



IEA SHC TASK 69 SolarShift Project



Collaboration on Energy and
Environmental Markets

Research team

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- Prof. Alistair Sproul (Chief investigator)

Project partners

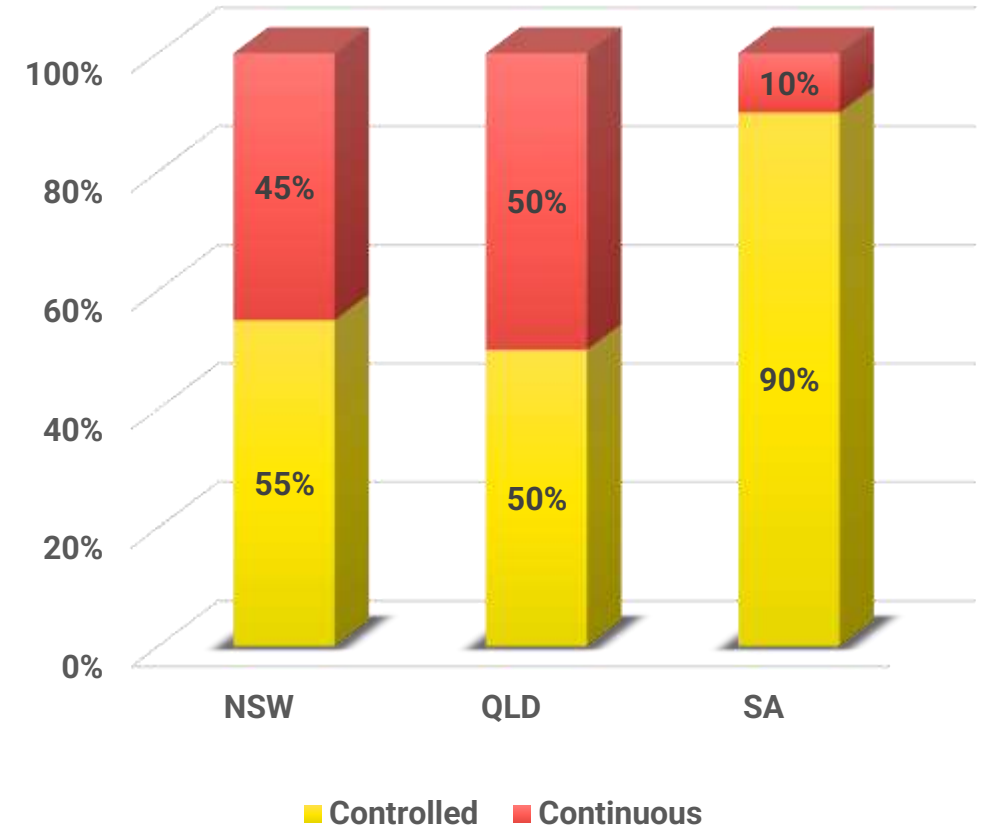
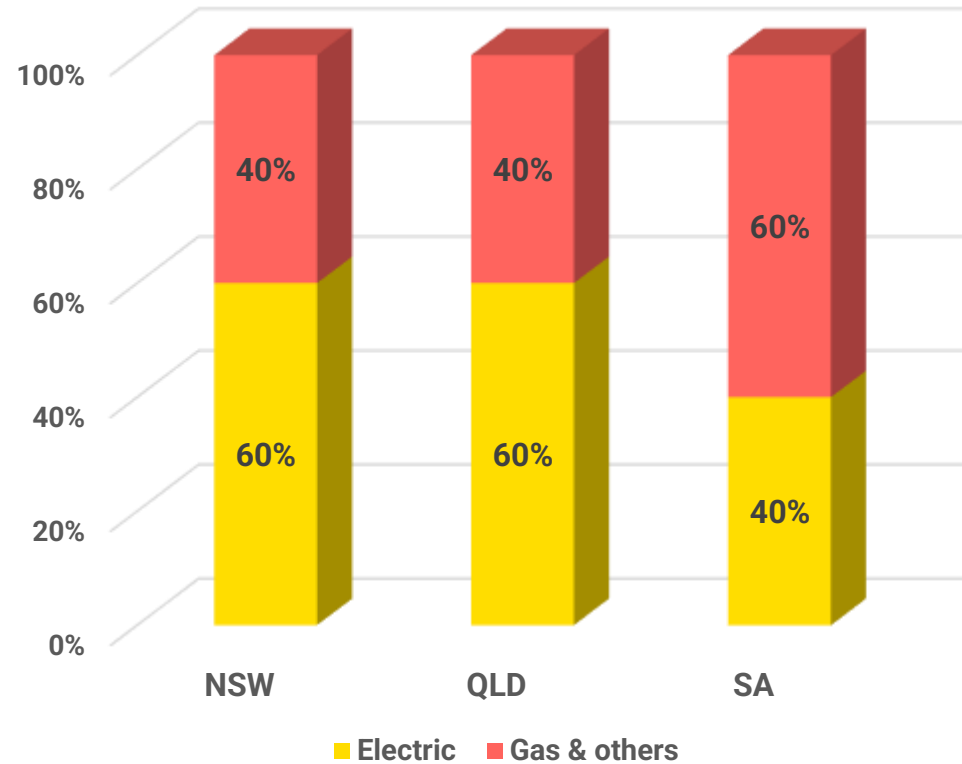


Treasury

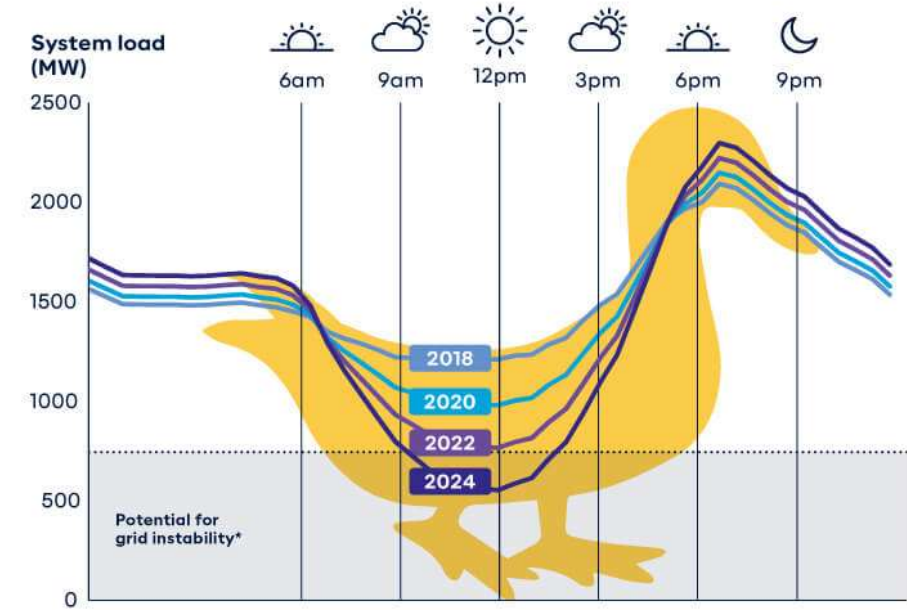


Project motivation

Project motivation #1



Project motivation #2



Project motivation #3

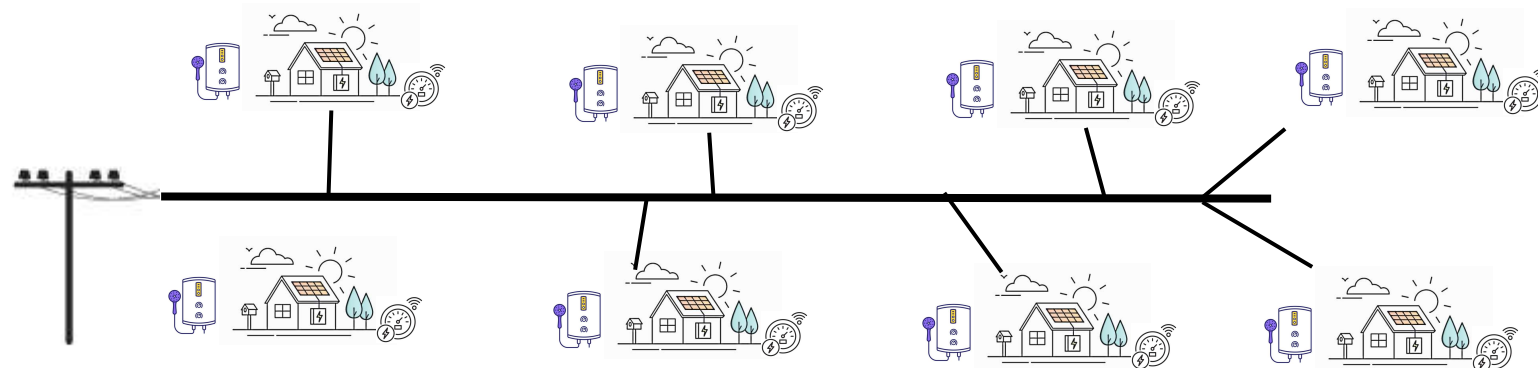
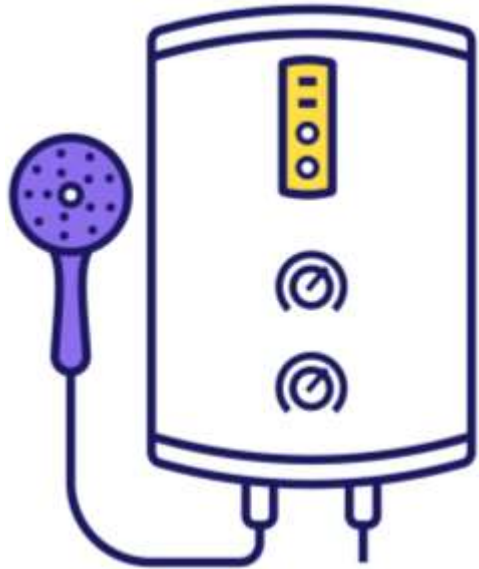


The screenshot shows the AEMC website header with navigation links: About Us, Energy System, Regulation, Our Work, News Centre, and Contact Us. Below the header is a blue banner with a purple and blue abstract background. A breadcrumb trail reads: Home / News Centre / Media Releases / AEMC on smart meters: 100% by 2030, new customer information, real-time data and protections. The main content area features the following text:

**AEMC on smart meters:
100% by 2030, new customer
information, real-time data
and protections**

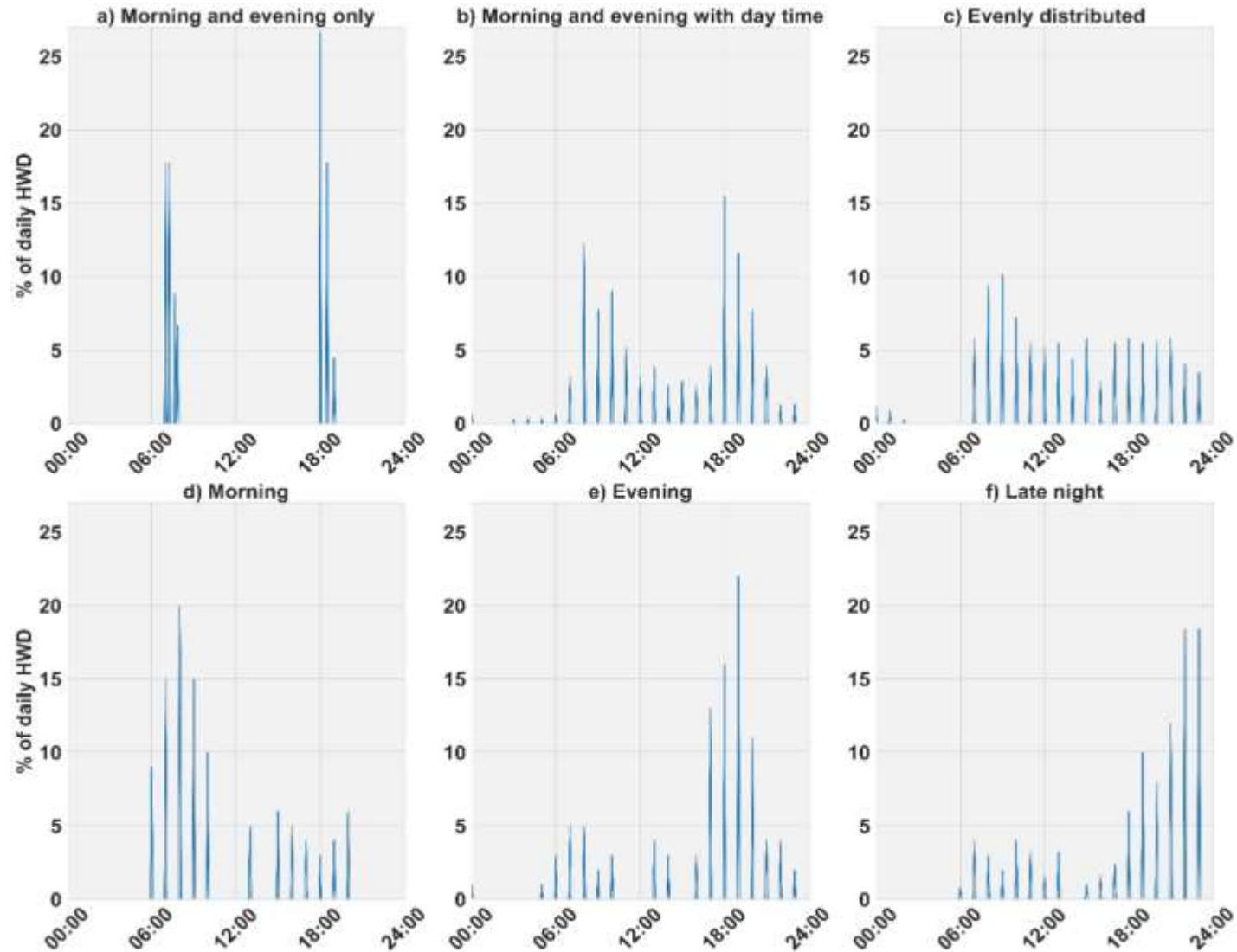


Project SolarShift



Thermal modelling findings

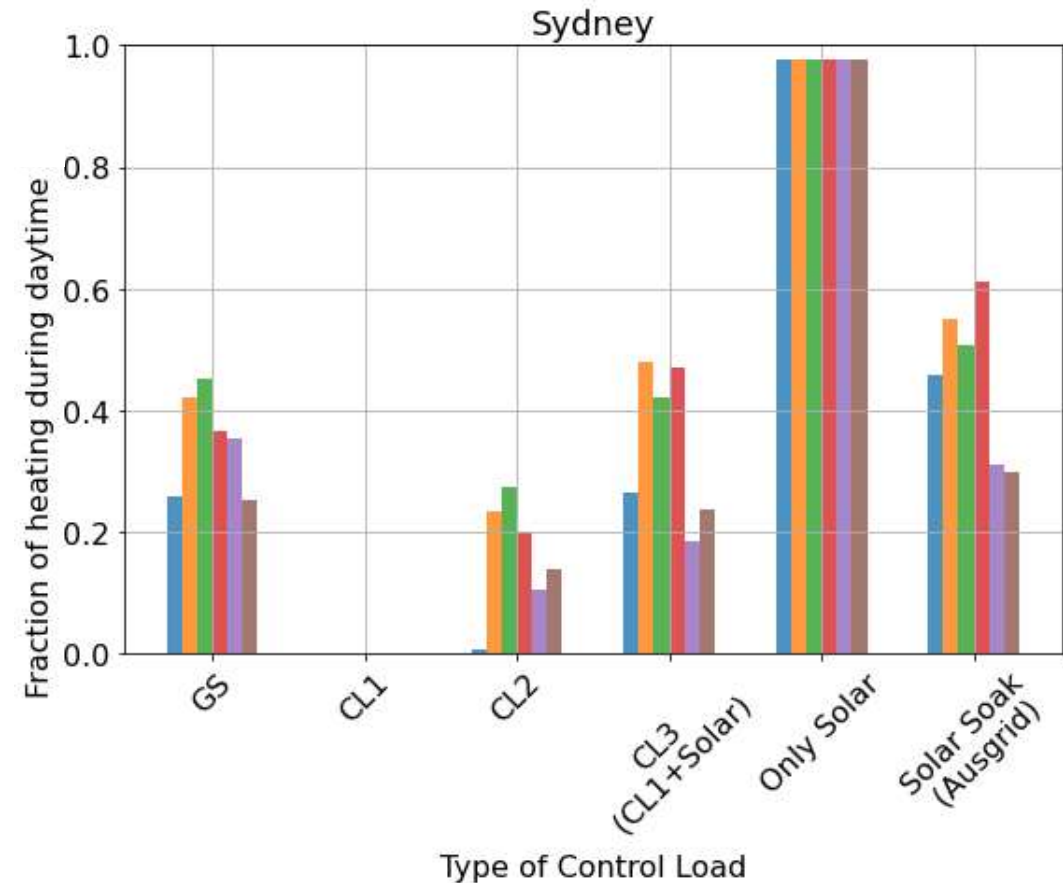
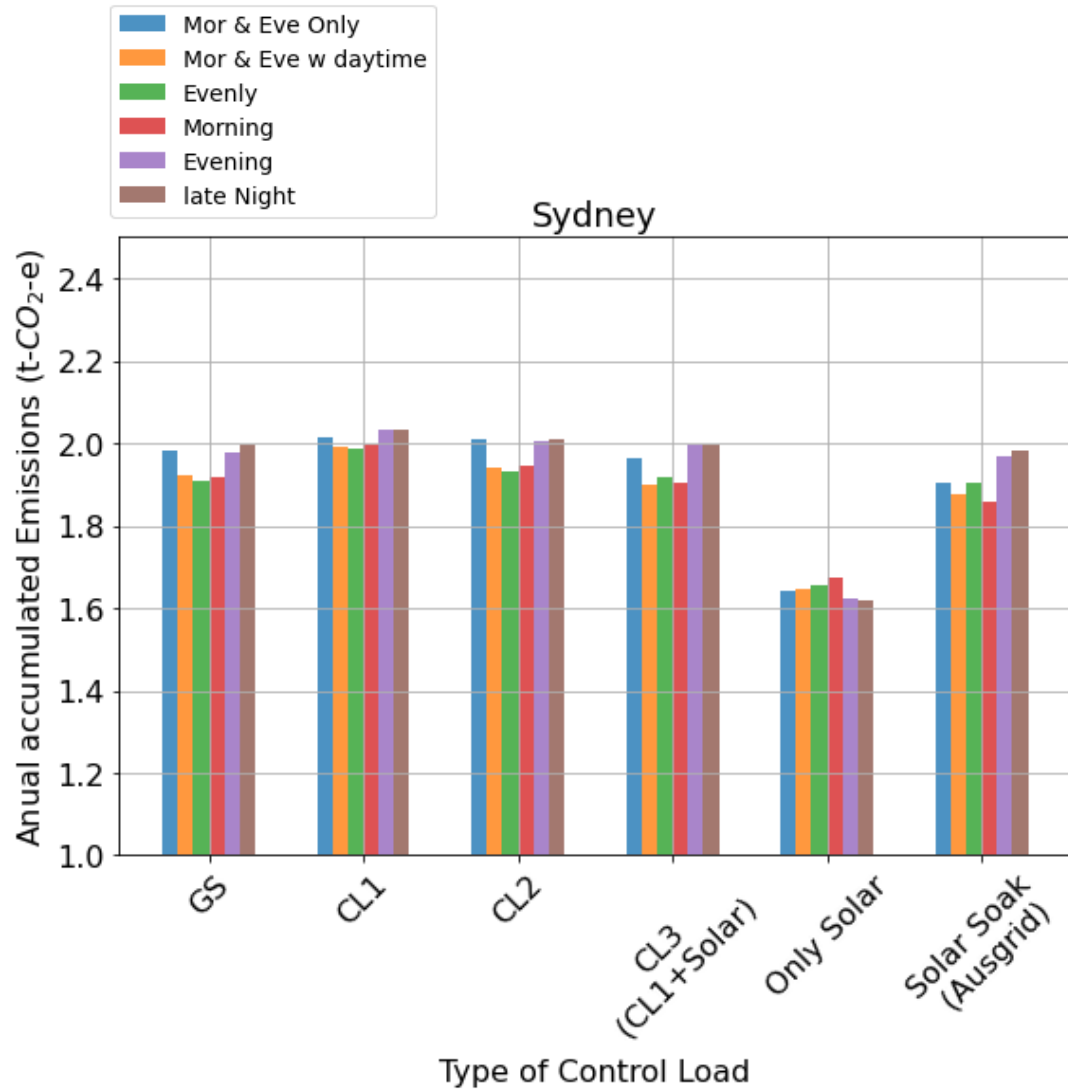
Hot water draw profiles



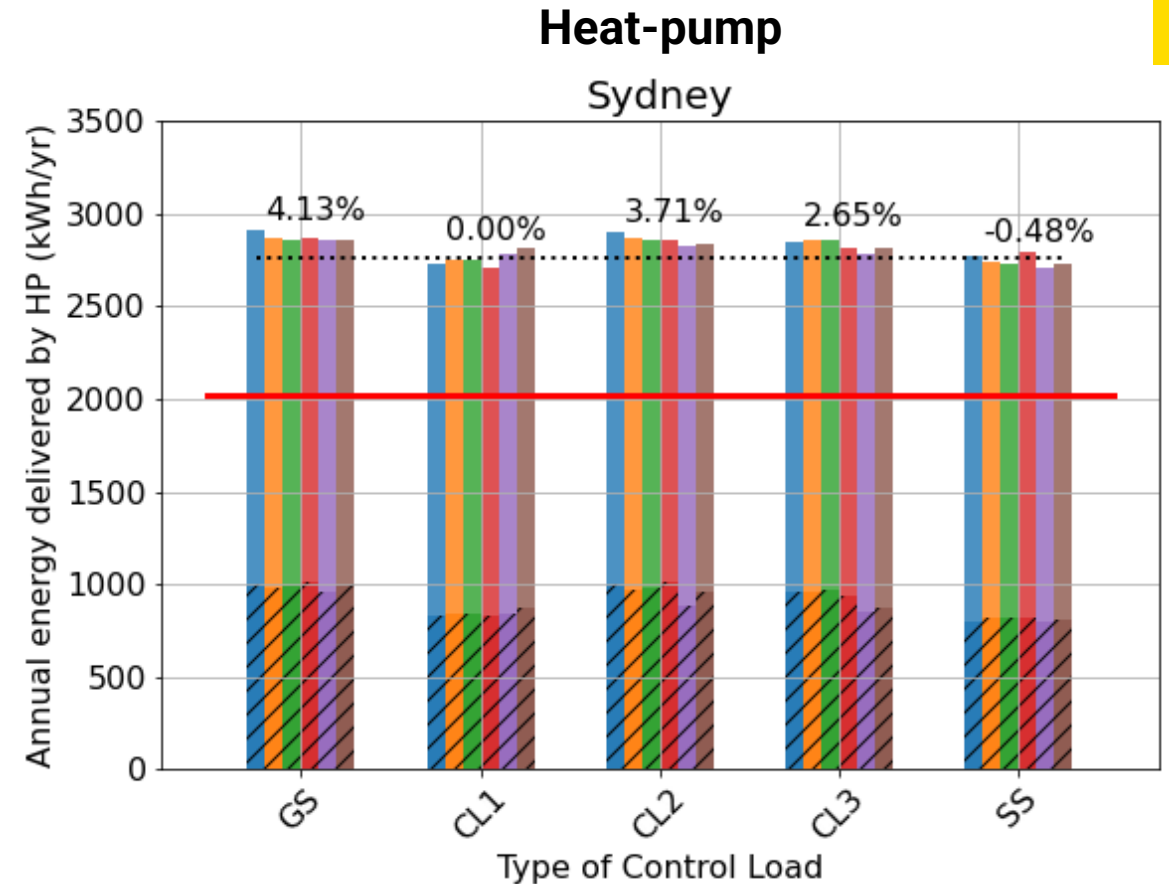
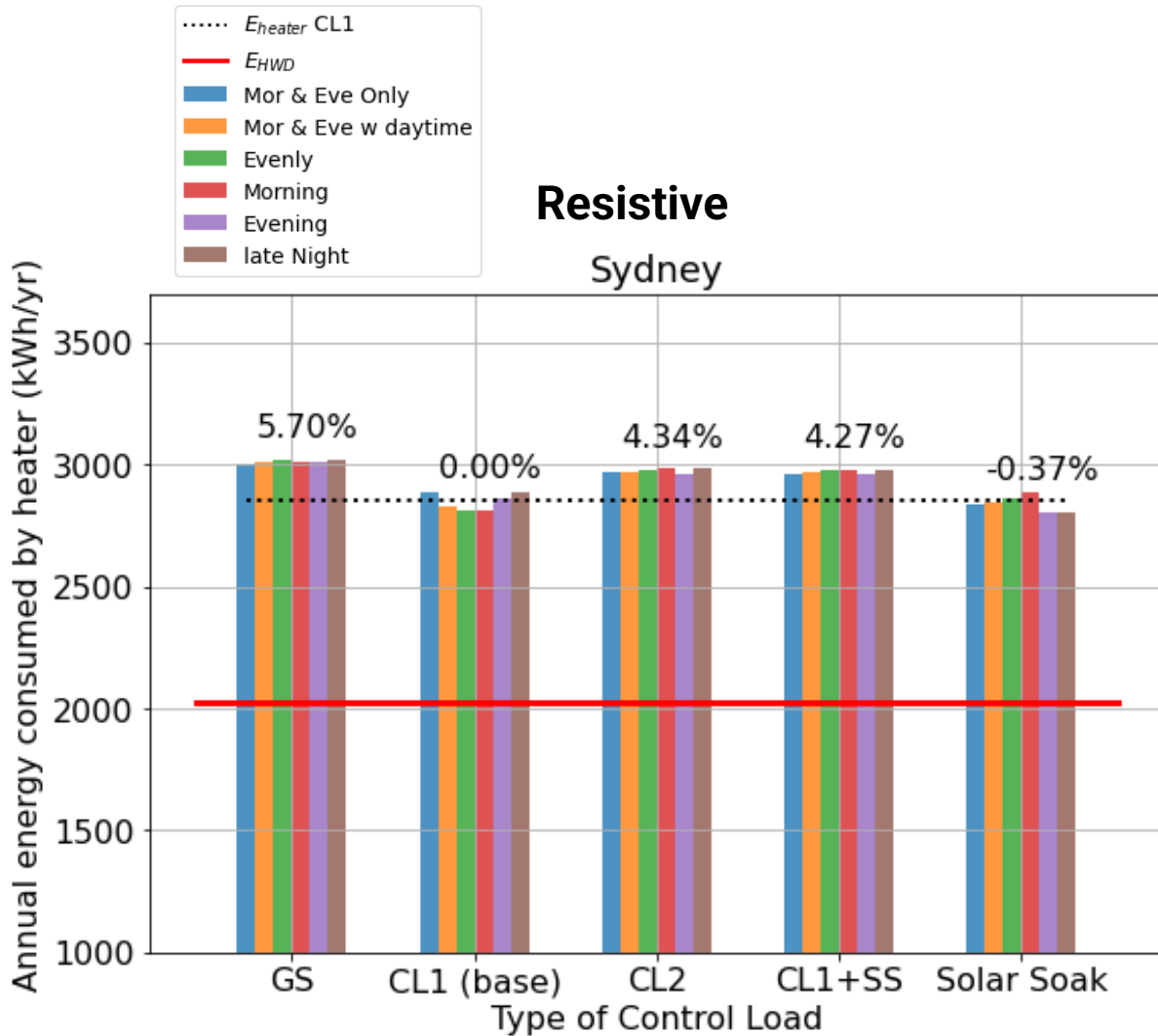
Controlled load types

- **General supply (GS)** : 24/7
- **Controlled load 1 (CL 1)** : 10pm-7am
- **Controlled load 2 (CL 2)** : 24/7 except seasonal peaks (3pm-8pm)
- **Controlled load 3 (CL 3)** : 10pm-7am + 9am-3pm
- **Only Solar** : 9am -3pm
- **Solar Soak (Ausgrid)** : 10pm-7am + 9.30am-3.30pm (solar window changes across different seasons)

Emissions and solar-soak (resistive heaters)

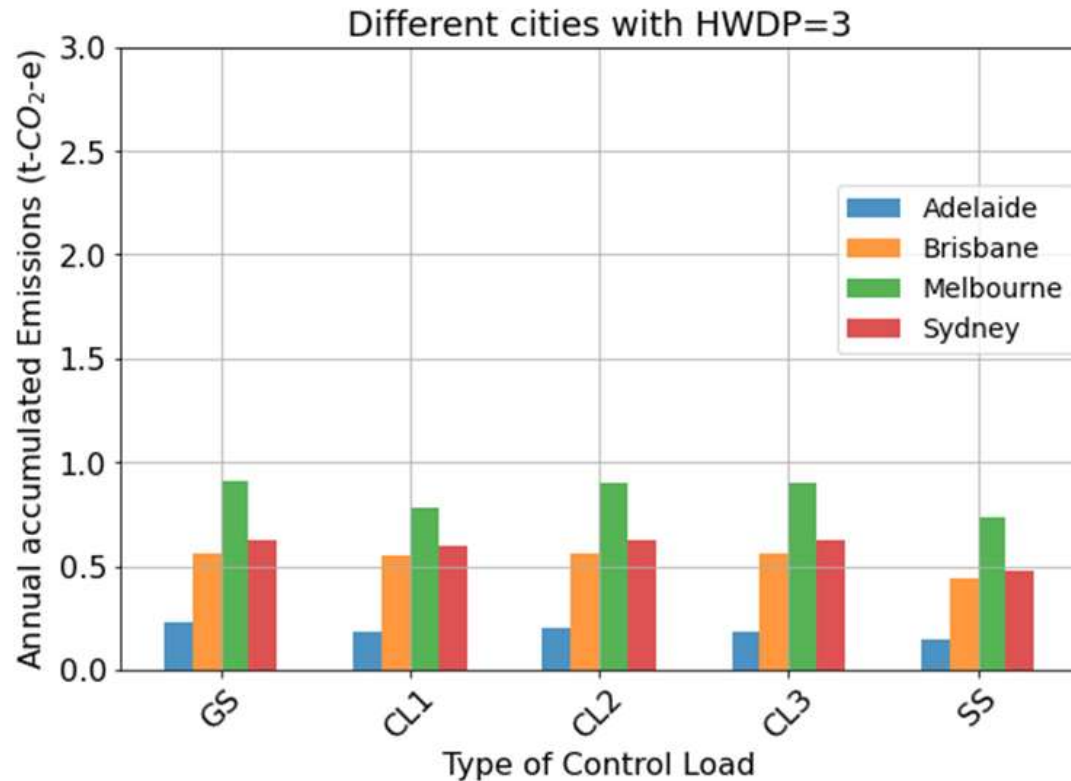


Annual energy consumption by different control strategies: resistive vs. heat-pumps

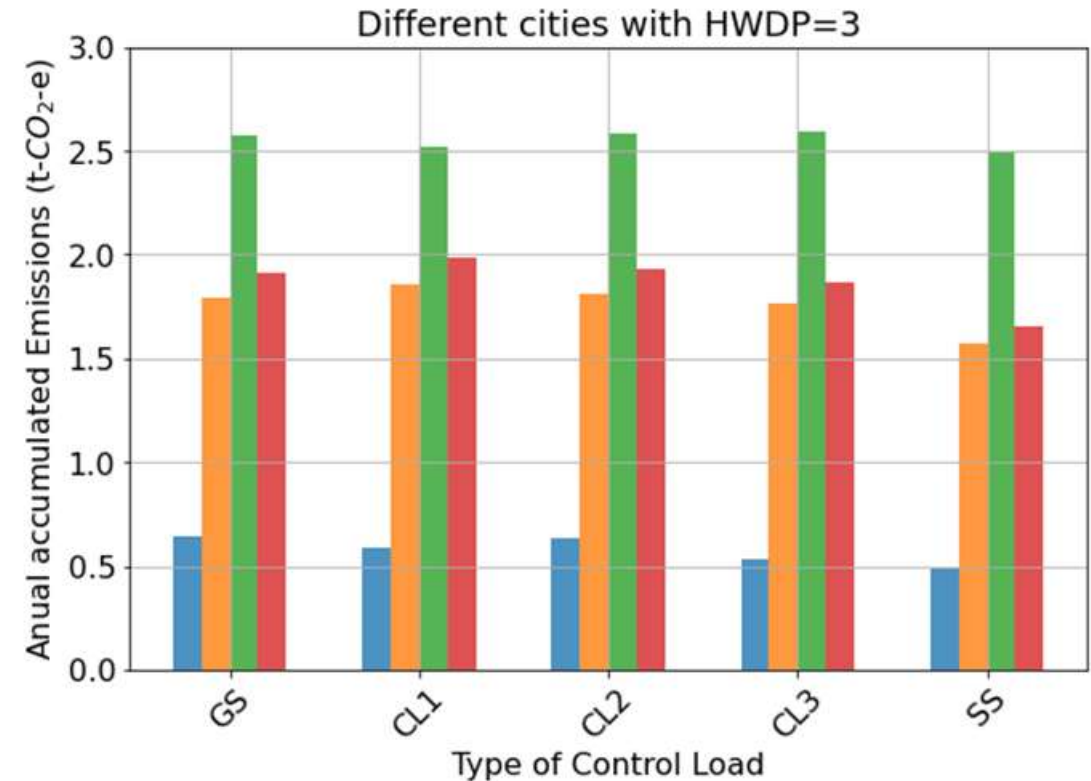


Emissions: Heat-pump vs. resistive immersive

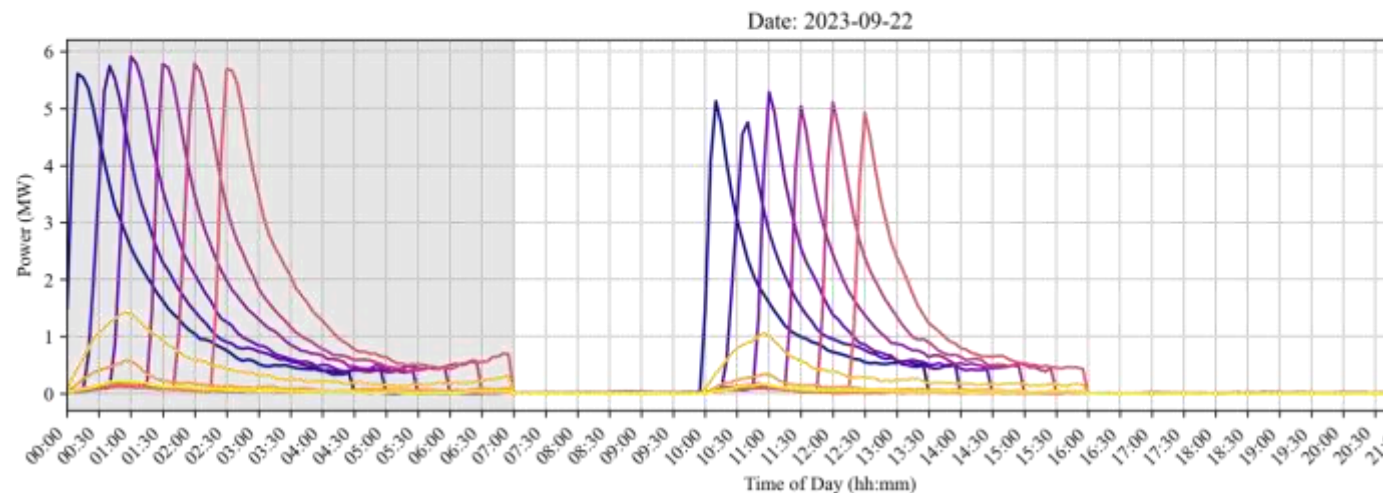
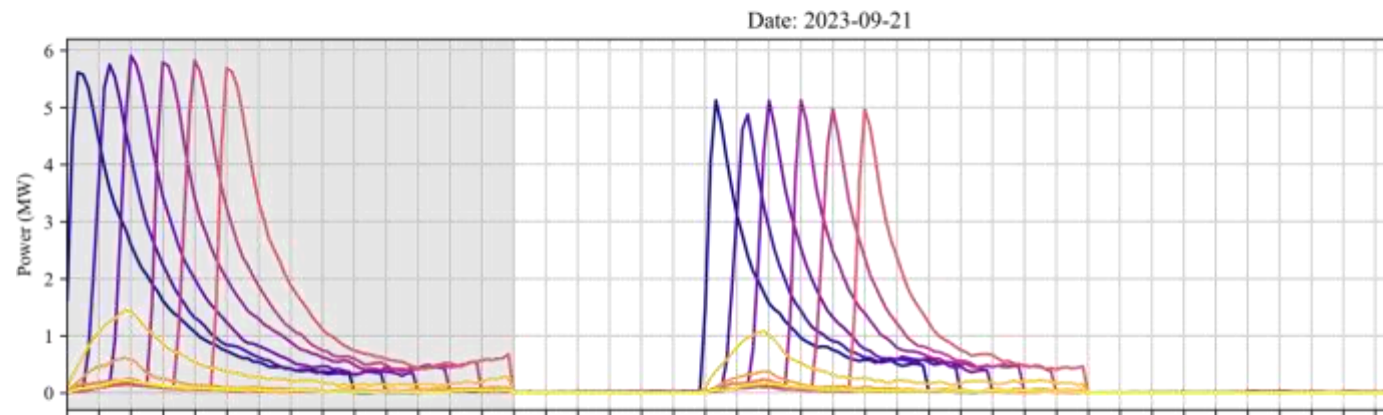
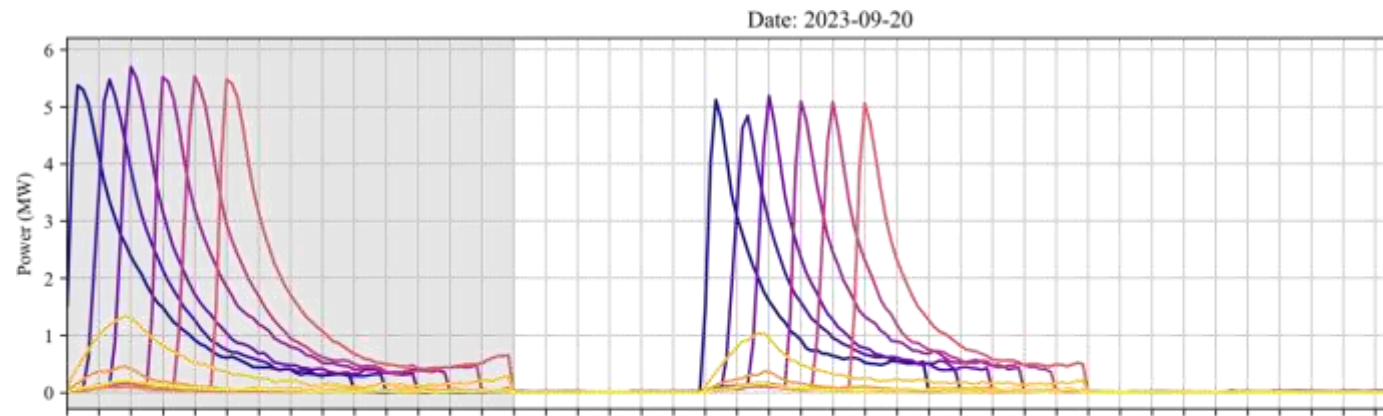
Heat pumps



Resistive immersive



Trial operations



- Around 20,000 participants

- Randomization of different customer groups to prevent local peak demand (40% reduction)

- Total controlled electric hot water demand ~15 – 25 MW

- Simple and static control strategies & wholesale arbitrage

- **40-50%** of daily hot water demand is shifted to day-time

- When we switch from Control Load 1 (CL1) to Control Load (CL3), the daily hot water demand increases ~ 3 - 8% (depends on season and time of hw use)

The future of controlled load?

Recent updates on the controlled load (CL)

- Households can change their water heating technology options without notifying DNSPs or retailers
 - There are costs associated with disconnection CL (~\$150-200)
 - Most people avoid these by leaving the connection on, but they may keep paying the daily connection fee
- In SA, ~ 20-25% of the CL fleet is inactive
- In NSW, ~15-20% of the CL fleet is inactive
- In QLD, 1/3rd of solar installers recommend timers/diverters (switch to general supply)



Electric hot water is a hero of flexible demand. Where does it stand in the age of rooftop solar?

Baran Yildiz 31 October 2023 18



New DNSP tariffs for controlled load

- Ausgrid Solar Soak option B (seasonal solar soak windows)
- Endeavour Energy Off-peak+ tariff with solar soak window
- Citipower, United Energy & PowerCor 24/7 ToU controlled load
- SAPN Solar Sponge 24/7 ToU controlled load window
- Energy Queensland new tariff trials for “trough demand” (solar-soak)

➤ **These new tariffs offer cheaper network rates during the solar soak period!**

Table B.4. Load control schedule for Type 4 meters (In this table – unless otherwise noted all times are in EST to match meter programming)

Switching Program	Load Control Schedule Controlled Load 1 (EA030) Legacy – OPTION A	Load Control Schedule Controlled Load 1 (EA030) Solar Soak Option – OPTION B	Load Control Schedule Controlled Load 2 (EA040)
Winter	1st Sun Apr – 1st Sun Oct ON at 22:00 OFF at 07:00 Randomised Delay ON 180min	1st Sun Apr – 1st Sun Oct ON at 22:00 OFF at 6:45 ON at 10:00 OFF at 16:45 Randomised delay ON 210 min OFF 15 min	1st Sun Apr – 1st Sun Oct ON at 20:00 OFF at 17:00 Randomised Delay ON 180 min
Spring		1st Sun Oct – 1 Nov ON at 21:00 (22:00 DST) OFF at 4:15 (5:15 DST) ON at 9:00 (10:00 DST) OFF at 15:45 (16:45 DST) Randomised delay ON 210 min OFF 15 min	1st Sun Oct – 1 Nov ON at 19:00 (20:00 DST) OFF at 16:00 (17:00 DST) Randomised Delay ON 180 min
Summer	1st Sun Oct – 1st Sun Apr ON at 21:00 OFF at 6:00 Randomised Delay ON 180min		
Peak Summer		1 Nov – 1st Sun Apr ON at 21:00 (22:00 DST) OFF at 6:45 (6:45 DST) ON at 9:00 OFF at 13:30 Randomised Delay ON 180 min OFF 15 min	1 Nov – 1st Sun Apr ON at 19:00 (20:00 DST) OFF at 14:00 (15:00 DST) Randomised Delay ON 180 min

1. Residential Daytime Saver

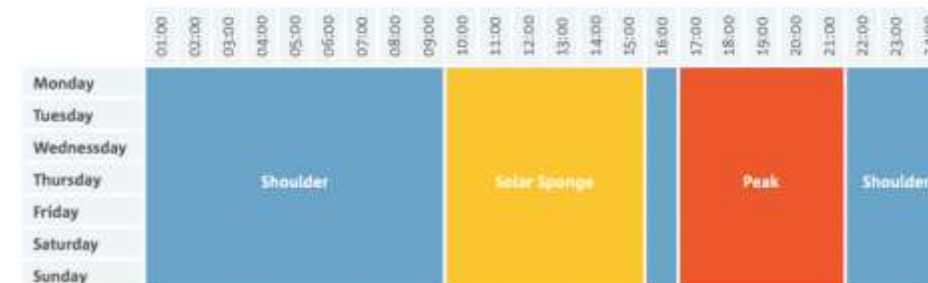
From 1 July 2022 to 30 June 2026 United Energy will offer an optional residential Daytime Saver trial tariff with the following tariff structure and indicative rates.

Time band	Fixed (cents/day)	Usage rate (cents/kWh)
10am – 3pm	23.29	0.0
4pm – 9pm		15.7
All other times		5.6

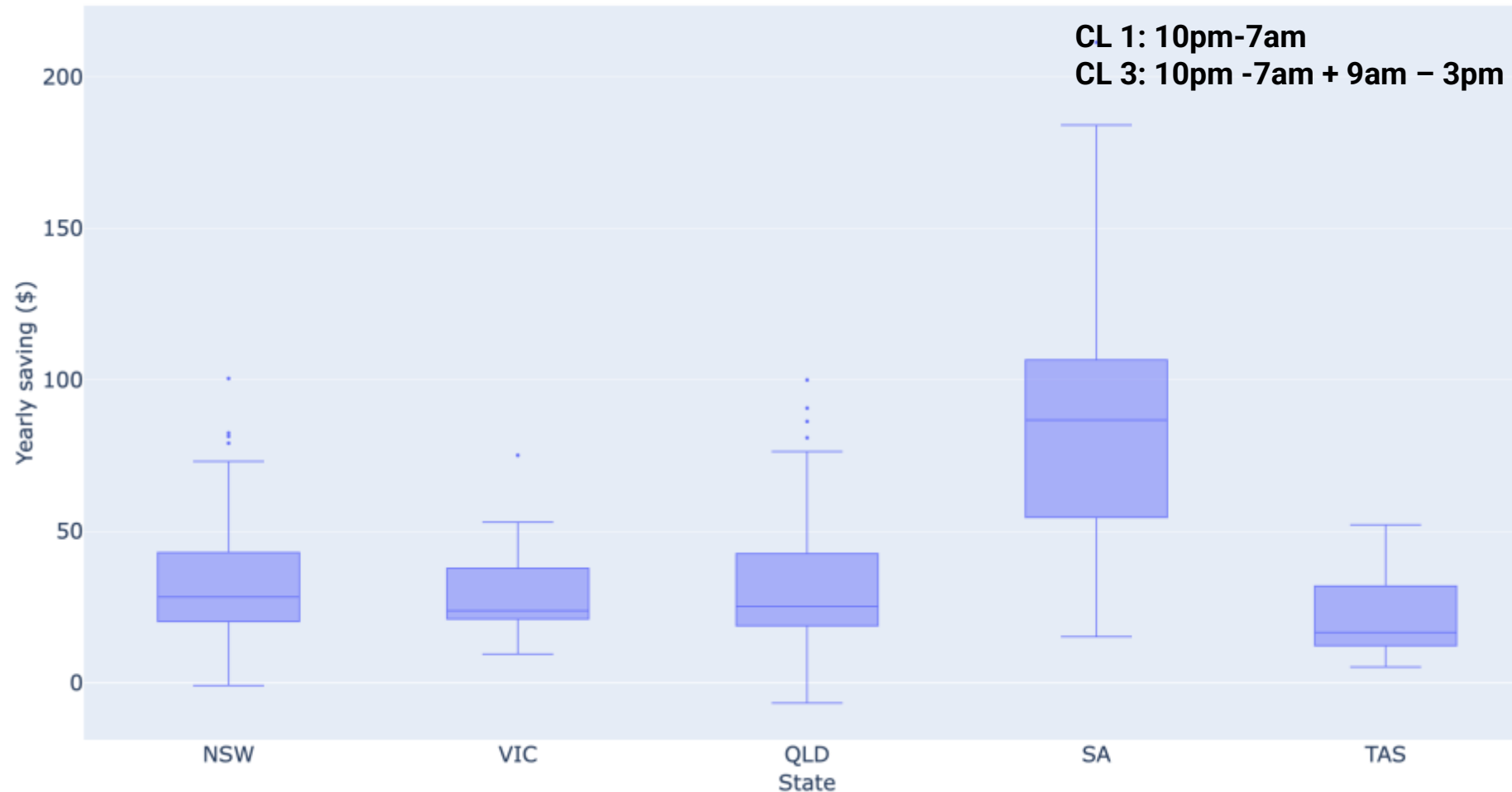
All times are in local time

Same rates apply every day of the year

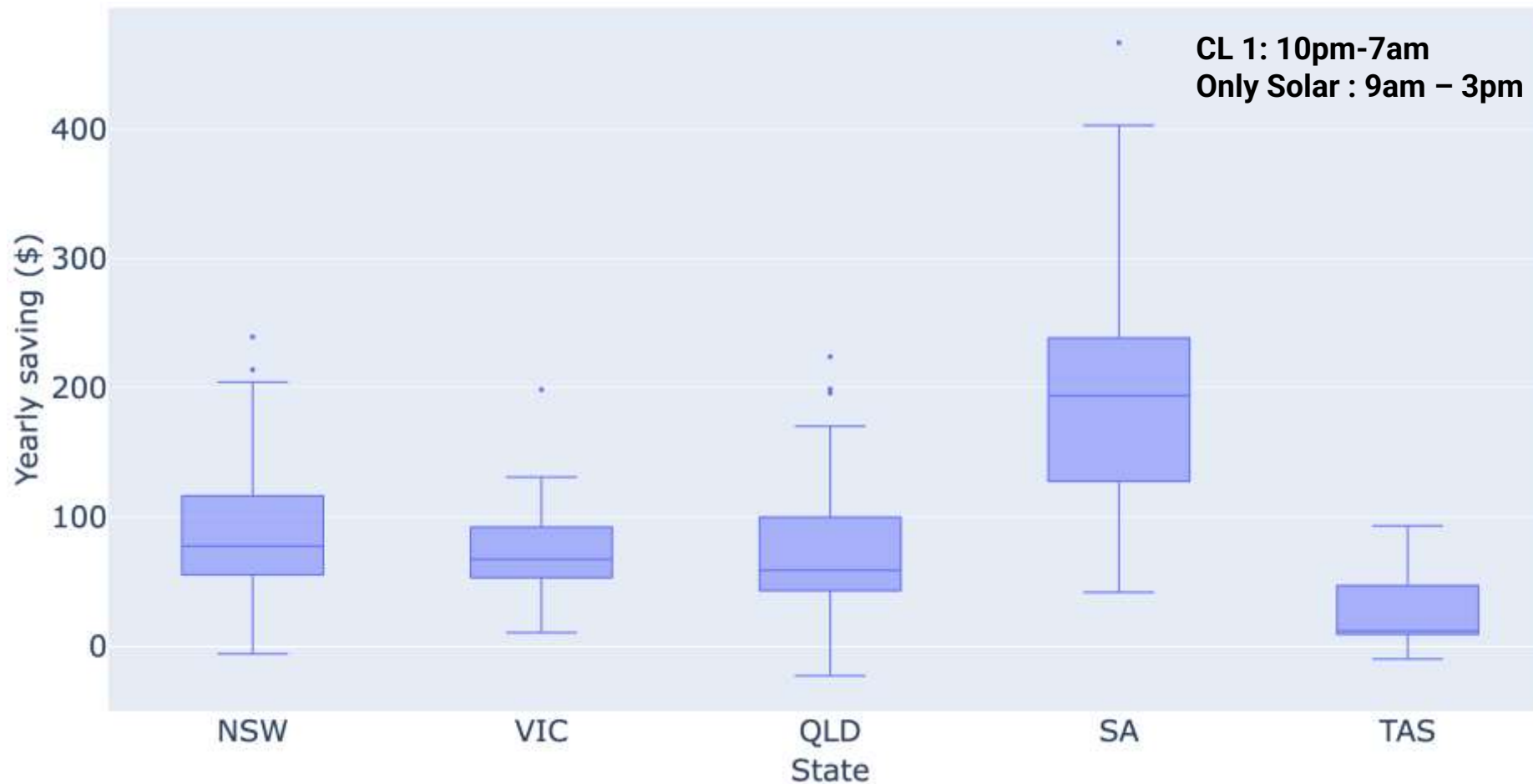
Energy usage all year



Distribution of Aggregator/Retailer savings (Change from CL1 to CL3)



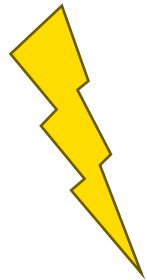
Distribution of Aggregator/Retailer savings (Change from CL 1 to Only Solar)



Key Messages



! Incentive to solar-soak has doubled by the recent increase in electricity prices (while solar feed-in remained mostly the same)!



!!DNSPs have started to offer new network tariffs to encourage consumption during solar-soak periods!!



!!! We need to come up with new & innovative retailer tariffs to pass these savings on to households to maintain central control/orchestration for hot water flexible demand !!!

Heat-pumps

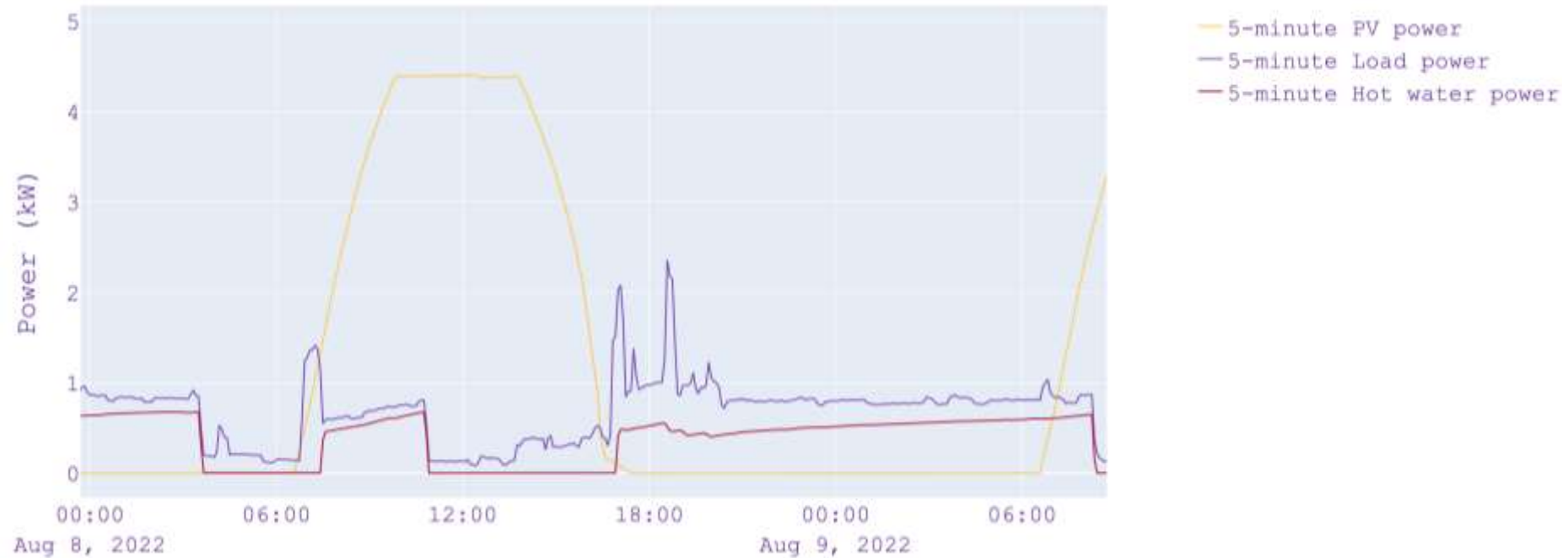


- Government incentives for heat-pumps: VIC (Solar Vic, Victorian Energy Upgrades), NSW (Energy Efficiency Scheme, Peak Demand Reduction Scheme), QLD (Climate Smart Energy Savers), ACT (Home Energy Support)
- Subsidies for heat-pumps to replace gas with heat-pump and or less efficient (immersive resistive) with heat-pumps or solar thermal
 - There are quality & customer satisfaction concerns regarding the cheaper heat-pumps!!!
- What happens to the flexible demand of hot water with more heat-pumps?
 - Heat-pumps have much smaller rating than resistive types (1kW vs. 3.6 kW)
 - Heat-pumps use 2 to 4 times less energy than resistive types (depending on COP)
 - Heat-pumps manufacturers/installers recommend installing them on the general supply (continuous/un-interrupted operation)
- Solar Victoria: Heat pumps with integrated-timers or PV connected (as of March 2024)

Immersive resistive



Heat pump



Consumer Engagement

Solar Maximiser



Your details



Your household



Your energy data

Your results



Next step

Choose your preferred option:

Option 1



More Solar (6kW)

Savings per year

\$1,000

New monthly bill

\$90

Approx. cost of system

\$8,500

Time to payback

7.5 yrs

[Learn More](#)

[Customise \(soon\)](#)

Option 2



More Solar (30kW) +
Battery (16kWh)

Savings per year

\$1,500

New monthly bill

\$50

Approx. cost of system

\$16,000

Time to payback

9.8 yrs

[Learn More](#)

[Customise \(soon\)](#)

Option 3



Solar (10kW) + Hot Water

Savings per year

\$1,200

Solar system size

10kW

Hot water system

Heat pump

Optimisation options

+ Timer

+ Diverter

+ Control

+ Offpeak

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Thank you!

Our research is sponsored by the Australian Government through Cooperative Research Australia RACE for 2030 program

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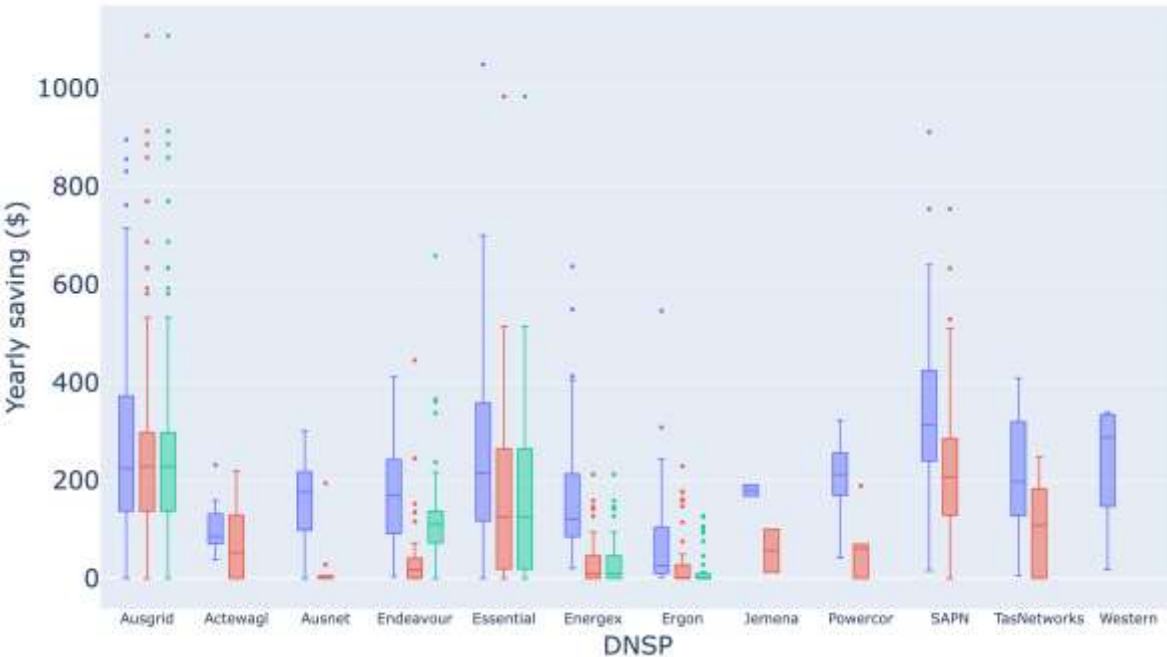


Ownership of smart meters & data

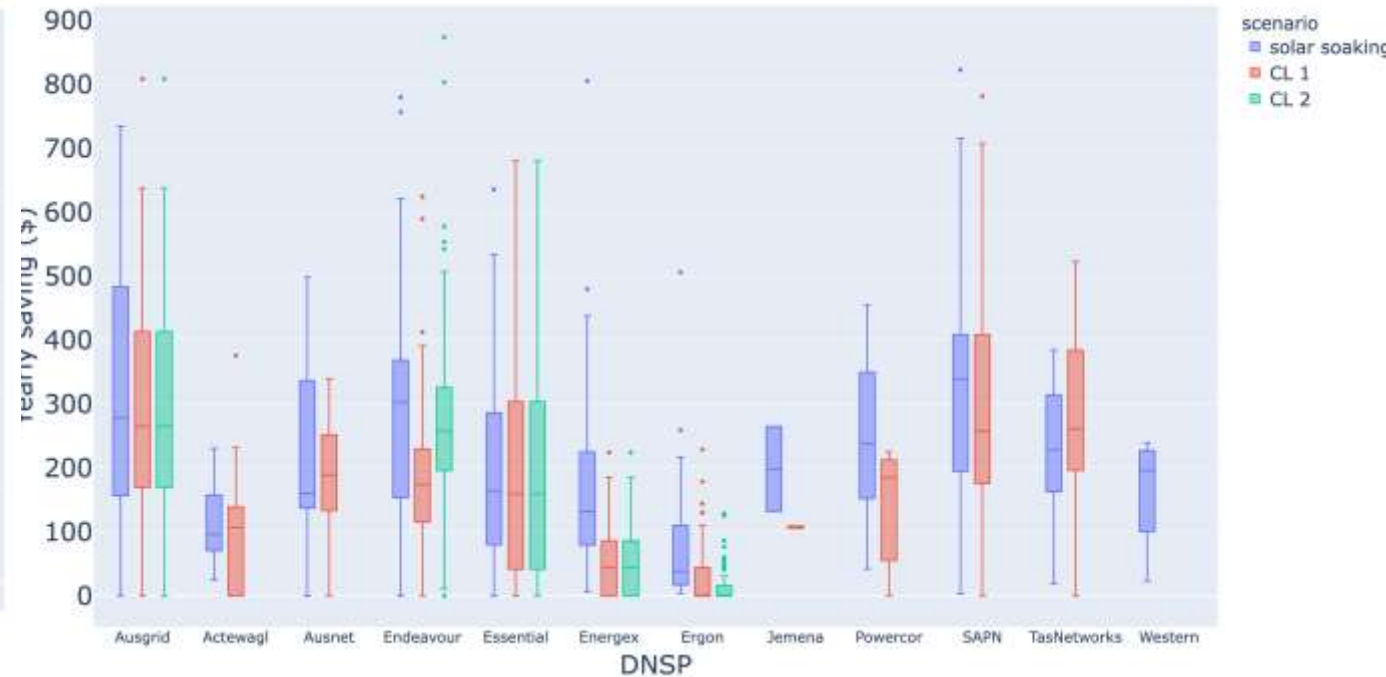
- In VIC DNSPs have the ability to use and control the smart meters and controlled load. Not the retailers.
- In NSW, metering coordinators tend to shy away from changing controlled load without retailer's approval.

Potential savings

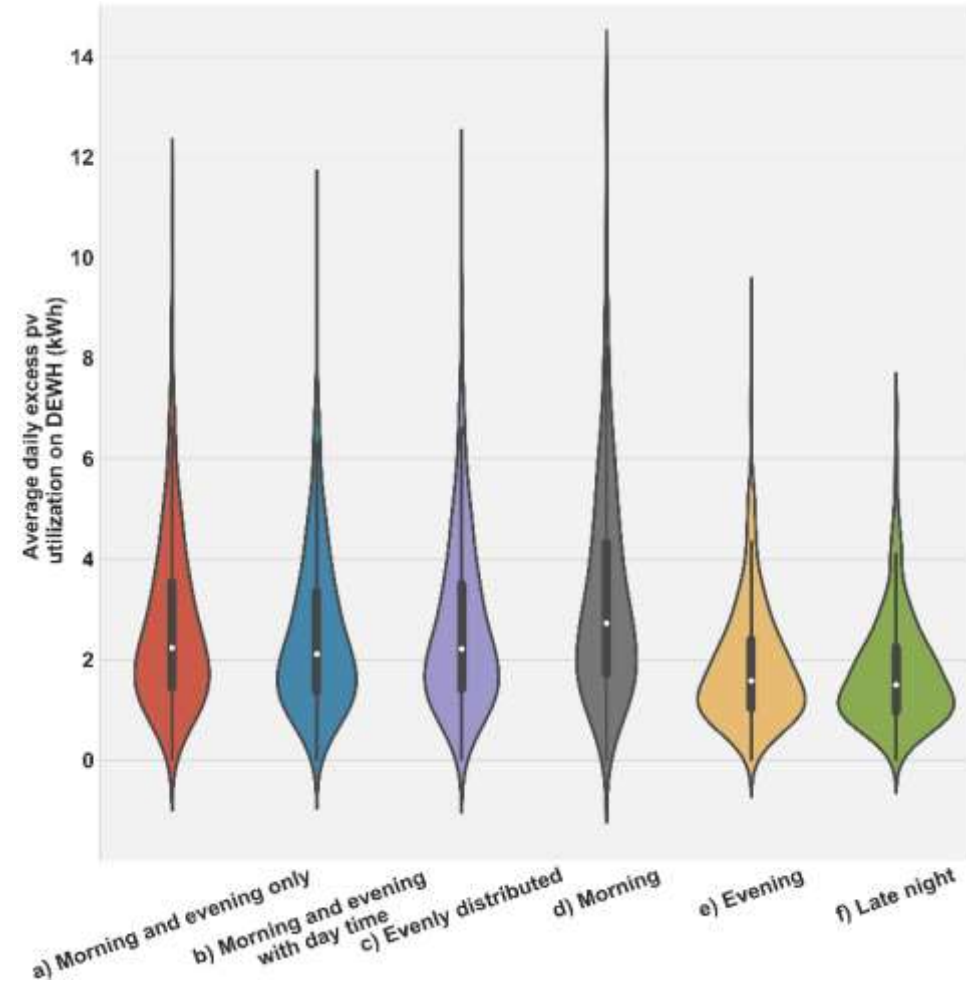
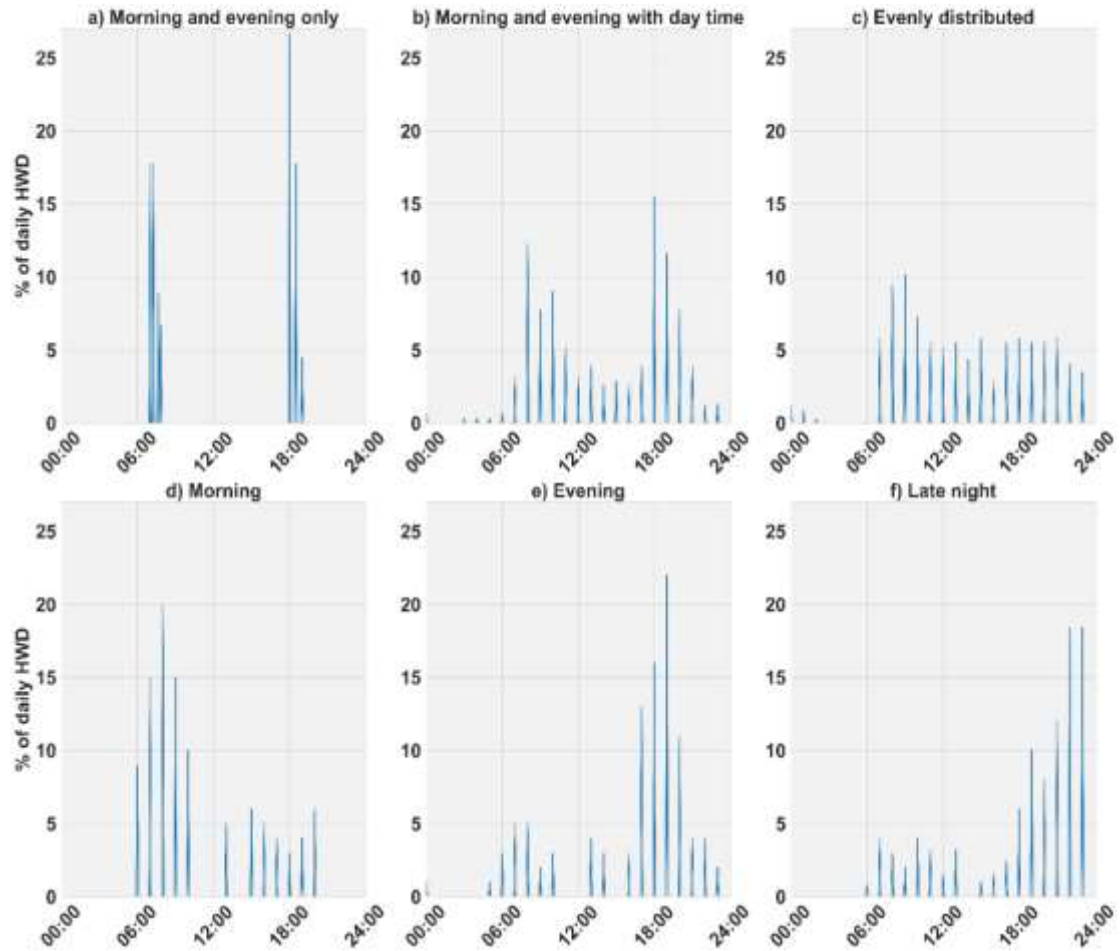
Boxplots of yearly saving for tou tariffs



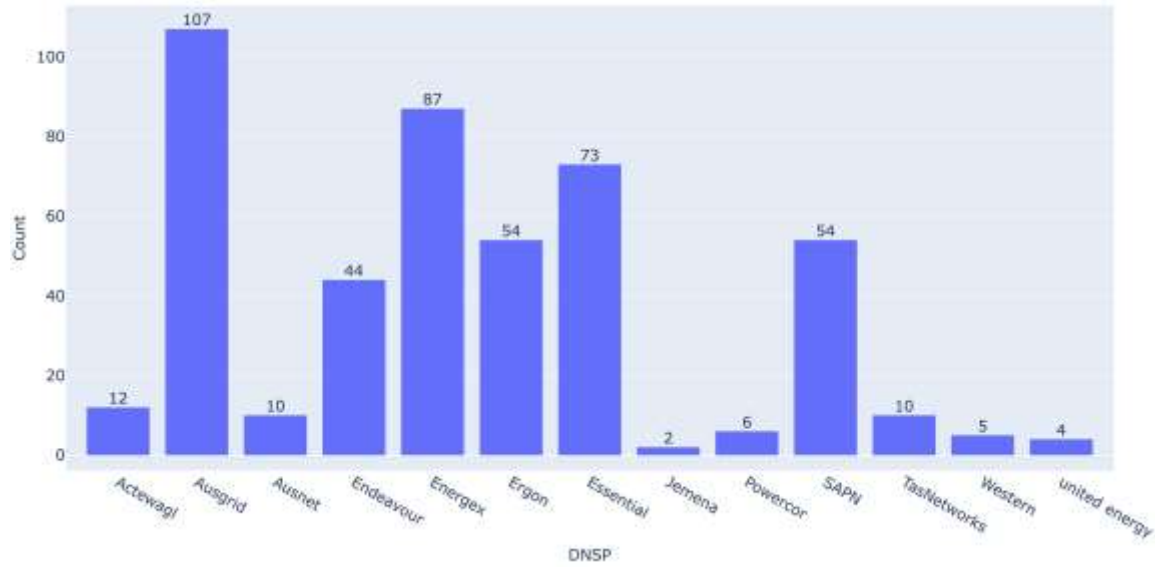
Boxplots of yearly saving for flat tariffs



Habitual hot water consumption & excess PV utilization



Fleet information



Resistive systems

Heat pumps

