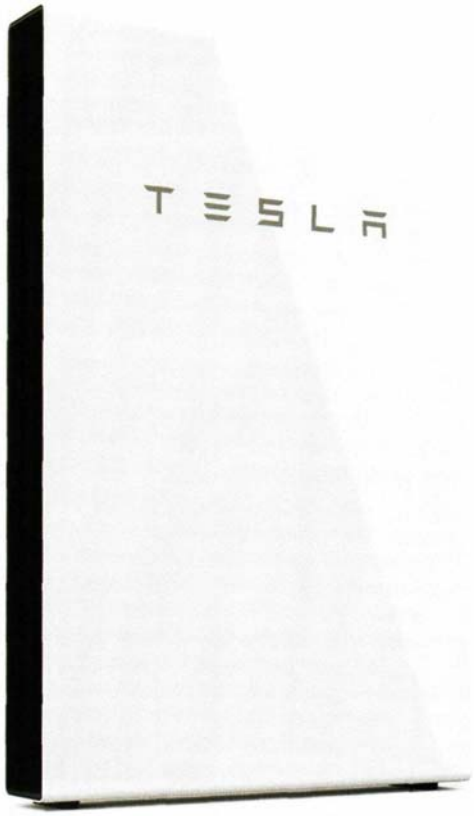
Popular Science
January, 2017
Page: 34
Section: General News
Region: National, AU
Circulation: 30000
Type: Magazines Science / Technology
Size: 1,551.00 sq.cms.

Next
Version 2.0



NEW POWERWALL: GREAT TECH, BUT STILL A HARD SELL AS A MONEY-SAVER.

by LINDSAY HANDMER

DID YOU BUY THE TESLA POWERWALL sometime in the last couple of weeks? You should have waited: Tesla has released a new Powerwall, with a 13.5 kWh capacity, priced at $10,000 in Australia. The new battery has more than just a beefed capacity. There's improved peak-power handling, a built-in inverter (which will save you some money), and both a DC and AC version.

The warranty has also improved, with a guaranteed 70% capacity left after 10 years for normal solar use, or 70% capacity after 37.80 MWh of throughput in other uses.

While many armchair analysts have jumped in claiming the new unit can pay for itself in as little as six years, most of these calculations continue to neglect aspects including efficiency losses and battery degradation over time. They also tend to be quite misleading, by using a combined solar and battery system, rather than looking at the total set up an operating costs of each. So it's up to us to present the brutal financial realities of bolting a big lump of batteries to your wall.

THE MATHEMATICS OF POWER

Thanks to variations in use and regional power pricing, calculating payback times is very complex, so we take a more comparative approach. The Powerwall 2 is warrantied to deliver 37,800 kWh over 10 years from the actual battery, or around 10.4 kWh a day.

This is an "ideal" figure, and doesn't include efficiency losses (because these will vary depending on the installation), but around 10 kWh a day throughput is realistic. Think the 0.4kWh doesn't matter? Think again.

In theory an off-grid install could have higher throughput, but it's a safe assumption that it won't be 100% utilised over its entire life, because who puts a constant load on their electricity system at home?

The installed cost of the Powerwall is around $10,000, which gives a "warrantied" per kWh throughput cost of around $0.28. But those kilowatt hours don't spring whole from the Earth: the Powerwall needs to be charged, which has a cost.

A basic starting point would be off-peak charging, which due to efficiency losses and, you know, the Second Law of Thermodynamics, will consume about 10% more power than it can then discharge back into your house. To be clear: if you fill the Powerwall with 10kWh of electricity by charging from the grid, you will actually have to pay for 11kWh.

Of course most Powerwall owners will use it in conjunction with a solar panel system. Charging the Powerwall from the PV panels on the roof is "free" – except of course you have to deduct the cost of the solar's installation. Even if your solar is all paid off because you've had it for a while, by "using" electricity to charge the Powerall, you're not releasing it back onto the grid. So you miss out on your pittance of a feed-in tariff.

Your power usage while the sun is up might also impact any savings. Anyone whose PV system doesn't cover their power use during the day will need to "top up" from the grid to charge the Powerwall. Which costs money.

So while this cost to charge from a PV system varies, we have assumed 8 cents per kWh to charge the Powerwall - excluding the cost of installing new photovoltaics (a new solar system price is explored later on).

Spending $10,000 on a battery system also has an opportunity cost - for example, the extra interest paid on a home mortgage without that $10K sitting in redraw keeping interest accumulation down. Even in this low interest rate world, this works out around

press clip

Popular Science
January, 2017
Page: 34
Section: General News
Region: National, AU
Circulation: 30000
Type: Magazines Science / Technology
Size: 1,551.00 sq.cms.

slice
CUT STRAIGHT TO YOUR NEWS

$0.07 per kWh produced, AND that assumes you pay off the $10,000 within 10 years.

Despite all these what-ifs and what-abouts, and the fact you KNOW this new tech is doing to break down at least once, we've generously assumed a best case scenario. That means no maintenance costs, no downtime, and the Powerwall being almost 100% utilised each day. Is that realistic? Probably not, but it hammers home our point:

The result is that over the 10-year warranty period, each kWh outputted by the Powerwall 2 costs about $0.43. So in other words, if a household's average power cost for the next 10 years is less than $0.43, the Powerwall will not save any money. At the moment, most providers do charge less than that per kWh – unless you exclusively use energy in peak hours.

With real world use (a few glitches now and then, and not charging the battery fully every single day), costs creep up to $0.50 per kWh.

LIFE AFTER THE WARRANTY

The nature of lithium ion and the way it loses the ability to charge over time, means Tesla needs to specify a warranty. But it's actually quite likely that the Powerwall will continue to work just fine past the warranty period.

While Tesla hasn't published the exact data, we can crudely estimate ongoing battery degradation by assuming the same rate - 70% of new capacity after 10 years, 70% of 10-year capacity at 20 years.

So roughly, we can still expect at least 7 kWh daily throughput after 20 years. That gives around an extra 31,000 kWh, and drops the price per kWh down to a much more impressive $0.14.

But wait, there's more to the equation than that: the charging cost stays about the same, as does the interest, assuming it is paid off over 20 years. And this gives an average price per kWh of $0.29 - still above what many pay for grid power. Considering the batteries will likely continue getting cheaper, it's not yet a good purchase for most users.

BUT WHAT IF I ADD SOLAR?

Factoring in solar is not straightforward, as the savings are very dependent on how much of the solar is directly used, and how much is exported to the grid. Solarchoice.net.au points out that a 5kWh solar system costs around $7000, and will produce around 21 kWh per day on average.

If you switch off all your stuff and just feed that power to the grid, the 5kWh array will produce around $1.70 of power per day, and pay itself off (including interest) in about 11 years.

If combined with a Powerwall 2, the spare energy is stored, not sold back to the grid. Take that in account, add opportunity cost, and the payback time is roughly 25 years.

For households with high daytime direct solar usage (or higher power costs), these payback times can be much lower. But it's important to note that adding the Powerwall to a Solar system increases the payback time.

WHERE CAN IT WORK?

Forget the boring financial stuff for a second: the Powerwall 2 is a great bit of tech, and as prices drop in the future, it will eventually hit an inflection point and suddenly become very worthwhile.

For now, it's only really for those who like to be early adopters, or those with very high power prices. And Telsa loyalists.

It can be used for off-grid applications, but bulkier, yet cheaper, lead acid based systems are more cost effective – and if you're fully off the grid let's be honest: you probably have space for a battery shed too.

When (if?) the Powerwall cost per kWh halves again, then it will have reached the break-even point for many users. Our pick? Based on current rate of improvement, Powerwall 4 will be an attractive investment.

THE COMPETITION

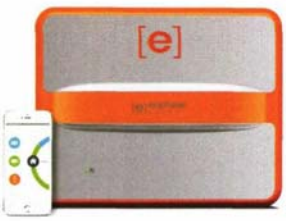
Thanks to its association with cool cars, the Tesla Powerwall 2 gets most of the press attention, but there are a few competitors. For now, they are kind of a pain to actually buy, and the Powerwall 2 currently has the best price of about $740 per kWh (of capacity, that's not an operating cost). To give an idea of the options, we have profiled four of the best setups.

LG CHEM

At around $10,000, the LG Chem battery system has an 8082 kWh usable capacity. While better value than the first generation Powerwall, it still costs about $1200 per kWh.
www.lgchem.com

ALPHA ESS STORION-ECO

Available for as little as $8000, the 8.64 kWh Alpha ESS Storion-Eco battery starts from $900 per kWh.
www.alpha-ess.com



ENPHASE

Multiple little 1.2kWh Enphase AC batteries can be coupled together for higher capacity, but each unit costs $2200, giving a cost of about $1800 per kWh.
www.enphase.com

REDFLOW THE ZCELL

Reflow uses advanced flow battery technology, which gives better capacity retention over time. But at around $18,000 for 10 kWh, it still costs $1800 per kWh.
www.redflow.com