GEM ENERGY AUSTRALIA

2018 Cotton Conference

Battery Storage Feasibility

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DISCUSSION POINTS

- Battery Technologies
  - Various battery technologies and brands
  - Pricing points & applications
- Identifying opportunities for PV & PV + Battery
  - How to quickly determine if solar or battery storage is viable
    - Load profiles, energy prices, tariff structure
  - Tariff optimisation
- Case Studies
  - Bundaberg Christian College

GEM ENERGY

- GEM Energy specialise in design and installation of Solar PV & Battery Storage projects ranging from 5kW to 5MW
- Signatory to the Clean Energy Council Approved Retailer Standard
- CEC Design and Install Award Winners 2016
  - Grid connect systems over 100kW
  - Grid connect systems with battery backup
- Installed first Tesla Powerpack 1.5 System in Australia
- 25MW Solar PV & 8MWh battery storage FY17-18
- Recognised industry leaders

MASTER ELECTRICIANS MEMBER

OBSEQUENTIA QUALITY CERTIFIED ISO 9001:2015

GRID CONNECT OVER 100KW
CLEAN ENERGY COUNCIL Solar Design & Installation Awards 2016 WINNER

GRID CONNECT WITH BATTERY BACK-UP
CLEAN ENERGY COUNCIL Solar Design & Installation Awards 2016 WINNER

CLEAN ENERGY COUNCIL APPROVED SOLAR RETAILER

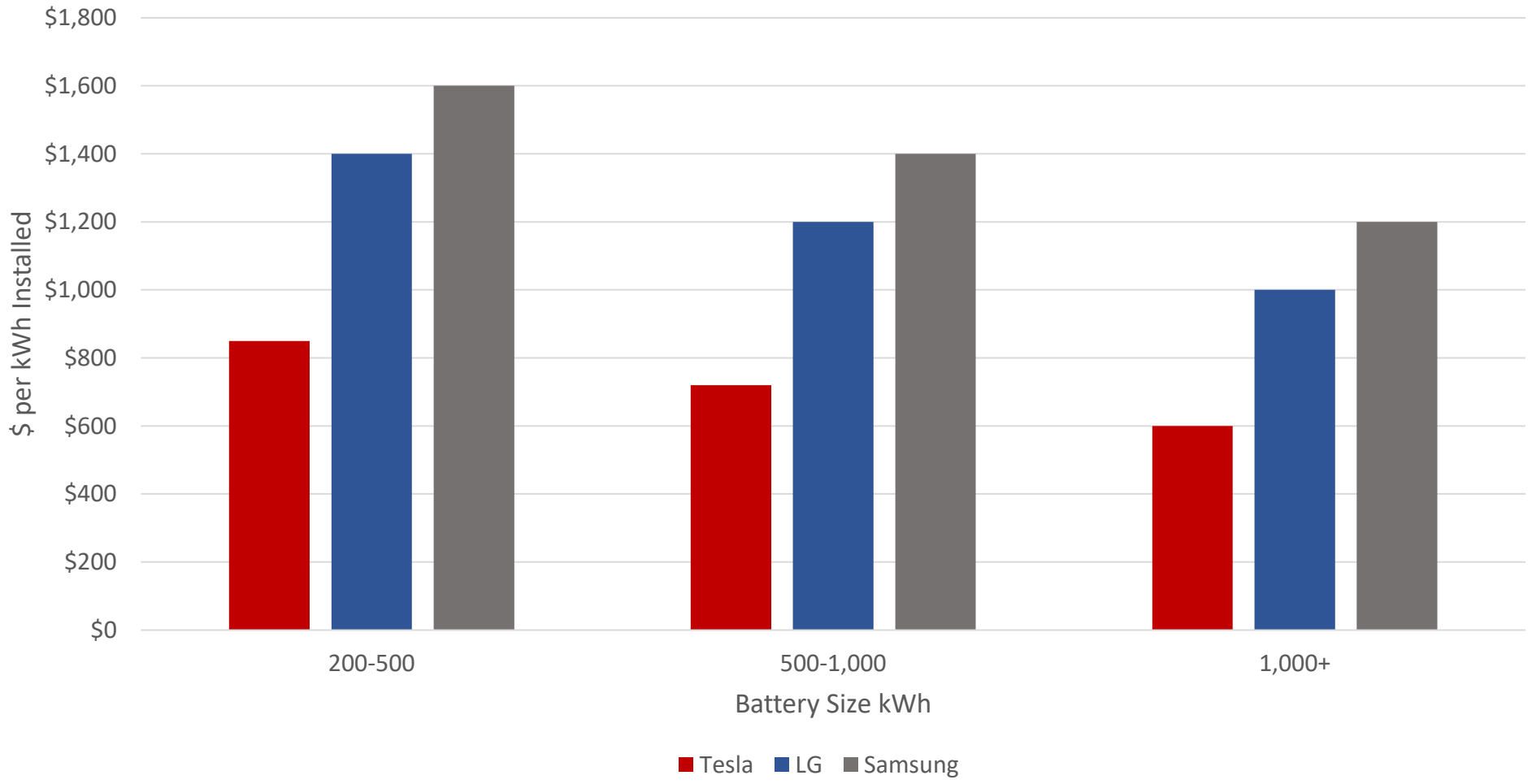
MAINSTREAM BATTERY TECHNOLOGIES

ATTRIBUTE	LITHIUM-ION	LEAD ACID	FLOW
BATTERY LIFE (CYCLES)	4,000 – 8,000	2,000 - 4,500	10,000
DC ROUND TRIP EFFICIENCY	~90%	~70%	~65% - ~75%
DEPTH OF DISCHARGE (DOD)	80% - 95%	50% - 60%	100%
TEMPERATURE EFFECT	<45 C	<27 C	<50 C
CHARGE CURRENT	Limited	Severely Limited	Limited
DISCHARGE CURRENT	1.6 hours	10 - 20 hours	2 - 10 hours
THERMAL STABILITY	High Risk	Minimal	Minimal
ENERGY DENSITY	High Risk	Medium	Low

Major Brands

- Tesla (Lithium)
- LG (Lithium)
- Samsung (Lithium)
- BYD (Lithium)
- HID (AVRLA)
- Sonnenschein / EXIDE (Lead Acid)
- UNIFLEX (Vanadium Flow)

LITHIUM PRICING - INSTALLED



BATTERY APPLICATIONS

APPLICATIONS

PEAK SHAVING

Discharge at times of peak demand to reduce expensive demand charges

EMERGENCY BACKUP

Powers a facility when the grid goes down

DEMAND RESPONSE

Discharge or charge in response to signals from a demand response administrator

LOAD SHIFTING

Shift energy consumption from one point in time to another

MICROGRID

Build a localized grid that can disconnect from the main power grid

ANCILLARY SERVICES

Provide service to the grid in response to signals sent

PEAK DEMAND MANAGEMENT- w/ SOLAR

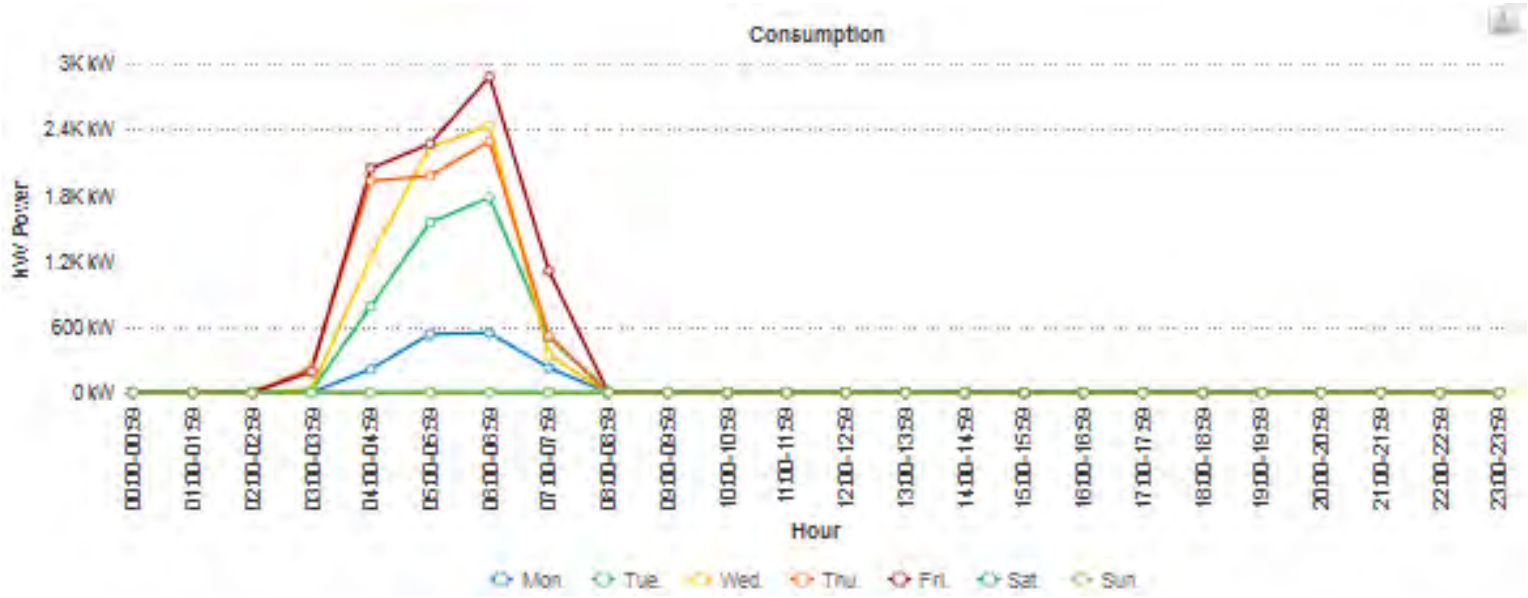
There are 2 applications for peak demand / bill management with solar and battery storage.

1. **GENERIC**
    - This is achieved through the installation of solar PV and battery storage.
    - During the day, solar PV supplies the load directly
    - Excess solar PV charges the battery
    - Battery discharges in peak and off-peak hours to manage demand and or consumption
2. **TARIFF OPTIMIZATION & RECLASSIFICATION**
    - Installation of solar PV and battery storage may reduce demand enough to achieve either:
        - Reclassify site from large customer to small customer (demand tariff to regulated tariffs)
        - Optimize current tariffs to a higher demand charge and lower access charge (ie: EDMTT1 to EDSTT1 / Ergon Network medium demand to small demand)

WHERE BATTERY STORAGE IS VIABLE

- Operate at least 5 days a week
- Load Factor below 0.3 (base load is 30% of peak demand)
- Peak Demand charge exceeds $30 per kW
- Tariff optimization and tariff reclassification

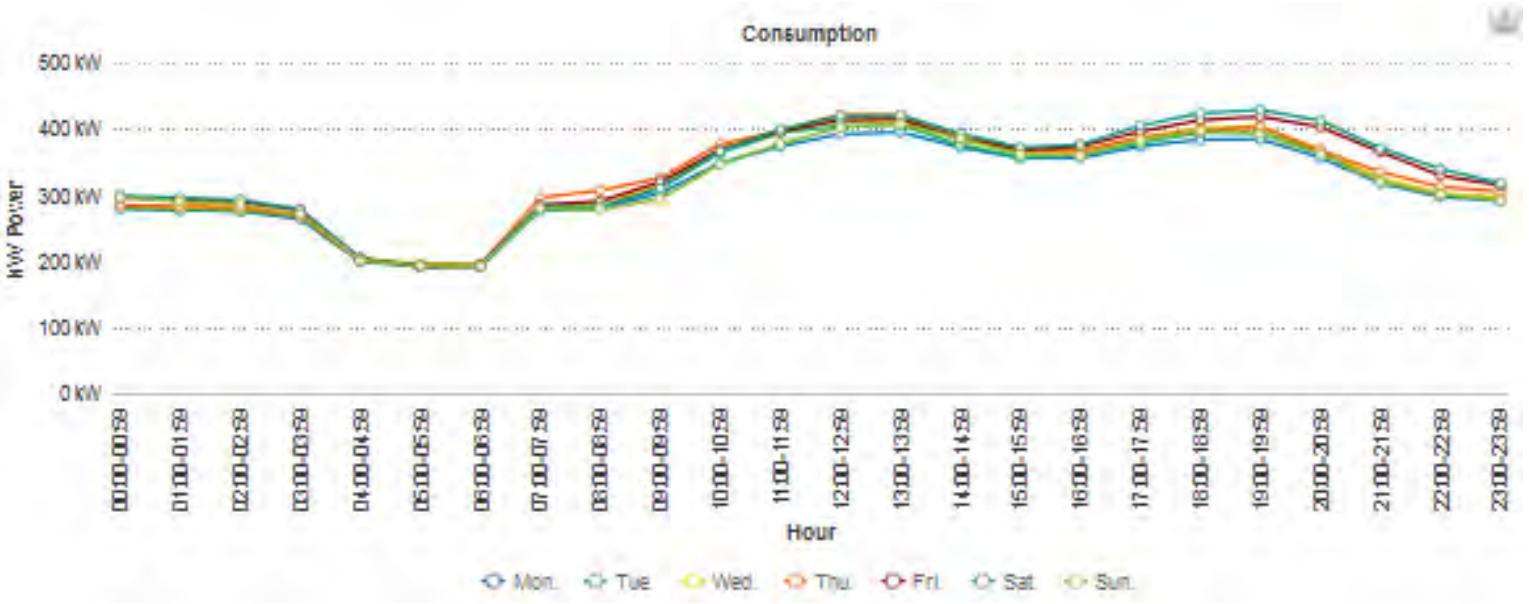
WHERE BATTERY STORAGE IS VIABLE



WHERE BATTERY STORAGE IS NOT VIABLE

- Operate 2-3 days a week
- Load Factor above 0.8 (Peak Demand is only slightly higher than average base load)
- Peak Demand charge below $30 per kW
- Extended period of operating over night
- Extended periods of constant high load (pumps)

WHERE BATTERY STORAGE IS NOT VIABLE



CASE STUDY – BUNDABERG CHRISTIAN COLLEGE

SYSTEM INSTALLED

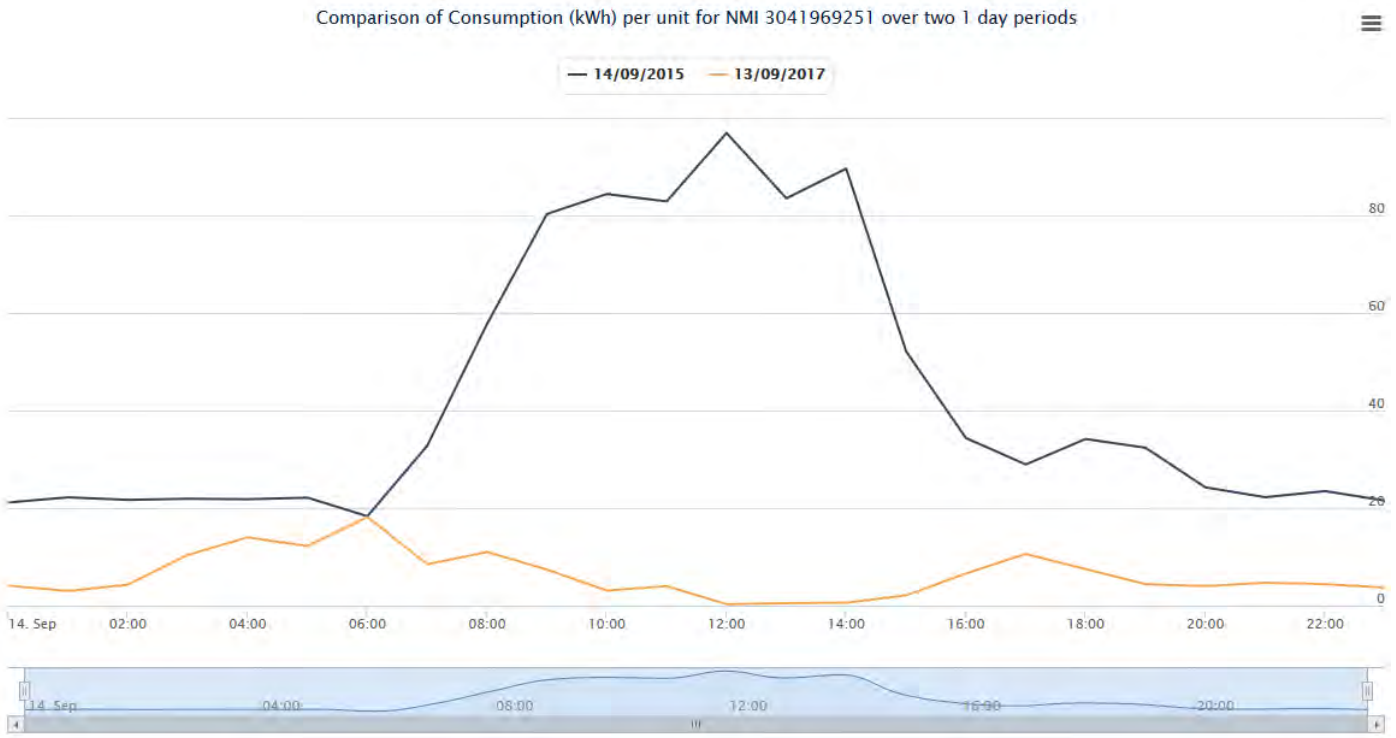
- 200kW PV, 250kWh battery storage and replacement of 1,500 Fluro lights to LED
- Custom built battery system and control system

GRID CONNECT WITH BATTERY BACK-UP

CLEAN ENERGY COUNCIL
Solar Design & Installation Awards 2016
WINNER

CASE STUDY – BUNDABERG CHRISTIAN COLLEGE

EXAMPLE DAY – SMARTVIEW

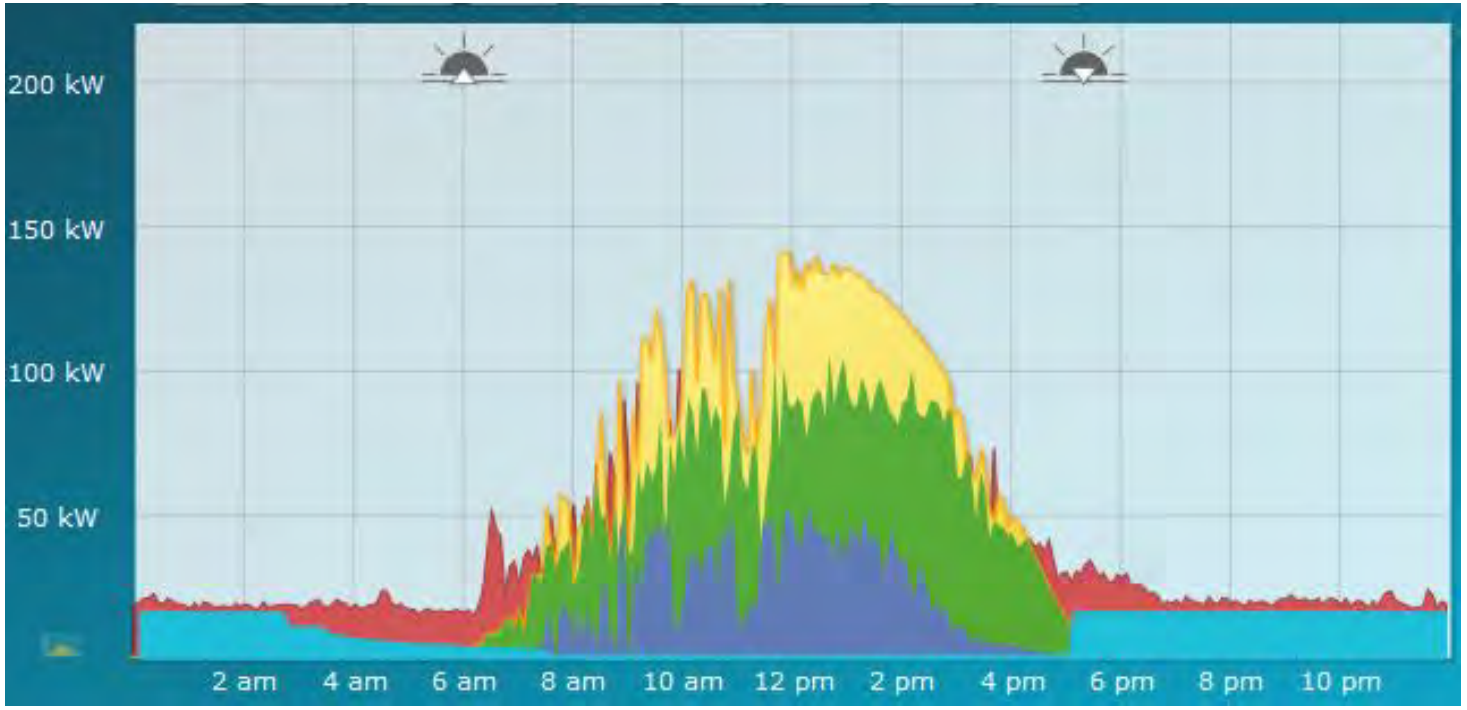


hide summary

	Period start	Period end	Readings	Total Consumption (kWh)	Compared to base
14/09/2015	Monday, September 14, 2015	Monday, September 14, 2015	1 / 1 days	1,031.200	
13/09/2017	Wednesday, September 13, 2017	Wednesday, September 13, 2017	1 / 1 days	149.600	85.5% ▼

CASE STUDY – BUNDABERG CHRISTIAN COLLEGE

SAME EXAMPLE DAY – OUR PORTAL



- The spikes in load and production are a result of the export protection. The system is ‘ramping to meet’ the site loads and the battery charging requirements.

Thank You

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