Solar Victoria

VICTORIA State Government

C4NET

Longitudinal research into consumption patterns after installation of a Solar Homes Program approved product – 2022 to 2024

Summary of findings

Purpose and scope

- In 2022, Solar Victoria commissioned the Centre for New Energy Technology (C4NET) to undertake a 3-year longitudinal study analysing Solar Homes Program participant's electricity consumption before and after solar PV, battery, and hot water upgrades.
- This unique study was the first in Australia to link actual household and business electricity use with solar program participation over multiple years.
- The research is now complete to inform future program and policy design, and advance the renewable energy transition

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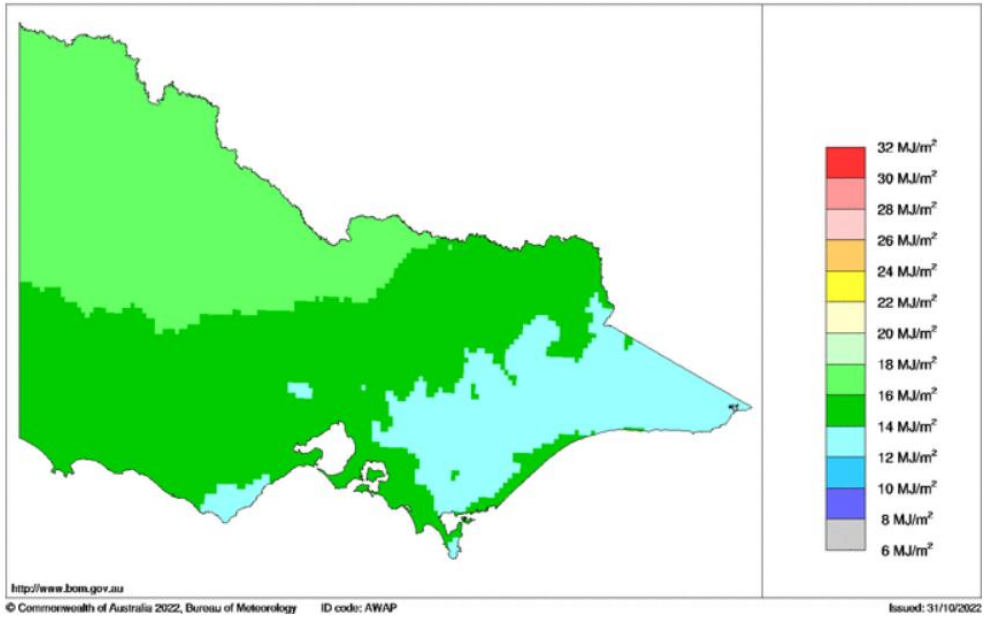
Methodology

- Sample size used data from over 4,400 sites over the 3-year period
- Samples of rebate recipients were randomly selected across multiple Distributed Network Service Provider (DNSP) areas
- Sites were used where electricity usage was available for 12 months prior to the installations, and 12 months post installation – at 30-minute increments using smart meter data
- All sites were anonymised
- Electricity generation data extrapolated using:
  - Solar system size (module kW); and
  - Geographic region (sites allocated to 1 of 3 regions to reflect solar generation variance)
- Grid use and export are known so solar self-consumption is derived from the estimated generation.

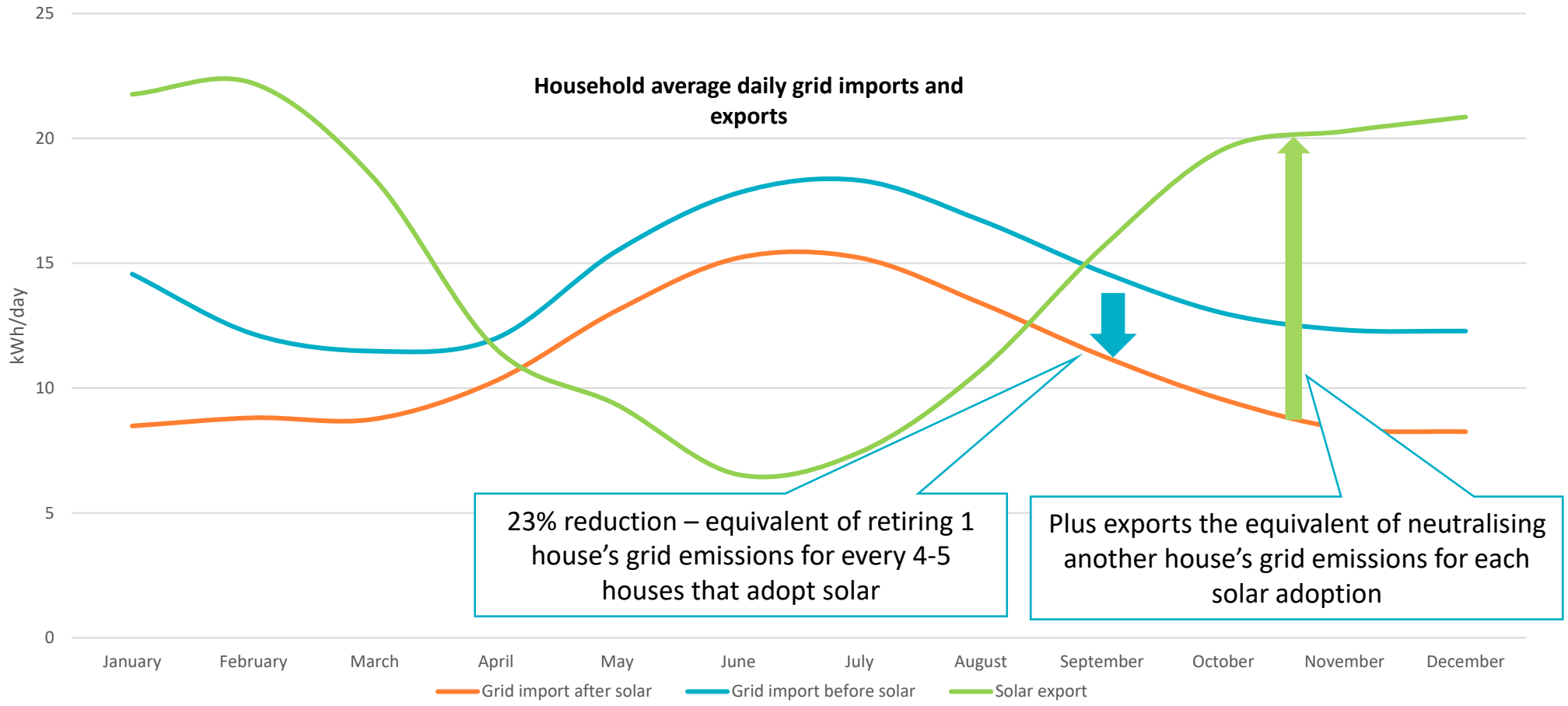
Victorian 12-month solar exposure



Regions used	Melbourne metro	Northern regional	Southern regional
Annual solar generation (kWh/kW_p)	1369	1547	1304
Annual generation relative to Melbourne metro	1.00	1.13	0.95

Residential solar is significantly reducing electricity use

Solar PV only customers have significantly reduced use of electricity from the grid, and become net exporters for most of the year



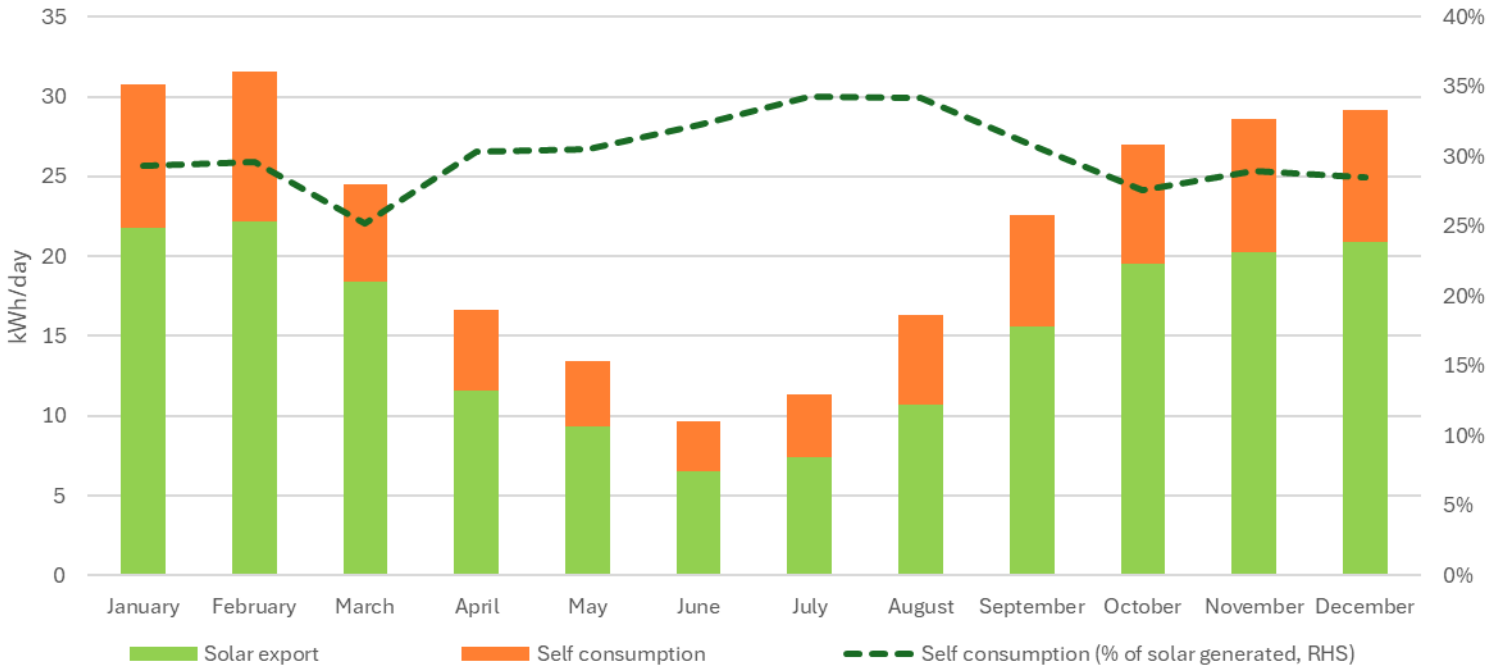
Source: C4NET analysis 4400 sites across AusNet, Jemena, Citipower, Powercor, and UE areas, with an average system size of 6.5 kW

Residential solar consumption patterns

Over the three-year study, households with solar consumed an average of 29% of the solar they generated

- Victorian households use more electricity in winter than summer. In these months solar generation is also lower so unsurprisingly that self-consumption of that solar is highest in winter.
- In summer, the morning and afternoon peak are more likely to align with solar production times hence greater volume self-consumed.
- Reducing solar export through increased self-consumption increases savings for households.
- Options to increase self-consumption include behaviour change initiatives to shift electricity usage (i.e pre heat/cool), and storage of excess solar (through batteries, electric vehicles or heat pump hot water systems).

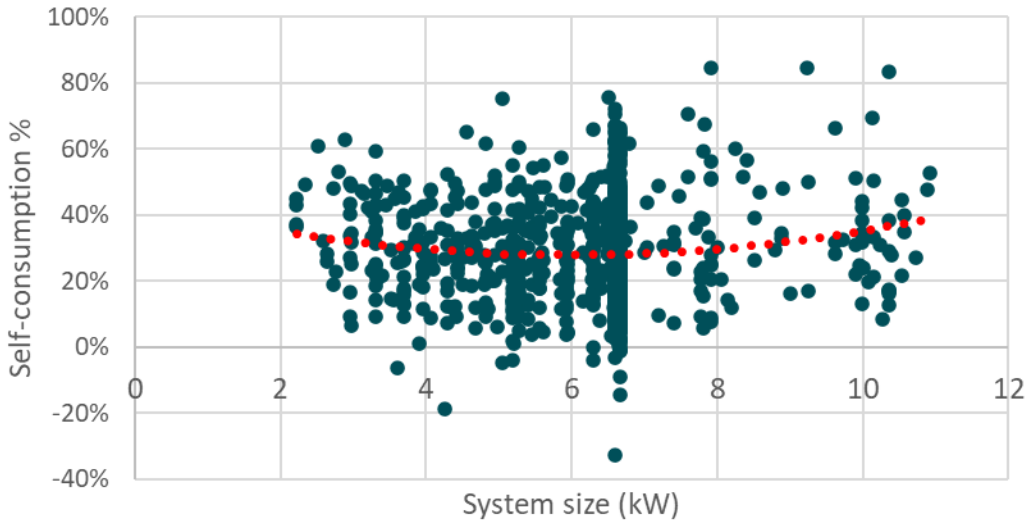
Average daily generation split by use (self-consumed and exported)

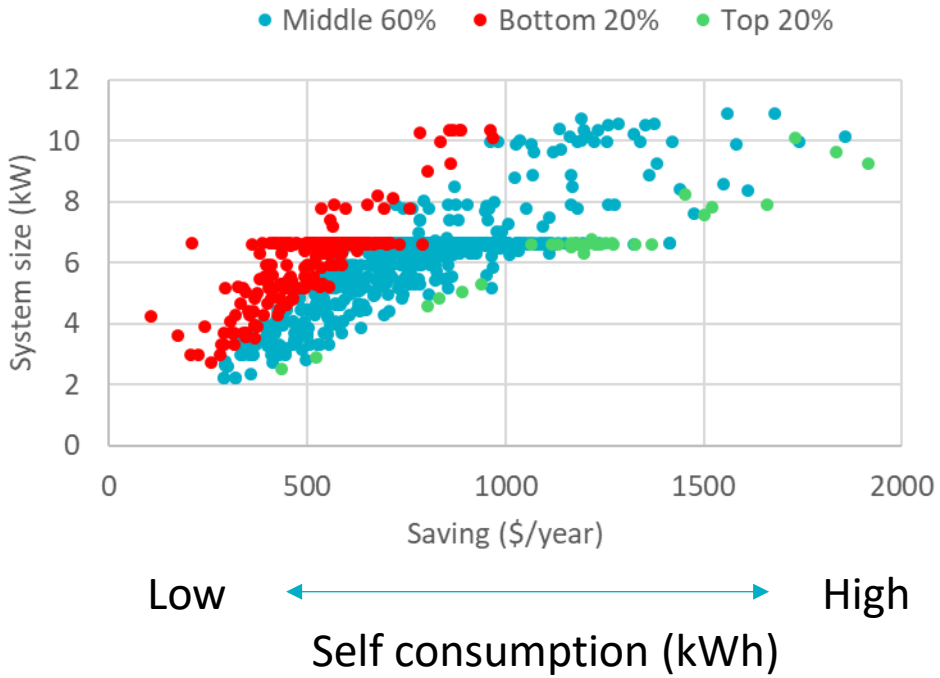


Source: C4NET analysis (sample size 990 sites)

Each customer is unique

The rates of self-consumption vary significantly, irrespective of system size. When communicating potential benefits to customers, it's important to consider that customer needs are unique.





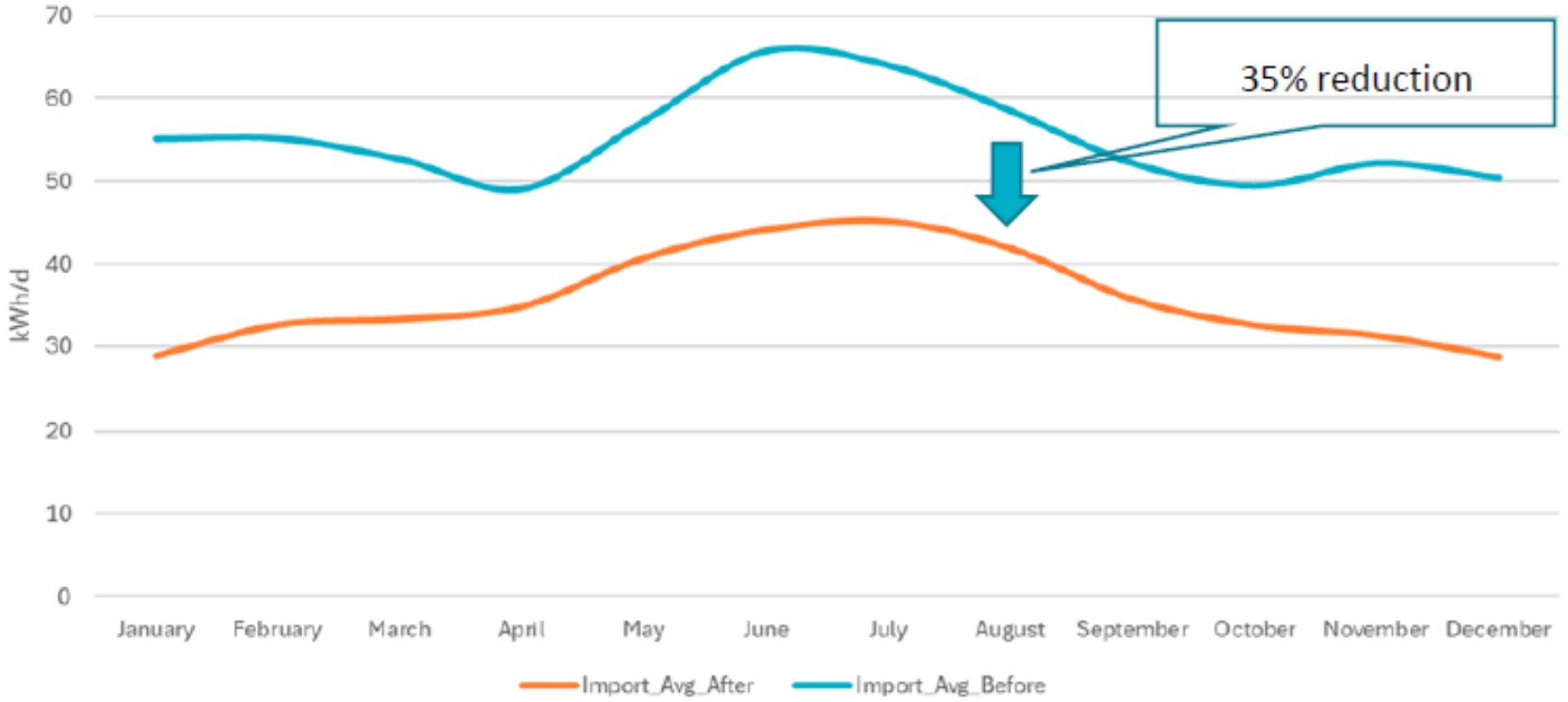
Low ⟷ High

Self consumption (kWh)

Big benefits for businesses with solar

Businesses with solar had significant benefits, saving on average $3,300 – $3,600 in FY24, and reduced their grid imports by 35% across the year on average.

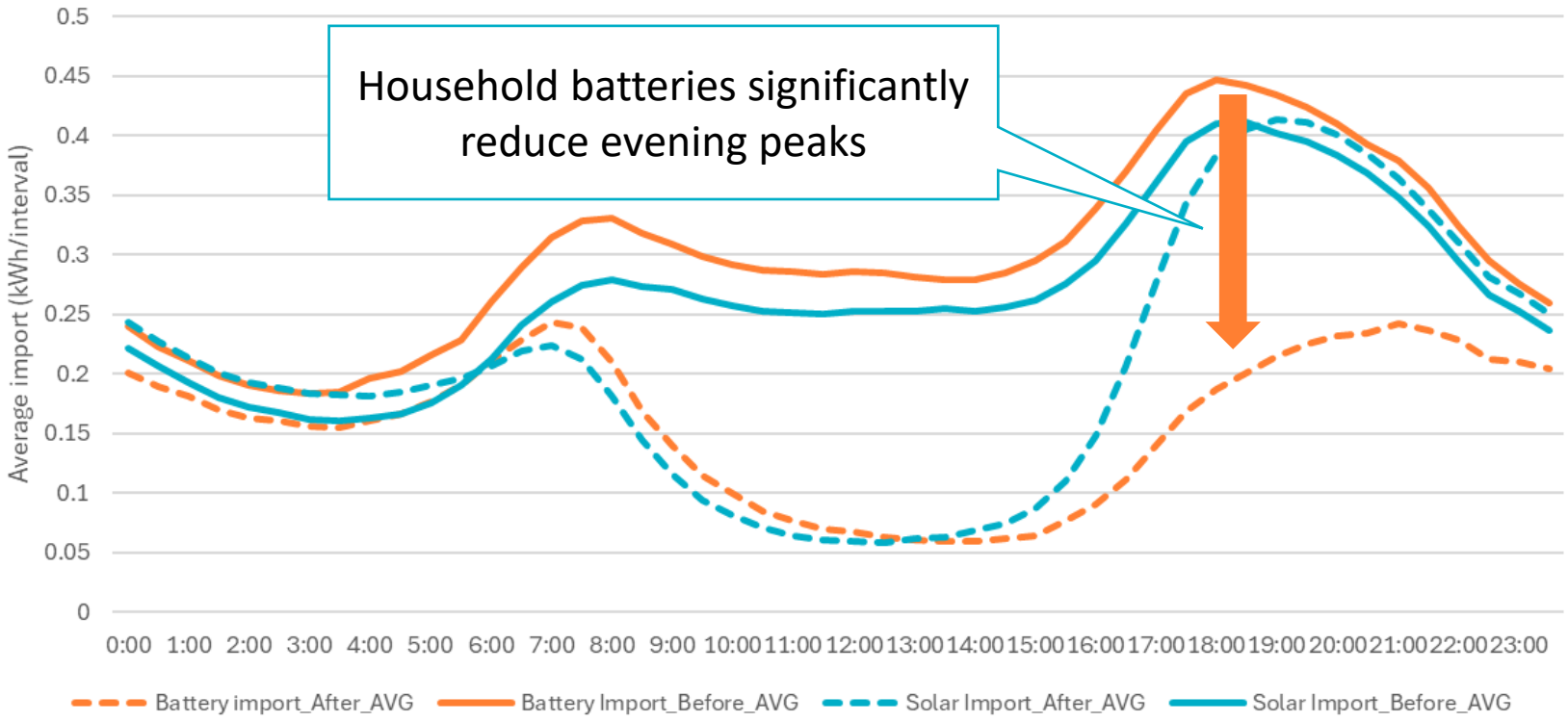
This is driven by their high rates of self-consumption (~47%) and larger system sizes. Those with 7-day operations also saved more, as they were able consume more of the solar that they generated.



The impacts of adding batteries is clear

Solar customers with a battery:

- draw down 36% less electricity from the grid
- have very high rates of self-consumption (~57% vs 29% for solar PV-only customers)
- significantly reduce their evening peak – particularly in summer which has significant grid benefits
- save on average of 100% more per annum than solar PV-only customers



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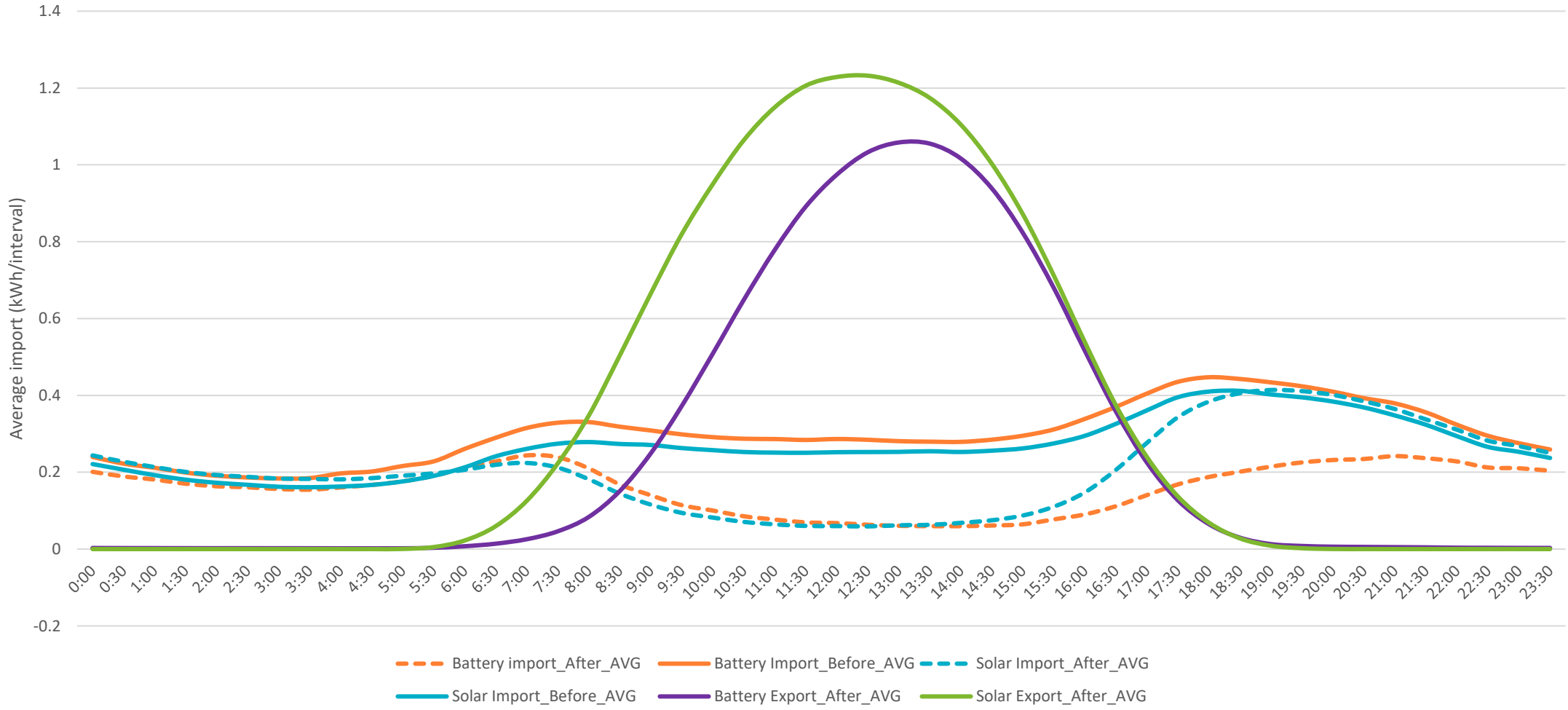
Batteries and grid impacts

Adding a battery reduced solar export to the grid during the daytime, which has benefits for grid security



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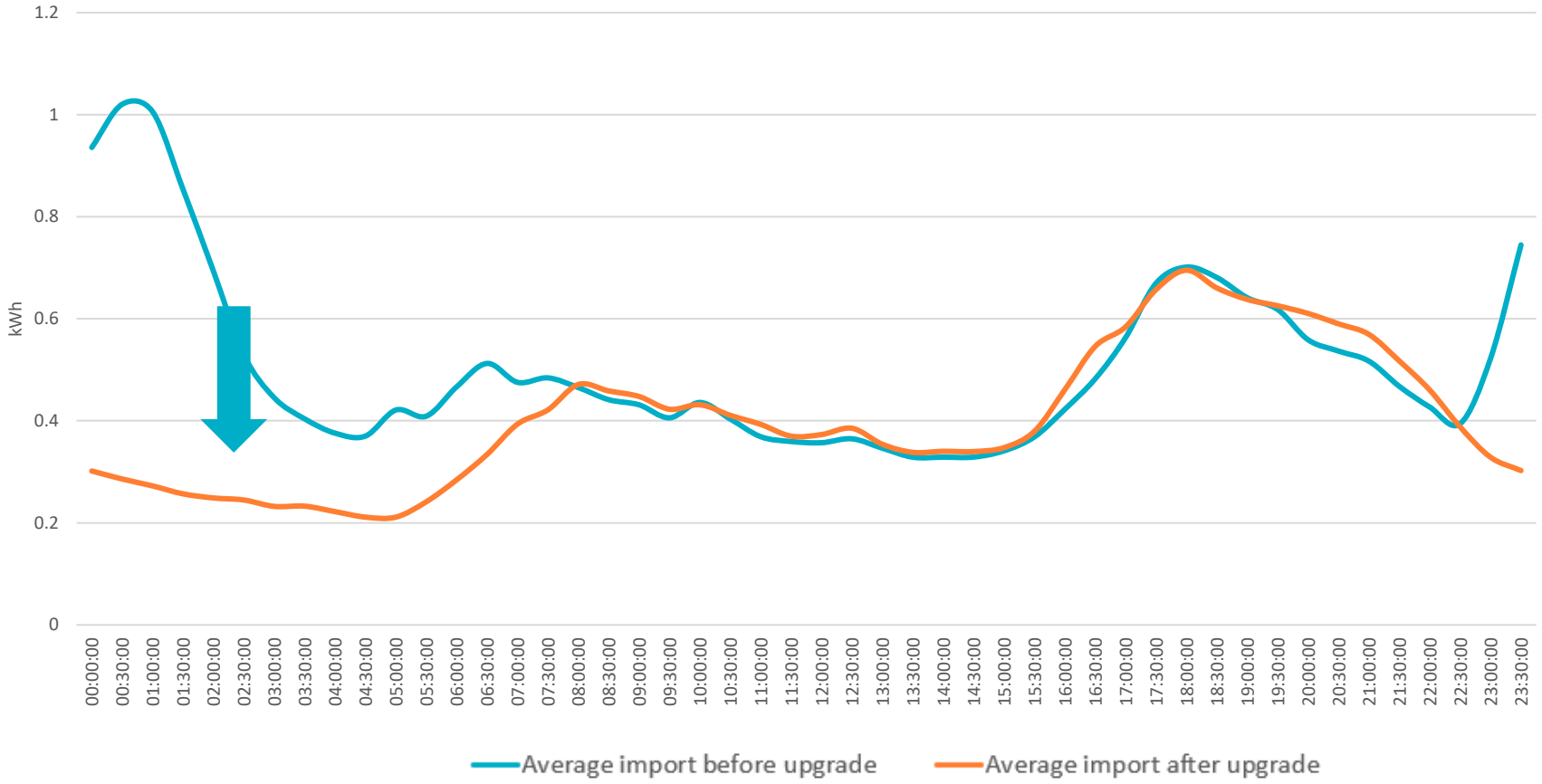
Switching to high efficiency hot water systems changes electricity use

High efficiency upgrade from resistive electric storage to heat pump lowers electricity by ~5kWh/d



Note - Sample too small for quantitative reliance relative to other figures provided in this pack, but are sound directionally

Increasing the rate of self-consumption

Battery and Solar for Business customers use more of the solar they generate which can grow savings

The annual savings of Battery and Solar for Business recipients was higher than solar only customers due to:

- Larger solar systems
- Higher self-consumption

The adoption of battery systems is skewed to the largest users of household electricity.

- Solar – higher than average household
- Battery – 30% higher than Solar Homes sites

	System Size (kW)	Savings relative to residential solar only customers	% Self consumption
Solar Homes	6.51	1	29%
Batteries	8.06	1.89	57%
Solar for Business	15.56	3.71	47%

Conclusions

This has been a world-leading study in terms of size and detail. The study has quantified:

- How much household and business's solar and battery adoption has reduced their grid electricity use
- The rate of self-consumption/export to grid from solar
- How households and businesses can increase their self-consumption further as electrification and adoption of storage increases.
- The breadth of usage patterns and that no typical customer exists

The granular design of the study has also afforded some unique insights:

- How battery customers are shifting evening peak demand
- Impacts between usage of 5- and 7-day business customers
- The impact of electrification of gas heating and switching to high efficiency devices