DRAFT DER Projection Results

February 2020

Enlightening environmental markets

Green Energy Markets

Central Scenario Results

Residential – Solar capacity

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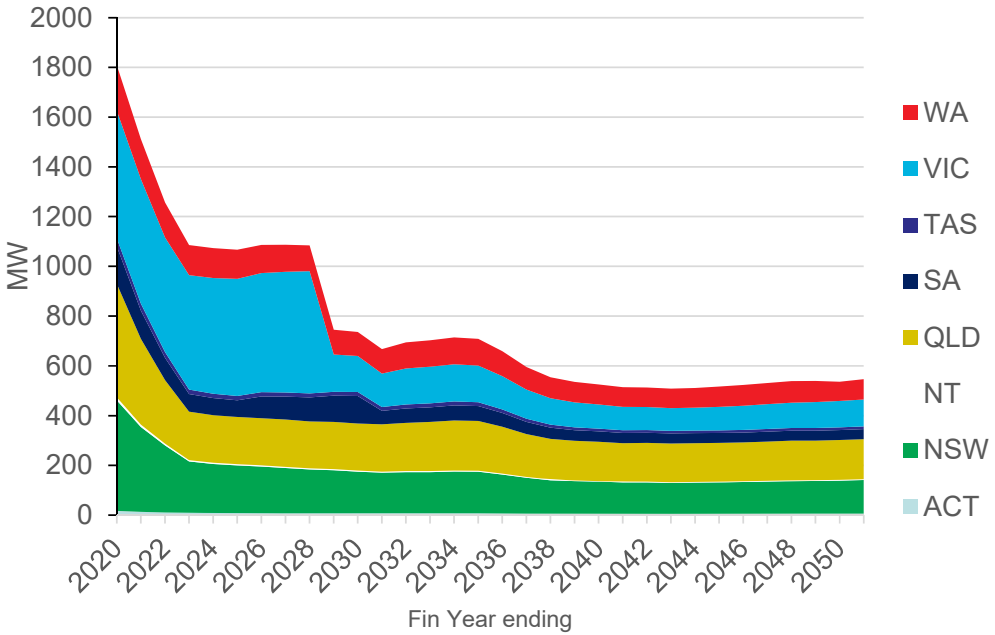
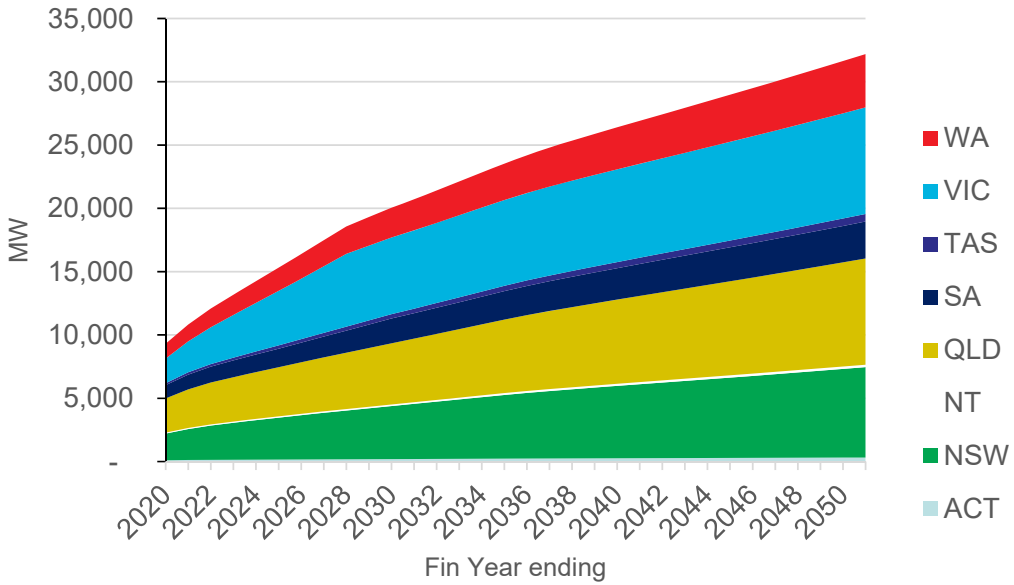
- **Residential solar system capacity is expected to decline rapidly from recent levels above 2000MW/annum due to an expected fall in daytime wholesale power prices and therefore feed-in tariffs as a result of the large influx of solar capacity including large solar farms.**
- **An abrupt drop occurs in 2029 due to expiry of Victoria solar rebate.**

Megawatts of residential solar installations per year - Central



Cumulative megawatts of residential solar installations - Central



Residential – Solar capacity

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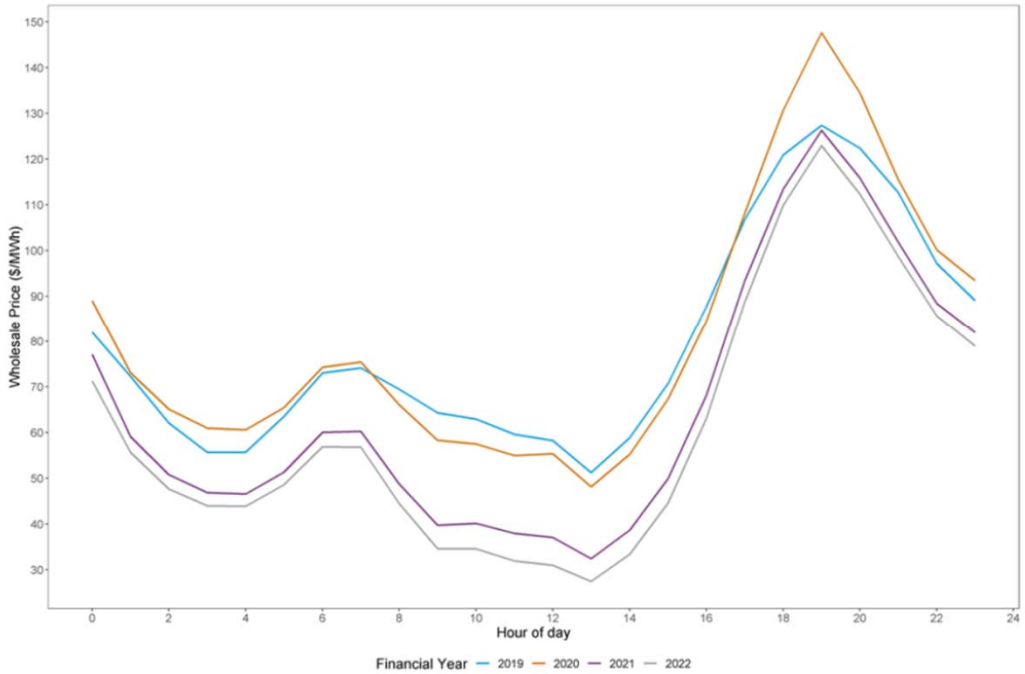
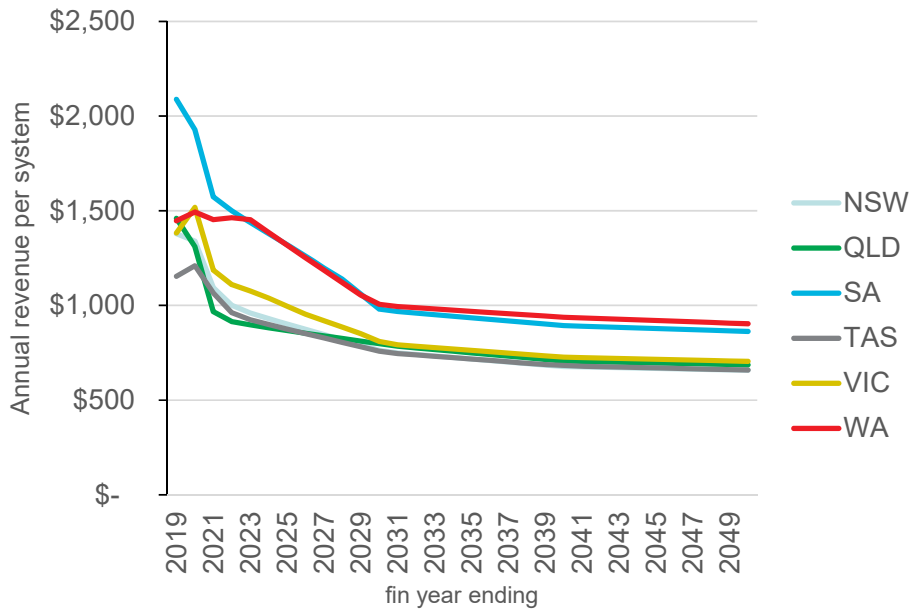
- **The hollowing out of daytime power prices (based on AEMC analysis) drives significant fall in revenue per system In addition an expected move towards recovery of network costs via "cost reflective" pricing also erodes revenue provided by solar.**

Figure 2.3: Average wholesale electricity prices by hour of day in QLD



Source: AEMC analysis

Annual revenue per system - Central



Residential – Solar capacity

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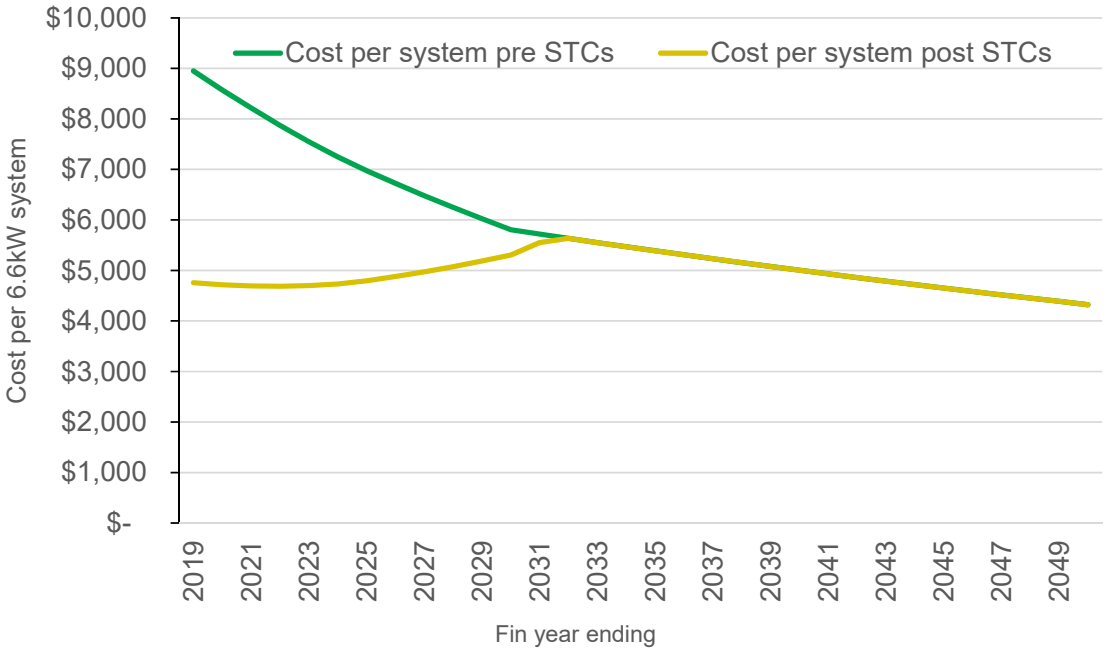
- **While revenue is falling, cost reductions are expected to slow and will fall behind reductions in the value of the STC rebate as deeming steps down in annual increments to 2030.**
- **Cost reductions are expected to slow because the residential market has reached a hard constraint in upsizing residential systems. Most systems are now 6.6kW of panel capacity which reflects networks' 5kW inverter limit plus CEC 33% oversizing limit. This constrains ability to take advantage of improvements in module conversion efficiency to drive labour productivity improvements.**



Small commercial – Solar capacity

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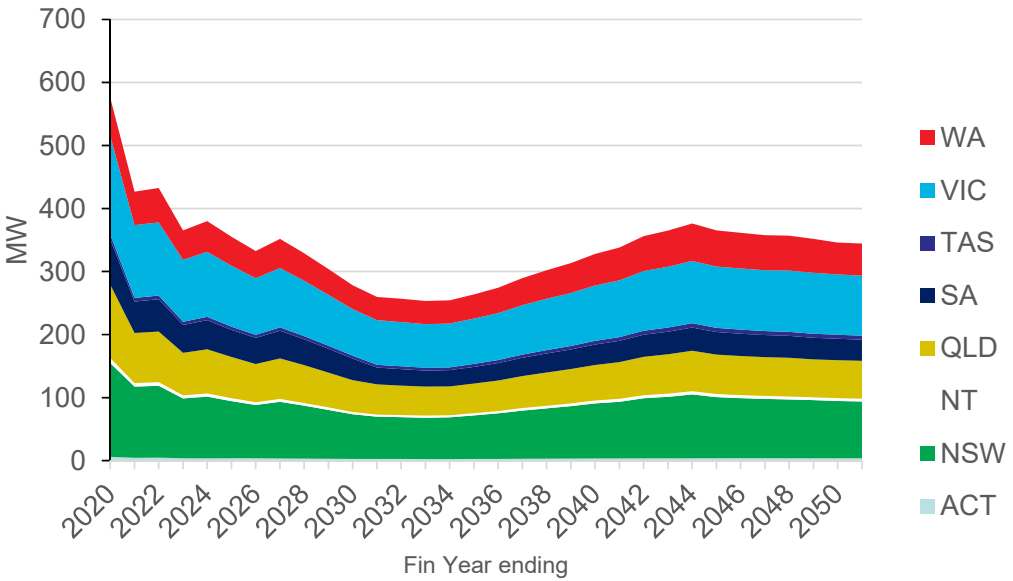
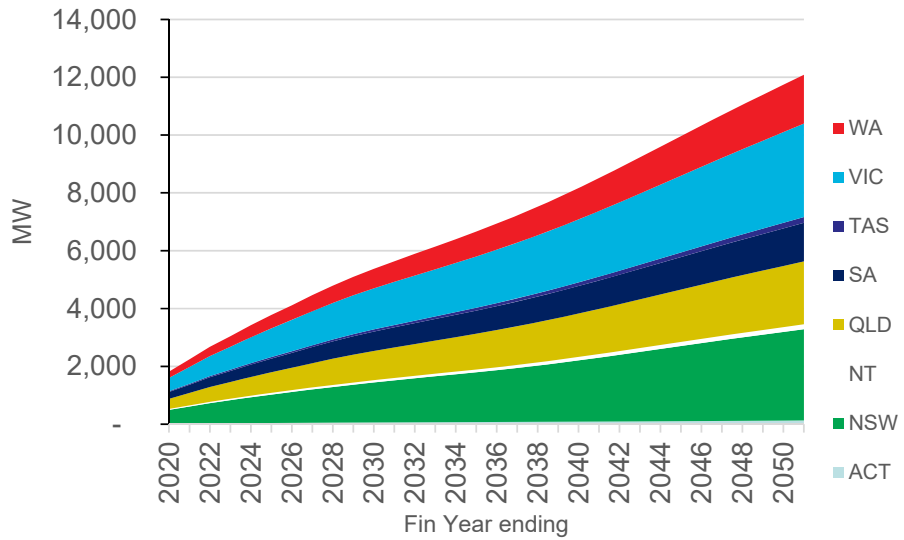
- **Small commercial (sub-100kW) solar systems also suffer a decline in installations over the next decade as a result of falling daytime wholesale prices and decline in STC rebate.**
- **However these larger systems have greater capacity to benefit from ongoing labour installation cost declines through improving module conversion efficiency (less panels need to be installed for the same amount of kilowatt capacity). This leads to a recovery in installations over the 2030's.**

Megawatts of small commercial solar installations per year



Cumulative megawatts of small commercial solar installations



Large commercial – Solar capacity

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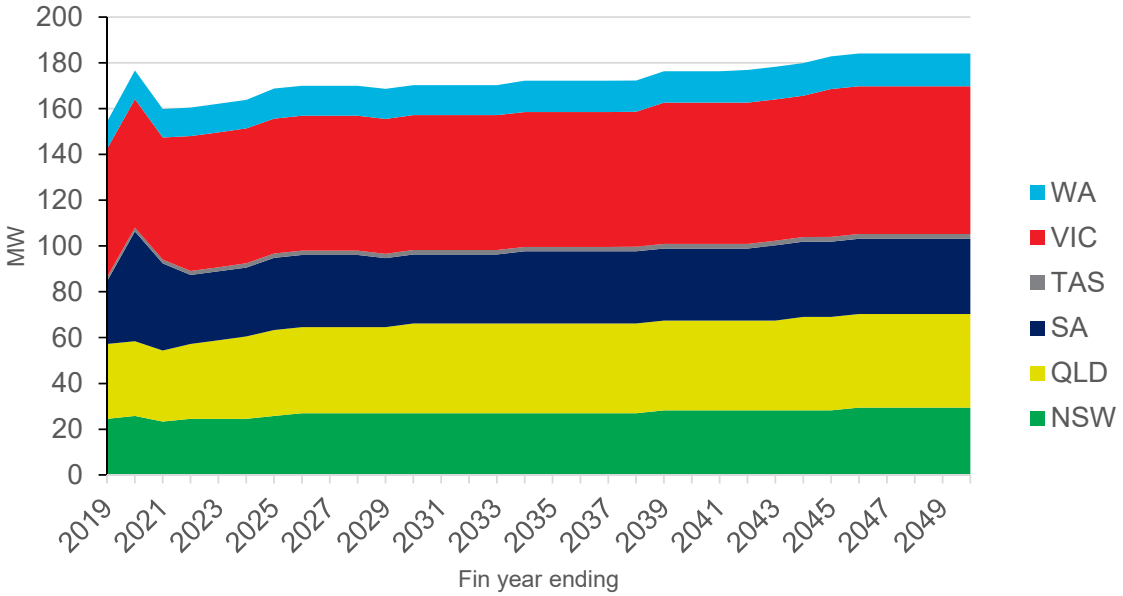
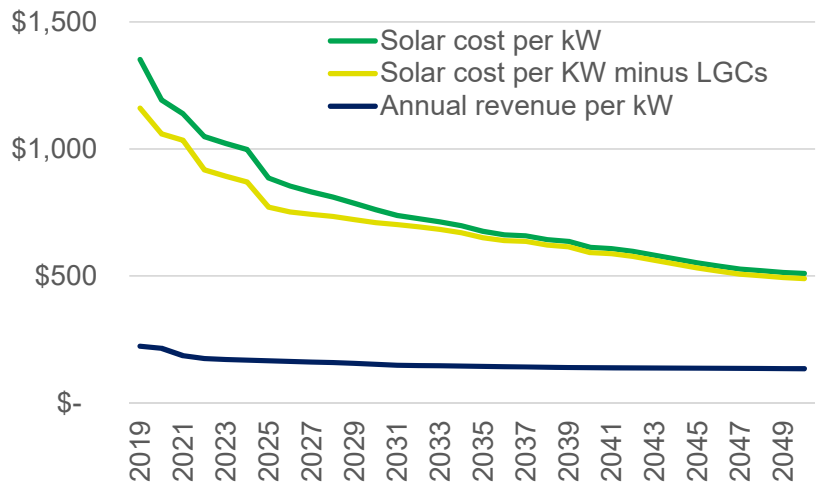
- **Large commercial (sub-100kW) solar manages to maintain modest growth in spite of hollowing out of daytime wholesale prices.**
- **Large commercial hosts already face network demand charges and so aren't impacted by "cost reflective" tariff changes and fall in LGC assistance already priced-in**
- **Unlike residential, these large systems can take greater advantage of labour productivity gains from increasing module conversion efficiency.**

Megawatts of large commercial solar installations per year



Change in cost of solar versus revenue for large commercial



Batteries – sub 100kW

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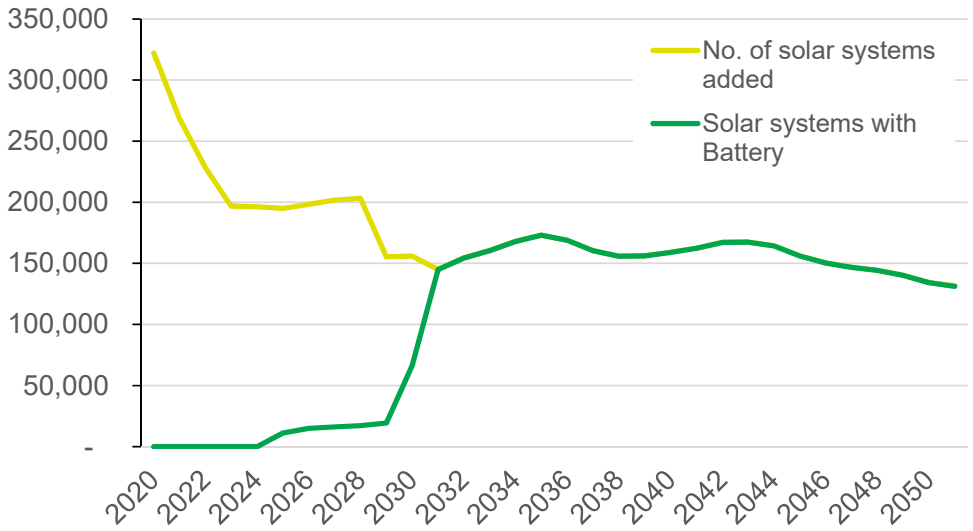
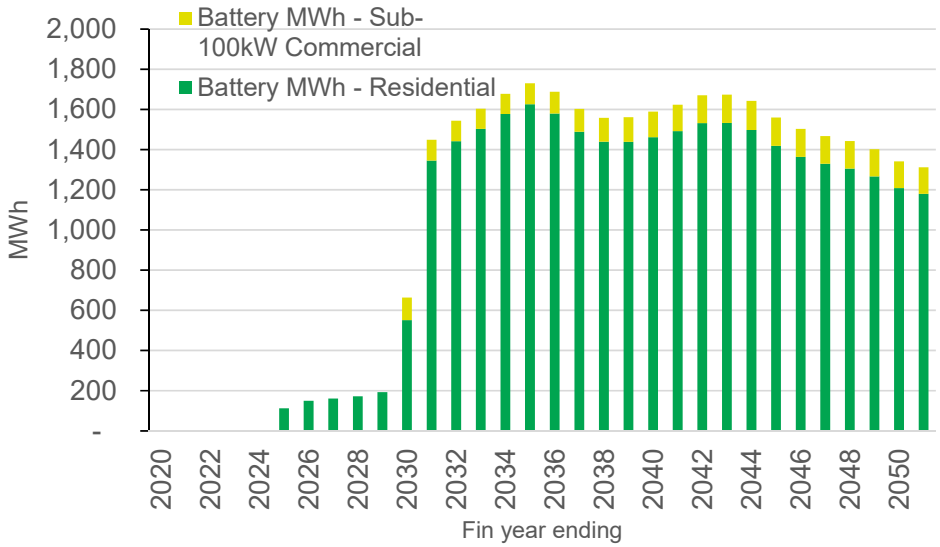
- **Battery uptake is expected to remain low until the back end of the 2020's when it rises rapidly and almost all solar systems are expected to incorporate a battery system.**

Number of solar systems added overall and with batteries
Residential and small commercial



Note: there is an underlying level of battery installations that are occurring independent of economic feasibility which are not displayed on this chart above. These are running at around 20,000 to 30,000 systems per annum but data is patchy and based on surveys that do not capture all participants and outcomes from government rebate programs. DER register should hopefully soon provide vastly better information.

Megawatt-hours of battery installations per year
Residential and small commercial



Batteries – sub 100kW

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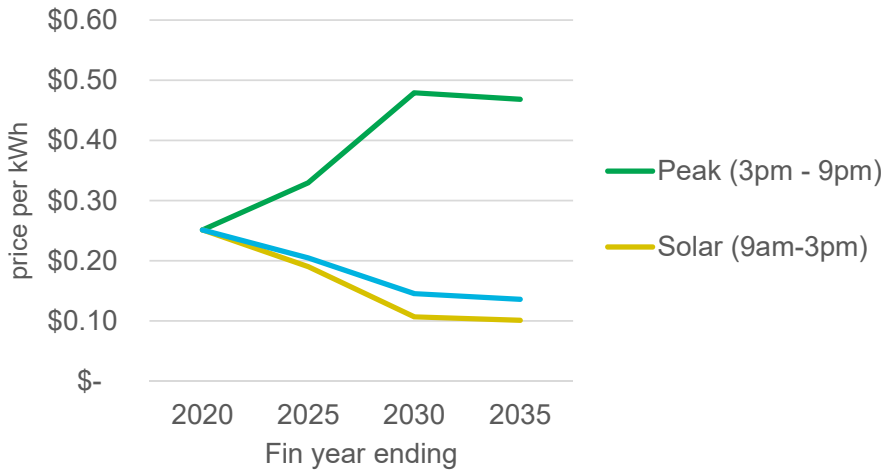
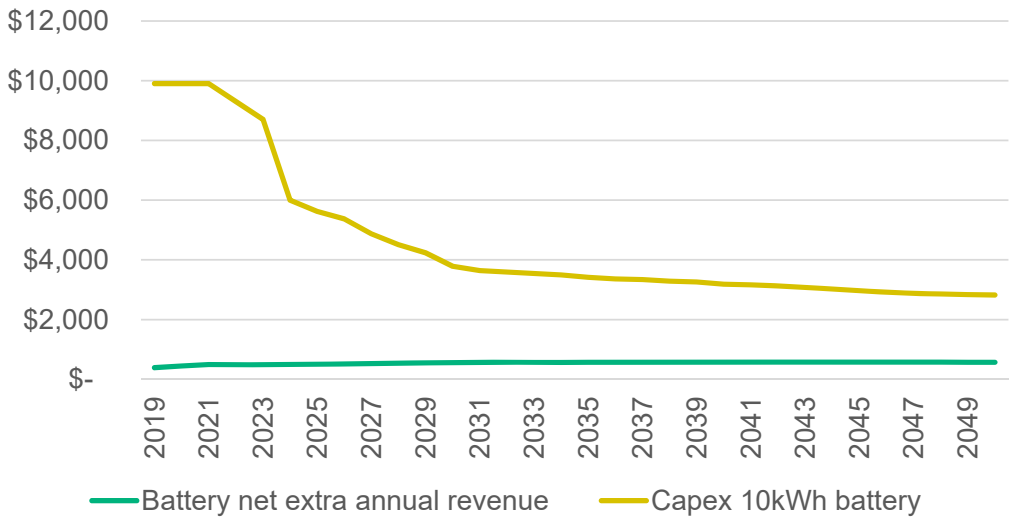
- **Battery economics are expected to improve in terms of both:**
  - **Revenue** from a battery is enhanced by an increasing discrepancy in both network and wholesale prices between the solar generating daytime period and the afternoon-evening peak.
  - **Costs** are anticipated to fall significantly.

Assumed changes in residential power price by time period



Fully installed cost of 10kWh battery versus annual extra revenue on top of solar system



Batteries – Large commercial

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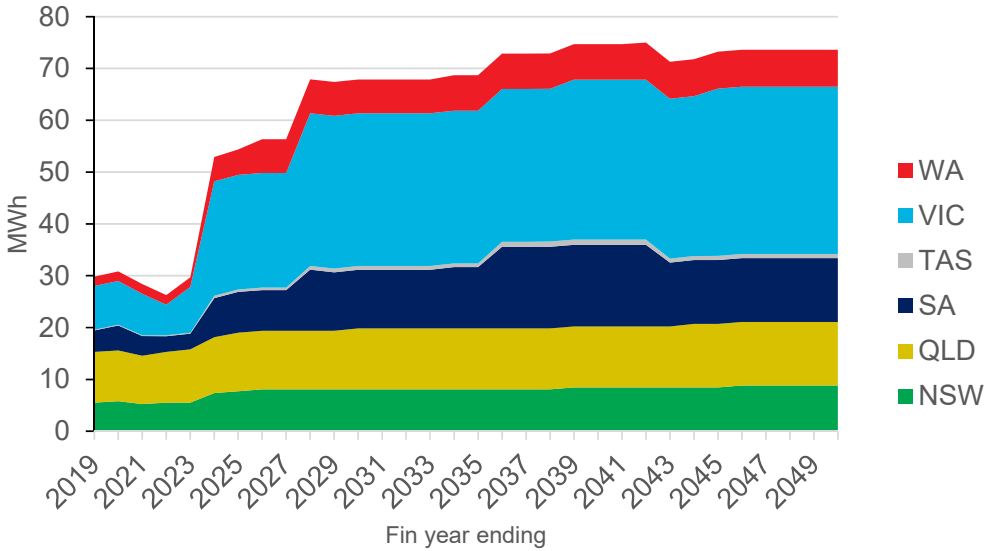
- **Battery uptake in the large commercial market follows a similar path and timeline as residential.**
- **Because large commercial consumers' network costs are largely embodied within demand charges, batteries provide significant value in firming-up the potential for solar to deliver reductions in network demand charges while also allowing arbitrage between a low wholesale price solar period and high afternoon-evening peak.**

Megawatt-hours of battery systems installed per year
Large Commercial



Central compared to Step Change Scenario

Solar capacity – sub 100kW

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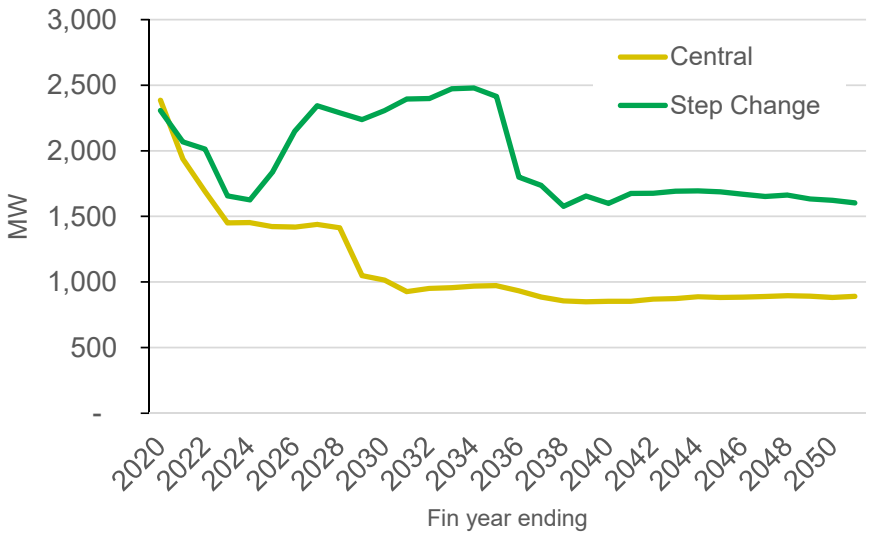
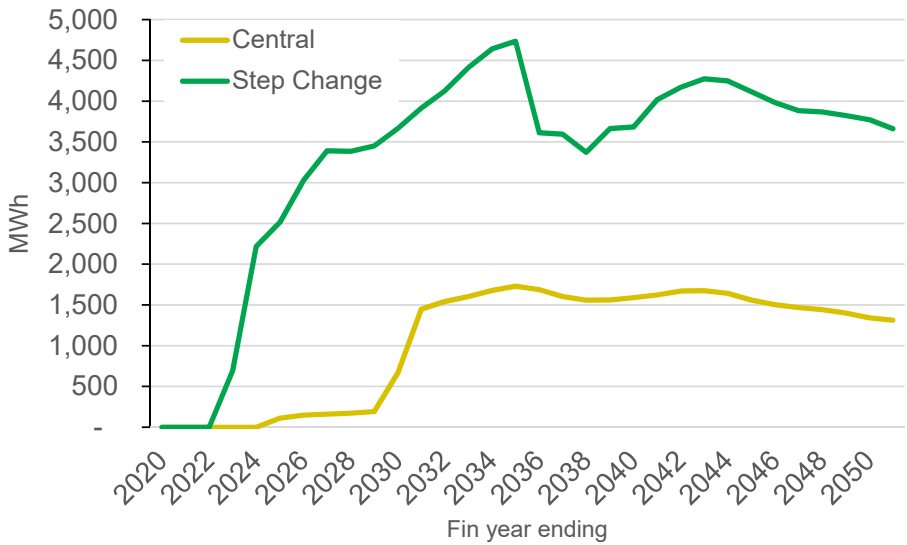
- **Both solar and the megawatt-hours of battery capacity are substantially higher in Step Change than Central.**

Megawatts of sub-100kW solar installations per year
Central vs Step Change



Megawatt-hours of battery installations per year
Central vs Step Change



Solar capacity – sub 100kW

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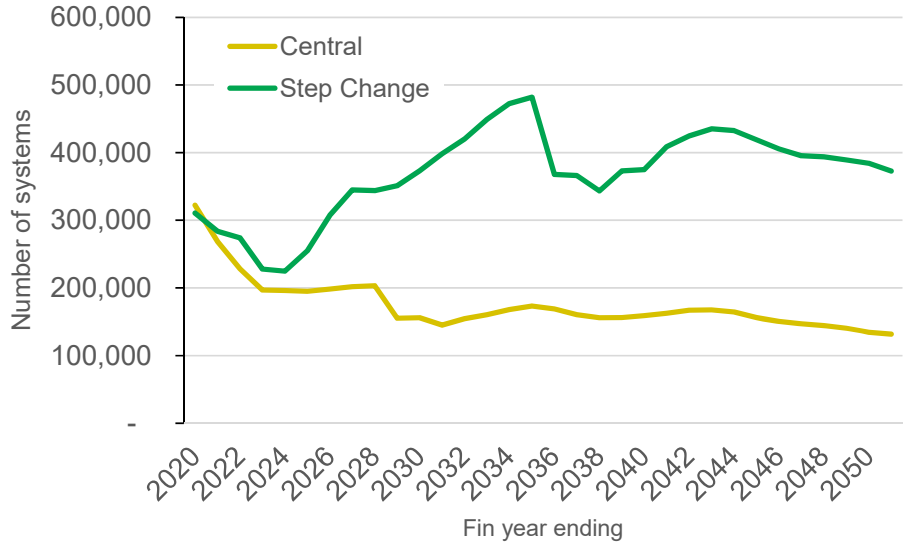
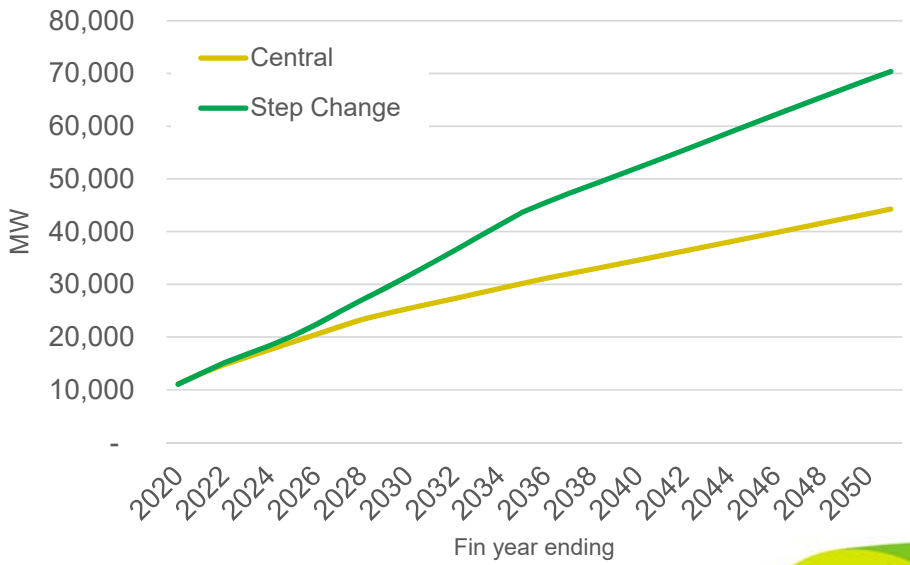
- **The number of solar systems installed and the level of capacity under the Step Change Scenario entails very high levels of household penetration in owner-occupied dwellings and would need to involve adoption in rental stock.**
- **The high proportion of battery installations from 2030 will provide a significant load to absorb the output**

Number of solar systems installed per year
Central vs Step Change



Cumulative solar capacity installed in residential & small commercial
Central vs Step Change



Large commercial – Solar Capacity

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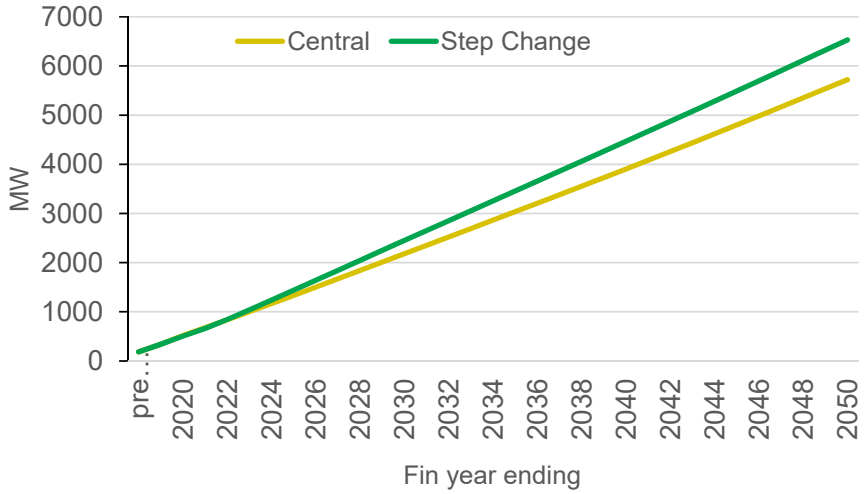
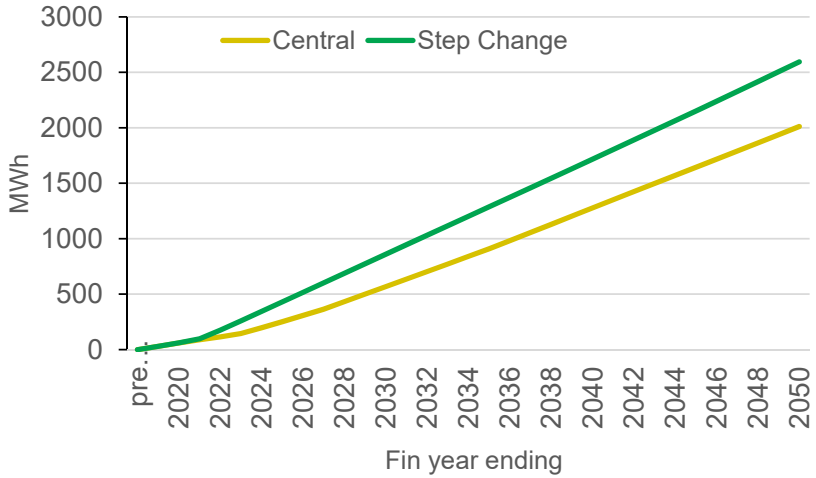
- **The difference between the scenarios is more modest in the large commercial sector.**
- **However because this market segment is relatively immature there is a lack of useful statistically valid historical data we don't have a particularly good idea of how this market might respond to significantly shorter paybacks than we've recently experienced.**

Cumulative megawatts of large commercial solar installations per year Central vs Step Change



Cumulative megawatt-hours of battery installations per year in large commercial
Central vs Step Change



What drives higher uptake in Step Change?

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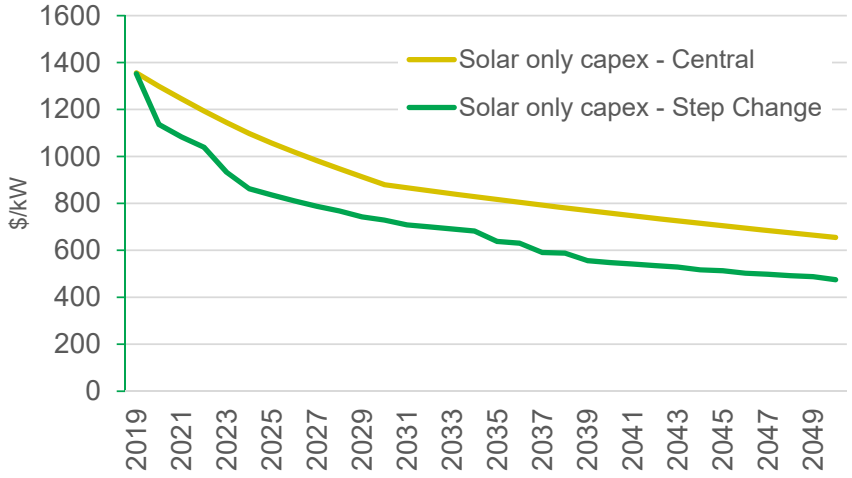
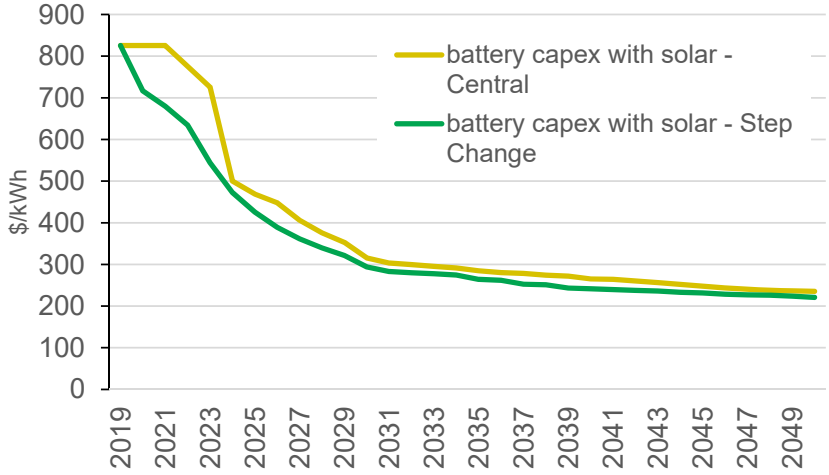
- **Faster cost reductions for batteries and solar in Step Change relative to Central**

Cost per kilowatt for a residential solar system without battery (excluding government subsidies)



Cost per kilowatt-hour for battery system installed in conjunction with solar (excluding government subsidies)



What drives higher uptake in Step Change?

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- **Greater government policy support for zero emission energy sources**
  - Under Step Change it is assumed that batteries across all market segments and states become eligible for assistance of $500 per kWh beginning in 2021-22. This support steps down by $100/kWh every four years
  - The table below lists assumed carbon abatement revenue per MWh for solar systems for the Central and Step Change scenarios (excluding STCs). These are based on an extrapolation and expansion of existing policies such as the Carbon Farming Initiative and Emission Reduction Fund and state-based energy efficiency certificate schemes. Because the emissions intensity of the grid falls to low levels the value captured by a solar system per megawatt-hour is actually lower than what has been provided by either LGCs or STCs in the past.

Scenario	State	Item	2020	2030	2040	2050
Central	**NEM**	ACCU value per MWh	12.89	16.66	2.74	2.54
	NSW	State carbon Value per MWh	0.00	0.00	0.00	0.00
	NT	ACCU value per MWh	9.35	12.00	3.00	2.80
		State carbon Value per MWh	0.00	0.00	0.00	0.00
	QLD	State carbon Value per MWh	0.00	0.00	0.00	0.00
	SA	State carbon Value per MWh	0.00	0.00	0.00	0.00
	TAS	State carbon Value per MWh	0.00	0.00	0.00	0.00
	VIC	State carbon Value per MWh	22.75	16.66	0.00	0.00
	WA	ACCU value per MWh	11.73	13.79	2.27	2.10
		State carbon Value per MWh	0.00	0.00	0.00	0.00
Step Change	**NEM**	ACCU value per MWh	12.48	24.46	16.77	17.28
	NSW	State carbon Value per MWh	0.00	15.46	8.01	7.23
	NT	ACCU value per MWh	9.35	27.84	18.84	18.16
		State carbon Value per MWh	0.00	0.00	0.00	0.00
	QLD	State carbon Value per MWh	0.00	15.46	8.01	7.23
	SA	State carbon Value per MWh	0.00	15.46	8.01	7.23
	TAS	State carbon Value per MWh	0.00	0.00	0.00	0.00
	VIC	State carbon Value per MWh	25.69	15.46	8.01	7.23
	WA	ACCU value per MWh	11.22	22.62	15.70	22.70
		State carbon Value per MWh	0.00	0.00	0.00	0.00

Next steps

- **Undertake modelling of other scenarios (High DER, Fast Change and Slow Change). This will explore other conceivable paths for tariff structures and government climate and energy policy settings as well as battery and solar cost reductions.**
- **Examine potential future installations of in-front-of-the-meter, solar power stations below 30MW.**
- **Determine the geographical (postcode) distribution of solar and battery installations.**
- **Gather feedback from solar and battery industry professionals.**

Questions?

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