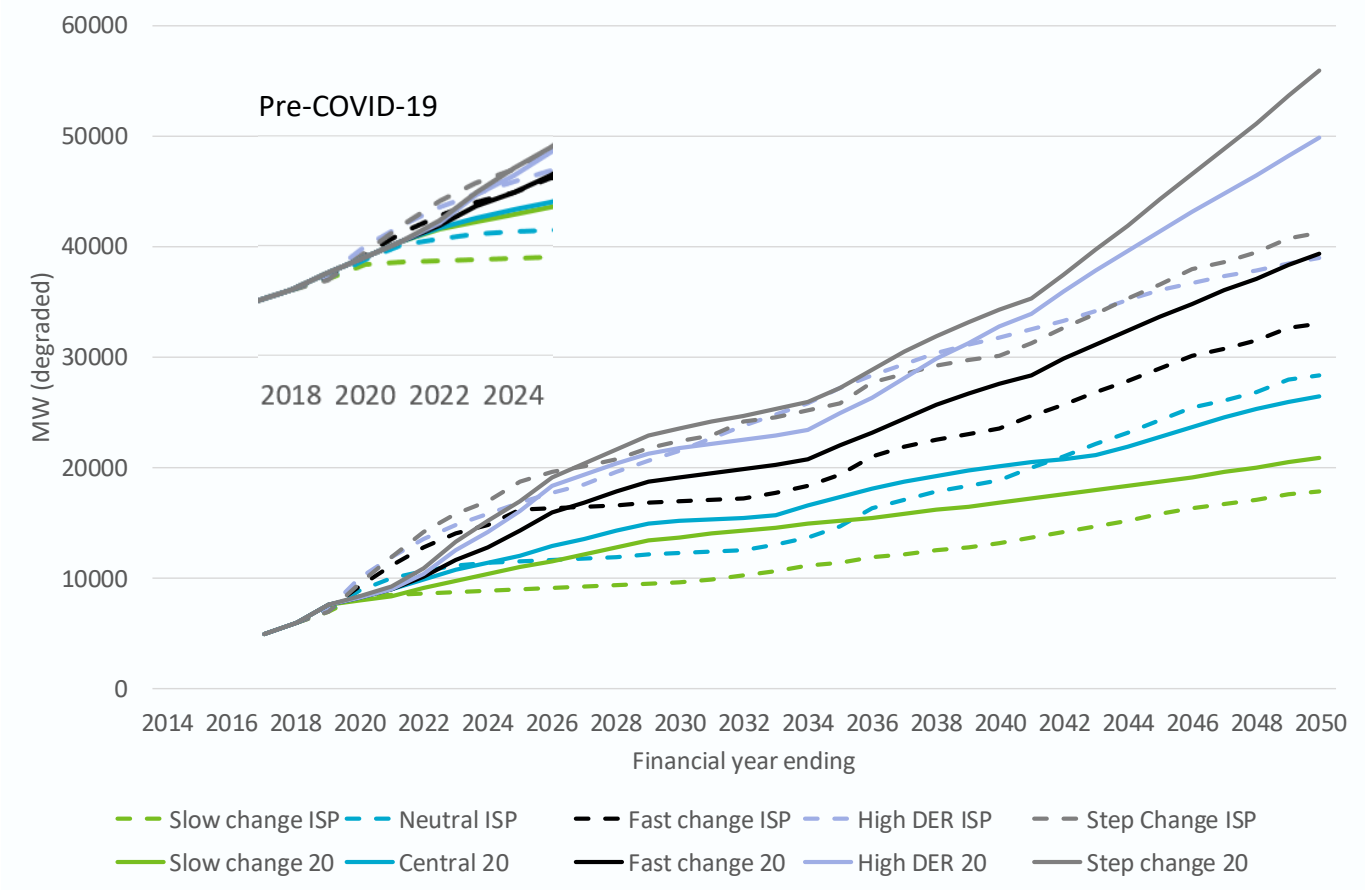
Historical data updates

- Batteries (SunWiz): flat year in 2019, around 20,000 installations as in 2018

- Electric vehicles (FCAI): 2019 115% higher than 2018, but only 22% higher than 2017

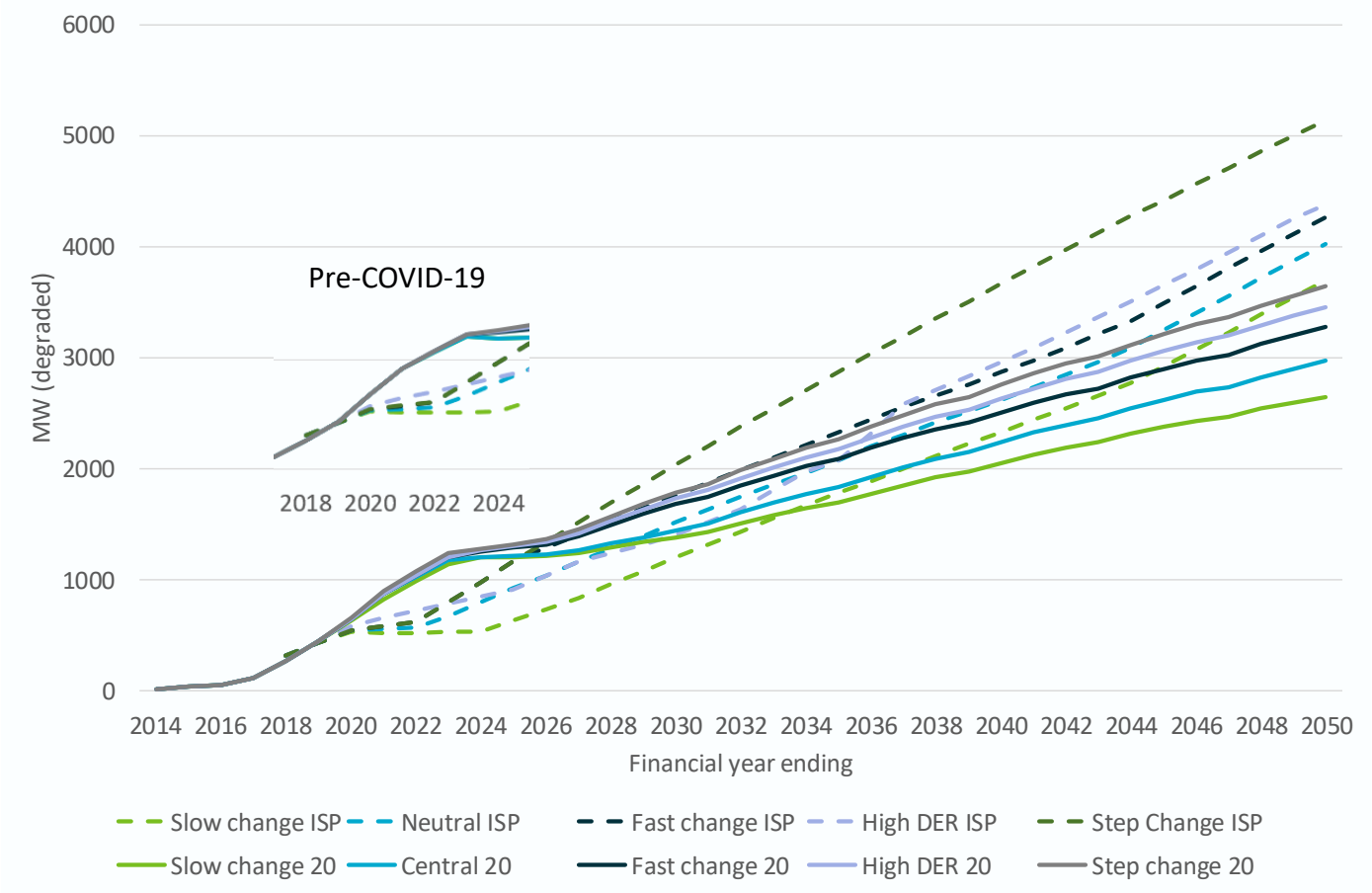
- Solar (CER): 2019 very strong year.

Rooftop solar PV projections



2050 level not significantly changed by COVID-19 because determined by market saturation assumptions

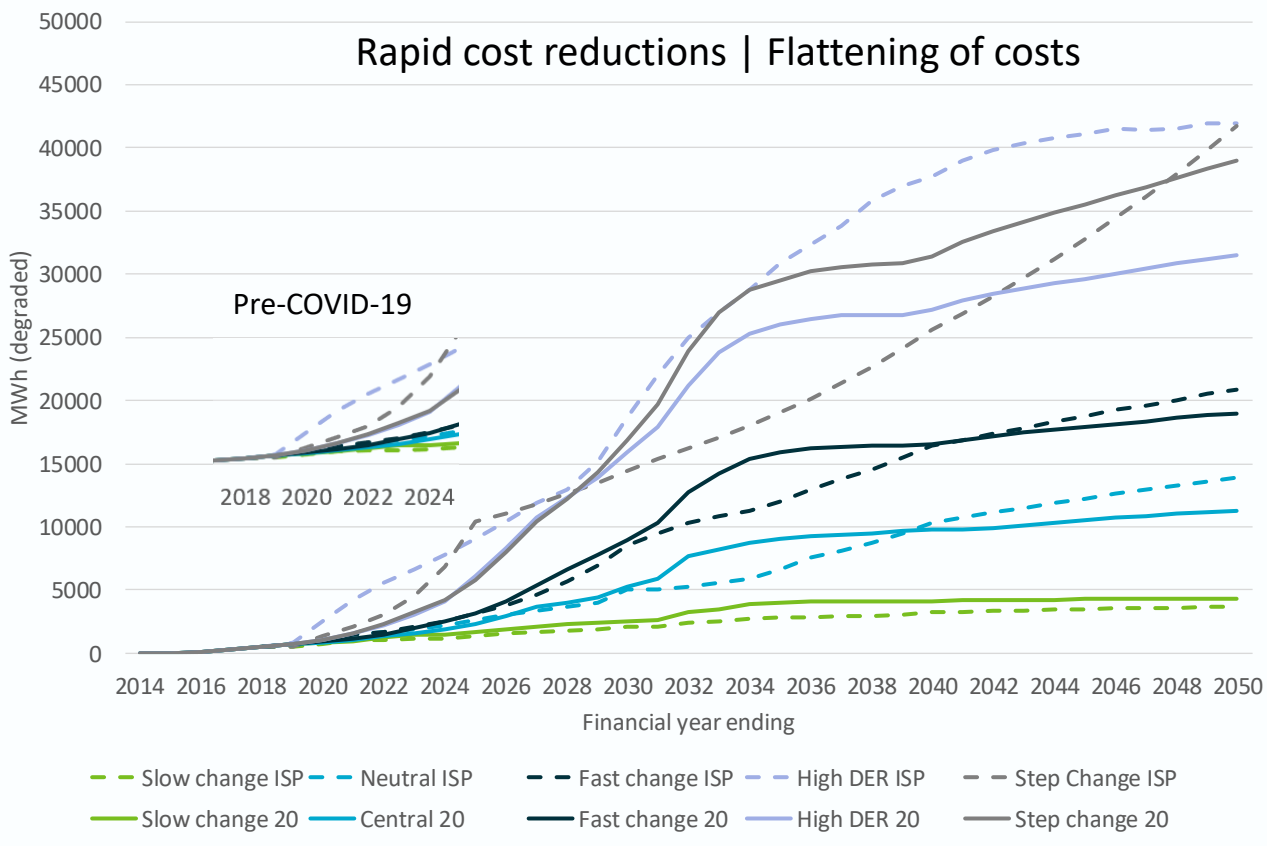
NSG solar PV projections

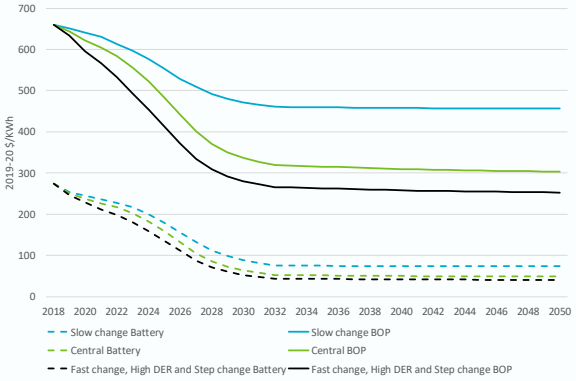


Lower long term projections assume subsidies converge towards equivalence with emission credit schemes

Non-smooth function allows for less frequent one-off projects

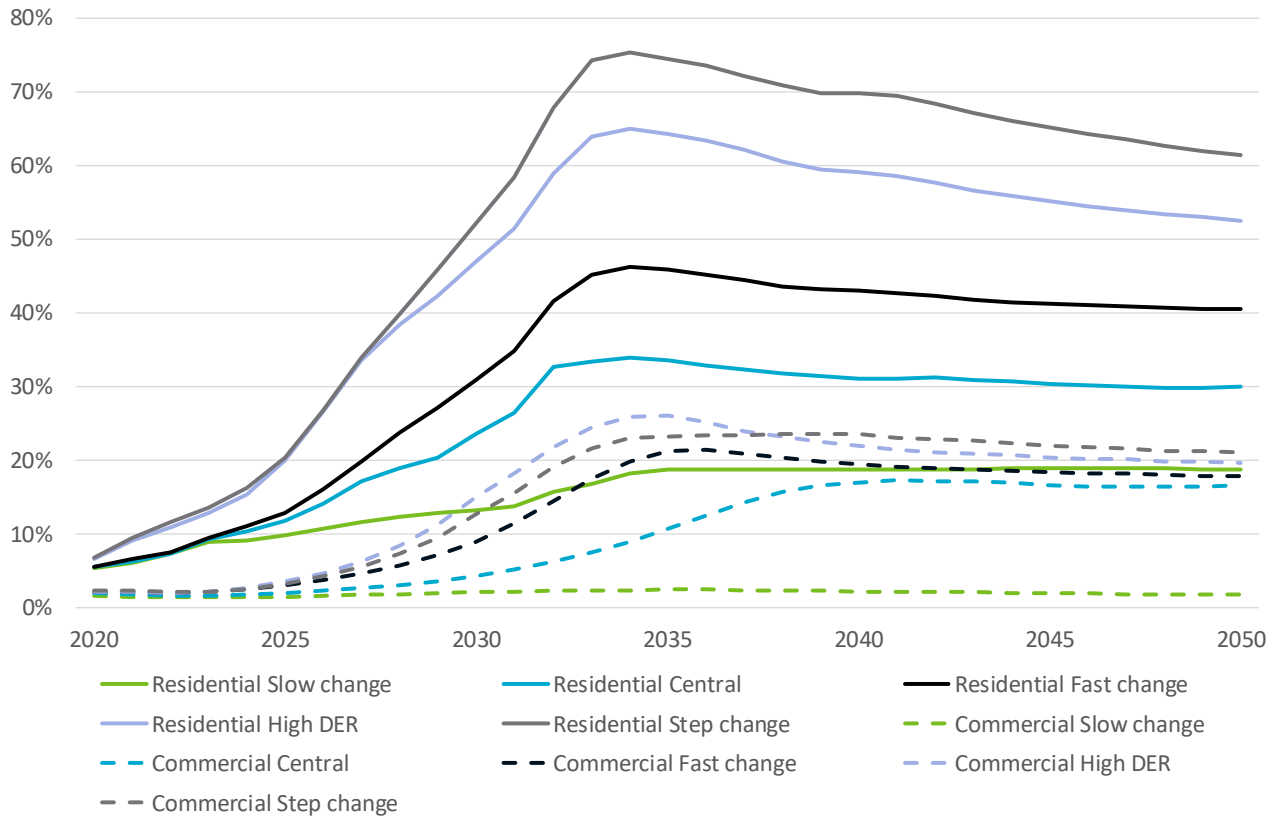
Battery projections





Battery cost assumptions

Battery share of solar installations



Two battery profiles (see appendix)

Solar shift

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

TOU

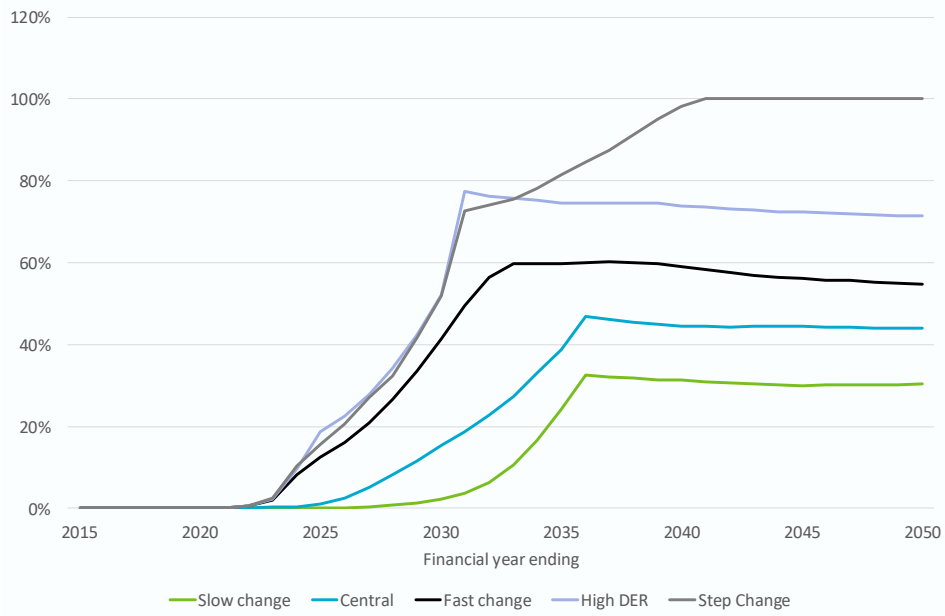
- Current price structure can lead to undesirable coincident battery behaviour
- Simulation of customers: Res & Bus saves 6 & 8% respectively on bill
- Future TOU price structure will change with wholesale price and converge with VPP behaviour
- Assumed shares designed to phase out TOU before profile becomes a issue

		Solar shift mode		Time-of-use		VPP mode	
		Residential	Commercial	Residential	Commercial	Residential	Commercial
2030	Central	76%	14%	6%	56%	18%	30%
	Slow change	88%	17%	3%	68%	9%	15%
	Fast change	60%	10%	10%	40%	30%	50%
	High DER	52%	8%	12%	32%	36%	60%
	Step Change	48%	7%	13%	28%	39%	65%
2050	Central	68%	12%	2%	48%	30%	40%
	Slow change	84%	16%	1%	64%	15%	20%
	Fast change	44%	6%	4%	24%	53%	70%
	High DER	40%	5%	4%	20%	56%	75%
	Step Change	36%	4%	4%	16%	60%	80%

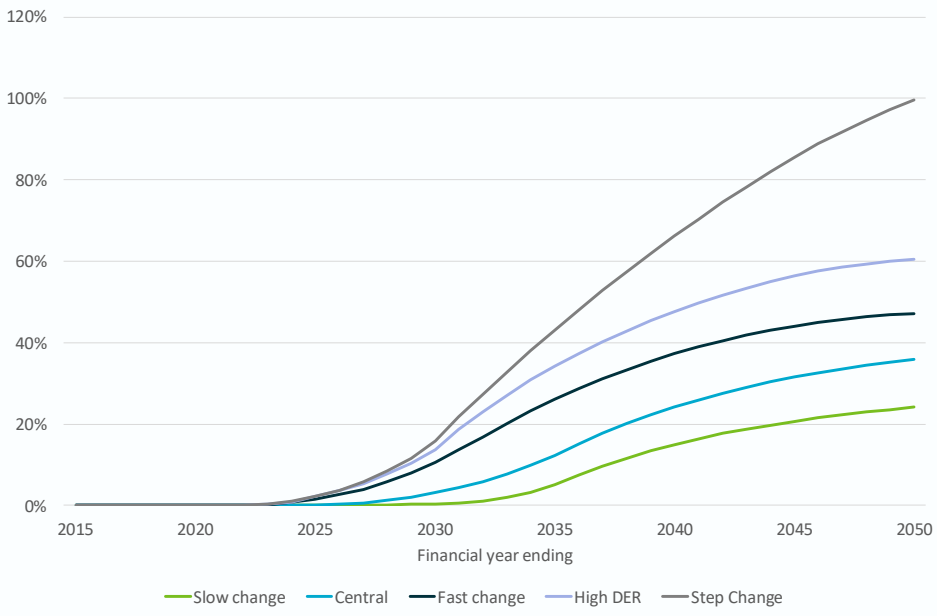
The profile operating shares presented are initial projections only and are representative of typical behaviours. These may be adjusted by AEMO as part of the development of half hourly demand profile forecasts when these profiles would result in abnormal and avoidable social costs – such as charging behaviours overlapping and amplifying system peak demands. In these circumstances, the scenarios reasonably allow customer incentives to develop to shift charging behaviours, minimising total system costs.

Electric vehicle projections

Sales share



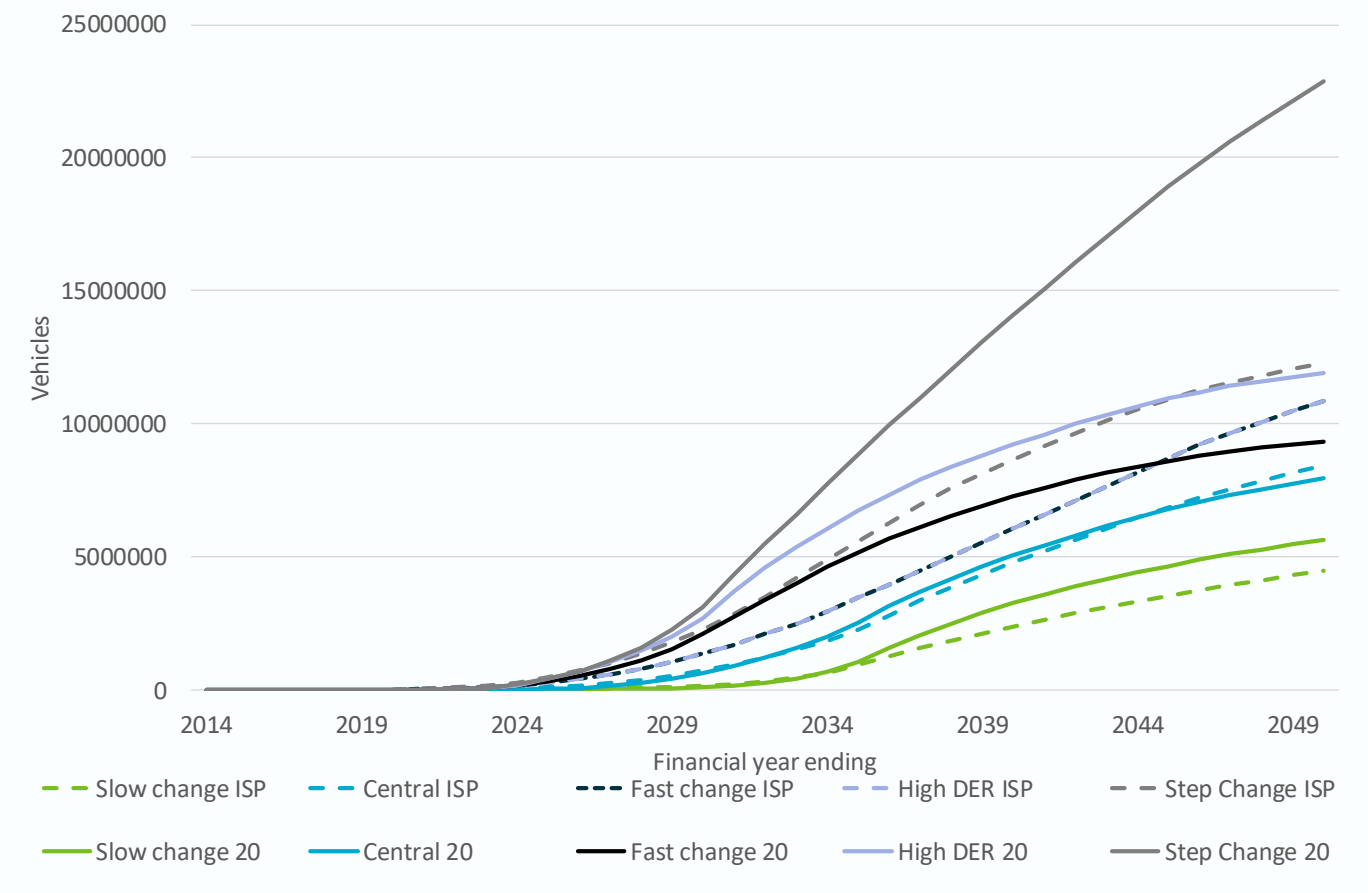
Fleet share



Step change now includes accelerated scrapping of ICE vehicles so that increased sales can translate into fleet share at a faster than normal rate

The articulated (large) truck segment 2050 incudes 50% fuel cell vehicle share

Electric vehicle numbers

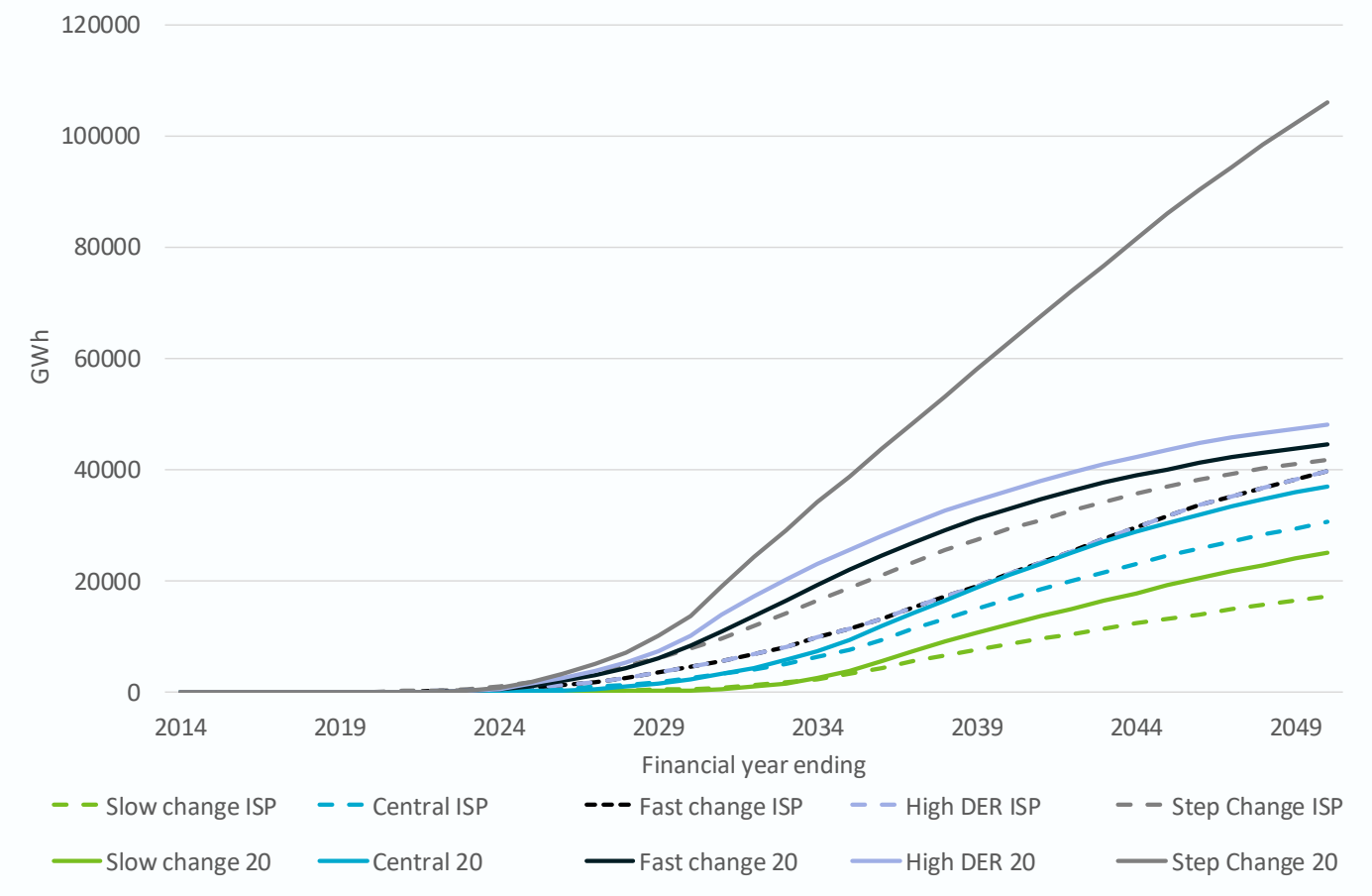


-Slow change has slightly higher maximum market share

-Fast change & High DER allow for faster imports and are differentiated

-Step change re-designed

Electric vehicle consumption projections

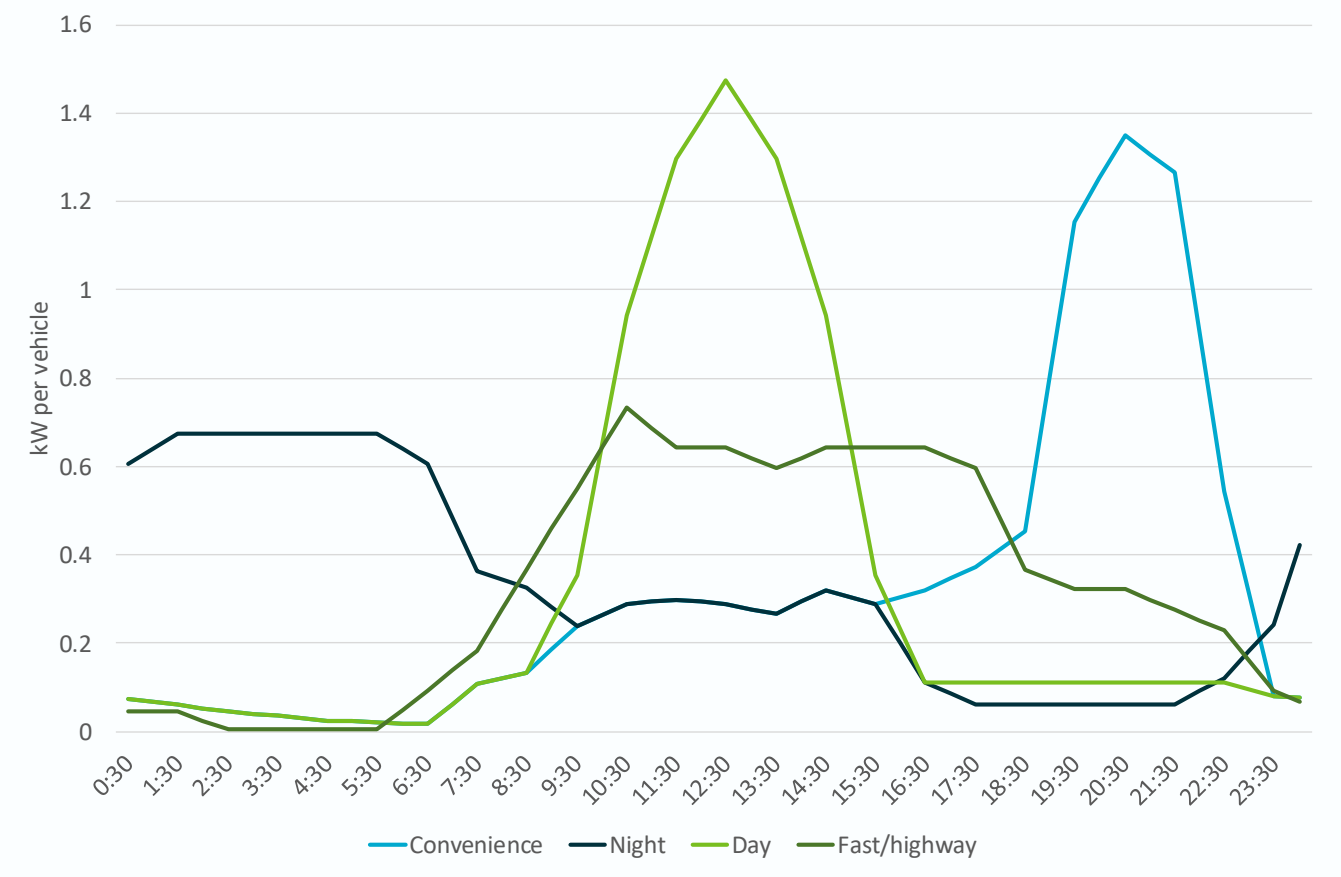


Significantly higher compared to 2019 projections

-Higher vehicle numbers

-Articulated (large) trucks included. They use 50 times more electricity per day than a medium passenger vehicle

Electric vehicle profiles: residential/passenger



Uncontrolled:
1.Convenience
2.Fastcharge/Highway

Some/full control:
3.Day
4.Night

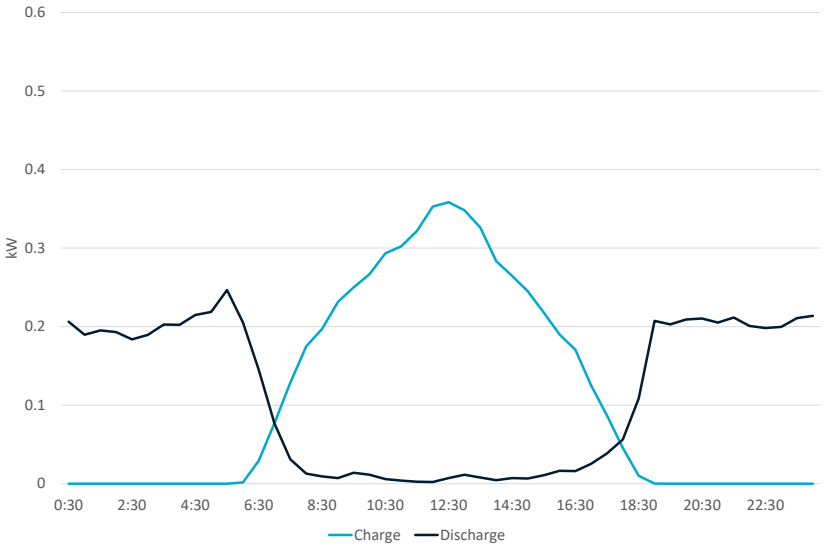
Electric vehicle profiles: Large/articulated truck

Commercial profiles already partially controlled by TOU

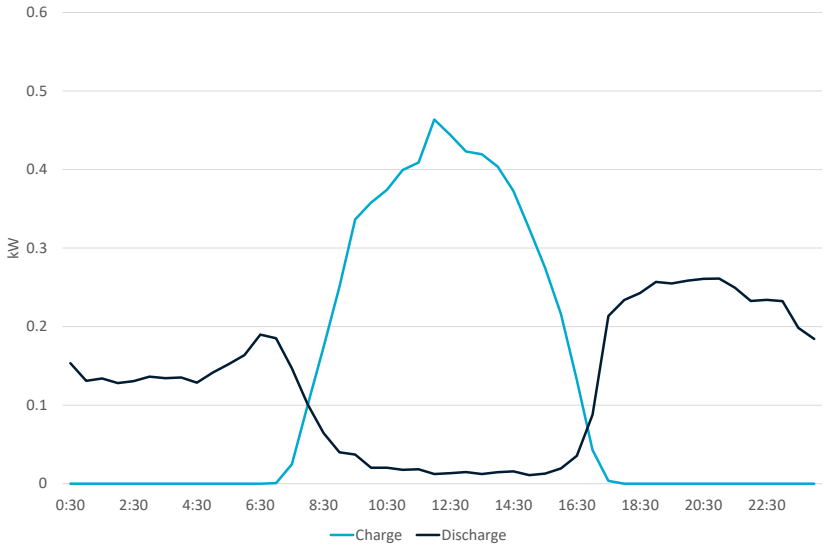
Battery profile appendix

Battery profiles – residential, flat tariff

Summer average



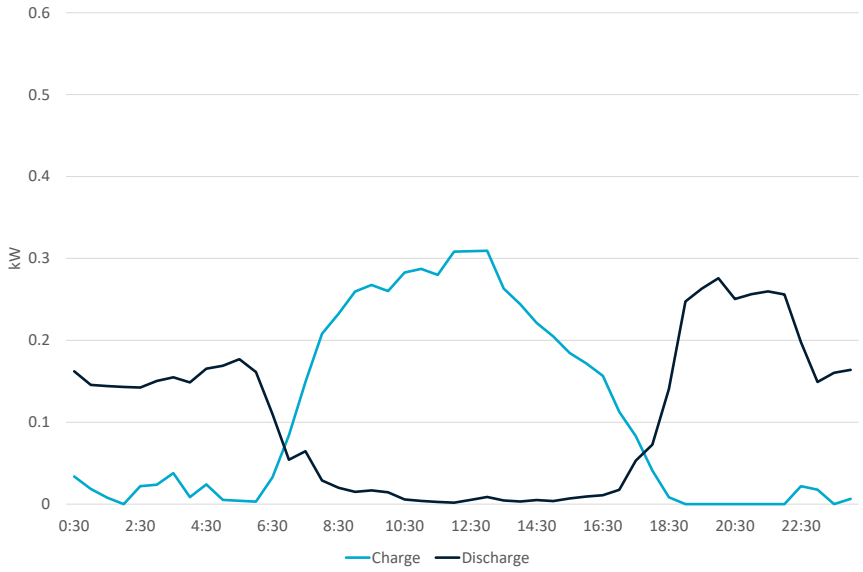
Winter average



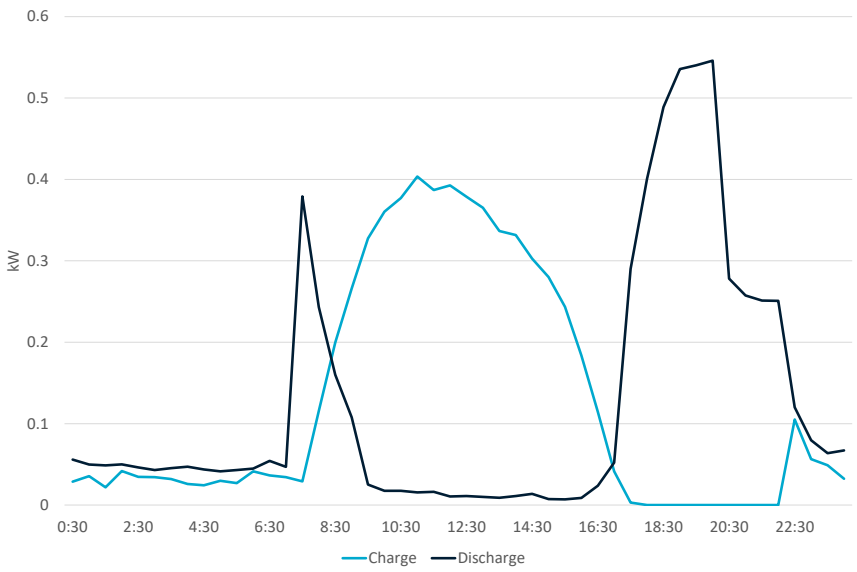
Data is average of activity across 45 customers (i.e. after-diversity) but not normalised
After-diversity profile is significantly lower than individual profiles due to lack of correlation in charging/discharging times
The battery takes longer to charge in winter and as a result charging activity is more coincident between customers

Battery profiles – residential, TOU tariff

Summer average



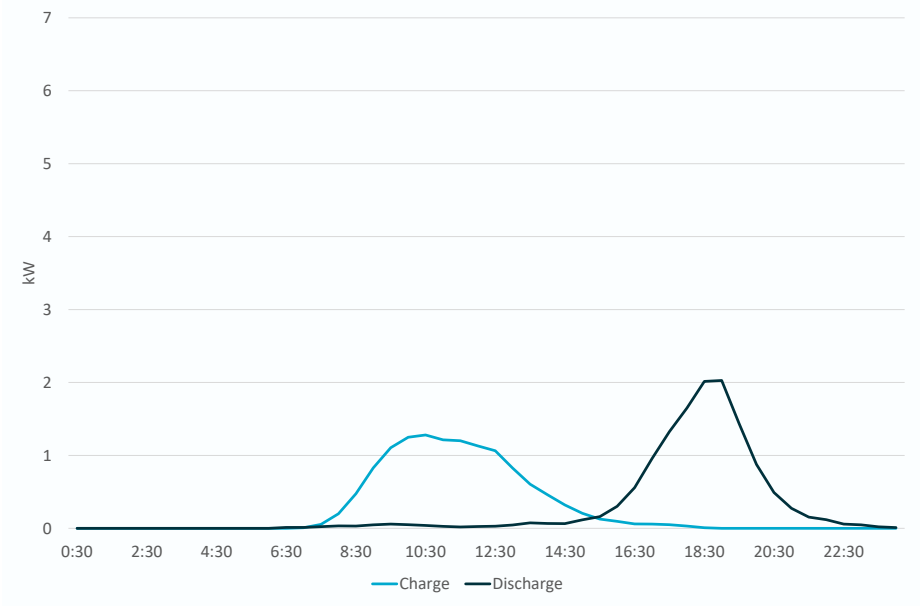
Winter average



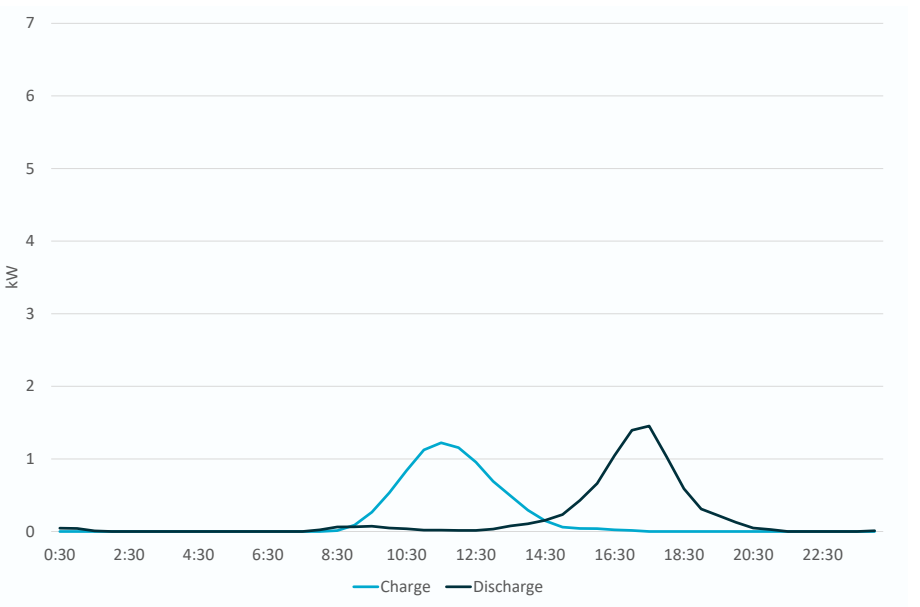
Bill minimisation in Winter includes ensuring battery is able to discharge into the evening and morning peak pricing periods by adding an extra charge from the grid at night. Both charging and discharging is more coincident across customers than in summer.
In summer, solar output and battery charge is sufficient to cover both morning and evening peak as well as load through the night on most nights (although pattern indicates night charging on some nights – likely following days when solar outputs was poor)

Battery profiles – commercial, flat tariff

Summer average



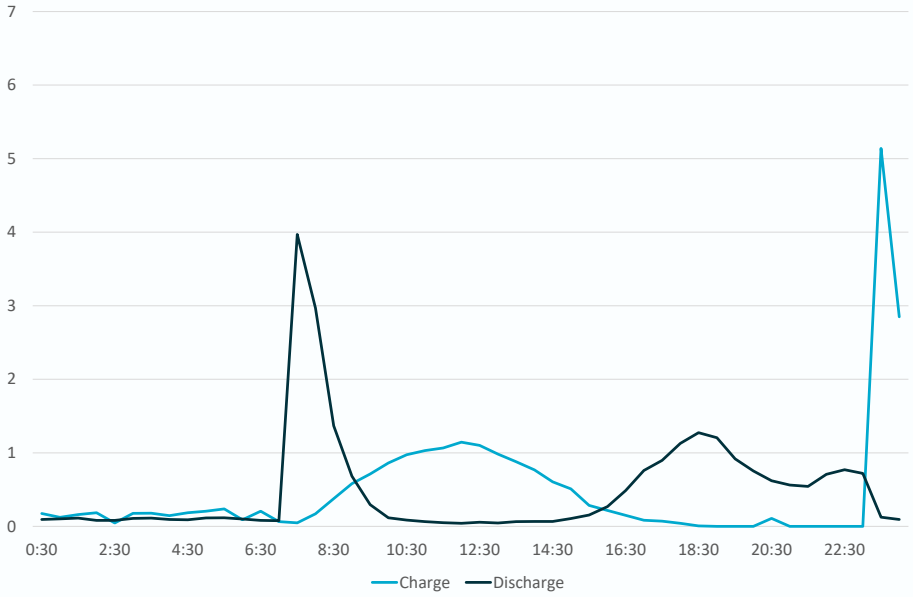
Winter average



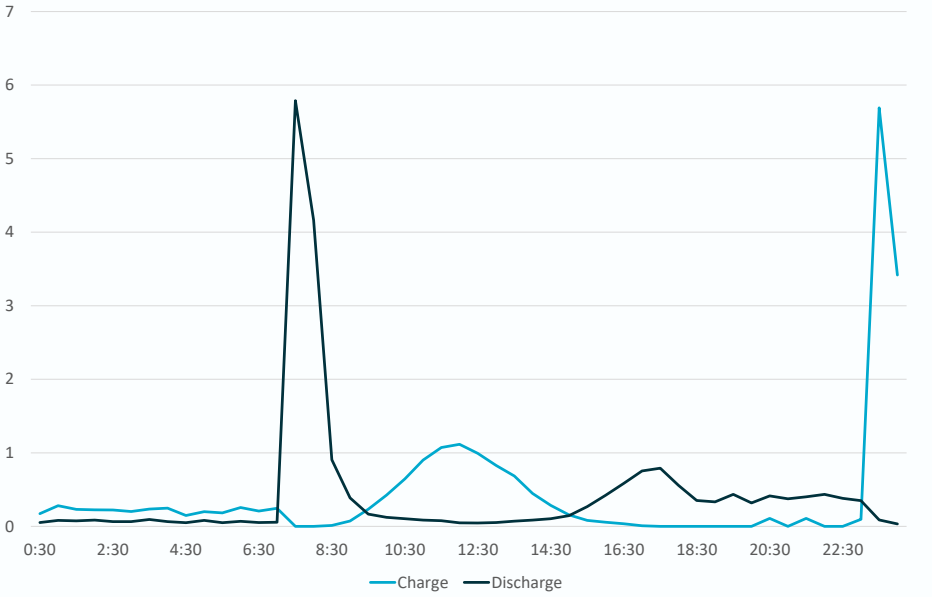
Less excess solar available due to better load matching to solar and installed battery storage duration is shorter

Battery profiles – commercial, TOU

Summer average



Winter average



Thank you

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