

Sound and Fury: The Outlook for Australia's Distributed Energy Storage Market to 2025

A Confidential Report for Strategic Research Clients

The Australian storage market has seen a quickening of developments over the past few months with a host of retailer and electricity network trials kicked off, announcements by major local players such as AGL and Origin Energy of planned storage products by the end of the year, and Tesla's halving of the market's lithium battery pricing point overnight.

While all this has prompted the media and equity analysts to announce the imminent arrival of cost effective storage, Energeia's review of the available analysis has found it to be fundamentally flawed in each case. Key shortcomings include neglecting to discount future cash flows, converting costs to Australian dollars, and ignoring real world constraints to theoretical returns. The key question then remains: When will storage truly become cost effective, for whom, and using what kind of solution?

In this confidential report for our Strategic Research clients, Energeia updates and expands its groundbreaking techno-economic analysis of the market for Distributed Storage (DS) over the next decade. The number of market segments modelled has increased from 2 to 6, improving our ability to identify opportunities. This report also analyses the market's key drivers, barriers, customer segments, technologies, products and industry players to gain insight into its medium to long-term outlook.

Energeia's review of Australia's policy and regulatory policy settings for DS has found that despite having no formal policy or regulatory framework for DS, few institutional barriers exist to wide scale storage deployment. ARENA has stepped up to fund the capability developments needed to catalyse the early market, and the AEMC has just announced its own storage focused review. Our analysis shows the main regulatory barrier to be the lack of truly cost-reflective tariffs.

Although we see near-term demand from network and retailer spending targeting government and regulatory funding from ARENA and the Demand Management Innovation Allowance, we expect this to collectively represent a few hundred units at most. While renewables integration and demand management will both be important niches, we see demand over the next 3 to 5 years coming from a few key customer segments with the right conditions to unlock the most value from storage services.

The range of available storage solutions has increased significantly since our last report, with the majority of new units designed to drop into an existing solar PV circuit to reduce system costs by sharing the inverter. Unfortunately, solution developers have yet to fully understand DS economics, and none of the units provide a cost effective solution due to some combination of functional and cost gaps. The emergence of bolt-on software solutions may help address current functional gaps.

While the industry is rapidly expanding, most of the growth is in product manufacturers and suppliers and not in storage service providers. Product market concentration is low, with only Sunverge's solution winning more than one trial at this stage. Storage chemistry concentration is another story, however, with all trials featuring some kind of lithium-ion solution.

Energeia's modelling shows cumulative Australian DS market investment of \$300 million and annual installations reaching 55,000 nationally across residential and commercial segments by 2025. While some of this demand will come from existing solar PV customers looking to leverage their investment, the vast majority of demand is expected to come from those customers with the right kind of load profile and those able to access a truly cost reflective retail and network tariff.

Energeia's latest research report dispels the sound and fury of the current crop of would-be storage players, solutions and strategies as ultimately signifying nothing with respect to the main \$300 million opportunity. Instead, we see the ultimate winners as those whose strategic positioning best reflects the fundamental economics of storage.

Contents

1	Introduction	5
1.1	Scope	5
1.2	Definitions	6
1.3	Structure	6
2	Policy and Regulation	7
2.1	International	7
2.2	Federal	11
2.3	State	15
3	Customers and Markets	16
3.1	Market Drivers	16
3.2	Customer Segments	26
3.3	Market Activity	28
4	Products and Services	30
4.1	Key System Features	30
4.2	Assessment of Key Products	39
4.3	Key Market Services	41
5	Industry and Strategy	43
5.1	Industry Structure	43
5.2	Player Strategy	46
5.3	Player Performance	48
6	Outlook	50
6.1	Policy and Regulation	50
6.2	Customers and Demand	52
6.3	Products and Services	60
6.4	Industry and Strategy	63
7	Glossary	65

Figures

Figure 1 – Storage Procurement Targets for CA Utilities by Utility, Year, and Point of Interconnection	8
Figure 2 – Best Practice Policy and Regulation	10
Figure 3 – Demand and Supply-Side Funding per Customer by Country	11
Figure 4 – ARENA Funding of Energy Storage Projects	12
Figure 5 – Status of DMIS Allowances by Distribution Network for the Current Regulatory Period	13
Figure 6 – Smart Meter Policy and Regulation Timeline	14
Figure 7 – Selected Australian Industry Standards for Energy Storage Components	15
Figure 8 – Matrix of Key Demand Drivers and Applications of Energy Storage	16
Figure 9 – Average Peak to Off-Peak (ToU) Retail Price Differentials by State and Customer Type	18
Figure 10 – Possible Peak Pricing Mechanisms for Maximum Demand Network Tariffs	18
Figure 11 – Availability of Cost Reflective Tariff Types by DNSP	19
Figure 12 – Fit Savings for Storage Charging by State	20
Figure 13 – Proportion of Customers on Premium FiTs and Average Installation Size by State	21
Figure 14 – Average SAIFI and SAIDI figures by State	22
Figure 15 – Value of Customer Reliability by Customer Type and State	22
Figure 16 – Storage Benefits from Avoided NEM Price Spikes by State and Year, 2011-2014	23
Figure 17 – DNSP Forecast Level of Constrained Assets for 2015-2019	24
Figure 18 – Value of Local Network Demand Management by Asset Type	24
Figure 19 – Rates of Solar Penetration vs. Rates of Voltage Rise Excursions	25
Figure 20 – Market Potential for Residential Storage	26
Figure 21 – Current Investment Case for Distributed Energy Storage in SA	27
Figure 22 – Market Potential for Business Customers	28
Figure 23 – International Distributed Energy Storage Projects	28
Figure 24 – Energy Storage Projects and Installations in Australia	29
Figure 25 - Required System Features against Energy Storage Services	30
Figure 26 – Indicative Cycle Life of Lead-Acid vs Lithium-Ion Batteries	33
Figure 27 – Indicative Standing and Cycle Losses of Selected Battery Chemistries	34
Figure 28 – Average and Best in Class Discounted Present Costs of Selected Battery Chemistries	34
Figure 29 – Failure Rates for Inverter and Battery System Components by Type	36
Figure 30 – BenQ PowerLegato EnergyOptimizer Software In-Device Display	38
Figure 31 – Bosch BPT-S 5 Hybrid Reporting Software for Smart Phone	38
Figure 32 – Examples of Residential Energy Storage Systems available in Australia by Year	39
Figure 33 – Characteristics of Selected Storage Systems Available in Australia	40
Figure 34 – Australia’s Energy Storage Industry Structure	43
Figure 35 – Key Distributed Storage Product Developers in Australia	44
Figure 36 – Key Distributed Storage Retailers in Australia	45
Figure 37 – Key Distributed Storage Service Providers in Australia	45
Figure 38 – Strategic Positioning of Selected System Developers	46
Figure 39 – Strategic Positioning of Selected System Retailers	47
Figure 40 – Estimated System Developer Market Shares (2015)	49
Figure 41 – Estimated System Retailer Market Shares (2015)	49
Figure 42 – Solar PV Customer Numbers on Premium FiTs	51
Figure 43 – Assumed Nominal Retail and Wholesale Price Growth Rates	52
Figure 44 – Cost Reflective Tariff Availability Assumptions	53
Figure 45 – Assumed Nominal Network Price Growth Rates	53
Figure 46 – Assumed FiT Price Growth Rates	53
Figure 47 – Forecast Lithium-Ion and Lead-Acid Battery System Prices	54
Figure 48 – Historical and Forecast Storage and Solar PV System Prices (\$/kW)	55
Figure 49 – Population Growth Rate Assumptions	55
Figure 50 – Residential and Business Customers by Segment to 2025	56
Figure 51 – Storage Market Penetration by State and Segment to 2025	56

Figure 52 – Annual Storage Installations by Residential and Business Customer Segment 57
Figure 53 – Weighted Average Storage Size for Residential (LHS) and Business (RHS) Segments 58
Figure 54 – Annual Storage Capacity Added by State and Year to 2025 59
Figure 55 – Annual Storage Expenditure by State and Year to 2025 59
Figure 56 – Summary of Emerging Distributed Battery Storage Technologies 61
Figure 57 – Diagram of Storage System with Integrated Load Management 62



The arrival of cost effective storage in Australia has been a hot topic in the electricity industry in recent years. Two recent ‘breakthrough’ announcements by global electric vehicle darling Tesla, and a reinvigorated, distributed energy focused AGL have sent shockwaves through Australia’s storage industry.

Since our last report in 2013, in which we forecast cost effective battery solutions being offered by 2015 to niche customer segments, lithium based battery system availability has taken off, but the price of these systems remained stubbornly high – until Tesla’s announcement in May 2015 rocked the global storage industry with cost per kWh pricing for lithium as low as \$350/kWh. Since then, manufacturers and suppliers have been scrambling to compete, and prices have begun to fall.

What has not been so well understood in the media melee following Tesla’s announcement is the limitations of the system Tesla is offering relative to the requirements of a cost effective storage solution. Tesla’s product currently lacks the functionality needed to capture most storage service revenue in Australia, making it uneconomic despite its market leading cost per kWh price tag.

The other potentially key market development has been AGL’s announcement of their storage solution, which like Tesla’s, at first appears to be a watershed event for the Australian market for storage. And while it certainly is for AGL, and potentially other first-tier energy retailers who have yet to offer a storage product, storage has been offered by off-grid specialists for years, and lithium products have been offered by solar PV suppliers and specialists since before our last report.

Like Tesla, AGL’s selected product also lacks key functionality needed to address most storage benefits in Australia. Its high price tag, nearly double the price of Tesla’s solution, means that AGL’s positioning strategy is likely to limit sales beyond the 2.5% of early adopters that are driven by factors other than price and return on investment.

Energeia’s own analysis of these issues and identification of market ‘leader’ beating strategies is laid out in this report, which updates our view of the key:

- Financial benefits of storage services in Australia
- Customer segments with the highest storage service revenues per customer
- Functionality and performance of systems needed to capture these revenues
- Products available in Australia representing the greatest value for money
- Player strategies and business models adding long-term shareholder value.

The following sections in this chapter describe the specific scope of this report and summarises its structure.

1.1 Scope

This report is part of Energeia’s Strategic Research service, which focuses on the emerging energy technologies that will power the Customer of the Future. The report addresses the market for distributed energy storage over the next ten years and the industry value chain that will develop, manufacture, distribute and service the various products.

While we see significant potential opportunities for utility scale renewable energy project attached storage solutions and distribution network attached storage solutions, the scope of this report has been limited to customer premise installed distributed solutions, again to give greater focus to what we see as the key emerging market opportunities in Australia.

The scope of battery storage technologies considered in this report is limited to lead acid and lithium-ion as the two most prospective storage technologies over the next decade. While we believe that flow

and potentially heat based storage systems could become viable over the next ten years, we have excluded them from this report to give greater focus to the more commercial technologies.

Due to their relative market size, the report focuses on the main Eastern markets of Queensland (QLD), New South Wales (NSW), South Australian (SA) and Victoria (VIC). National figures, and those of other key states, are also included where it is practical to do so.

1.2 Definitions

Distributed energy storage refers to an energy storage device that is located on a customer's premise and behind the customer's meter. It includes the necessary hardware and software to transfer energy between the system and the premises, including the switchgear, power inverter, battery charger, system controller, communications and enclosure. It may be centrally or locally controlled.

1.3 Structure

The report is structured into the following main sections:

1. **Overview** – Provides a high level summary of the report and its key findings
2. **Introduction** – Outlines the scope and structure of the report and provides technical definitions and assumptions
3. **Policy and Regulation** – Reports on Australia's policy and regulatory framework as it relates to energy storage technology at the Federal and state level against international best practice
4. **Customers and Markets** – Reports on the Australian market for energy storage devices, including the estimated size, profile and potential of key market segments
5. **Products and Services** – Reports on distributed energy storage products and services, including an assessment of their functionality and performance against market requirements
6. **Industry and Strategy** – Reports on the industry value chain by segment including key challenges and opportunities, the number and type of players, and player strategies
7. **Outlook** – Reports on Energeia's proprietary models and outlook for policy and regulation, energy and product pricing, market demand, products and services and industry value chain.

Sections 3 through 6 provide the results of Energeia's research and analysis of historical and contemporary information. Section 7 is forward looking, and mostly concerned with describing the key inputs and assumptions underpinning our twenty year outlook.