



: The Energy Storage Experience on : Both Sides of the Meter

Outline





Context



- DNSP servicing Western Sydney and the Illawarra areas within NSW
- Approx. 2.5M people / 1M customers
- System peak demand of approx. 4GW
- Approx. 25,000 sq. km service area, 60,000 km line, 430,000 poles, 188 major substations.

Context



- Major challenge is responding to growth within the context of energy source uncertainty
- One of the fast growing areas in Australia
- Greater Sydney Commission projects that Sydney's population will grow to 8 million over the next 40 years, with almost half of that population residing west of Parramatta.

Customer Battery Trial : The Objectives

- Trial the use of battery energy storage technology for peak demand reduction
- Understand how to operate a Virtual Power Plant (VPP) in the real world
- Test the operation of communications systems to and from customers premises.
- Study peak demand reduction for summer and winter load peaks






Customer Battery Trial : The How

- 400 direct mails sent to targeted customers
- 60 registrations received (15% recruitment hit rate)
- 40 systems installed
- 4 sites rejected due to unavailability of suitable location to install a battery system
- 7 customers
- 9 customers declined as the program was fully subscribed



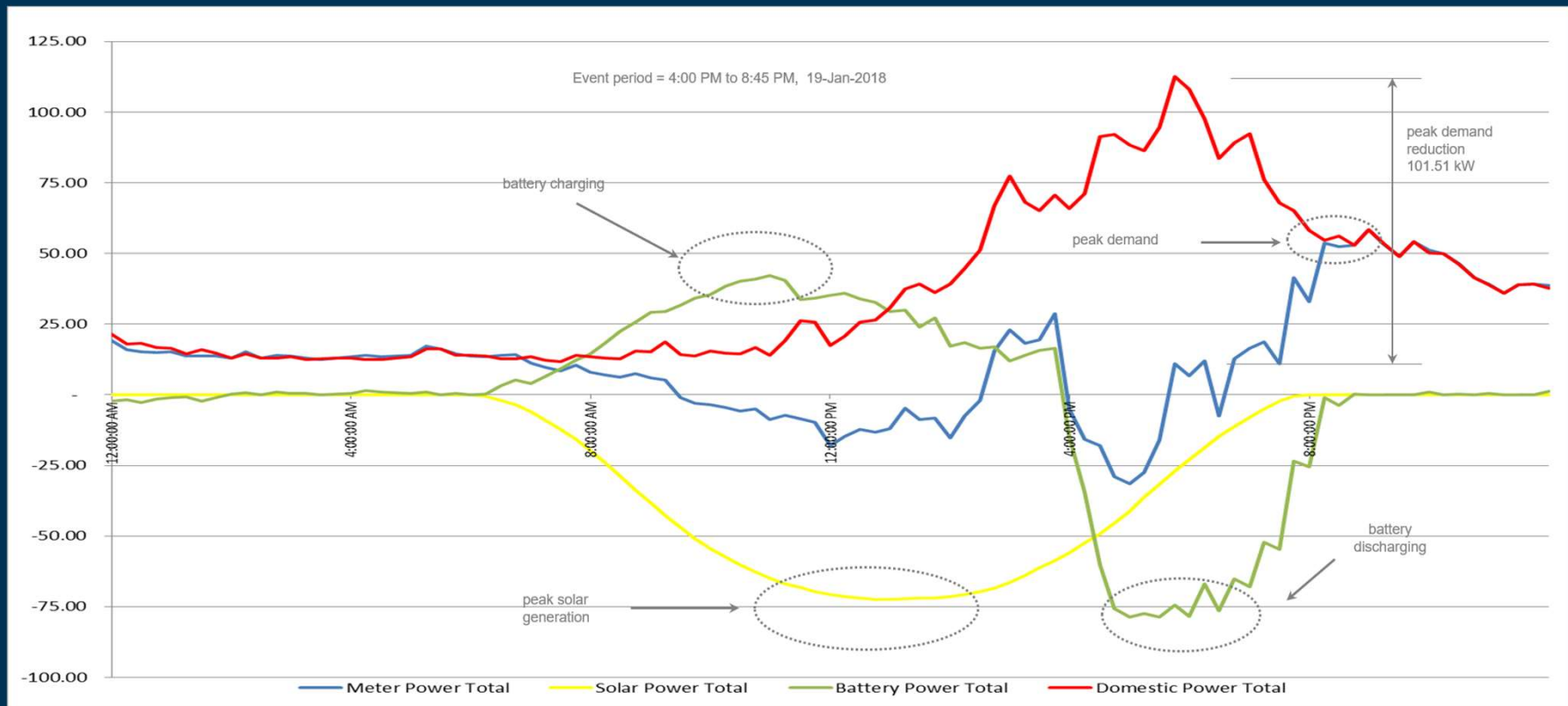


Customer Battery Trial : The What

- 75% battery system cost subsidy provided by Endeavour Energy
- Up to 24 times a year, the customer agreed their storage could be accessed by Endeavour Energy
- Trial period from 1st Dec 2016 up to 31st Mar 2019
- Technology:
- LG Chem 9.8 kWh lithium ion battery
- SMA Sunnyboy Storage 2.5 kW inverter
- Reposit control system
- Put together like Lego.... 
- Five VPP's created – one with all 40 sites, and four each with 10 sites.



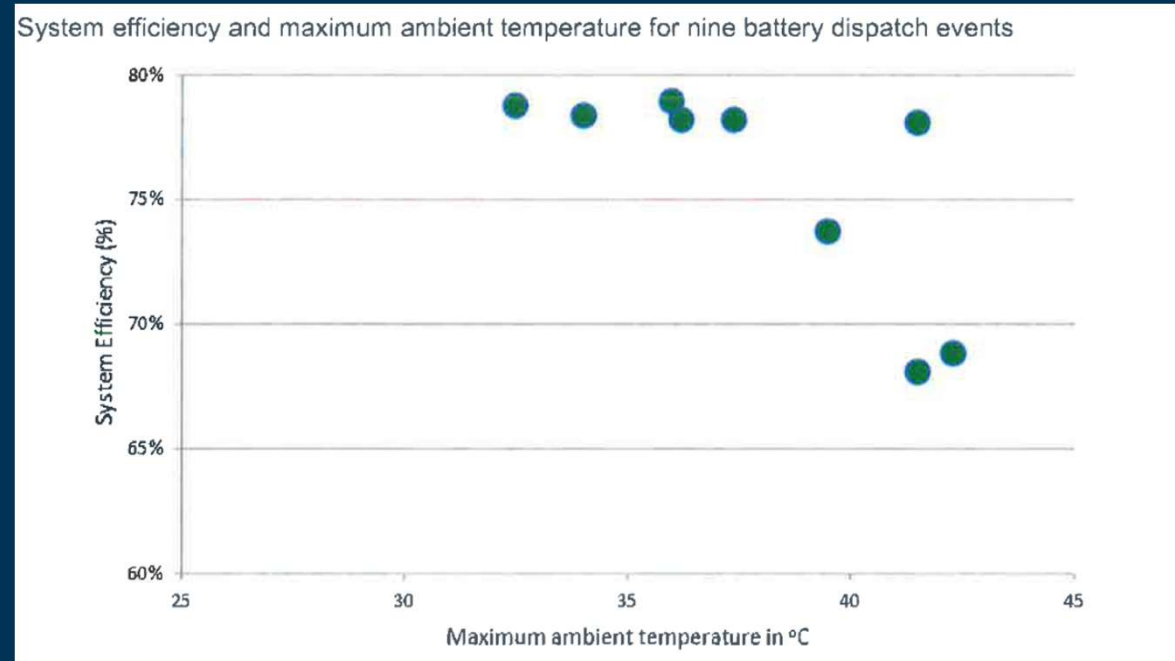
Customer Battery Trial: The Results



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Customer Battery Trial: The Results

- System efficiency was lower than calculated – theoretical efficiency 85%, actual average 75%.
- Battery efficiency appears to be impacted by ambient temperature

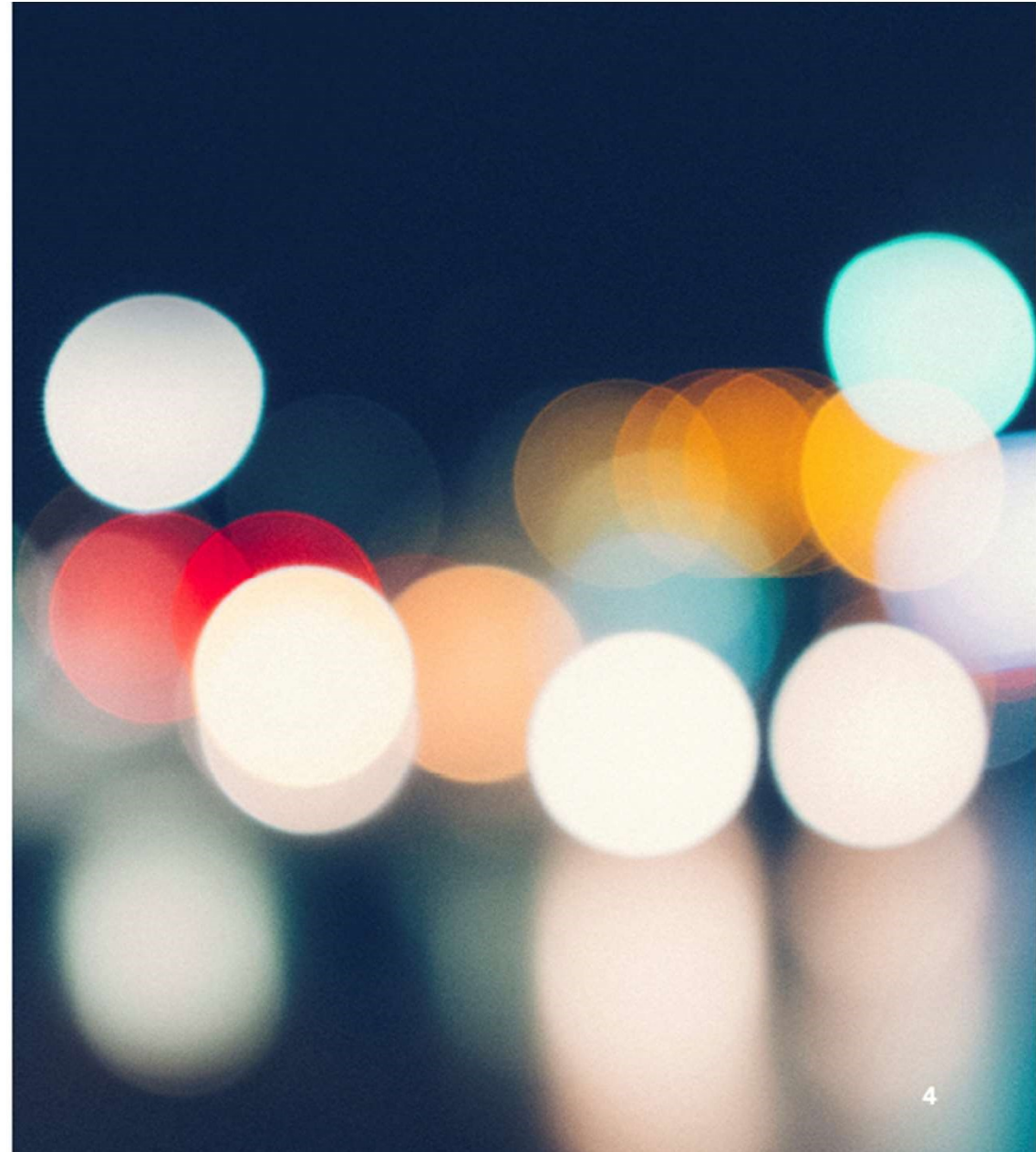


Customer Battery Trial – Lessons and Observations

- Some customers are still hesitant to invest in a battery system despite the 75% subsidy
- Some sites did not have a suitable location for a battery
- Customer and Utility interfaces are user friendly.
- Historical data suggests that the battery charges to its full capacity (9.8 kWh) and discharges to its safe discharge level (5%)
- Losses in the inverter affects the overall system output
- Wifi communication issues prevents some sites from accepting dispatch instructions

Grid Battery Trial

- Battery storage technology is approaching a NPV positive price point for certain network applications:
 - Peak Shaving
 - Correcting Load unbalance
 - Voltage drop management
 - Power factor correction
 - Reliability improvement (island operation)



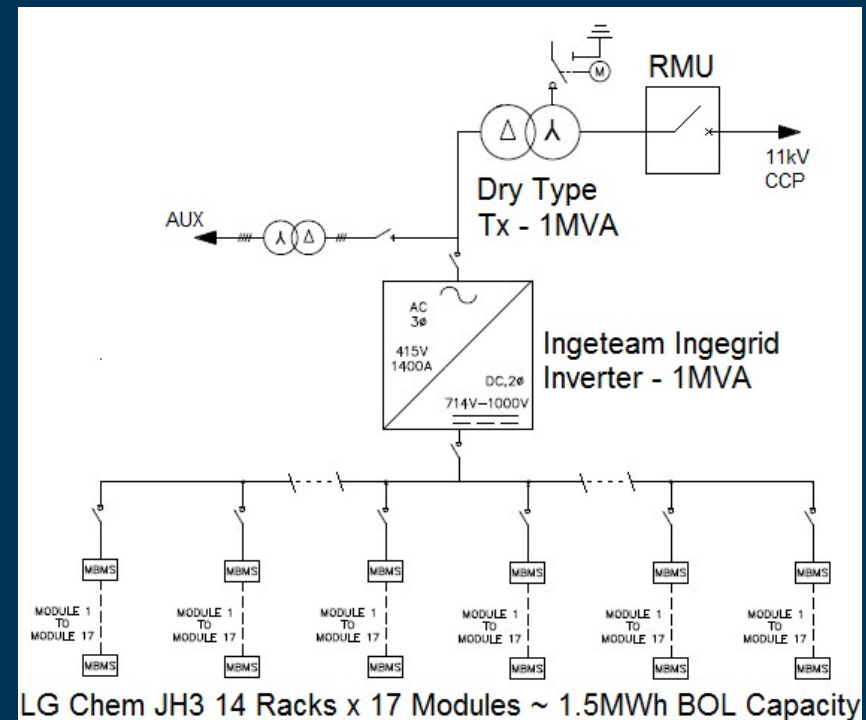
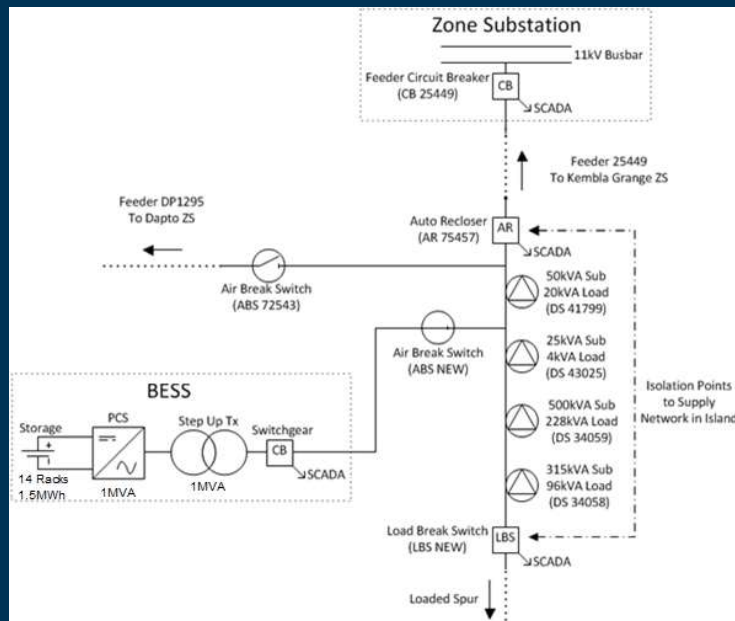


West Dapto Site

- Green field residential development area.
- Good site to test peak demand reduction and islanding
- Future Zone Substation site



Electrical Lego....



LG Chem JH3 14 Racks x 17 Modules ~ 1.5MWh BOL Capacity

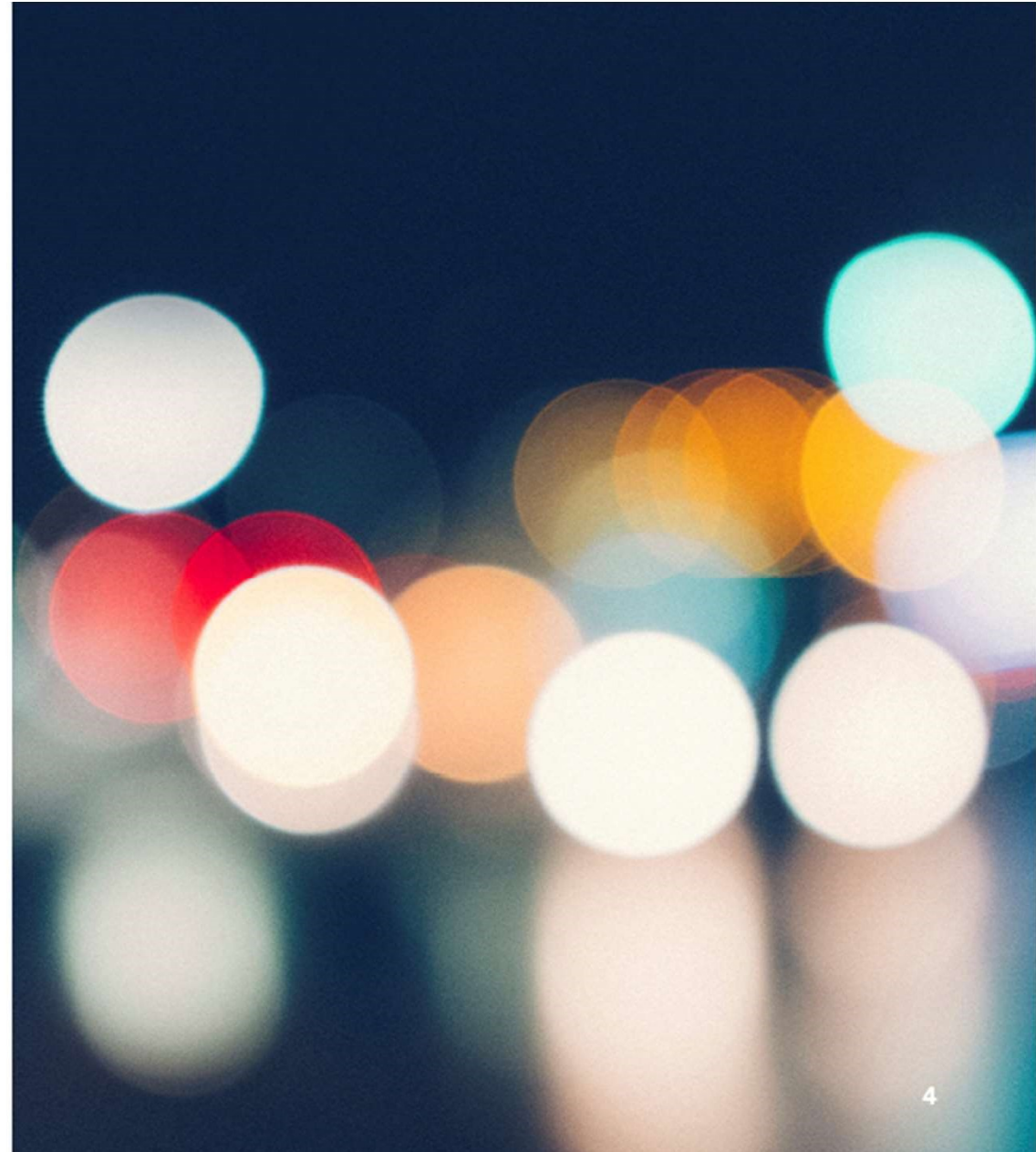
Really Big Lego

- “Containerised” Units are relocatable
- The battery system is on site and connected
- Undergoing commissioning checks and on time for operation during Summer 2018/19

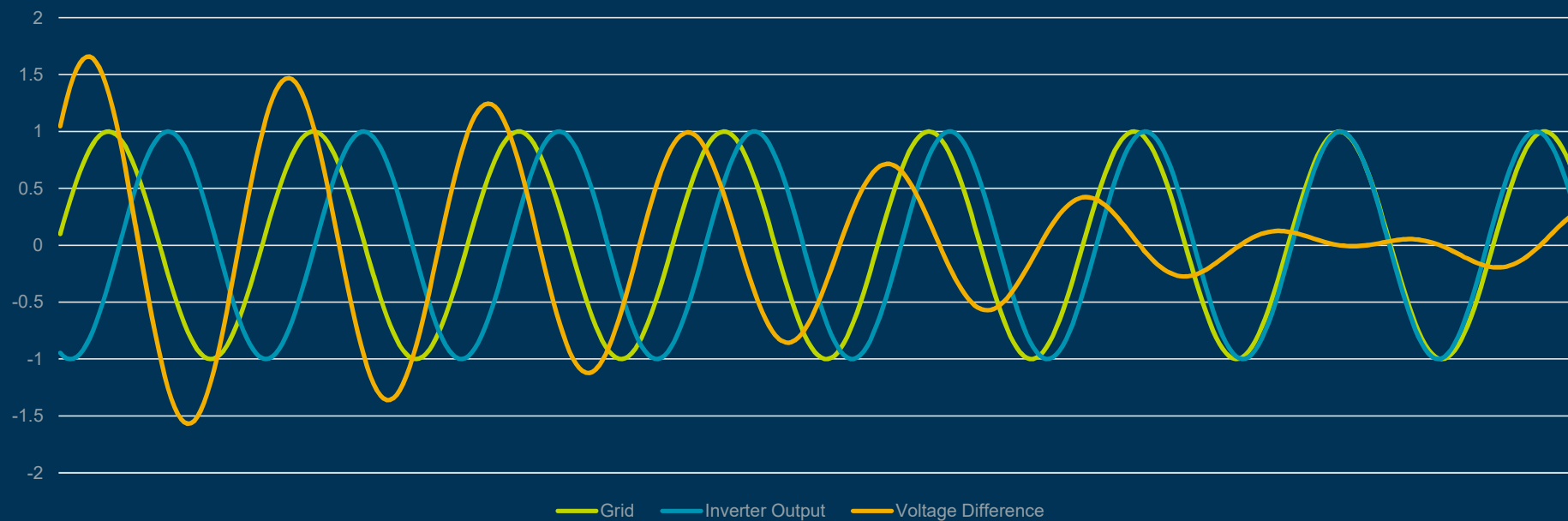


Island Mode

- Can supply ~80 customers
- Requirements
 - Inverter capacity
 - Protection calcs
 - LV fuses
- How to sync out?
- How to sync back?



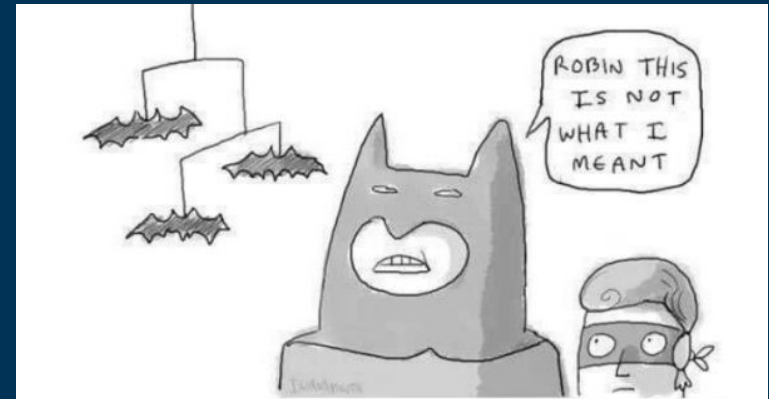
Island Mode – Passive Sync





Lessons Learnt

- Competitive but immature market
- Integration is key to success - get the Lego to click together
- Industry standards have not caught up to the technology so you need to trail blaze a bit
- Specification focused on functional requirements for inverter and battery, whilst HV equip was based on established company standards – use the Lego pieces you have
- Battery of this size is not universally applicable for deferral – a much larger system would be required for other sites
- Existing easements/landholdings help make the business case viable



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Conclusions

- Grid connected batteries are likely to become a viable tool in the network planning tool kit for meeting particular network capacity constraints.
- Behind the meter batteries will help shape demand on the distribution network
- Long term battery and inverter performance is still not fully known.
- Interaction between retail and network tariffs as well as non tariff incentives were (mostly) not created with battery storage in mind.
- Overall, our current operating rules need to be expanded to accommodate a new operating reality