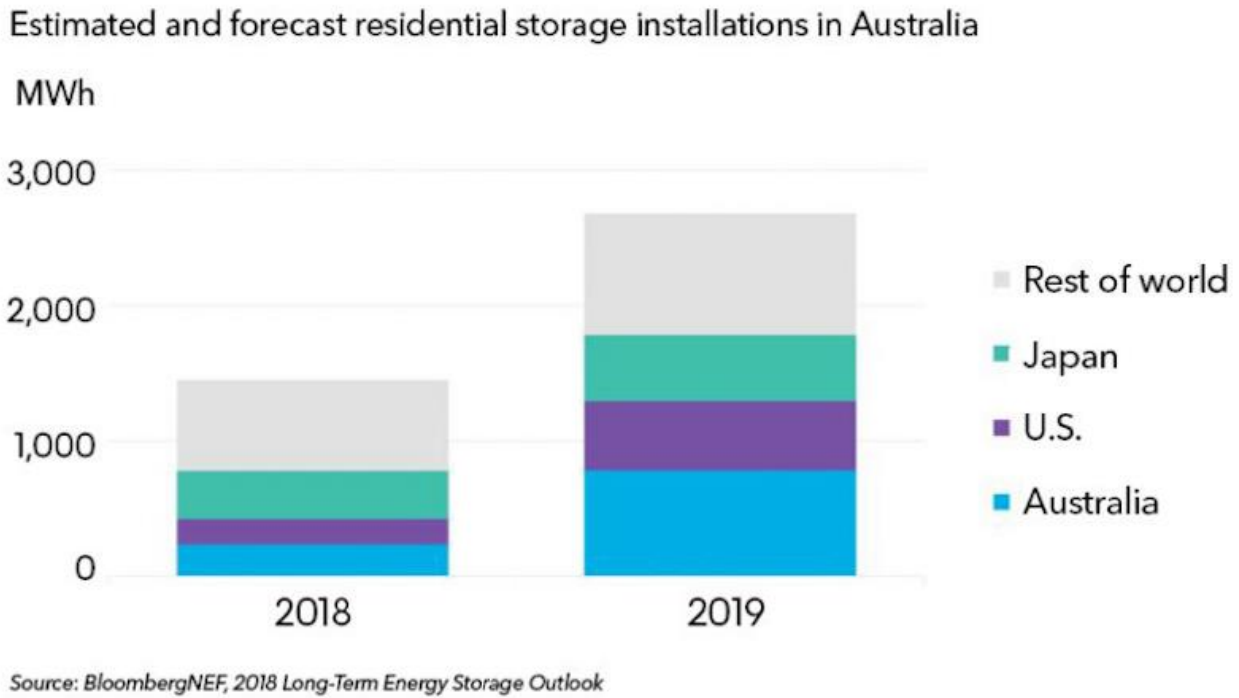
Evaluating the performance and safety of residential battery systems

Tim Moore| 5 September 2019

Importance of Battery Energy Storage System (BESS) testing



Source: BloombergNEF, 2018 Long-Term Energy Storage Outlook

Today’s talk – two key areas

System performance

Safety

BESS performance evaluation – why?

Performance standards and testing are commonplace for other home appliances…

BESS can actually be a high net-energy user

System efficiency is important

This is largely invisible to customers

A number of other groups looking at performance

ITP Renewables

Pacific Northwest NATIONAL LABORATORY

Sandia National Laboratories

CSIRO

Two-fold approach:

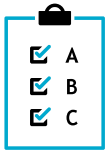
- System performance evaluation
- Partnering with DNV-GL to develop a performance testing standard

How we perform BESS performance evaluation

We are putting a number of residential BESS through their paces

Our current focus is on three applications

- Solar self-consumption
- Virtual Power Plant
- Backup



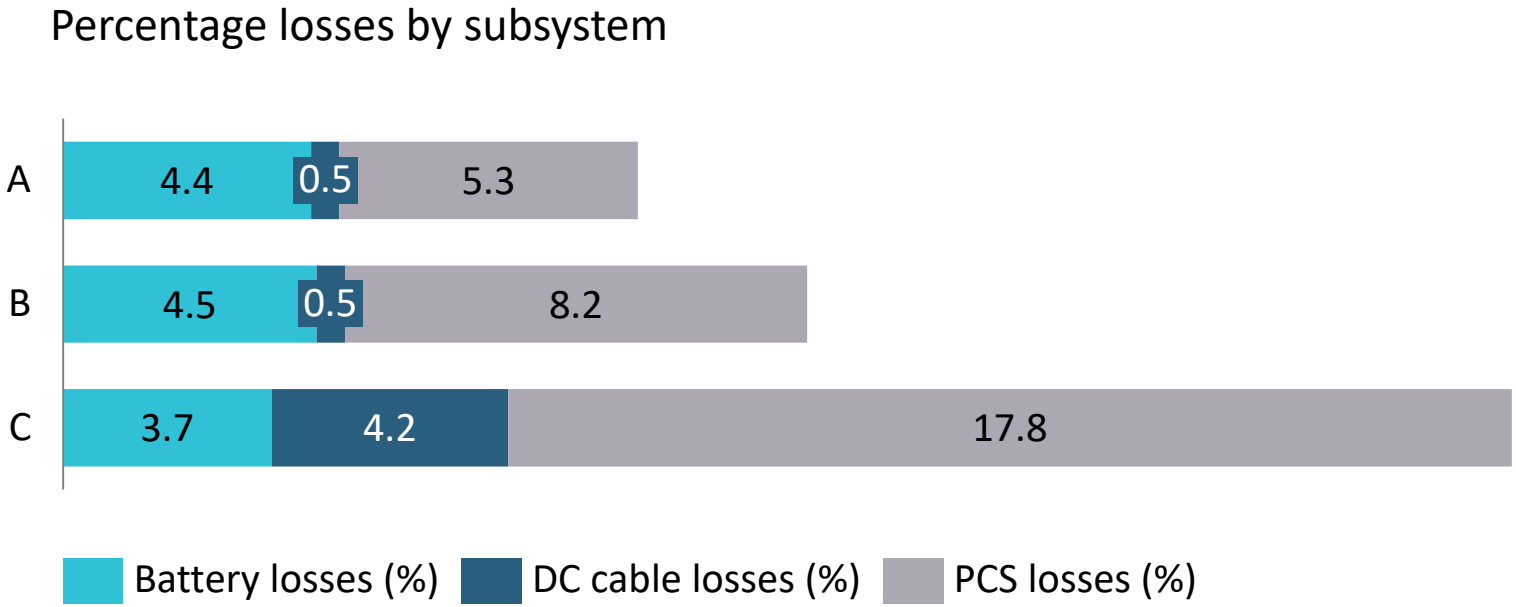
We are monitoring the breakdown of losses across the system

- “At the terminals”, DC cabling, power conversion
- Standby losses

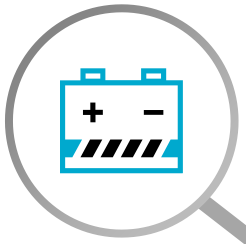
Solar self-consumption, 0.3C (early results)

Battery	Battery efficiency (%)	DC efficiency (%)	AC efficiency (%)
A	95.6	95.1	89.8
B	95.5	95.0	86.8
C	96.3	92.1	74.3

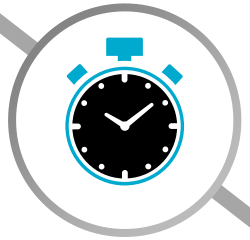
Solar self-consumption, 0.3C (early results)



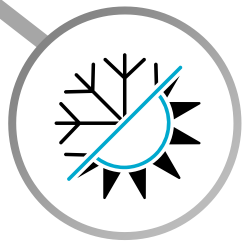
Next steps



Test more batteries!



Improve/validate testing methodology and profiles - looking for real-life data to support this



Looking into setting up climate-controlled testing facilities

Safety testing

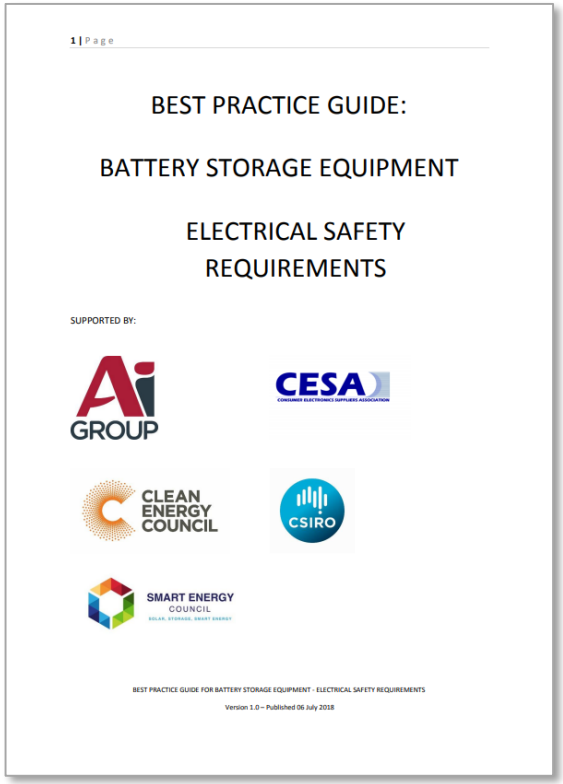
BESS safety is a hot topic!

- Stringent safety requirements, standards and the Best Practice Guide

Commercial manufacturers are confident in the safety of their systems

- Not all systems are built to the same high standards

Given the consequences, is caution warranted?



What's the worst that can happen?

We investigated a host of BESS failure modes

- Standards analysis, battery teardowns

Most are well covered by (international) standards, and are broadly well-built

There is one failure mode that’s particularly challenging - so we built a world first facility!

Destructive Battery Testing Facility

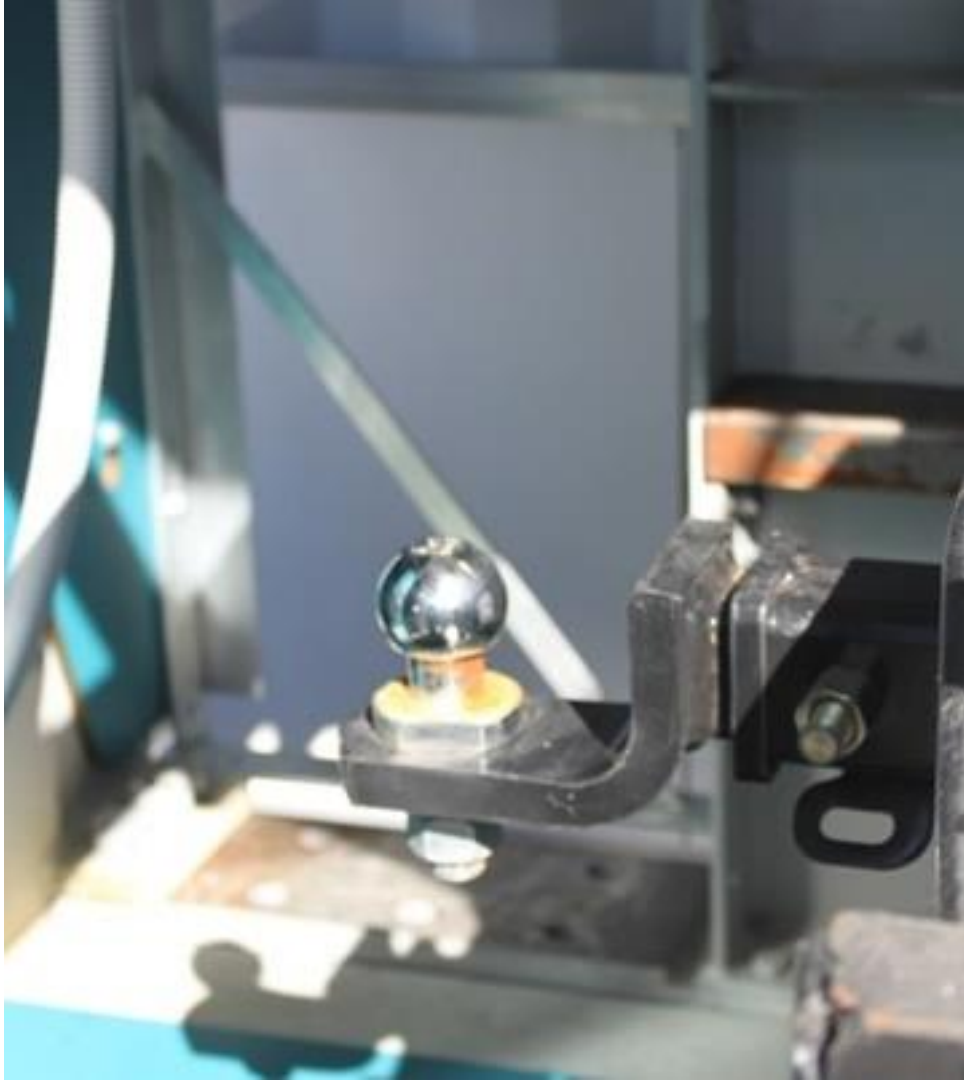
A Holden Commodore wagon tow ball attached to a spring-loaded 2-tonne mass

Launch it at an unfortunate BESS at up to 10km/h

- Grid-connected and fully-charged
- Heated to 50 °C

Watch the fallout

- Fire suppression
- Gas detection



Destructive Battery Testing Facility

What is our objective?

Give some confidence to consumers, industry and emergency response services


18-03-2019 Mon 11:16:50
Video – commissioning test:
2 x 55Wh LiPo RC battery
Camera 2

Thank you

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