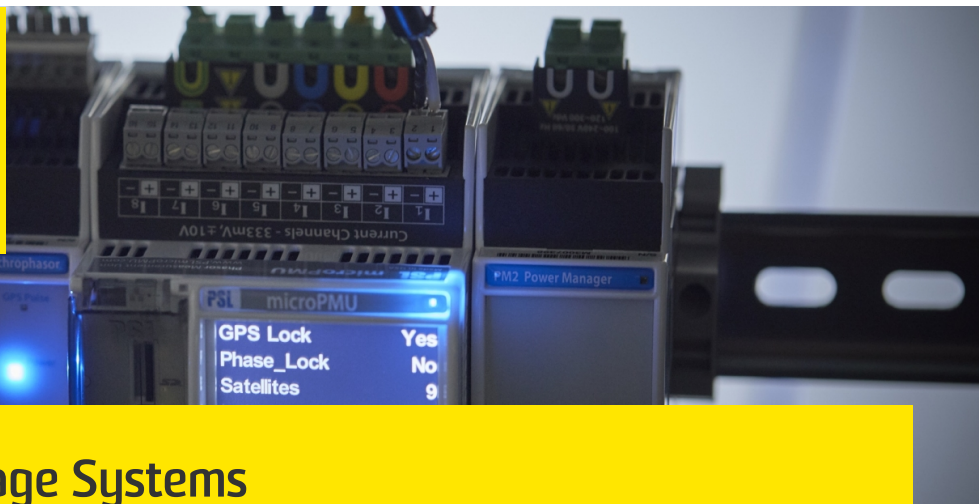




UNSW  
SYDNEY



## Hybrid Energy Storage Systems

**Hybrid energy storage systems (ESS) combine individual advantages of different types of storage to realise a single ESS with both higher power and energy capabilities. Battery-supercapacitor based hybrid ESS help to reduce the battery power rating and extend battery life by minimizing the current variation.**

### Competitive advantage

- Novel energy storage technologies that can be customised based on industry/customer specifications, allowing rapid introduction into the market
- Ability to conduct rapid prototyping and real-time verification of advanced power electronic concepts using Opal RT/RTDS, provide fast verification and quick adoption by industry for mass production
- World-class power hardware-in-the-loop capabilities to enable testing at full power

### Impact

- Improving reliability, efficiency and flexibility in grid energy storage, rail systems, residential energy storage and electric vehicles.

### Successful applications

- Developed novel DC linked and direct AC linked hybrid (battery/ultracapacitor) energy storage systems. Their main advantages are increased lifetime, improved efficiency, increased reliability and flexibility
- Reconfigurable hybrid ESS that can be adapted online to fulfil different operating modes: feeding the load from the battery system or from a backup power source, regenerative mode, intra-module balancing mode and charging mode. Unlike conventional systems, they share components among the different operating modes making them more compact

### Capabilities and facilities

- Hybrid energy storage system prototypes
- Hardware-in-the-loop simulation for rapid assessment of control techniques
- Hardware testing capability up to 50kVA, 1kV, 400A
- Arbin battery and supercapacitor tester with environmental chamber

### Our partners

- ABB Corporate Research, Sweden

### More Information

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