



Battery Storage Systems

Currently available for purchase in Australia (March 2016)

1. TESLA Powerwall



Key features:

- LiFePo4 high voltage technology
- 7 (6.4 useable) kWh capacity per unit
- Expandable to 2 or more 7kWh modules
- 3000 cycles at 100% depth of discharge (DoD)
- 3.5kW peak power
- UPS functionality
- End Of Life: 80% retained capacity after 3000 cycles
- 92% roundtripⁱ efficiency
- Cost approx. \$11,000 for full system, including battery, inverter, delivery in NSW and installation
- Warranty on battery 10 years
- Pre-order for installation approx. May/June 2016

Supplier / Installer:

- Energy Matters (SunEdison), Sydney
- Natural Solar, Sydney
- Origin Energy

2. AQUION S20P08



Key features:

- AHI (Aqueous Hybrid Ion) technology (48V)
- 2.4kWh nominal capacity per unit
- Expandable to any capacity in multiples of 2.4kWh
- 3000 cycles at 100% depth of discharge (DoD)
- 0.9 kW peak power per module
- End of Life: 100% retained capacity after 3000 cycles
- 85% roundtrip efficiency
- UPS functionality with the right power electronics
- Warranty on battery 5 years full plus 3 years pro-rated
- Available for shipment now
- Total system cost for 7.2kWh system expected to be \$10-12,000 (approx. \$1,800 for one battery unit)

** e.g. SMA Sunny Island, \$4-5000 for 5kW rating*

Supplier / Installer:

- Ampetus Energy, Melbourne
- Ecoelectric, Brisbane
- Fusion Power, Brisbane

3. LG RESU 6.4EX



Key features:

- LiFePo4 technology (48V)
- 6.4kWh capacity per unit
- Expandable to 12.8kWh
- 6000 cycles at 90% depth of discharge (DoD)
- 5kw peak power
- UPS functionality; backup power: not specified
- End Of Life: 60% retained capacity after 6000 cycles
- 95% roundtrip efficiency
- Cost approx. \$7-8,000 for battery only.
- Warranty on battery 10 years
- Available for shipment now
- Total system cost for 6.4kWh system expected to be approx. \$11-12,000

Supplier / Installer:

- Solar Juice, Sydney
- Ecoelectric, Brisbane
- Supply Partners, QLD
- Potentially others

4. Ampetus Sunbank



Key features:

- LiFePo4 technology (LinkData Technologies – 96V)
- 7.5kWh capacity per unit
- Expandable to 15kWh
- 2000 cycles at 100% depth of discharge (DoD)
- 15kw peak power, 5kW rated power
- End Of Life: 80% retained capacity after 2000 cycles
- Roundtrip efficiency not specified
- True UPS function (<4ms switching time)
- Warranty on battery 10 years, inverters 5 years
- Available for shipment now
- Cost approx. \$14,000 for 11.4kW plug-and-play solution

Supplier / Installer:

- Ampetus Energy, Melbourne

5. Samsung SDI Power Bank



Key features:

- LiMnO₂ technology (48V)
- 3.6/7.2/10.8 kWh capacity per unit
- Scalable
- 6000 cycles at 90% depth of discharge (DoD)
- 2/4/5 kW peak power
- End Of Life: 80% retained capacity – more than 10 years
- 95% roundtrip efficiency
- Product warranty on battery 5 years product, 10 years performance warranty
- Available for shipment now
- From \$7,500 total package incl. solar and battery inverter
- Cost approx. \$15,000 for 10.8kWh plug-and-play solution

Supplier / Installer:

- SOL Distribution, Sydney
- Solar Juice, Sydney
- (Origin Energy?)

6. SunVerge SIS



Key features:

- LiFePo₄ technology
- 11.6 and 19.4 kWh capacity
- 7000 cycles at (90%) depth of discharge (DoD)
- 5kW peak power
- 6.8kW backup power; UPS functionality
- End Of Life: 10 year battery life specified (7000 cycles or 10 years whichever comes first)
- Roundtrip efficiency not specified
- Warranty on system 10 years
- Available for shipment now
- From \$7,500 total package incl. solar and battery inverter (Approx. \$20,000 for 11.6kWh plug and play system incl. installation)

Supplier / Installer:

- AGL Energy 'Power Advantage'

7. ALPHA ESS



Key features:

- LiFePo4 technology
- Battery capacity 2 – 18kWh, modular
- 8000 cycles at 80% depth of discharge (DoD)
- Up to 5kW peak power
- UPS function built in
- End of Life: > 10 year battery life specified
- Roundtrip efficiency not specified
- Cost from approx. (not specified)
- Warranty on system 5 years, 10 years performance warranty
- Plug and play system with hybrid inverter
- Available for shipment now
- Cost from approx. (not specified)

Supplier / Installer:

- SolarChoice, Manly NSW

8. AU Optronics Power Legato



Key features:

- LiFePo4 technology
- 7.2 kWh capacity
- 5000 cycles at (90%) depth of discharge (DoD)
- 3kW peak power
- UPS functionality: 3kW backup power
- End Of Life: 10 year battery life specified (7000 cycles or 10 years whichever comes first)
- Roundtrip efficiency not specified
- Warranty on system 10 years
- Available for shipment now
- Cost from approx. \$12,990 for plug-and-play solution. incl. battery inverter and installation

Supplier / Installer:

- AGL Energy 'Power Advantage'

9. Selectronics MyGrid



Key features:

- LiFePo4 technology (German 'Sonnenschein' brand)
- 3.5 kWh capacity nominal
- Expandable up to 70kWh (3.5/7/14/28/35/70kWh)
- 4000 cycles at (80%) depth of discharge (DoD), 2800 cycles 100% DoD
- 3kW peak power
- Backup power not specified
- UPS functionality
- End of Life: not specified
- Roundtrip efficiency not specified
- Warranty on system up to 8 years – see website for details
- Selectronics is an Australian manufacturer of inverters and related equipment
- Available for shipment now
- Cost not specified

Supplier / Installer:

- Selectronics, Melbourne

10. Enphase Modular AC batteries

Key Features:



- LiFePo4 technology (230V AC)
- 1.2 kWh capacity nominal per module
- Expandable in 1.2kWh increments
- Seamless integration with Enphase microinverters and controllers
- 7000 cycles / 10 years life at 95% DoD
- 275W rated, 550W peak power per module
- **Backup power: currently not suitable for UPS**
- End of Life: 10+ years
- 96% Roundtrip efficiency
- 10 year warranty on battery
- Available for shipment winter 2016
- Approx. \$1,150 per module

Supplier / Installer:

- Available through selected electricians

11. DESS /BYD



Key Features:

- LiFePo4 technology (230V AC)
- 10kWh capacity rated capacity
- 3500 cycles / 100% DoD
- 3kW or 9kW continuous power
- UPS power with ultrafast switching
- Design Life 20 years
- 93.7% inverter efficiency
- Warranty 5 (up to 10) years
- Turnkey system with battery and solar inverter
- Cost not specified

Supplier / Installer:

- Solar Balance, WA

12. REDFLOW (ZCell)



Key Features:)

- Latest Zinc Bromide Hybrid (ZBM2) technology
- 10kWh capacity rated capacity
- 100% DoD over life
- Power: 3.6kW continuous, 6kW – 30 minutes
- Design Life 10 plus years (Electrolyte warranted for 30,000kWh = 3000 full cycles)
- No danger of thermal runaway due to safe chemistry
- No loss of charge over time when fully charged
- Designed to work in hot environments (up to 45 degr. C ambient)
- Warranty 10 years for battery
- Available 2nd half of 2016
- Total cost for system expected to be \$17,500 to \$19,500

Supplier / Installer:

- Reflow, Australia

13. Other manufacturer that to date did not provide sufficient information about their products but are worth monitoring

a. **SONNEN Battery**

Modular system from 2 to 16kWh, launched in Australia March 2016. SONNEN claims 10,000 cycles life, which is the highest available so far. More details in pricing to come soon.

b. **PANASONIC**

8kWh Lithium Ion battery – no clear specifications provided to date.

Panasonic, the largest manufacturer of rechargeable batteries in the world is deemed to distribute its PV battery products in Australia via Energy retailers only.

c. **MAGELLAN POWER**

Magellan has 2 systems with 9.2 and 13.8 kWh on offer, both LiFeO4 technology.

The specified cycle life of 2000 at 80% DoD is rather low. There is extensive product information on their website. The products are distributed by Reposit Energy, Sydney.

d. **ZEN Energy, South Australia**

ZEN offers a comprehensive range of plug and play solutions for every budget, made in SA.

e. **BOSCH, FRONIUS, BYD**

We did not research their solutions due to lack of detailed information available.

f. **SONY ESS 5/7**

Distributed by Off-Grid Energy, Sony offers a 5 /7kWh (nominal) LiNiMnCoO2 (Li NMC) battery with a massive power output of output power of more than 5kW, 5000 full cycles, 97% roundtrip efficiency and a 7 year warranty. The system can be expanded to 75kWh maximum.

Summary and Disclaimer

The market for battery storage solutions is complex and varied and changes rapidly. Even for 'experts', it's impossible to tell which technology will be successful in the end in regards to cost, reliability and performance. The winning technology in 10 years time may not have left the lab yet.

This paper is not meant to be a complete picture of the market. New technologies and suppliers emerge on a regular basis. Specifications can change without notice. Current pricing may be following a downward trend similar to solar panels.

Life expectancy, expressed as 'cycle life' or number of cycles the battery can be discharged and charged again, is confusing:

Hardly any 2 manufacturers base their figures on the same assumptions (such as depth of discharge, ambient and operating temperature, end of life definition etc.). It is probably fair to say that (almost) all Lithium Ion (LiFePo4 and LMC batteries) will have a cycle life of at least 3000 cycles at a depth of discharge of 80% or better. Depending on actual use, some batteries may live much longer.

Lead acid batteries in all their varieties have not been included for 2 reasons:

Firstly, we believe that their pros and cons are well known to the wider community; and secondly, we think that over the next few years they will largely disappear from the market for new applications of residential and commercial energy storage due to their inherent lower cycle life.

Some vendors of battery storage technology have not been featured in this paper because sufficiently detailed information was not available (at least we could not find it!). The information missing relates mostly to cycle life versus DoD and warranties. These vendors include well respected names such as BOSCH, SCHNEIDER, FRONIUS and others. We will continue to observe the market for new and more detailed offers from these companies.

While compiled to the best of our knowledge in January 2016, **GOODBYEGRID** cannot accept responsibility for any content published in this publication, nor for any technologies/products/suppliers or distributors that may have slipped our attention.

Due to the complexity of the matter and the individuality of any household or commercial site, we strongly suggest getting professional advice before investing money into any type of solar battery storage solution.

Please visit our website www.goodbyegrid.com.au for regular updates.

ⁱ Efficiency of one full charge and discharge cycle