Advanced Control of Battery Energy Storage Systems

Chemical Engineering

Competitive advantage

- Unlike in existing battery control developments where a battery is modelled as an equivalent circuit, we develop advanced battery control approaches based on the mechanisms of the electrochemical reactions to improve the efficiency and flexibility of battery operation.
- We study the method to use vanadium batteries for simultaneous electricity quality control and power demand/supply balance (without supercapacitors) to reduce the capital and maintenance costs of such systems.
- We develop a novel scalable distributed control approach (using advanced control theory) to control and coordinate distributed energy storage systems and load management for enhanced reliability and flexibility of electricity supply and distribution.

Advanced control and monitoring technologies for flow batteries and system integration

1. Monitoring and control of Vanadium Redox Batteries: flow control, temperature control, charging current control etc.
2. Control of distributed Battery Energy Storage Systems for power sharing and power quality control.

Recent research projects

ARC DP150103100: Bao, Skyllas-Kazacos, **Control of Distributed Energy Storage System using Vanadium Batteries**

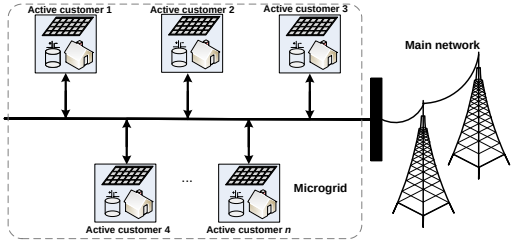
This is the first attempt of a storage centric approach that includes (1) an integrated approach to design and control of Vanadium flow batteries with novel advanced power electronics technologies to achieve optimal charging/ discharging conditions and (2) a scalable distributed energy storage and power management approach incorporating energy pricing for storage dispatch that allows distributed autonomous controllers to achieve optimal local techno-economic performance and microgrid-wide efficiency and reliability.

Successful applications

- Laboratory scale studies.

Facilities and infrastructure

- Vanadium battery systems
- Programmable power sources for charging/discharging tests
- Temperature control environment for battery experiments



Our experts

- Prof. Jie Bao
- Prof. Maria Skyllas-Kazacos
- Prof. John Fletcher (collaborator from Elec Eng)
- Dr. Chris Menictas

More information

Prof. Jie Bao

T: +61 (0) 2 9385 6755

E: j.bao@unsw.edu.au

新南威尔士大学火炬创新园区
Torch Innovation Precinct at UNSW