www.redflow.com.au

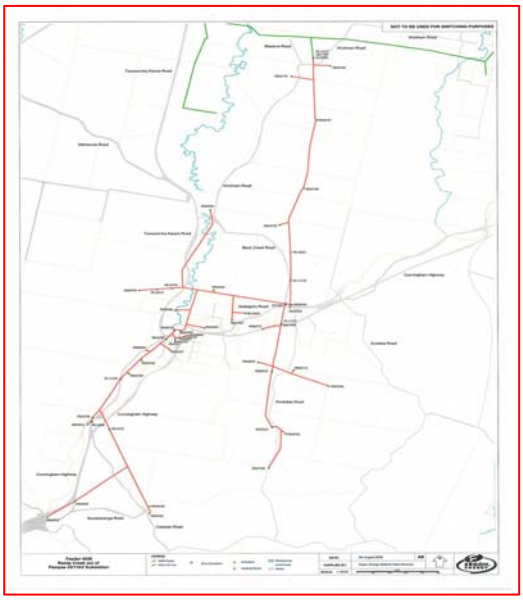
next generation energy storage

Demand Management Tools for Utilities

"RedFlow has developed a modular battery and control system package specifically for Distribution Networks Service Providers."

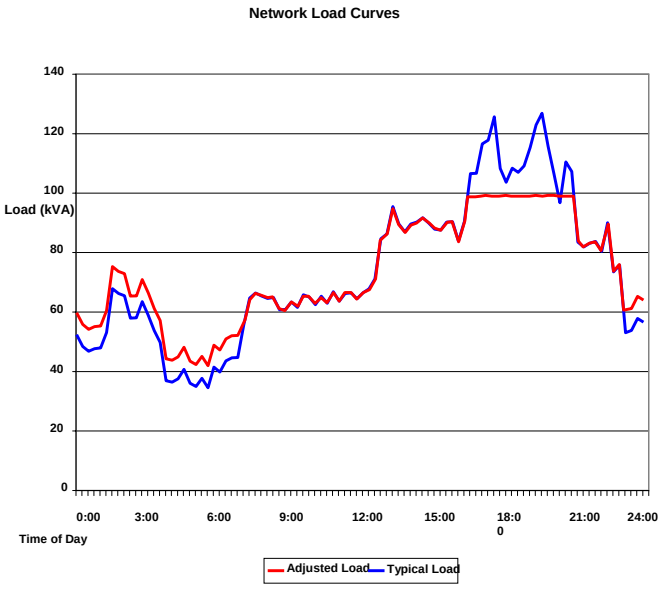
This novel "plug and play" energy storage system is designed to assist DNSPs with:

- **Demand Management**
  - Peak lopping
  - Load shifting
  - Curtailment
- **Renewable energy storage**
  - Dispatchable energy
- **Network support**
  - SAIDI & SAIFI reduction



Ideal applications for RedFlow systems include:

- **Edge of grid / SWER**
- **Constrained assets**
- **Island networks (Micro/Mini Grid)**
- **Remote area power supplies**



RedFlow's unique electronic interface can be configured to allow interoperability with utility communications systems, including:

- **SCADA**
- **Powerline Carrier / AFLC**
- **FM RDS**
- **Radio Meshed Networks**

A Breakthrough Technology

RedFlow has developed a unique breakthrough battery technology capable of supporting peak demand management and enhancing intermittent Solar PV technology at the household and small enterprise scale.

The patented zinc bromine flow battery module (ZBM), when combined with RedFlow's electronic interface systems (EIS) provides tailored energy storage and management with a range of applications.

When mass produced and in our targeted applications (heavy daily discharge), the RedFlow ZBM has a number of compelling advantages over lead acid as the nearest comparable battery technology. Compared with lead acid the RedFlow ZBM is expected to be:

- ***1/3 of the capital cost***
- ***100% vs. 30% daily discharge***
- ***1/3 of the volume***
- ***Long life (10 years)***
- ***1/5 of the lifetime cost***
- ***1/6 of the weight***
- ***Robust and non-perishable***
- ***No Toxic Heavy Metals***

5kW & 10 kWh zinc-bromine battery module

Unique Storage Technology

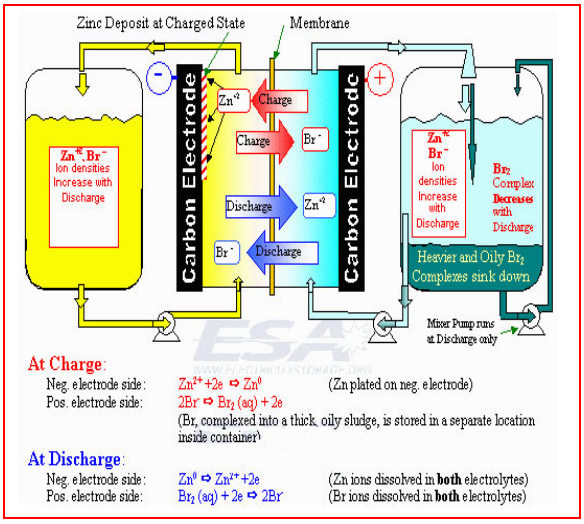
RedFlow has produced a ZnBr battery at kilowatt scale suitable for use in residential and small enterprise applications. Versatility is achieved through modular expansion. RedFlow's products have two technology building blocks:

- ***RedFlow's innovative electronic interface systems (EIS); and***
- ***RedFlow's revolutionary ZnBr flow battery module (ZBM).***

Technology - ZBM

The basic operation of the ZnBr flow battery is most simply described as an electroplating process. During charging zinc is plated onto the plastic electrodes. During discharging the reverse reaction occurs and zinc is removed. When the zinc has been used up the reaction stops and the battery is empty. In any state-of-charge the battery is stable and non-perishable because the materials associated with the reaction are stored separately.

When compared with other battery technologies, ZnBr offers the unique potential for high energy density in a non-perishable battery system, which operates at "normal" ambient temperatures without requiring expensive raw materials. When successfully commercialised and in mass production this results in a battery with high performance at low cost.



Schematic of Generic ZnBr Flow Battery courtesy of Electricity Storage Association

Technology – Electronic Interface System (EIS)

The development of an EIS is critical to making the ZBM useful in our targeted applications. The EIS is responsible for communications and control of the ZBM, providing the unique "plug and play" attribute of the RedFlow system. It is the feature that will link into future smart grid backbones and enable the potential to achieve the "ubiquitous connectivity" expected of other modern electronic appliances. The EIS enables RedFlow to maximise the value of the technical features of the ZBM.

Debut Products

Three products have been developed and will be seeded into the market, beginning with the **Power+BOS™ LA** (lead acid) which provides feedback on key features, allows any electronic and communications issues to be overcome.

Power+BOS™ Products

Features	Power+BOS ™ LA	Power+BOS ™ ZB
Application	Off Grid/ Fringe of Grid	Off Grid/ Fringe of Grid
Max Capacity	10kWh (at 30% DoD)	30kWh
Operating Modes		
Demand Management		
Load Shifting	✖/✓	✖/✓
Peak Lopping	✖/✓	✖/✓
Curtailment	✖/✓	✖/✓
Renewable Energy Storage	✓	✓
Network Support	✓	✓
Battery Charging	✓	✓
Grid Connect	✖/✓	✖/✓

Grid+BOS® Product

Features	Grid+BOS® ZB
Application	On Grid
Max Capacity	10kWh
Operating Modes	
Demand Management	
Load Shifting	✓
Peak Lopping	✓
Curtailment	✓
Renewable Energy Storage	✓
Network Support	✓
Battery Charging	✓
Grid Connect	✓

Customer Endorsement

The potential of the RedFlow ZBM and EIS technology has already been recognised by the Australian Government and the electricity utility sector through the award of an Australian Energy Storage Technology grant. The AEST's $1.1 million grant funding will be matched by $1 million from Ergon Energy to trial RedFlow's debut products.

Field Trials with Ergon Energy

Ergon Energy is currently conducting field trials, initially with 30 Power+BOS units in SWER and urban locations. Performance monitoring is well underway and with initial performance illustrated by the following graphic.

Systems being assembled for the Karara SWER project

Data from the Magnetic Island project

A Visionary Company

RedFlow is a technology development company founded by Chris and Alex Winter in 2005 to commercialise a low cost, high performance battery technology that has been under development since 2001.

RedFlow's vision is to be a world leader in kilowatt-scale electrical energy storage and management solutions. The company's founders identified zinc bromine (ZnBr) electrolyte flow technology as being capable of cost effectively meeting the increasing global demand for high quality and high reliability electricity.

Shipping Power+BOS systems

An Outstanding Team

The company has assembled a highly capable technical team under the stewardship of Chris and Alex Winter. Both these individuals bring extensive engineering and business capability gained from diverse experience with international corporations over the last 20 years. As the founders and inventors of the suite of RedFlow technologies Chris and Alex have instilled their drive and passion for the RedFlow technology into the growth of the technical team. The team has grown rapidly to 25 staff (11 engineers) over the last 12 months and has contributed significantly to the evolution of the ZBM from prototype to market ready product.

More Information

Chris Winter, CEO
RedFlow Group
Unit 1, 27 Counihan Road
Seventeen Mile Rocks
Brisbane, QLD 4073.
T: +61 7 3376 0008
F: +61 7 3376 3751
M: 0415 189 122
E: chris.winter@redflow.com.au