

Domestic Battery Storage (2019 Update)

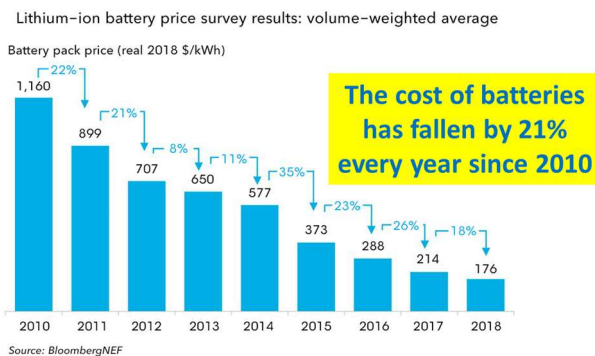
Dr Martin Gill

As 2016 drew to a close the domestic battery storage market looked set to take off. Significant price reductions and rapidly rising electricity prices indicated batteries would soon be cost effective. Over the next 3 years electricity prices continued to soar but the price of battery storage has remained high. Do Government subsidies help?

A brief history of domestic storage prices

Tesla's announcement of the original Powerwall® in 2015 was seen as a major turning point for domestic battery storage. The headline price of US\$3,000 caught everyone's attention! This was quickly followed by the Powerwall 2 in 2016, offering an installed price of \$10,400 or 66% less per kWh than the original.

The long term trend of battery prices made it clear battery storage was set to make a major impact. Bloomberg New Energy Finance's annual survey of battery prices shows:



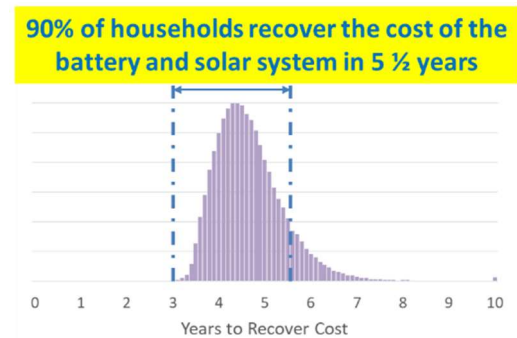
Bloomberg's figures reveal Lithium Ion battery prices have decreased by a staggering 21% every year since 2010. Applying Bloomberg's average price reduction to the published price of the Powerwall 2 in 2016 suggests now, 3 years later, the price should have halved, to a little over \$5,000.

Instead over the past 3 years the installed price has increased by 35% to \$14,000.

An alternative approach starts with the published price of the Li-Ion cells used in the Powerwall. Both Tesla and VW have indicated they have reached the battery price milestone of US\$100/kWh giving a battery cost of US\$1350. Assuming the batteries comprise 50% of the unit cost and including a 20% retail margin, 10% GST and an exchange rate of AU\$0.68/US\$1 confirms the price should be \$5,000.

Economics of battery storage systems

The majority of consumers choosing to invest in a solar battery storage system do so because annual electricity savings eventually exceed the system cost. The first question many consumers ask is "How many years does it take to recover the cost of the solar battery storage system?" Assuming forecast battery prices were currently available the answer is:



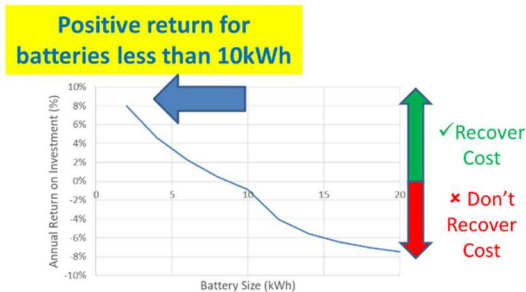
The above presents the financial benefits for consumers installing a 5kW solar system and a 13.5kWh battery system. Average electricity savings come to \$1,100 a year. Significantly 90% of the analysed consumers recover the cost of both the solar and battery system in less than 5 ½ years. The result explains why battery storage has the potential to revolutionise Australia's energy market.

There is a major road block to this exciting energy future. When the actual \$14,000 price of the Powerwall 2 is used, none of the analysed households recover the cost of the battery in less than 10 years.

South Australian Battery Subsidies

The current market price of the Powerwall 2 is a little over \$1000/kWh. The analysis of global battery price trends suggests the figure should now have fallen to \$400/kWh. Perhaps this explains why the South Australian Government has chosen to introduce a battery subsidy of \$600/kWh (for concession card holders).

The South Australian Government only offers the subsidy for the first 10kWh of battery storage. To determine if this is sufficient the following considers a household adding a subsidised battery system to their existing 5kW solar system. It then calculates the financial return over 10 years.



The analysis shows the average consumer installing a battery less than 10kWh recovers the subsidised cost. Even with the subsidy most households would not recover the cost of a battery larger than 10kWh.

The conclusion is the South Australian Government’s decision to limit the battery subsidy to 10kWh is reasonable.

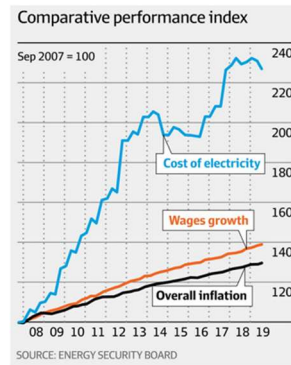
Discussing subsidies

The unintended outcomes of earlier Government subsidised solar feed in tariffs should raise concerns about current battery subsidies.

The first question is who benefits? Ross Gittins recently wrote “Before long, only the rich will be able to afford a detached house with a backyard”. The unfortunate reality is most consumers applying for the solar battery subsidy will own their house and are therefore already better off than the increasingly large number of consumers struggling to achieve the “Australian Dream”.

Consumers who do not own their own property will find it virtually impossible to apply for the subsidy. Even apartments owners will find it too difficult to install a battery storage system. Hence the battery subsidy benefits consumers who own a house, most of whom are already in a strong financial position.

Cripplingly high electricity prices are pushing Australian consumers into energy poverty. Subsidies risk making this situation even worse. For example Queensland’s subsidised solar Feed-In Tariff initially recovered costs through a fee added to electricity prices. Analysis revealed the fee increased electricity bills for non-solar households by \$100 a year.



ACCC analysis shows 10% of the doubling of electricity prices is due to Government Green Schemes

A similar conclusion was reached by the ACCC who attributed 10% of electricity price rises over the past 10 years to Government added fees used to support various Green schemes.

St Vincent de Paul describes the subsidies as regressive. They note those unable to benefit from the subsidies end up paying significantly more.

But all consumers benefit – don’t they?

Multiple trials have shown how battery storage systems could benefit all consumers. These trials use domestic batteries to supply electricity to the network, typically in the late afternoon when solar output is low and electricity demand is high. The promised benefit is to reduce wholesale electricity prices indirectly leading to lower electricity prices for all consumers.

There are a number of problems with this idealistic scenario. The primary one being the battery subsidy does not require consumers to enrol their battery in these schemes. Most will choose not to do so because sending electricity to the network reduces the amount of electricity available to the battery owner, marginally reducing savings. Another issue is the additional charging and discharging of the battery can reduce the usable battery life.

This suggests current subsidies benefit the battery system owner, with little, if any, benefit to other consumers. This could be addressed.

Alternative Subsidies

It is possible to design subsidies sharing battery system benefits with all consumers.

One suggestion is subsidies should only be made available to consumers enrolling their battery in schemes intended to benefit all consumers. The problem with this scheme is once installed there is no incentive to continue to participate. For example Queensland’s PeakSmart program gives consumers a

\$400 subsidy for enrolling their air-conditioner. They can immediately unregister the air-conditioner but still keep the subsidy.

Encouraging continued participation suggests the subsidy should be based on **delivered benefits**. For example subsidising energy sent to the network during peak times. This also directly addresses two of the concerns limiting participation (compensating consumers for reduced savings and battery lifetime). The downside is this does not address the large upfront payment required to purchase the battery system.

This brings us back to the current price of battery systems. The analysis shows subsidies are not required if Australian's could access global battery prices. Perhaps rather subsidising inflated prices the money could be used to fund a Government program to continuously negotiate lower battery prices (much like the Pharmaceutical Benefits Scheme).

Maximising societal benefits

Another Telsa battery storage solution has been delivering societal benefits. After the 2016 statewide black out the South Australian Government funded the installation of a 125MWh battery system. In addition to the energy storage benefits this battery also provides grid stability. When required it exports energy to help stabilise the network.

If the South Australian Government subsidises 10,000 domestic battery systems will they provide the same amount of network support? No.

Australia's incredibly complex energy market also includes a separate market trading 'grid stability'. To offer services to the 'grid stability' market the battery system must be able to respond rapidly to centralised requests. While this is possible for ONE 125MWh system it is technically too complex for 10,000 small systems.

Currently societal benefits are maximised by installing a few larger battery storage systems not through generous subsidies benefitting those who are already financially better off.

Is the subsidy needed?

Current subsidies reward consumers able to install a battery system, predominantly those who own a house. Previous analysis by the Real Estate Institute

estimated purchasers are prepared to pay \$10,000 more for houses with a solar system.

While similar analysis is yet to be published for battery systems it is anticipated the price premium for houses with both a solar and battery system would be even greater. The conclusion is the home improvement value from installing a battery system is sufficient compensation for house owners. Lower electricity usage charges then provide further savings. In this light are subsidies really necessary?

Conclusion

With 2.2 million domestic solar installations Australia is well positioned to benefit from battery storage. Despite several years of sensationist reporting Australian consumers are yet to see the lower battery prices needed to revolutionise the energy industry.

Addressing the price gap through generous subsidies is not the answer. Previous experience with solar subsidies suggests these schemes primarily benefit those who are already financially better off. Cross subsidies ultimately push more consumers unable to access the subsidies into energy poverty.

Options linking subsidies to societal benefits can be found. When societal benefits are considered larger centralised battery storage options remain the better option.

Citation

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Comments or Questions?

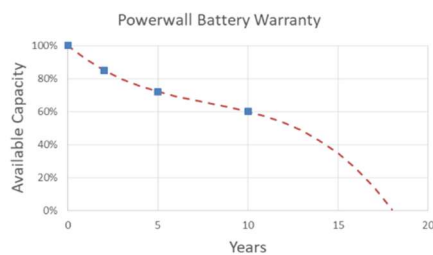
The author is happy to receive comments or questions about this article. He can be contacted at martin@drmartingill.com.au

Background to the analysis

The analysis is based on the Ausgrid dataset. This dataset contains separately metered 30 minute measurements of electricity consumption and solar system output from 300 Sydney households over a 3 year period.

Linear scaling is used to model the output of the solar system. The analysis assumes 6kW of solar panels are fitted with the inverter output limited to 5kW (2.5kWh per 30 minute interval).

Much of the analysis applies a yearly battery degradation factor as suggested by the original Powerwall warranty.



The Ausgrid dataset reveals significant differences in solar system performance. To capture these performance differences the modelling applies all 300 solar system outputs to all 300 households, essentially creating 90,000 different installations.

References

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A Behind the Scenes Take on Lithium-ion Battery Prices
[Bloomberg New Energy Finance](#)

VW has reached milestone in battery costs ([business insider](#))

South Australian Home Battery Scheme [website](#)

Under pressure, and for what? Ross Gittins

Green energy push transforms to tax poorer households,
Sydney Morning Herald

Ausgrid solar household dataset ([Ausgrid](#))

About Dr Martin Gill

Dr Martin Gill is an independent consultant specialising in the provision of consumer advice. This advice is based on a deep understanding of Australia's energy industry and strong analytical skills. As a consultant he has prepared advice for consumer advocates, government regulators, electricity distributors, electricity retailers, asset operators and equipment vendors.

Dr Gill is a metering expert. During the National Smart Metering Program he facilitated the development of a specification for Australian smart meters. Innovative metering products developed by his teams have been externally recognised with the Green Globe Award, NSW Government's Premier's Award and Best New Product by the Australian Electrical and Electronics Manufacturers Association.

He currently represents the interests of consumers on a range of Standards Australia working groups including metering, renewable power systems, battery storage and demand management.