

Executive Summary

White Paper: Opportunities for Batteries & VPPs in the Australian C&I segment

2020

Research and analysis by:



This report aims to inform battery sellers and VPP builders of the economics of C&I batteries to shape both market entry and sales strategy

AUDIENCE AND OUTCOMES OF THE REPORT

Who is this report written for?



Battery sellers

Solar retailers, battery retailers, battery OEMs & consultants



Virtual power plant builders

Aggregators, retailers, energy service companies, network companies

Outcomes from reading this report:



Where?

Where are the best opportunities located?



Who?

Who are the customers with the best loads and tariffs?



What?

What product offering can drive the most revenue?



How?

How to go-to-market to capture the best opportunities?

The findings are drawn from a deep-dive into battery project economics. Overall we modelled 280 different hypothetical battery projects across the National Electricity Market region.

ANALYSIS BEHIND THE WHITE PAPER

Inputs to the analysis



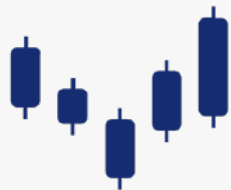
Five different C&I load profiles



with & without **solar PV**



28 different tariffs in **14** different networks



Five state-based wholesale electricity & **Three** FCAS markets

Process with Vippy™

Vippy™ – the virtual power plant economics engine

Vippy™ is our big data technical and economic modelling engine built on advanced linear optimisation.

It accepts load, solar, tariff and market data to identify, optimise and visualise battery opportunities.

To create this report we optimised and simulated ~180,000 years of battery dispatch

Output of the analysis

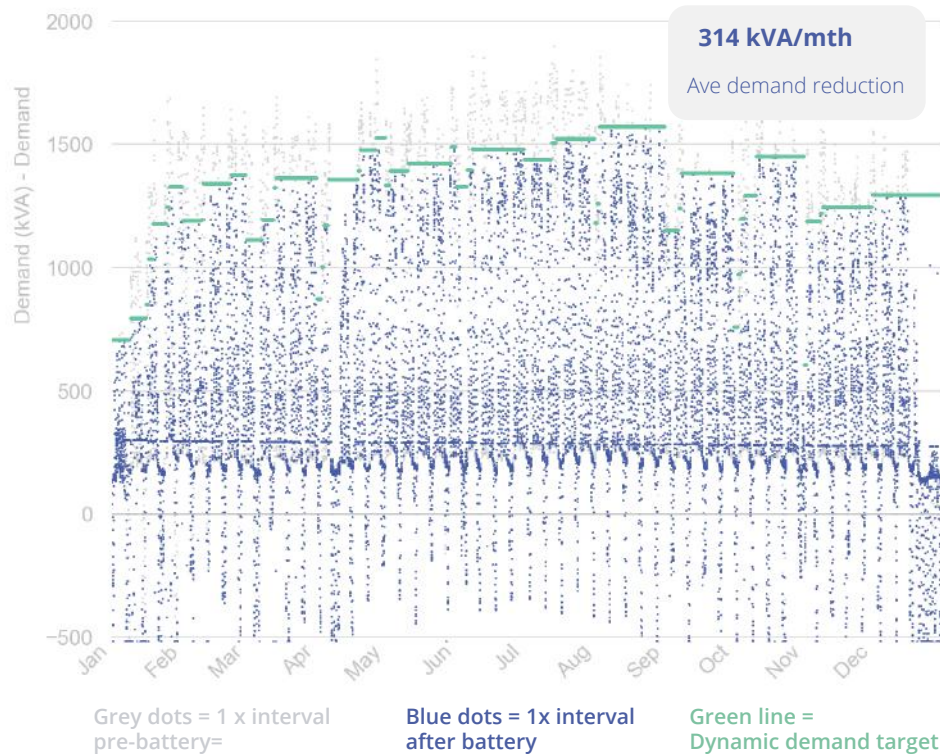
Where
Who
What
How

...of C&I battery opportunities

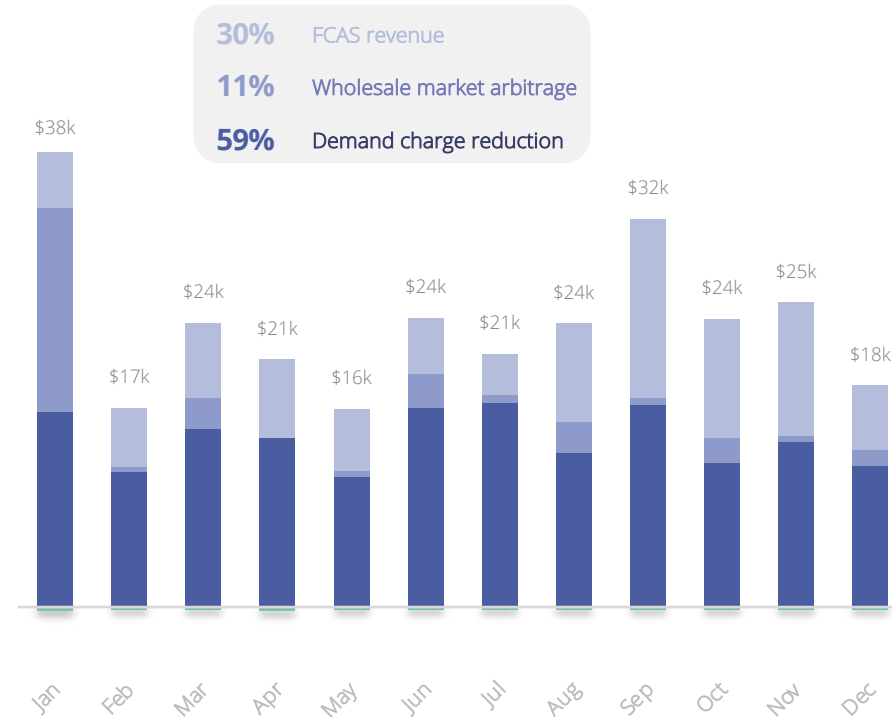
For each project, we simulated the battery operations for each interval of 15 hypothetical years. The model dispatches the battery to maximise revenue across all value streams.

EXAMPLE OUTPUTS OF BATTERY SIMULATIONS & REVENUE BREAKDOWN

First year load profile showing the effect of solar and battery



Calculated monthly revenue by service



We considered in detail two different value stacks – simple and advanced. These are battery opportunities with and without front-of-the-meter revenue.

WE COMPARE AND MODEL TWO DIFFERENT BATTERY VALUE STACKS IN THIS REPORT

Simple battery value stack

A battery which extracts value exclusively from “behind-the-meter” services - typically “out-of-the-box” use cases.

Modelled value stack:



Demand charge reduction

+



Time-of-Use Tariff Arbitrage

+



Increased solar self-consumption

Advanced battery value stack

A battery which extracts value from behind-the-meter AND market-facing or network-initiated activities. May need a virtual power plant.

Modelled value stack:



Demand charge reduction

+



Wholesale market arbitrage

+

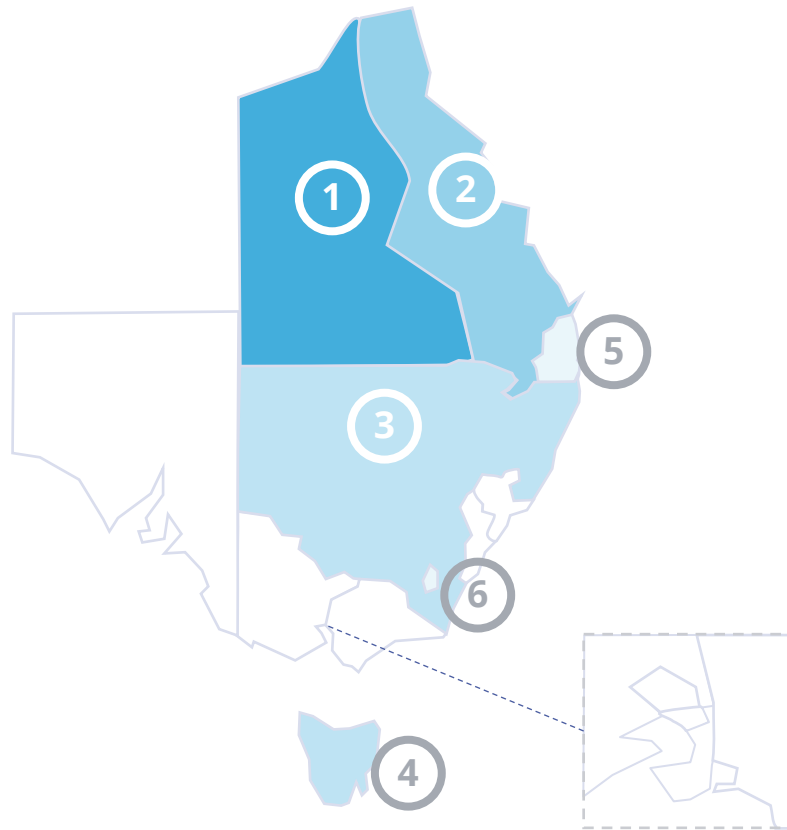


FCAS Markets participation

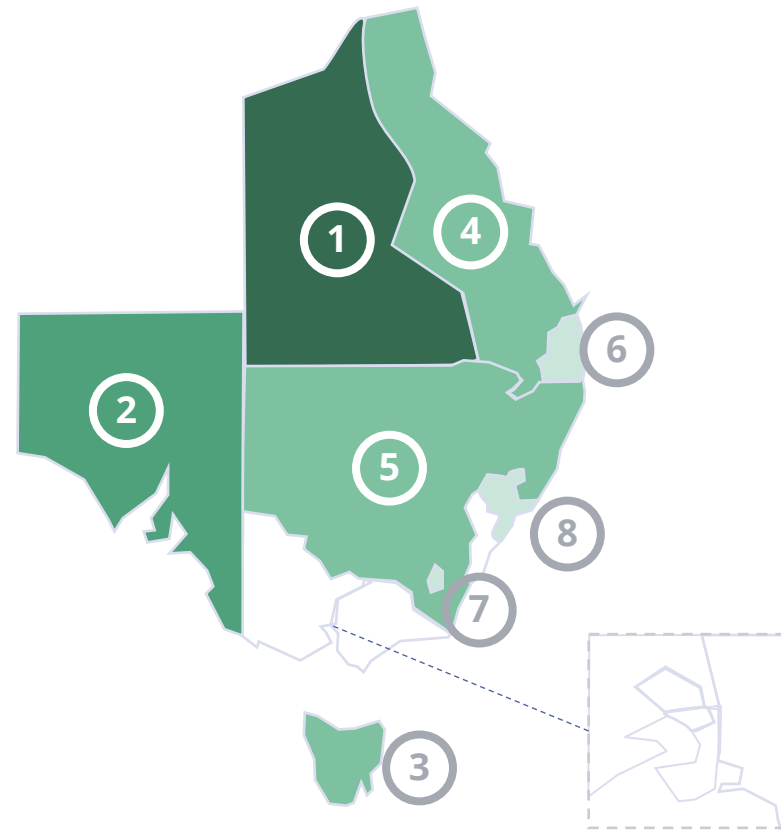
Key finding 1: In 2020, the best C&I battery opportunities lie in regional Qld, SA, Tasmania, and regional NSW.

RANKING OF NETWORK REGIONS – SIMPLE AND ADVANCED BATTERY VALUE STACKS

Simple Value Stack

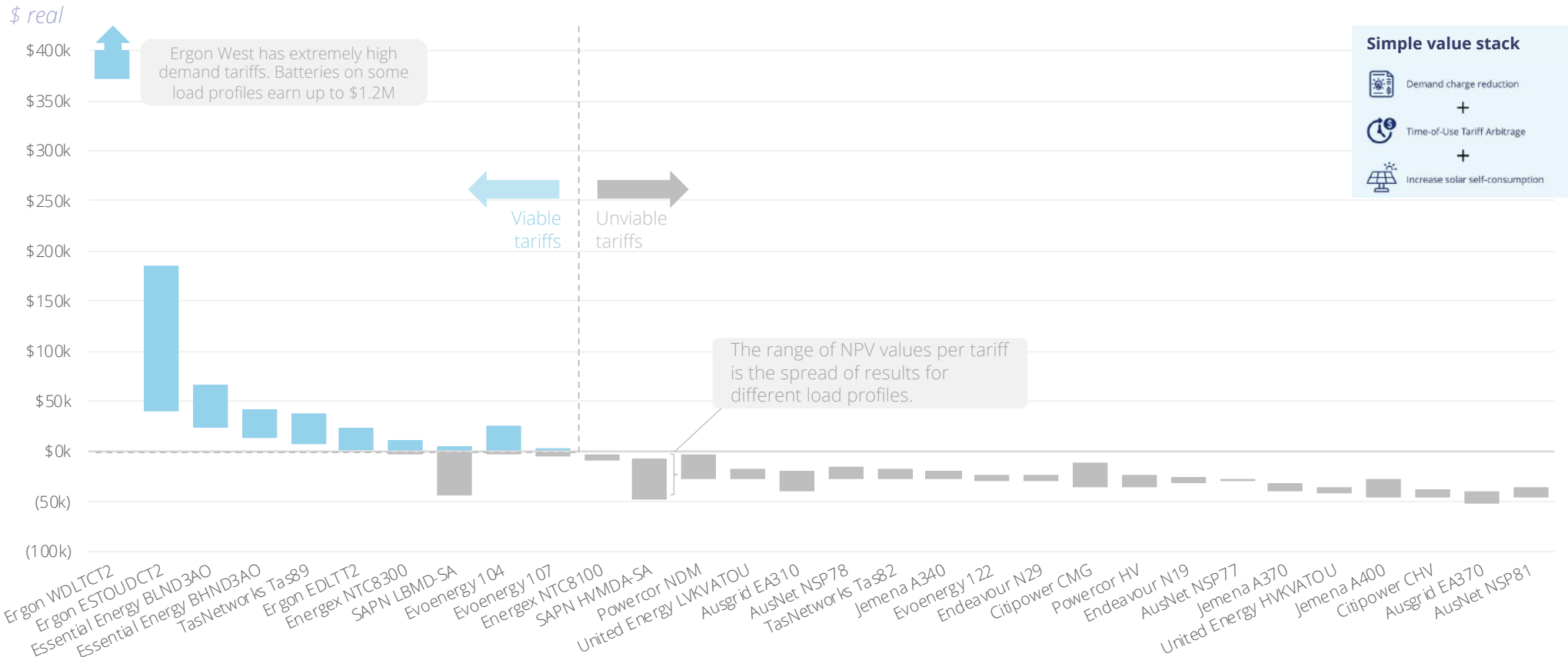


Advanced Value Stack



Key finding 2: Only 25% of network tariffs modelled yield positive returns, when looking at simple behind-the-meter savings alone

OPTIMUM 15-YEAR BATTERY NPV*, BY TARIFF CODE, ORDERED BY MEDIAN RESULT

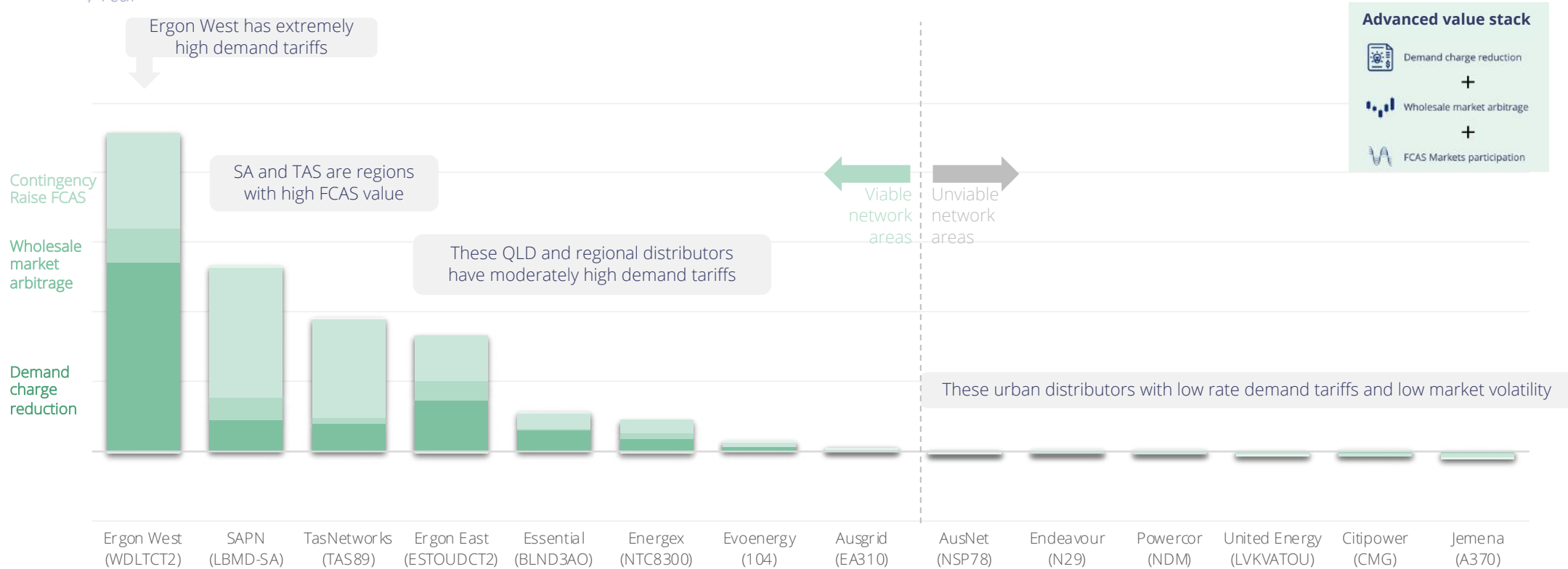


*Net present value is calculated with a 10% discount rate on a 15-year, pre-tax basis and includes battery revenue, OPEX and CAPEX. Battery cost: \$700/kWh. Range shown for five sites.

Key finding 3: Around 50% of network tariffs are viable for battery projects when considering the advanced value stack

NPV* FOR OPTIMUM BATTERY SIZE (MIN. 100KWH), BY DISTRIBUTION REGION, MANUFACTURING SITE

\$ real

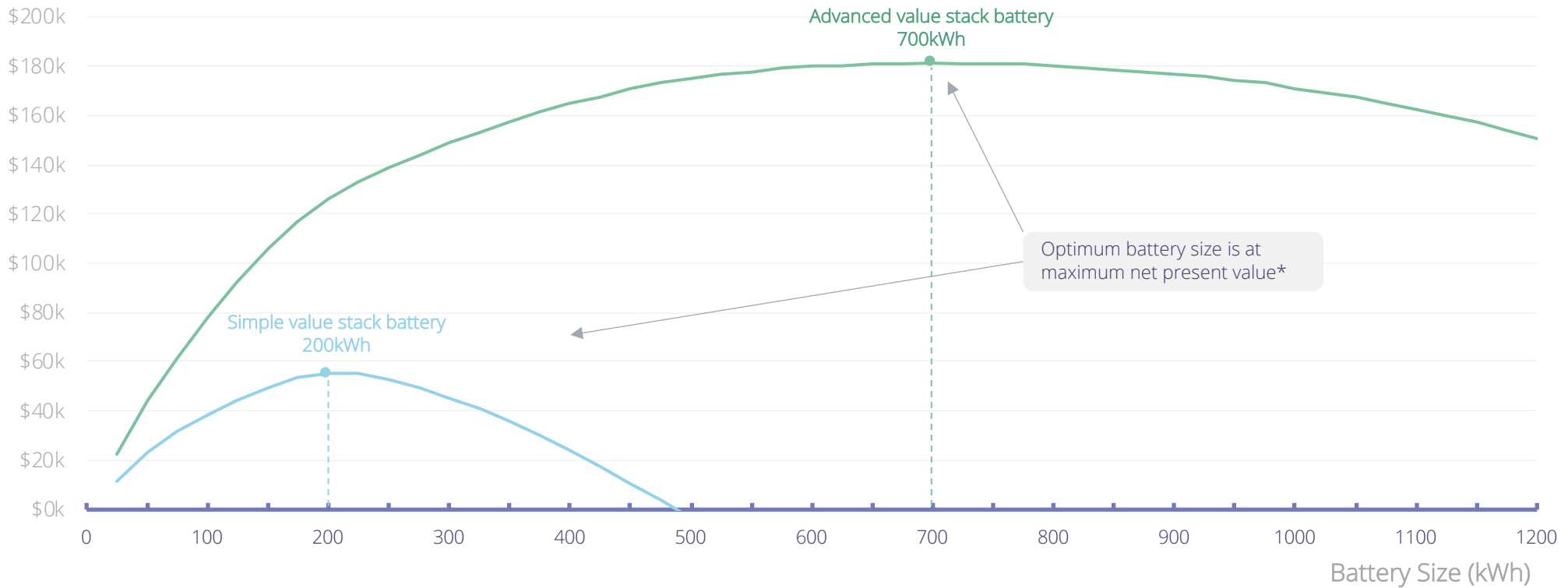


*Net present value is calculated with a 10% discount rate on a 15-year, pre-tax basis. The split of value streams based on 1st year revenue breakdown. Data input: 6-day Manufacturing profile 2MW, Solar size: 1MWp; Battery price: \$1000/kWh

Key finding 4: In general, more revenue opportunities mean bigger batteries. For both value stacks, optimal battery sizes for maximum value capture exist.

NPV BY BATTERY SIZE, SIMPLE AND ADVANCED VALUE STACK

Left-axis: 15-year NPV \$

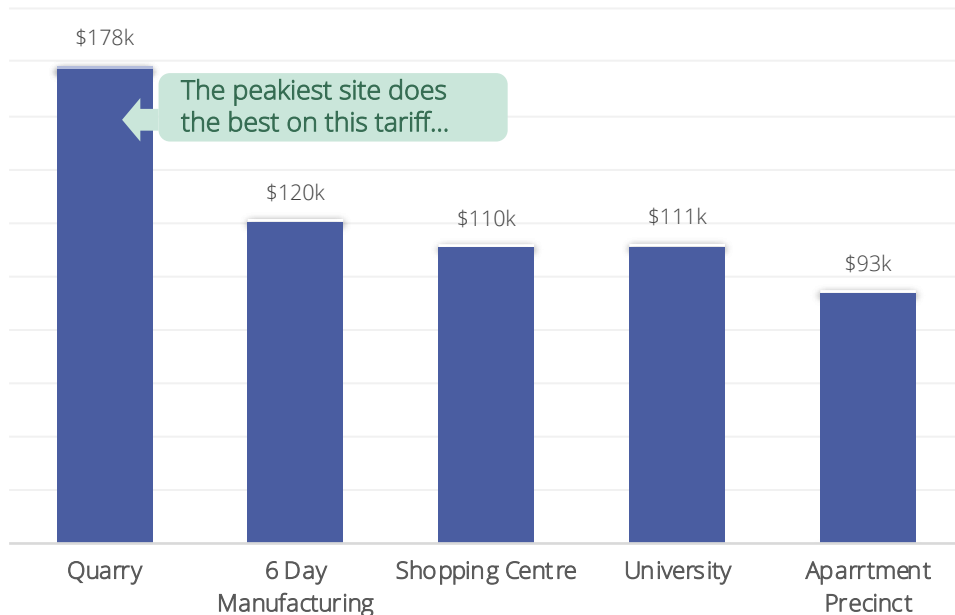


Key finding 5: Sites with peakier loads tend to earn more battery revenue, but not always. The interaction of network tariff AND load profile determine the best sites. Thus, modelling should be undertaken for every battery project.

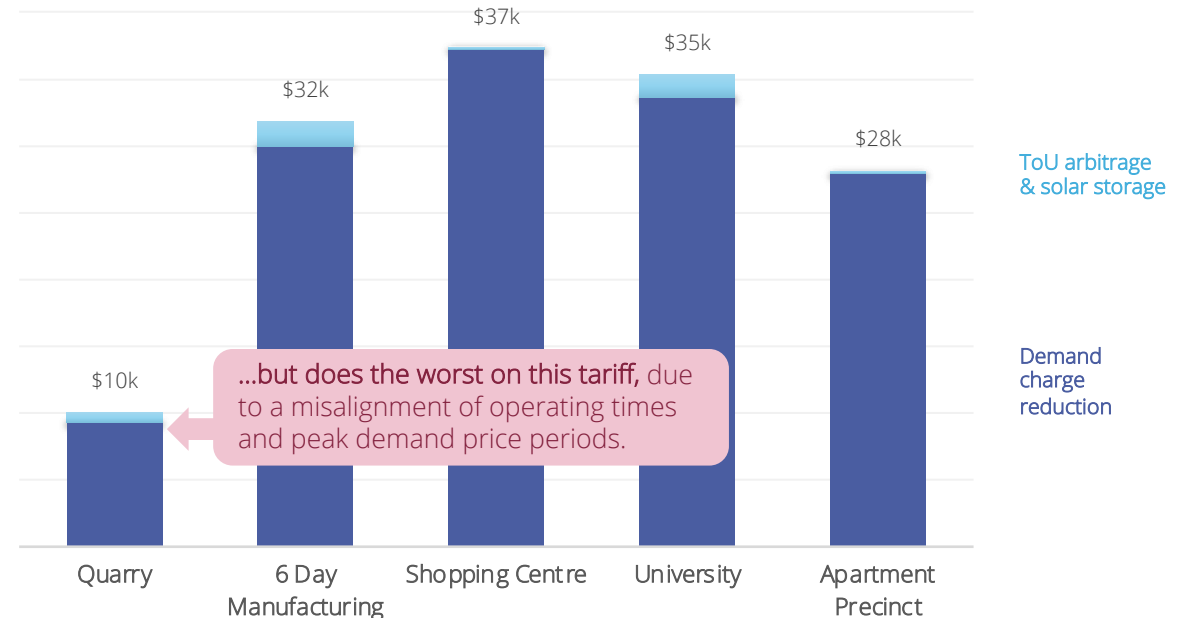
COMPARISON OF FIRST YEAR REVENUE FOR A 500KWH BATTERY, BY TARIFF AND LOAD, SIMPLE VALUE STACK

\$ real

Ergon west – non-TOU demand tariff



SA Power Networks – TOU demand tariff



Load factor for each load profile†

0.13

0.35

0.35

0.32

0.52

0.13

0.35

0.35

0.32

0.52

† Load factor is a measure of load peakiness with higher numbers meaning less peaky loads. It is calculated by dividing average demand with maximum demand. Data input: Tariff - (chart left) Ergon WDLTCT2, (chart right) SAPN LBMD-SA; Solar size: 1MWp;

Access the full report for a detailed exploration of simple and advanced battery opportunities and a practical guide to battery and VPP deployment

COVERED IN THE FULL REPORT

What, where and how valuable are the opportunities?

Part 1 – The economics of ‘simple battery value stack’ opportunities

What’s covered in this section?

- ✓ How to build a simple value stack for a C&I battery
- ✓ The **best customer load profiles** for batteries with a simple stack
- ✓ The **best locations and network tariffs** for batteries with a simple stack

Part 2 – The economics of ‘advanced battery value stack’ opportunities

What’s covered in this section?

- ✓ Background information about advanced value stack revenues
- ✓ **Understanding advanced value stack revenue streams**, wholesale market arbitrage and frequency control ancillary service (FCAS) markets
- ✓ The **best locations** for batteries with an advanced value stack
- ✓ The **best load profiles and network tariffs** for batteries with an advanced value stack

How to tap the opportunities

Part 3 – A practical guide to battery and VPP sales and deployment

This section aims to equip you with practical knowledge so you can take next steps towards selling and deploying C&I batteries and VPPs.

What’s covered in this section?

- ✓ Using a **data-driven sales strategy** for C&I batteries
- ✓ **Designing a battery system** to suit a C&I customer’s load profile
- ✓ **Key considerations** for deploying batteries & VPPs (regulatory, commercial, financial and technical)
- ✓ Understanding **revenue risk** for demand reduction, wholesale arbitrage & FCAS

We hope you enjoyed this excerpt from

White Paper: Opportunities for Batteries and VPPs in the Australian C&I segment

[Click here to access the full report](#)

Research and analysis by:



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