

# Why solar export management is good for solar system owners

14 December 2020 - Solar & Storage Digicon

[www.switchdin.com.au](http://www.switchdin.com.au)

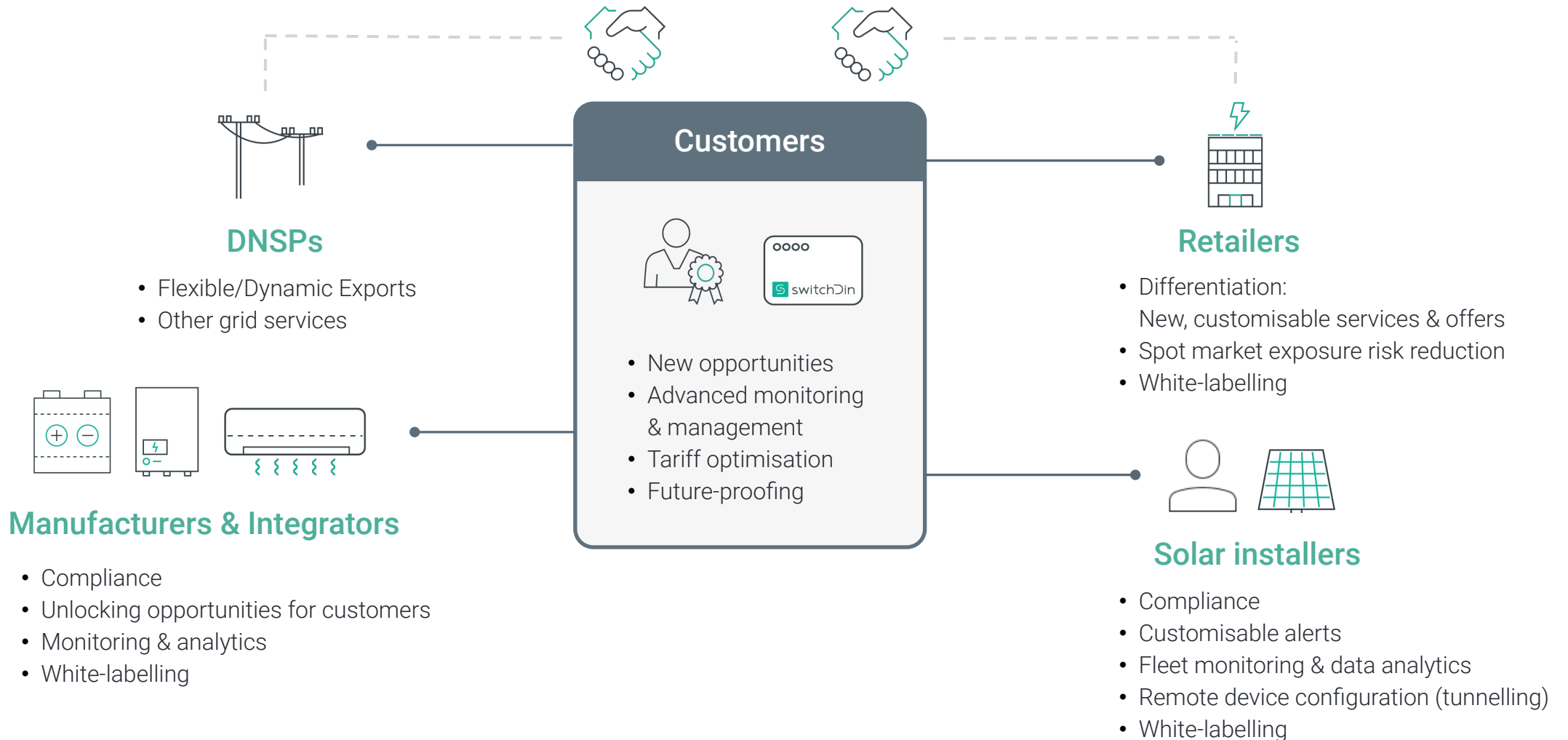




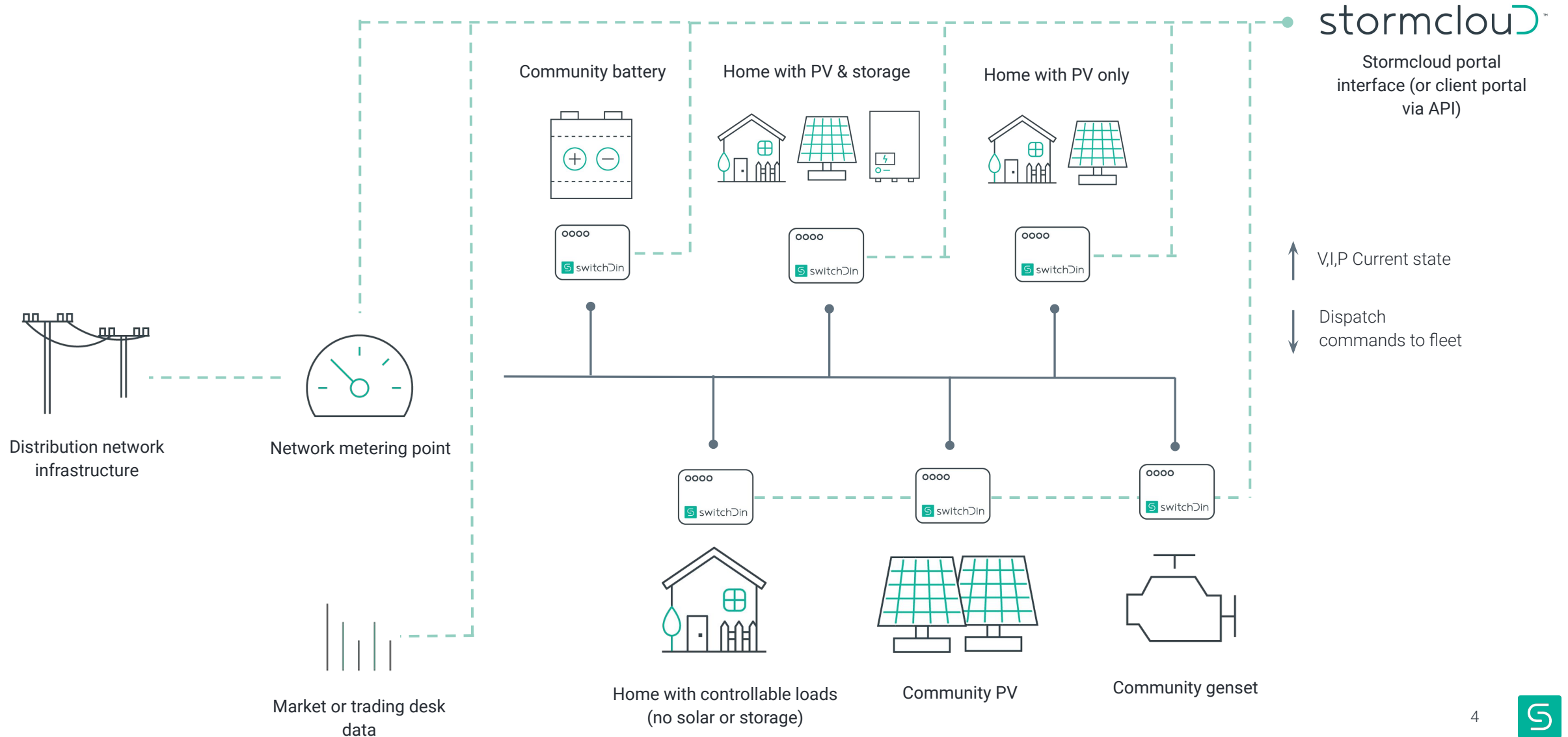
**We bridge the gaps between energy companies,  
equipment manufacturers and energy users.**

**We integrate & organise the world's energy resources to  
create a cleaner, smarter electricity system.**

# SwitchDin Unlocks Value by Bridging the Gaps



# Connecting Everything of Value





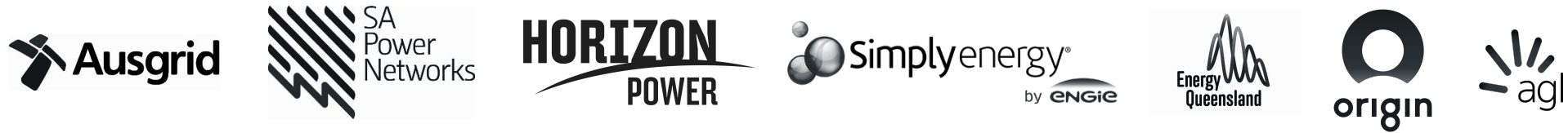
# Integration is core to what we do

Our **Droplets** act as universal controllers for a wide range of standard and proprietary communications protocols for inverters, battery storage systems and other devices.

Our **StormCloud platform** ties everything together, allowing these diverse assets to be managed from a single place via our native interface, API, or third party platform.

# Technology validated through collaboration with players across the industry

## Energy utility & retailer partners include:



## Device integrations include:



## Platform integrations include:



# 1. Dynamic vs static export limits: A way to increase value for solar system owners

Managed solar means more solar generation



# Percentage of dwellings with rooftop solar

Over 1 in 4 dwellings with rooftop PV in Australia

Approx 38% in SA





# Export limit types: Static vs Dynamic

## **Static export limit:**

Limits system size or puts a permanent cap on solar export level - e.g. 0kW, 3kW, 1.5kW

Solar homes/businesses with reduced or zero feed-in tariff revenues

## **Dynamic export limit:**

A new approach requiring remote control of the net export of site

Solar homes/businesses may export and earn FiT revenues most of the time, but may be curtailed from time-to-time to ensure system security

# Scenarios & assumptions

**Analysis of real SA solar, load and market data:  
1 Oct 2019 - 30 Sep 2020**

**Solar - typical 6kW system, north facing single  
array**

## **Low and high usage cases:**

- Low usage: 14 kWh/day, 84% solar export for 6kW system
- High usage: 40 kWh/day, 35% solar export for 6kW system
- These are extreme usage cases - most households would fit somewhere in between

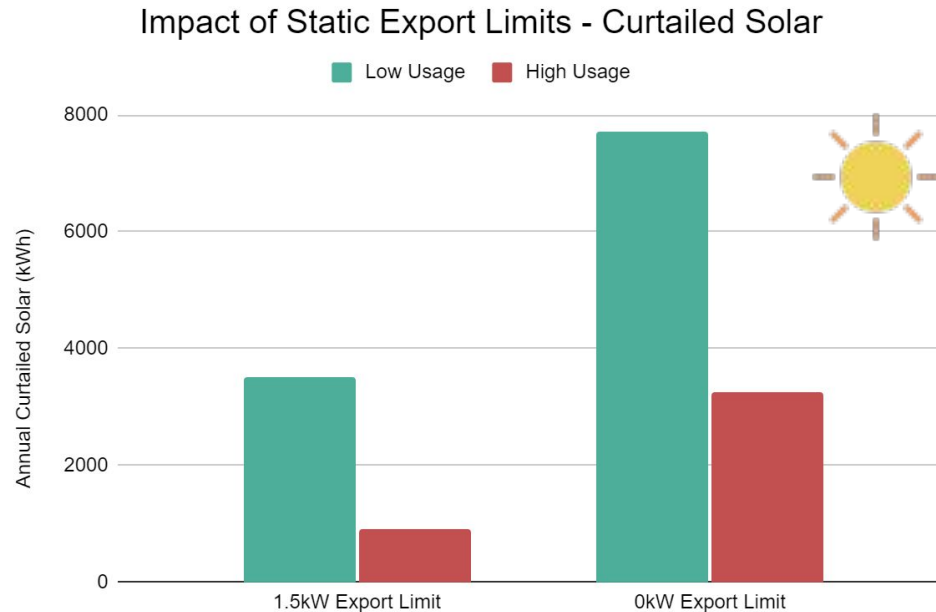
## **Flat Tariffs**

- Retail electricity cost - \$32.44 c/kWh
- Solar feed-in tariff - 12.44 c/kWh
- We also examined TOU 'solar sponge' tariff but not economic for pure solar households, especially those with large systems

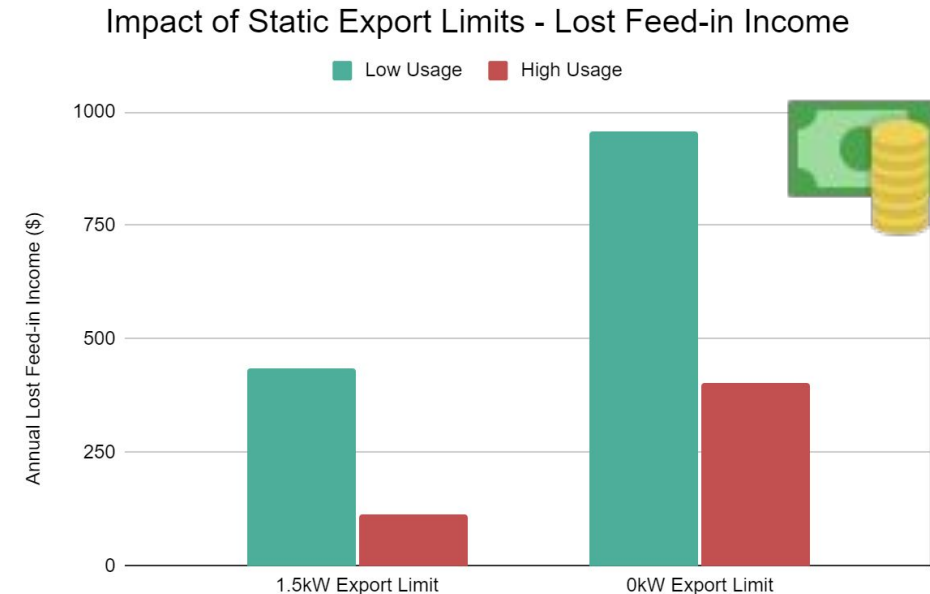


# Static export limits for new solar homes (6kW solar)

## Possible reduction in solar generation >7MWh/yr



## Possible reduction in solar savings >\$900/yr



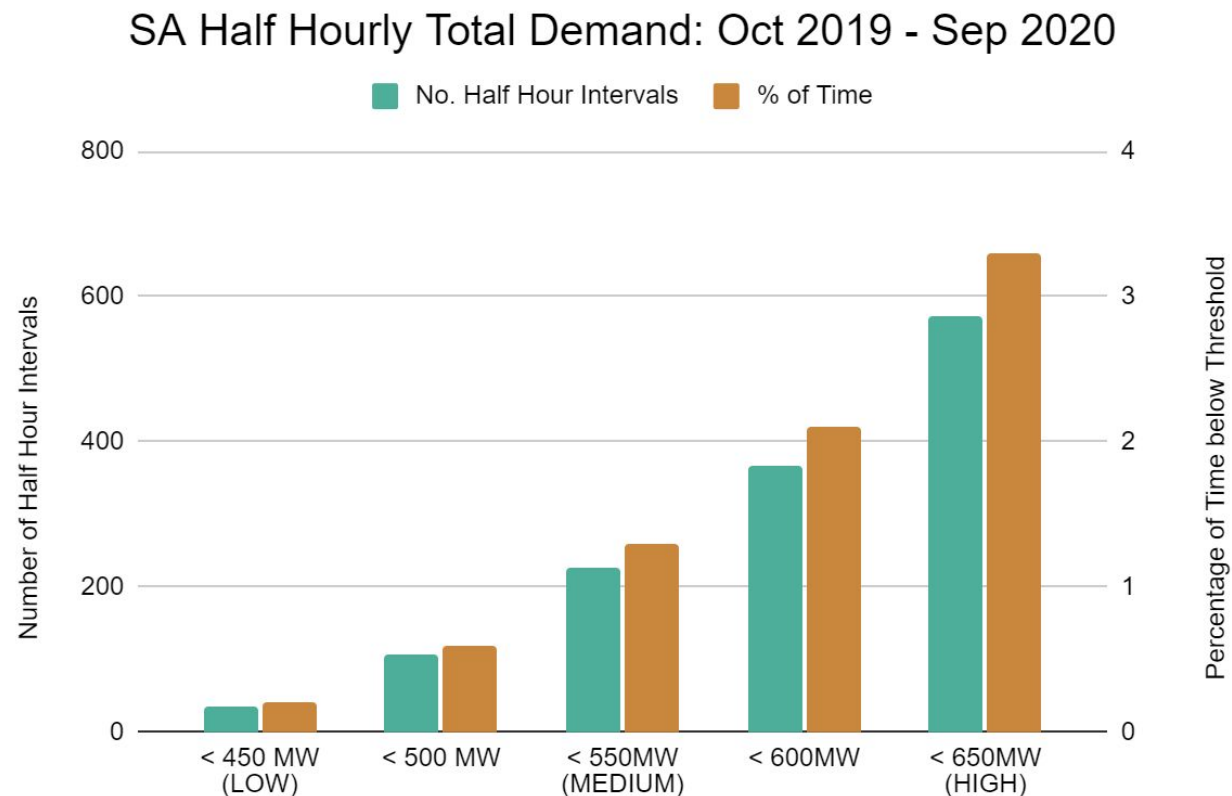
30,000 new systems installed in SA last year.

Zero export on all these systems = up to ~200GWh curtailed annually.

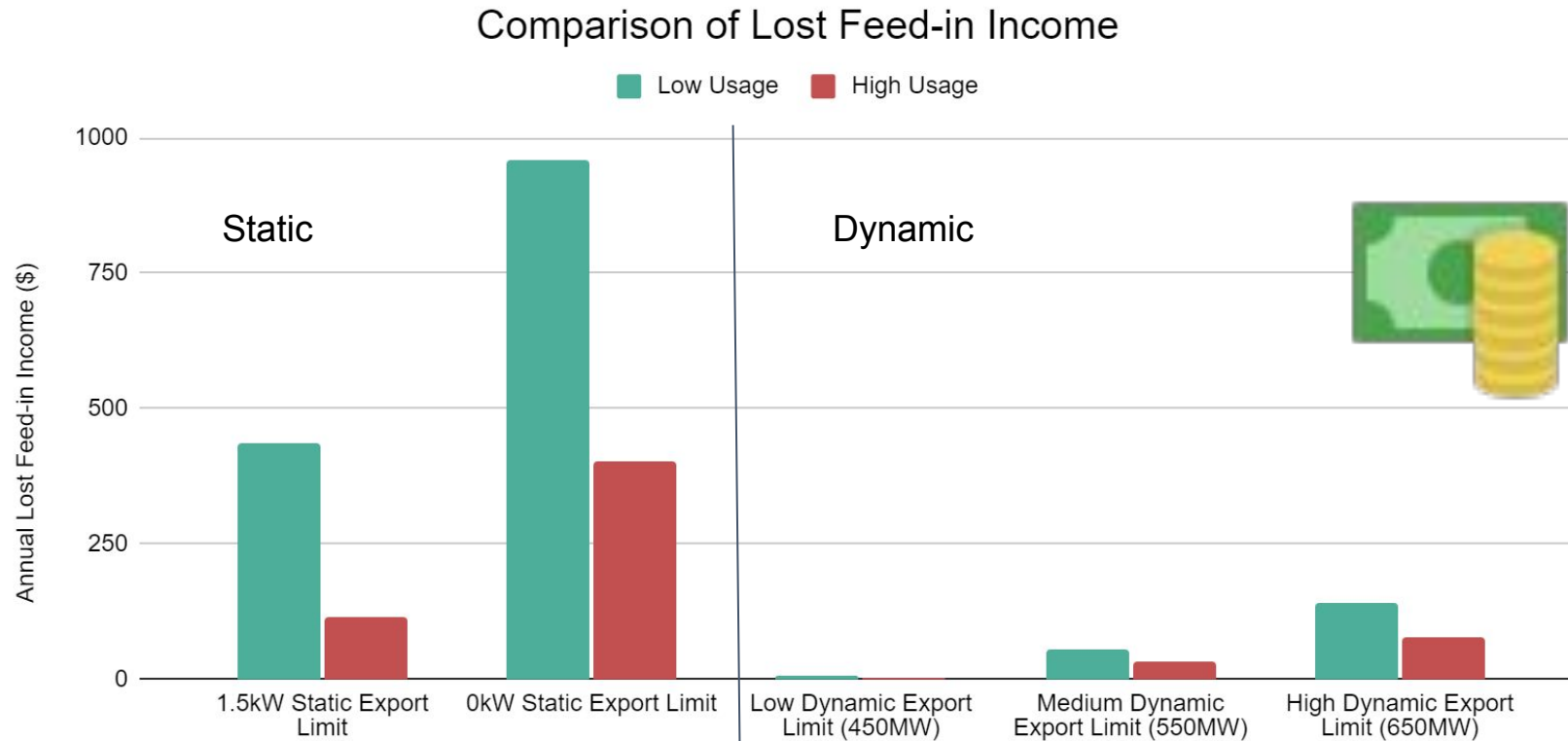
**This is approx 2% of SA's annual electricity demand.**

# Dynamic exports: Estimating export limits

- SA half hourly total demand used to simulate limit - actual limits would be set locally by networks
- Assumes zero export during 'dynamic export limit' periods
- 3 different limits explored
  - Low: <450 MW
  - Medium: <550 MW
  - High: <650 MW
- Guided by AEMO operational minimum demand for secure islanding:
  - 550MW (spring 2020)
  - 450MW (spring 2021)



# Comparison: Lost FiT Income (6kW Solar)



Dynamic export limit reduced lost feed-in revenues  
**less than \$200/yr versus more than \$800/yr**

# ARENA Flexible Exports Project



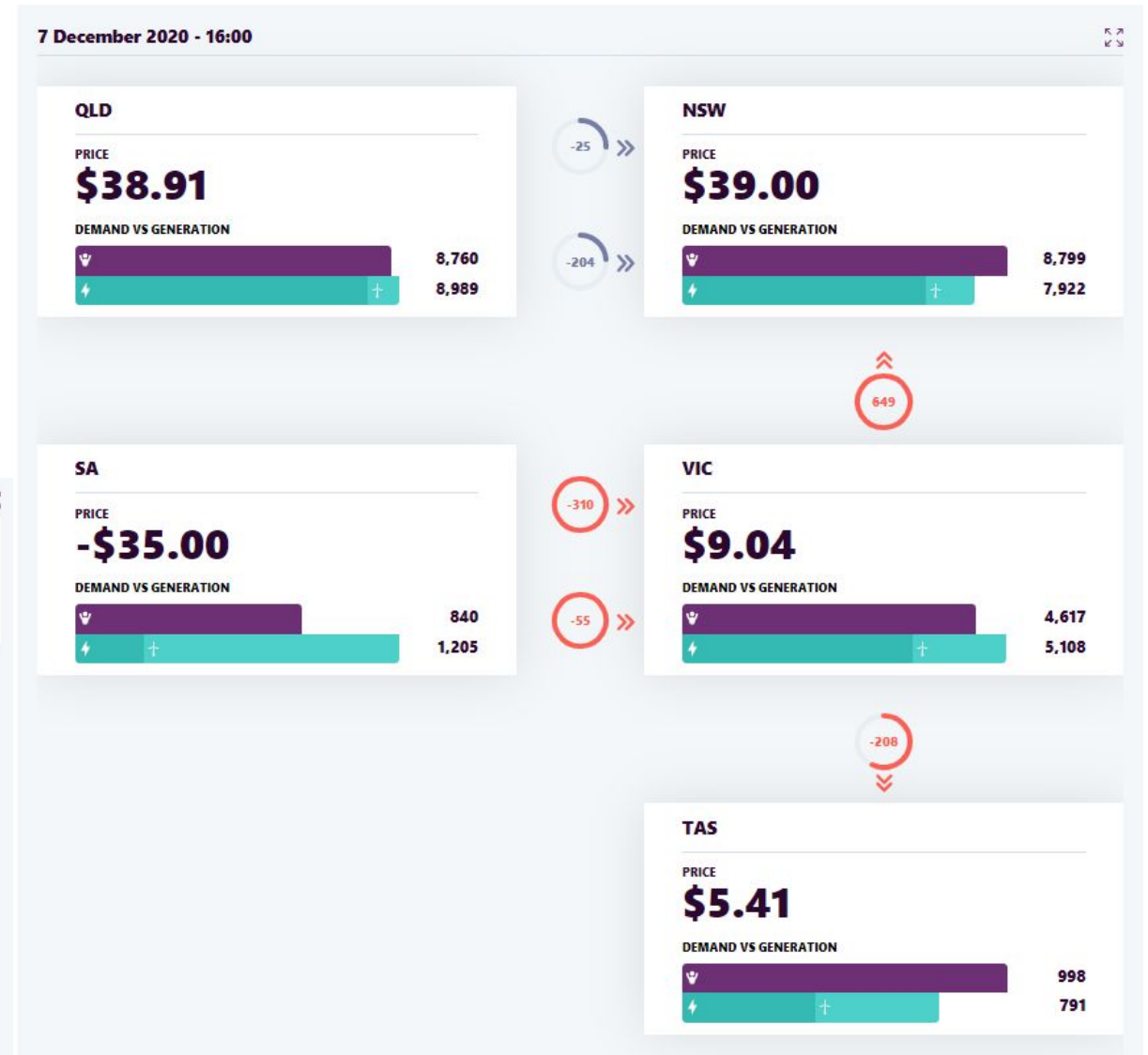
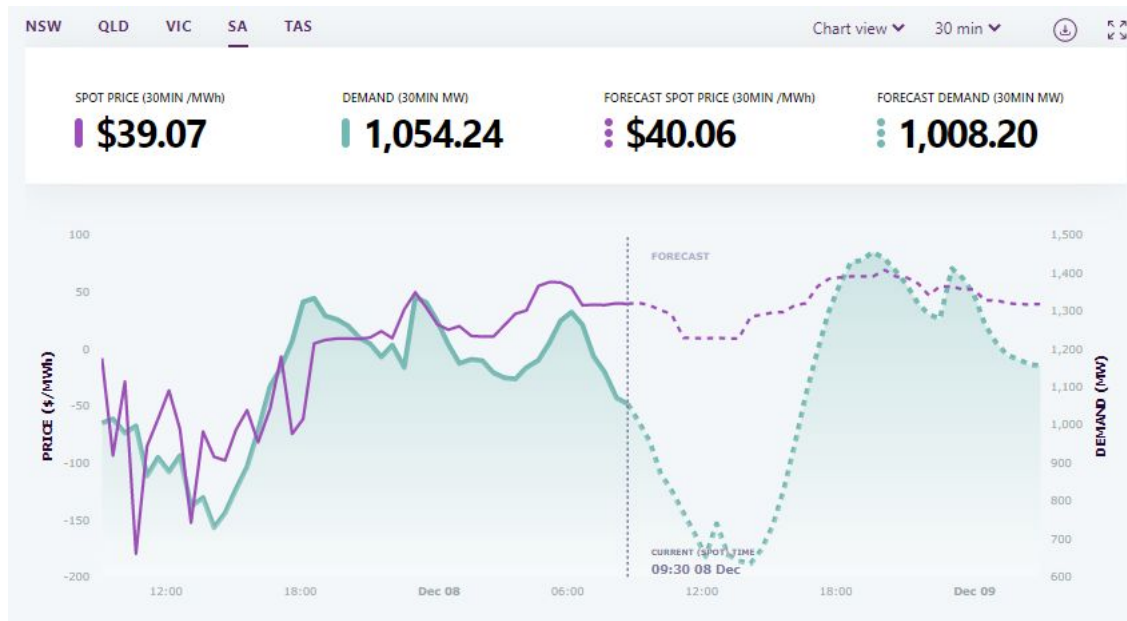
## 2. New market dynamics mean new opportunities

More opportunities for rooftop solar



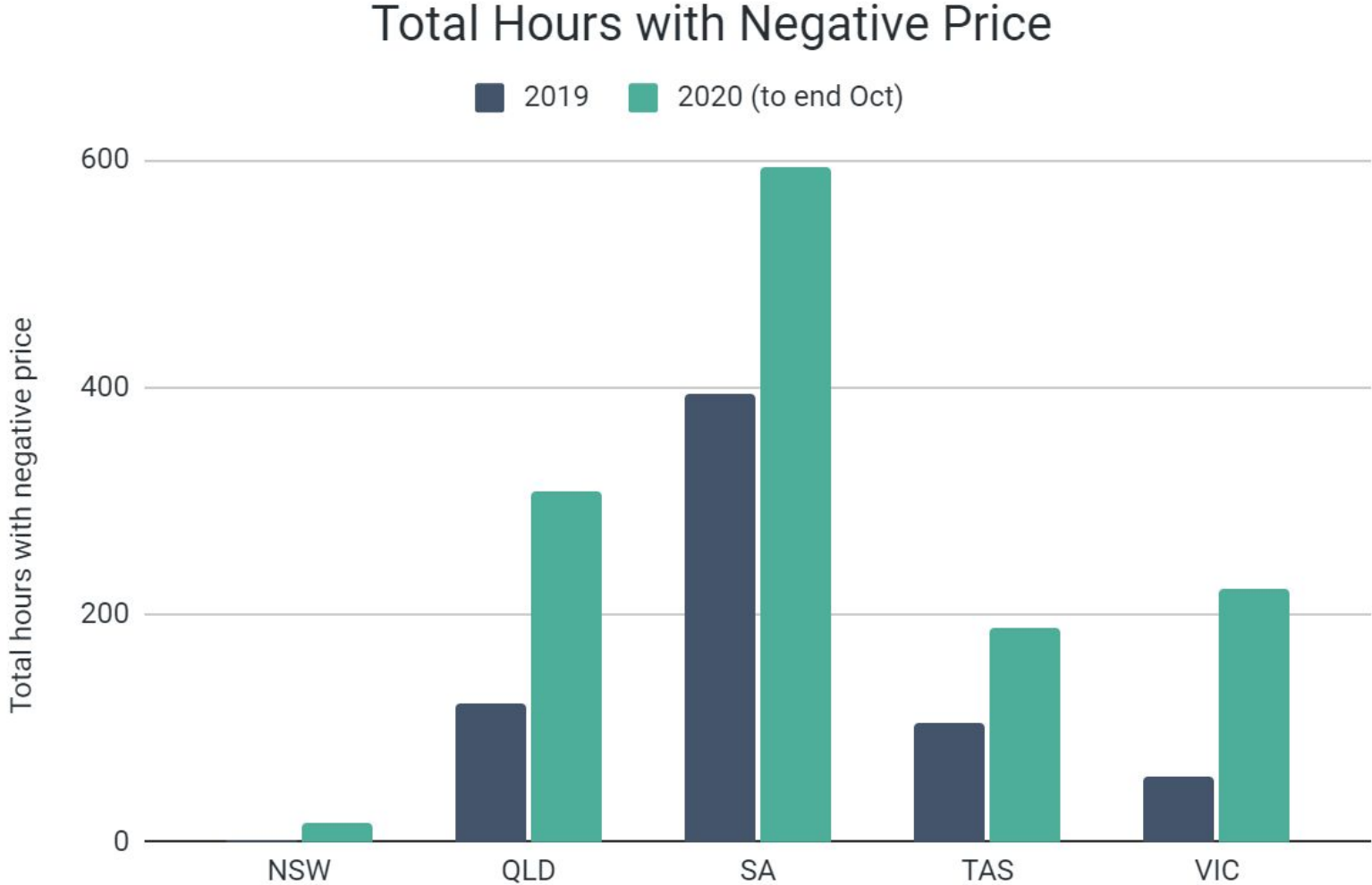
# Negative Spot Prices

- Oversupply of energy to the grid due to high levels of:
  - Wind
  - Solar
  - Low load

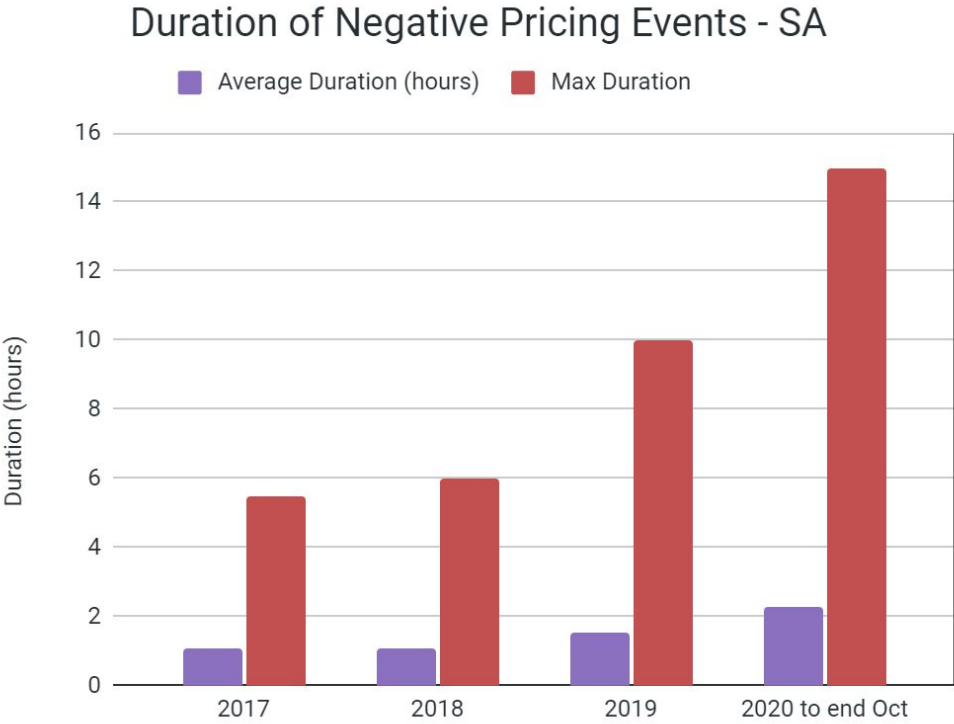
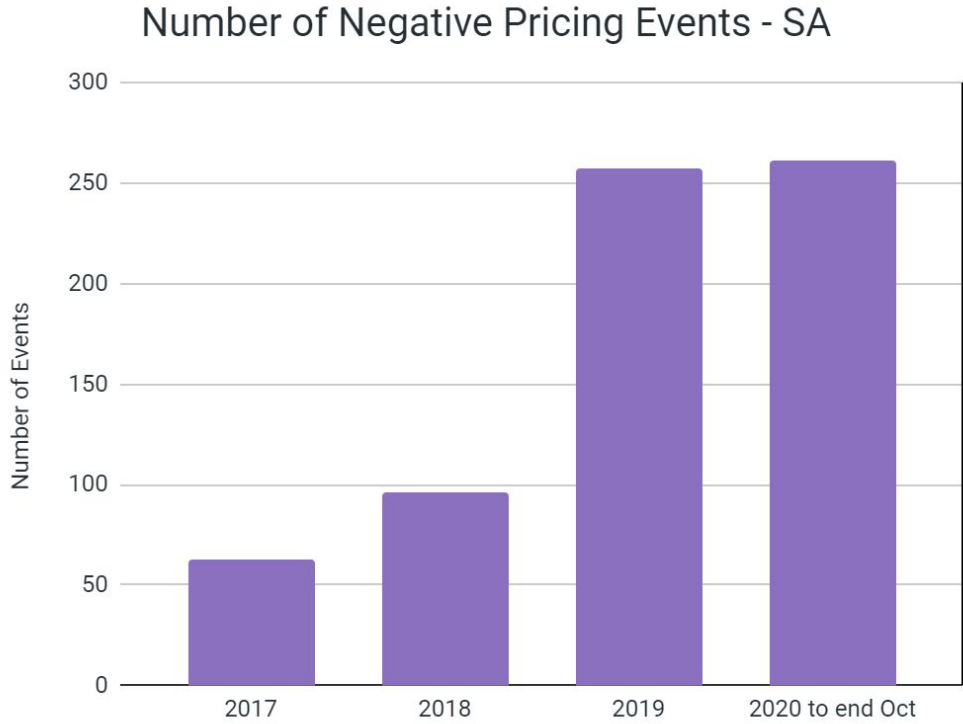




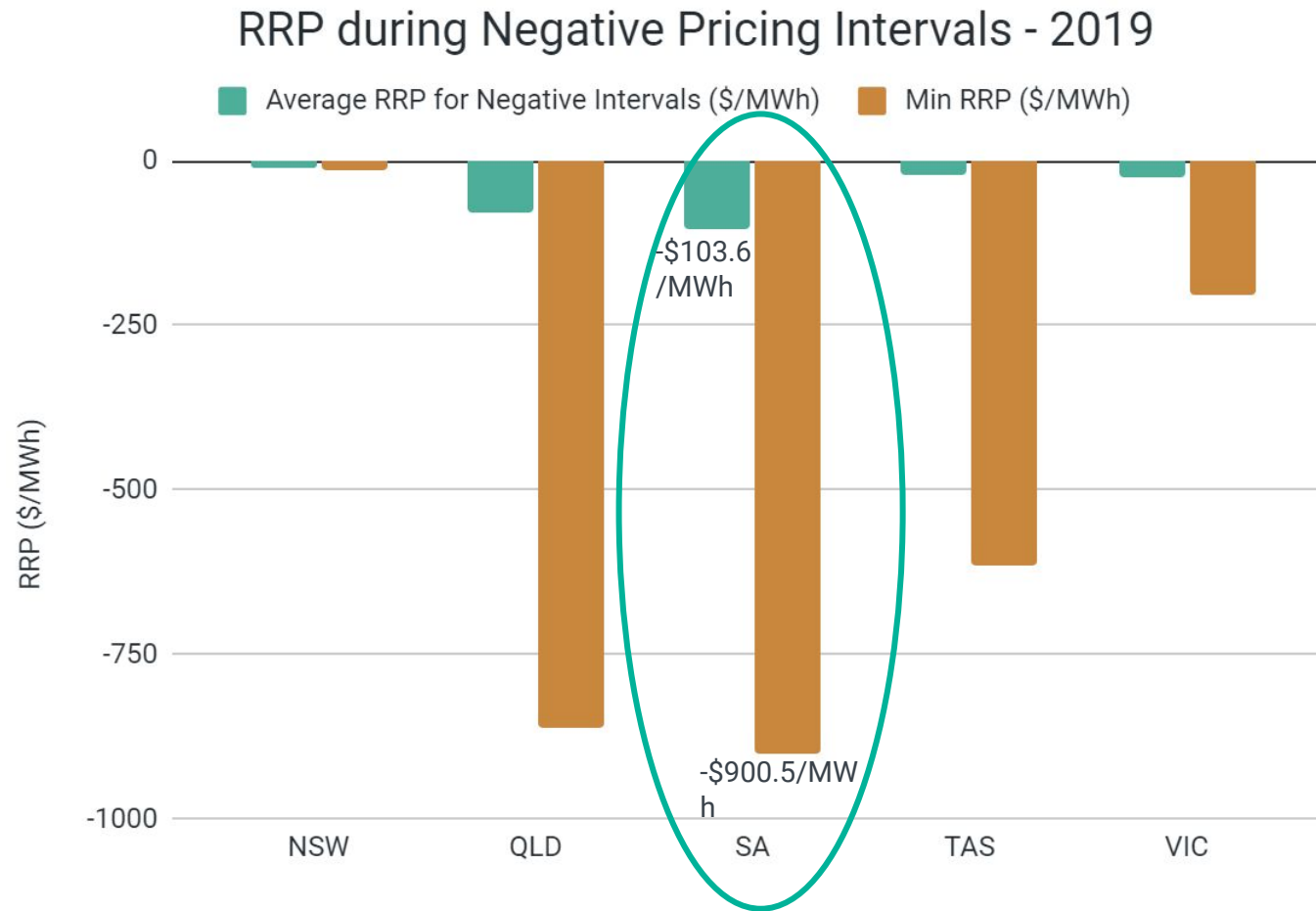
# Total hours with negative price are increasing in all States



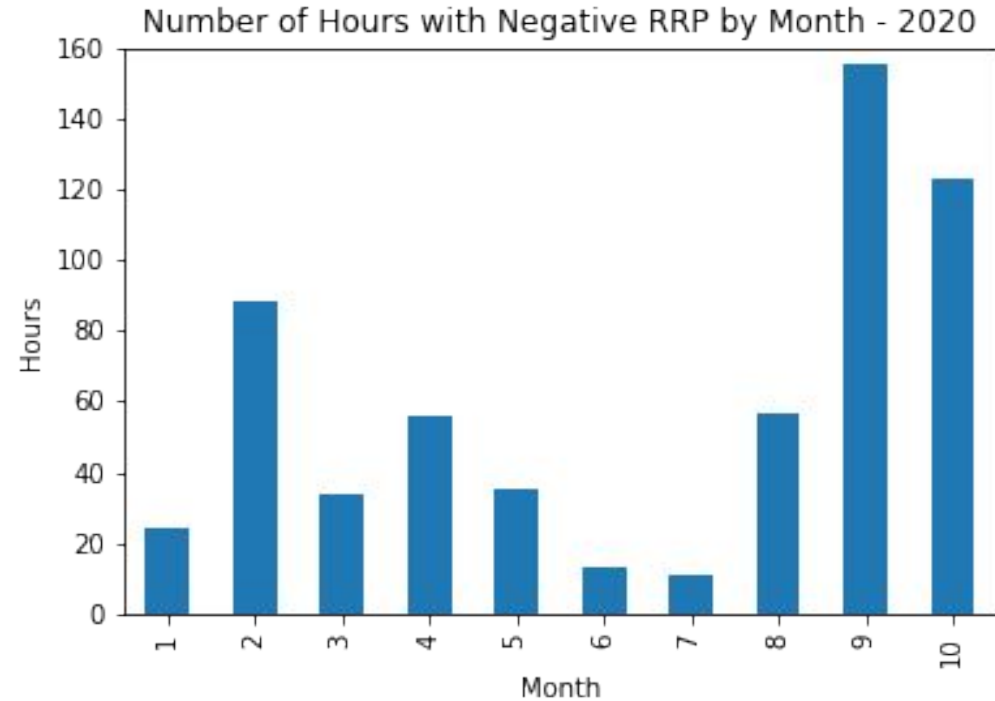
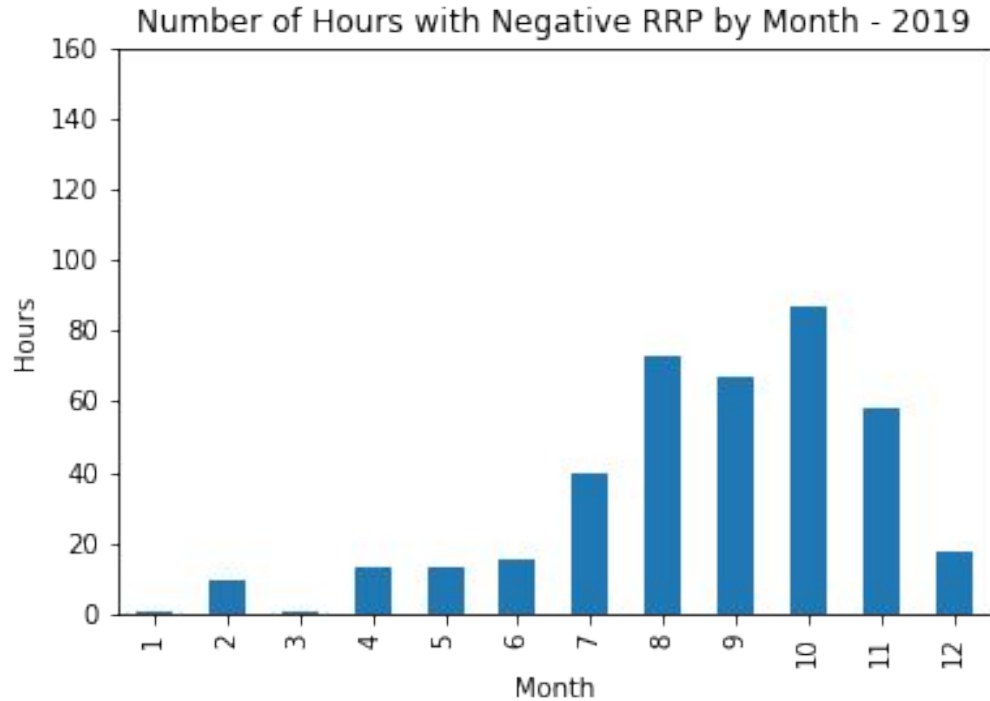
# Nowhere is this starker than in SA, where the incidence of events has been rising



# The lowest negative prices occur in SA

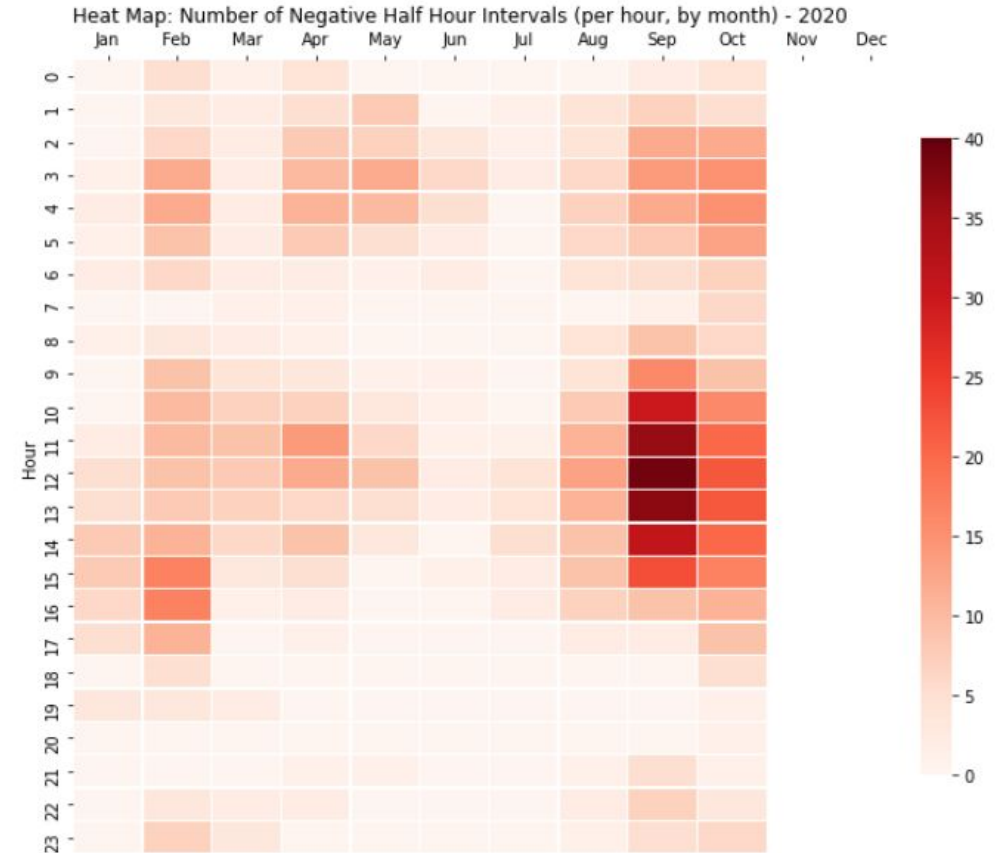
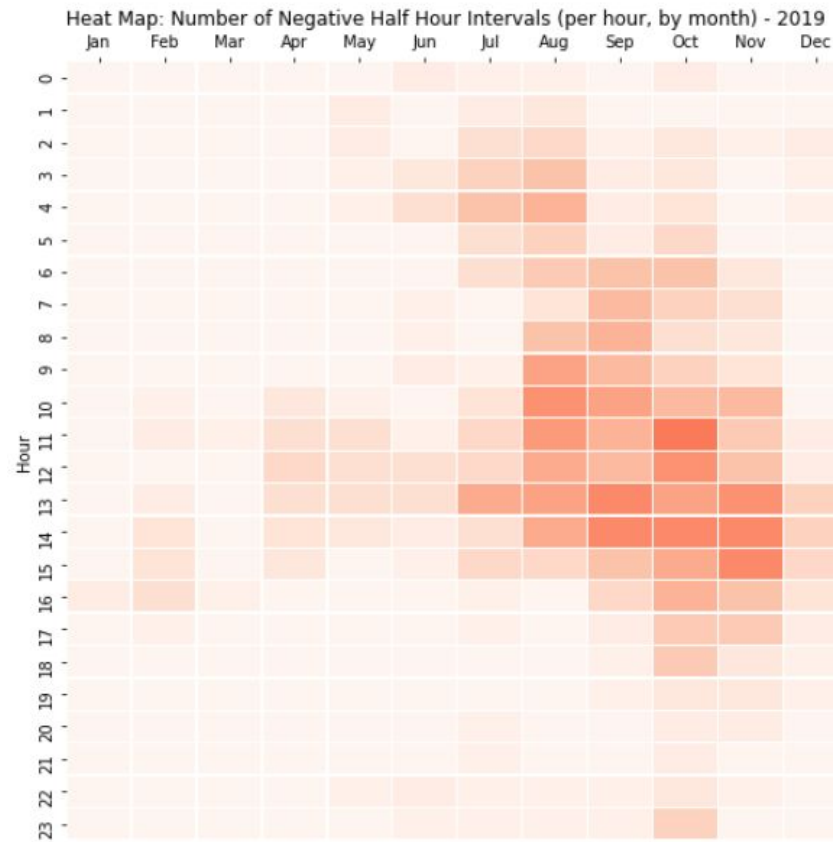


# When do negative pricing events occur in SA?



During the past 12 months (1 Nov 2019 to 31 Oct 2020) there were 672 hours of negative intervals - equivalent to 28 full days!

# When do negative pricing events occur in SA?



During past 12 months (1 Nov 2019 to 31 Oct 2020)

- 69% of negative intervals occurred during solar generation hours
- Av RRP for negative events: -\$68.2/MWh
- Av RRP for negative events during solar generation hours: -\$82.5/MWh

# Spot Market - General Operation

- NEM Spot Market
  - Generators dispatched every 5 min interval
  - Settlement on 30 min interval (RRP)
- Retailers
  - Purchase energy from spot market to cover customer usage
  - Pay feed-in tariff to solar customers (and receive that energy)
  - Hedge contracts, PPAs with generators
- Residential Customers
  - No exposure to spot market prices
  - Fixed rates for usage
  - Flat rate for solar feed-in to grid

# Spot Market - During Negative Pricing Intervals

- NEM Spot Market
  - Generators dispatched every 5 min interval
    - Generators pay to dispatch energy to the grid
- Retailers
  - Purchase energy from spot market to cover customer usage
    - Paid to take energy from the grid
  - Pay feed-in tariff to solar customers (and receive that energy)
    - Paying feed-in tariff for energy that they don't need
    - Feed-in energy: exposure to negative price
- Residential Customers
  - No exposure to spot market prices
    - No direct impact on customer
    - No market signal to encourage behaviour change

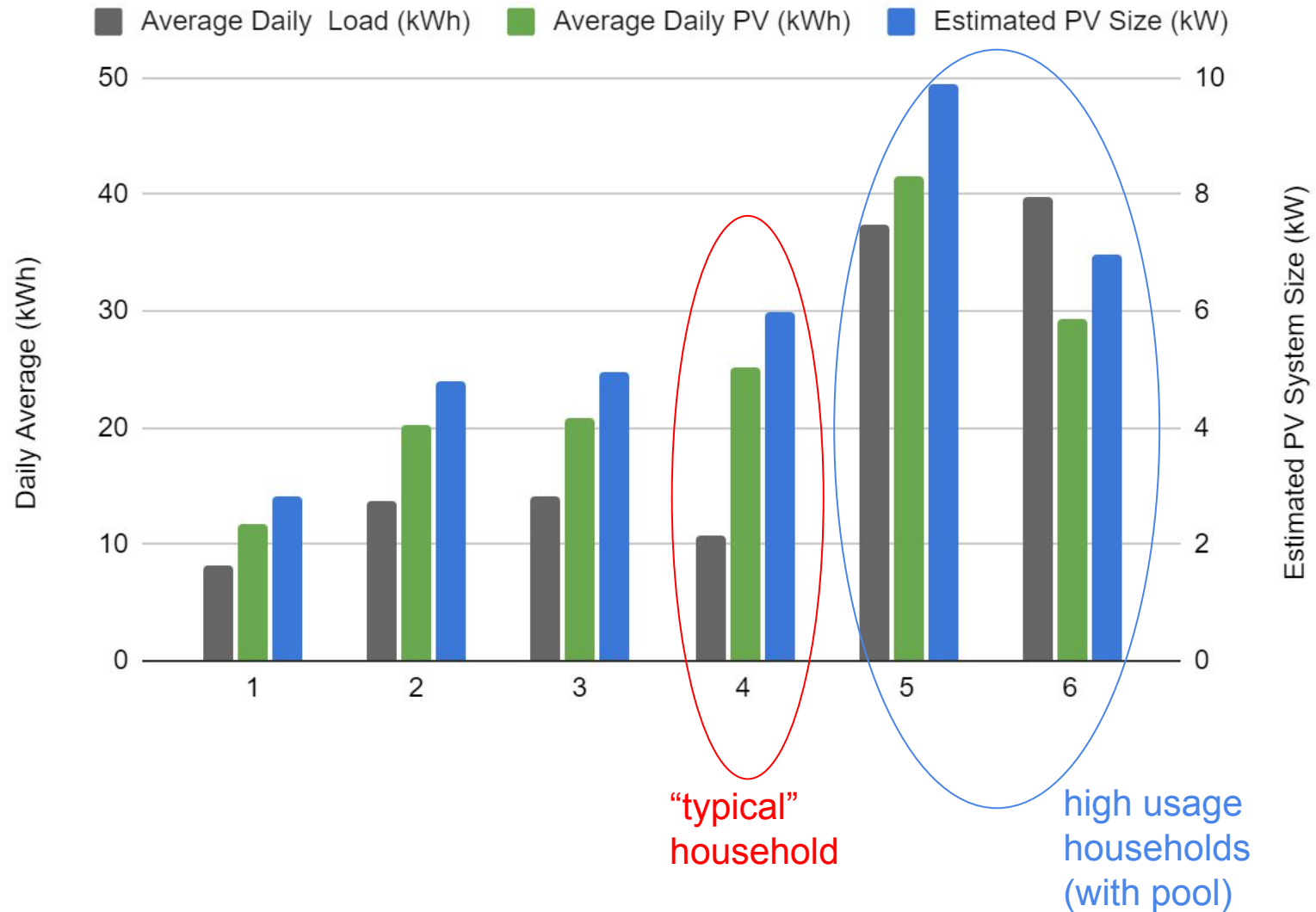


The Opportunity:  
Zero Solar PV Export during Negative  
Intervals



# Modelled Households - Adelaide

## Average Daily Load and PV by Unit



# Modelling the Opportunity

What is the overall retailer benefit (\$/year) and individual household position (\$/year) of zero solar export during negative pricing intervals in SA?

## Data Sources:

- Historical platform data (PV and Load) for 6 households at 1 minute resolution
  - PV <10kW, Load <50kWh/day
- NEM 30 min spot price (RRP) data for SA

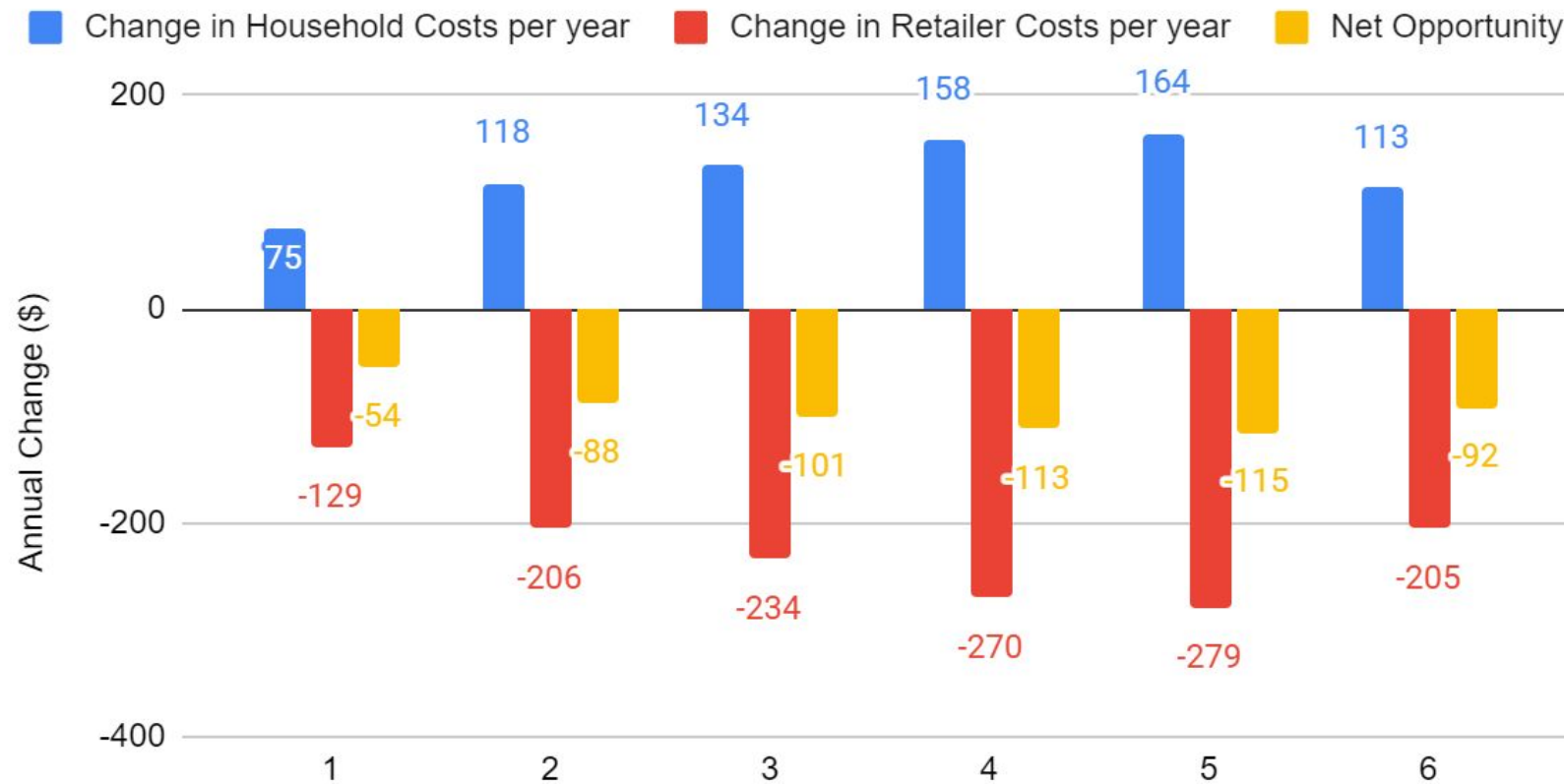
## Assumptions:

- Retailer has full exposure to the spot market
- Zero export triggered by 30 min spot price (RRP) < \$0/MWh
  - Perfect foresight
  - Scope to look at effect of triggering on spot price/5 min settlement
- No significant change in load profile due to battery installation/behavioural change
- AGL Essentials tariffs (retailer of last resort in SA) inc. 12.4c/kWh feed-in tariff

# Initial Insight into Potential Value of Zero Export

## Value of Zero Export during Negative RRP

Nov 2019 - Oct 2020 in SA, Feed-in tariff: 12.4 c/kWh



# Platform Data Example - “Typical” Household (#4)

South Australia, Nov 2019 - end Oct 2020

1minute load and PV data for household

<b>SA Solar Household Attributes</b>	
PV System Size	6kW
Average Daily Consumption	10.8 kWh/day
PV Export to Grid	80%
Feed-in tariff	12.4 c/kWh
Swimming pool	no

## Opportunity: Zero PV Export during Negative RRP

<b>Total Change in Household Costs per year</b>	<b>+ \$158/year</b>
- Lost feed-in revenue	\$158/year
<b>Total Change in Retailer Costs per year</b>	<b>- \$270/year</b>
- Avoided feed-in payments	- \$158/year
- Avoided negative spot market exposure due to feed-in energy	- \$112/year
<b>Net Opportunity</b>	<b>\$112/year</b>

# Platform Data Example - “High Usage” Household (#6)

South Australia, Nov 2019 - end Oct 2020

1minute load and PV data for household

SA Solar Household Attributes	
PV System Size	7kW
Average Daily Consumption	39.8 kWh/day
PV Export to Grid	43%
Feed-in tariff	12.4 c/kWh
Swimming pool	yes

Opportunity: Zero PV Export during Negative RRP	
<b>Total Change in Household Costs per year</b>	<b>+ \$113/year</b>
- Lost feed-in revenue	\$113/year
<b>Total Change in Retailer Costs per year</b>	<b>- \$205/year</b>
- Avoided feed-in payments	- \$113/year
- Avoided negative spot market exposure due to feed-in energy	- \$92/year
<b>Net Opportunity</b>	<b>\$92/year</b>

# Platform Data Example - “High Usage” Household (#5)

South Australia, Nov 2019 - end Oct 2020

1minute load and PV data for household

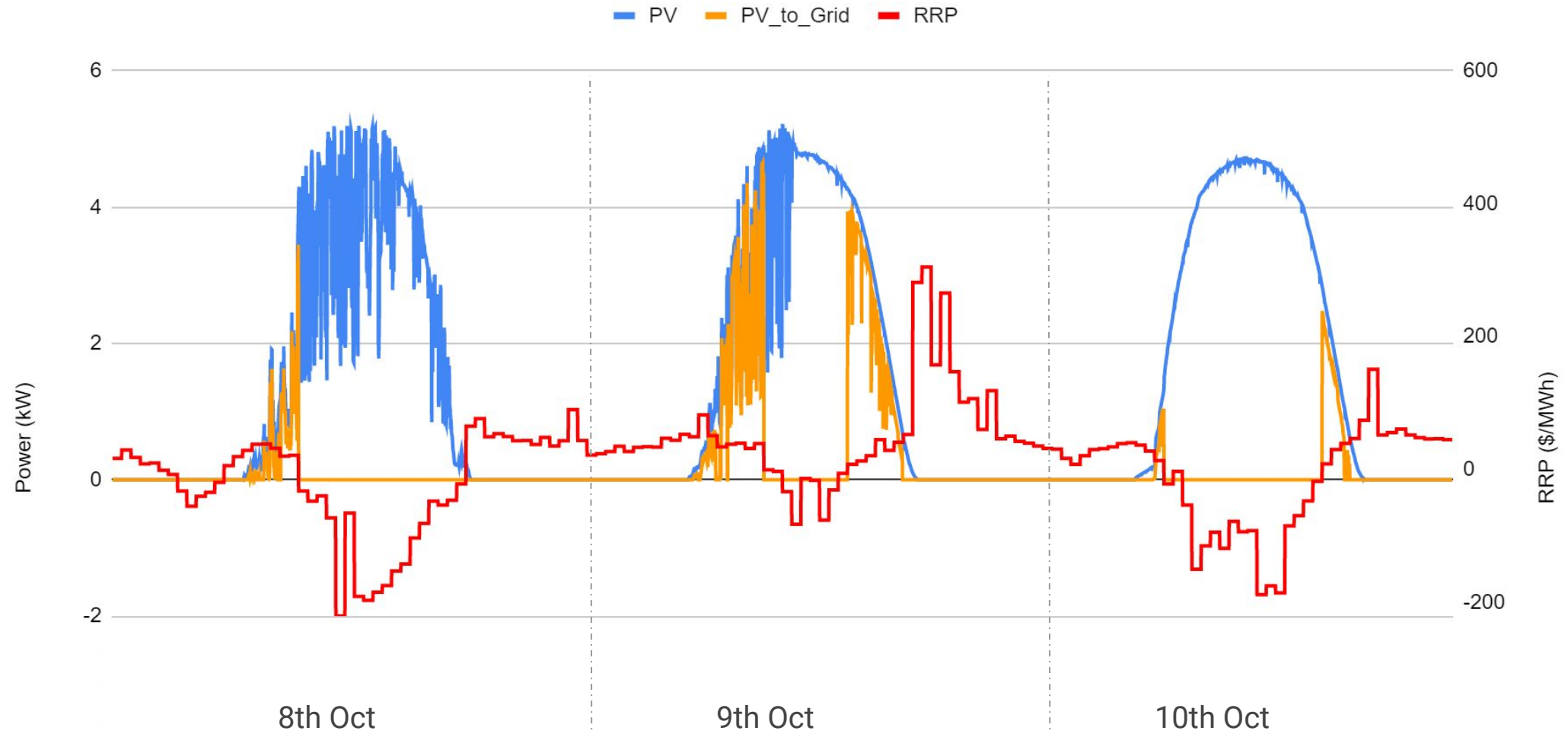
<b>SA Solar Household Attributes</b>	
PV System Size	10kW
Average Daily Consumption	37.3 kWh/day
PV Export to Grid	51%
Feed-in tariff	12.4 c/kWh
Swimming pool	yes

## Opportunity: Zero PV Export during Negative RRP

<b>Total Change in Household Costs per year</b>	<b>+ \$164/year</b>
- Lost feed-in revenue	\$164/year
<b>Total Change in Retailer Costs per year</b>	<b>- \$279/year</b>
- Avoided feed-in payments	- \$164/year
- Avoided negative spot market exposure due to feed-in energy	- \$115/year
<b>Net Opportunity</b>	<b>\$115/year</b>

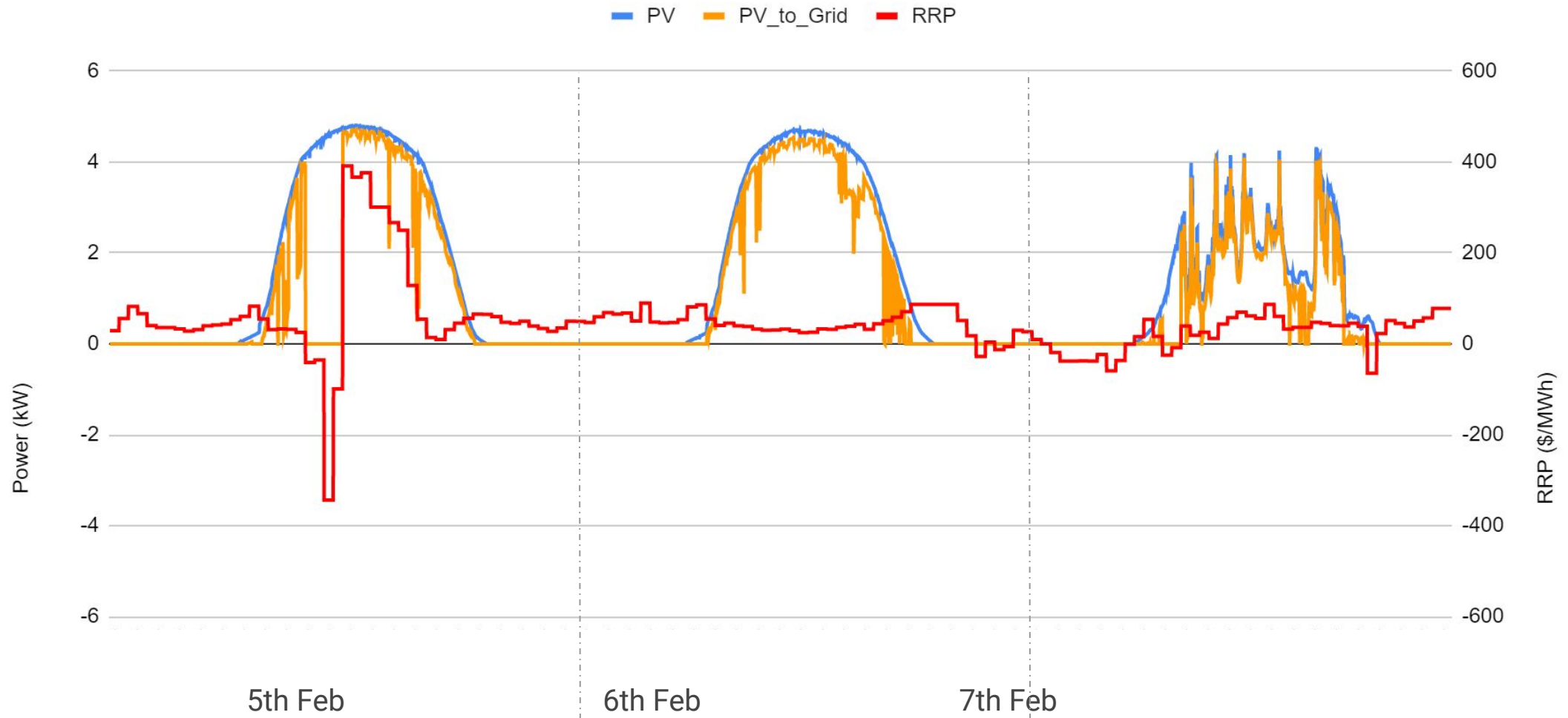
# "Typical" Household with Export Curtailed when RRP < \$0

8th - 10th Oct 2020



# "Typical" Household with Export Curtailed when RRP < \$0

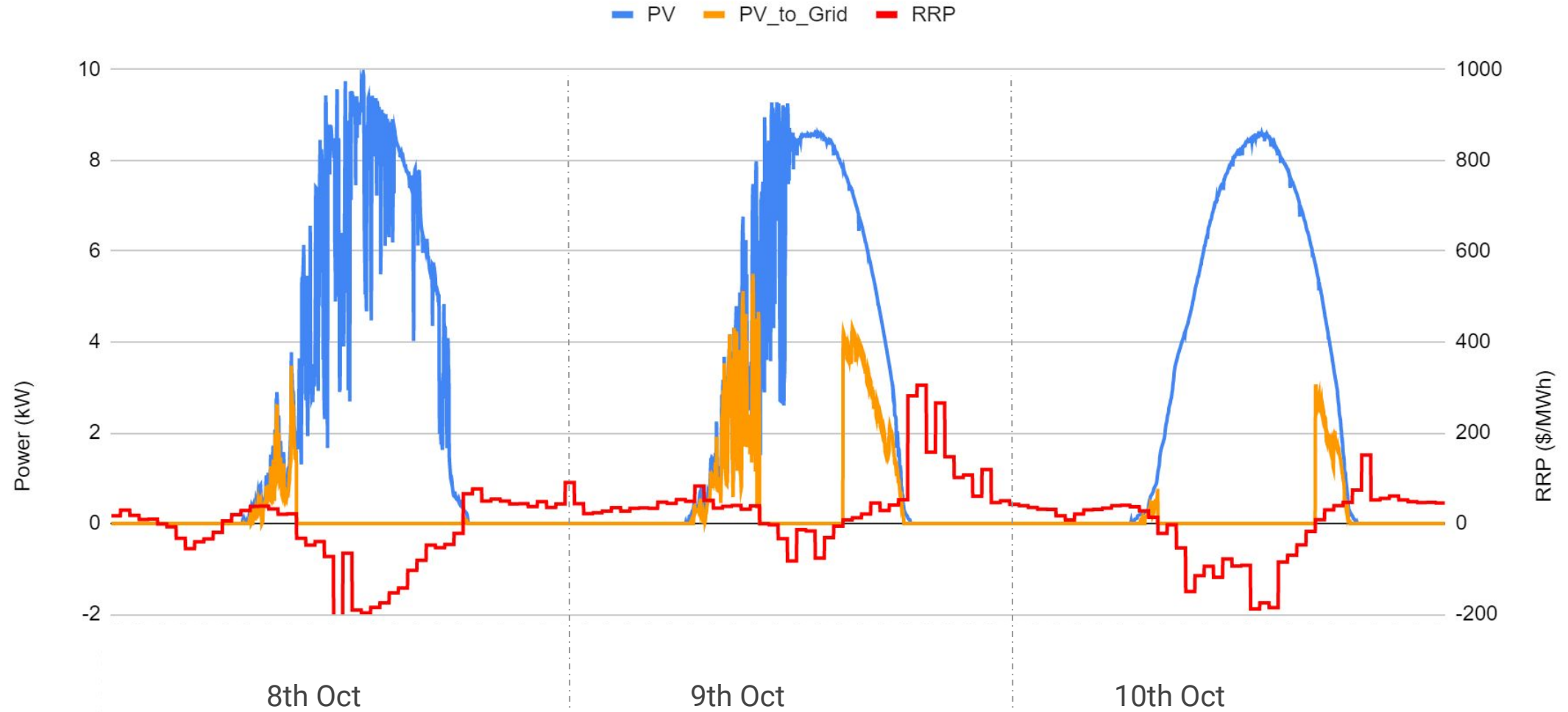
5th - 7th Feb 2020





# "High Usage" Household with Export Curtailed when RRP < \$0

8th - 10th Oct 2020



# Additional Value Streams

Additional value streams are highly dependent on retailer/customer reward mechanism

- Zero solar during negative pricing intervals
  - In combination with zero export
  - Trigger set point dictates value (likely a fraction of retail tariff)
  - High export level limits additional value
  - Likely to be unpopular with customers
- Controllable loads

# Combining the value streams

- Maximises value for all grid users
- Can enable new value streams for solar
- New models of retailer engagement with customers
- Careful deployment unlocks other opportunities through VPPs, battery storage, EVs & key loads



**Must ensure correct technologies in place which unlocks multiple value streams for prosumers**

# Reach out

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