Tesla Powerwall
Breakthrough or Marketing Miracle?

Bo Normark
Launch of “Powerwall”

Så funkar batteriet som kan starta elrevolution

Elon Musks superbatteri Powerwall. Lagrar el från sol- och vindkraft.

Foto: AFP
Unique media coverage

Google search for "Tesla Powerwall" showing around 1,810,000 results in 0.35 seconds.
Powerwall, 350 $ / kWh

Specs

Technology
Wall mounted, rechargeable lithium ion battery with liquid thermal control.

Models
10 kWh $3,500  
For backup applications  
7 kWh $3,000  
For daily cycle applications

Warranty
10 years

Efficiency
92% round-trip DC efficiency

Power
2.0 kW continuous, 3.3 kW peak

Voltage
350 – 450 volts

Current
5.8 amp nominal, 8.6 amp peak output

Compatibility
Single phase and three phase utility grid compatible.

Operating Temperature
-4°F to 110°F / -20°C to 43°C

Enclosure
Rated for indoor and outdoor installation.

Installation
Requires installation by a trained electrician. DC-AC inverter not included.

Weight
220 lbs / 100 kg

Dimensions
51.2” x 33.9” x 7.1”  
1300 mm x 860 mm x 180 mm

Certification
NRTL listed to UL standards
Powerblock, 250 $ / kWh

Tesla Energy for Utilities

For utility scale systems, 100kWh battery blocks are grouped to scale from 500kWh to 10MWh+. These systems are capable of 2hr or 4hr continuous net discharge power using grid tied bi-directional inverters.

Systems support applications including peak shaving, load shifting and demand response for commercial customers while offering, renewable firming and a variety of grid services at utility scales.
Unique market breakthrough

Barely a week after Tesla's Powerwall battery was announced, it's sold-out to mid-2016

38,000 Powerwall

2,500 Powerblock
Unique market breakthrough

Billion Faster Than the iPhone?

Elon Musk's battery launch could be even bigger than Viagra's
Germany has already a home storage market
Germany, batteries economical?
Germany, cost development home storage

Current storage system and price forecast: 6 kWh Lithium-Ion-Storage solution

Source: EuPD Research 2013

- EuPD - Low range
- EuPD - Average
- EuPD - High range
Traditional cost predictions Li-Ion batteries

Cost predictions for full automotive Li-ion packs

- Deutsche Bank (2009)
- Deutsche Bank (2010)
- BCG (2010)
- Frost & Sullivan (2011)
- McKinsey (2012)
- Bloomberg (2012)
- Bloomberg NEF (2012)
- Argonne NL (2012)
- Roland Berger (2012)
- Bloomberg (2013)

Analysis: V. Muenzel
Univ. of Melbourne / IBM Research - Australia
New cost prediction Febr 2015, Stockholm Environmental Institute

Estimates of costs of lithium-ion batteries for use in electric vehicles

Björn Nykvist and Måns Nilsson, 2015

Source: Stockholm Environmental Institute 2015
## Benchmark

### Tesla/Sonnenspeicher

<table>
<thead>
<tr>
<th>Sonnenspeicher</th>
<th>Tesla Powerwall</th>
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<tbody>
<tr>
<td>10.2 kWh</td>
<td>10.0 kWh</td>
</tr>
<tr>
<td>260 kg</td>
<td>100 kg</td>
</tr>
<tr>
<td>160/62/36 (360 l)</td>
<td>130/86/18 (220 l)</td>
</tr>
<tr>
<td>3 kW</td>
<td>3 kW</td>
</tr>
<tr>
<td>?? (battery only)</td>
<td>3.500 € (battery only)</td>
</tr>
<tr>
<td>17.000 € (12.000 € ??)</td>
<td>5.000 € (incl. converter)</td>
</tr>
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Cost per kWh, one way of calculating

<table>
<thead>
<tr>
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<th>Powerwall 10 kWh</th>
<th>Powerblock 10,000 kWh</th>
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<tbody>
<tr>
<td>Cycles</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>kWh/cycle (incl degradation, efficiency)</td>
<td>8.2</td>
<td>8280</td>
</tr>
<tr>
<td>Total kWh produced over lifetime</td>
<td>41,400</td>
<td>41,400,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>$ 3500</td>
<td>$ 2,000,000</td>
</tr>
<tr>
<td>$ / kWh used</td>
<td>0.085</td>
<td>0.05</td>
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But there are more benefits

• **End user**
  – Reduced power tariff
  – Reduced energy tariff
  – Allows increased local generation

• **Distribution Company**
  – Reduced network losses
  – Reduced grid investments

• **Transmission Company**
  – Reduced grid investments

• **Market**
  – New actor in balancing market
Australia, batteries economical before Powerwall...

**UBS: Solar + storage is cost effective already in Australia**

By Giles Parkinson on 10 November 2014

A new study from investment bank UBS says solar plus storage already make economic sense for Australian households, a finding that could dramatically reshape the nature of the energy industry in the country.

The new report suggests that one million households could invest $20 billion in storage systems in current years – nearly equal to the investment required for a new LNG export plant.

Source: UBS report Aug 2014
Tesla Powerwall / Powerblock summary

- Technologically nothing new but:
  - New actor in the energy market
  - New cost level of storage established. 2020 price today...
  - New modern design
  - Uniquely fast market penetration
  - Dramatic increase in interest for storage in general and distributed storage in particular
Tesla Gigafactory, world largest battery factory

**Tesla Gigafactory**

<table>
<thead>
<tr>
<th>Gigafactory Projected Figures</th>
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<tbody>
<tr>
<td>2020 Tesla Vehicle Volume</td>
<td>≈500,000/yr²</td>
</tr>
<tr>
<td>2020 Gigafactory Cell Output</td>
<td>35 GWh/yr</td>
</tr>
<tr>
<td>2020 Gigafactory Pack Output</td>
<td>50 GWh/yr</td>
</tr>
<tr>
<td>Space Requirement</td>
<td>Up to 10M ft² w/ 1-2 levels</td>
</tr>
<tr>
<td>Total Land Area (acres)</td>
<td>500-1000</td>
</tr>
<tr>
<td>Employees</td>
<td>≈6,500</td>
</tr>
</tbody>
</table>

**Planned 2020 Gigafactory Production Exceeds 2013 Global Production**

Battery pack cost/kWh reduced >30% by Gen III volume ramp in 2017

*Source:* RT Takedown 2012
But the real revolution is still to come.....comeback for European industry ???