

# Maximising benefits of the Redflow battery

**REDFLOW** produces small 10kWh zinc-bromine flow batteries that tolerate daily hard work in harsh conditions. Marketed as **ZCell** and **ZBM2**, Redflow batteries are designed for high cycle-rate, long time-base stationary energy storage applications in the residential, commercial & industrial and telecommunications sectors, and are scalable from a single battery installation through to grid-scale deployments. Available only in Australia, ZCell is a residential energy storage system that comprises a ZBM2 battery within an attractive weather-proof enclosure.

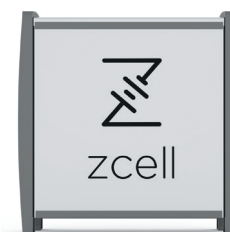
Redflow batteries are sold, installed and maintained by an international network of energy system integrators. Redflow's smart, self-protecting batteries offer unique advantages including secure remote management, 100 per cent daily depth of discharge, tolerance of high ambient temperatures, a simple recycling path, no propensity for thermal runaway and sustained energy delivery throughout their operating life. The following table provides a simple overview of the energy storage applications for which Redflow batteries are optimally suited.

ENERGY STORAGE APPLICATION	BATTERIES	DESCRIPTION	ZBM2 CAPABILITIES
Telecommunications – active renewable energy system	2 +	ZBM2 stores surplus renewable energy during the day to support the site at night, with or without diesel generator backup. Batteries actively deep-cycle on a daily basis.	Well-suited – the more actively the batteries are cycled, the better.
Telecommunications – backup generator replacement	1 +	ZBM2 in Standby Power System (SPS) mode. If the grid fails, the fully charged battery restarts from Standby mode in less than a minute to supply backup energy.	Well-suited – replaces a backup diesel generator with a quiet, emission-free, non-fossil-fuel alternative.
Solar self-consumption without grid failure backup (residential or commercial)	1 +	ZBM2 stores surplus solar energy during the day and uses it to avoid or offset grid energy use at night. This augmentation of grid power with renewably-sourced energy does not require protection against grid failure.	Well-suited – applications with daily deep discharge play to the strengths of the battery and leverage its benefits.
Solar self-consumption with grid-failure backup	2+	ZBM2 enables solar energy self-consumption while reserving a percentage of the stored energy for backup, to support the site during occasional grid failures.	Well-suited with at least two deployed batteries to reserve stored energy for full-time grid failure backup.
Off-grid site applications needing more than 10kWh of battery energy per day	2+	ZBM2 batteries can turn intermittent energy sources into reliable 24x7 energy supplies for off-grid energy systems, supporting a hybrid of solar and/or diesel energy sources.	Well-suited: Sites with constant moderate power demand are optimal.
Diesel run-time reduction	1+	ZBM2 can store energy from a diesel generator, enabling the batteries – with or without added solar – to run the site for as long as possible until further power is required from the generator.	Well-suited, maximising diesel genset operating efficiency by always charging at full power and avoiding operation at idle.
Peak shaving	1+	ZBM2 is charged off-peak then discharges energy to 'clip the peaks' during peak demand periods, avoiding punitive demand charges and decreasing energy required by site.	Well-suited, especially to long time-base support requirements.
Off-grid sites with short high-demand peak loads (e.g. large motors, pumps)	2+	ZBM2s are designed for long time-base energy output rather than for short time-base, very high energy discharge. Peak output is limited to 5kW per 10kWh ZBM2 module.	Site load analysis required to ensure meeting peak demands of off-grid sites. May require surge smoothing electronics.
Applications requiring very high peak charge or discharge rates		If an energy storage application requires more than an average of 3kW per 10hWh battery, the ZBM2 is not a good economic fit.	Ill-suited, may require additional batteries to meet peak energy rates.
Off-grid sites requiring less than 10kWh per day of energy output		ZBM2 maintenance cycles require full discharge at regular intervals, so are optimal for applications that draw more than 10kWh of energy per day. Low energy consumption can impede site operation.	Ill-suited: Application may be adversely impacted by ZBM2 maintenance cycle and by reduced efficiency at very low output levels.
Online Uninterruptible Power Supply applications		ZBM2 operating cycle is advantaged by applications that charge and discharge the battery daily. This is not optimal for UPS applications that require 100% SoC on a 24x7 basis with instant response to energy demands.	Ill-suited to applications that need the battery 100% charged 24x7, with only occasional discharge.

*While ZBM2 may not be optimal for some applications, Redflow can propose design strategies and hybrid solutions that may meet the specific needs of the application.*



ZBM2



zcell



zcell

Redflow's **ZBM2** battery is a unique energy storage system that redefines your understanding of how a battery works. This scalable 10 kilowatt-hour (kWh) zinc-bromine flow battery delivers 100 per cent depth of discharge each day for a warranted 10 years while retaining its energy storage capacity. The **ZBM2** is designed to work on its own and can scale to work as part of a much larger energy storage system, with as many batteries as you require.

The **ZBM2** battery management system (BMS) captures performance data in real-time to enable 24/7 remote monitoring. Monitor and manage your **ZBM2** batteries from your computer or mobile phone. The **ZBM2** performs flawlessly in warm climates without external cooling. Made from easily recycled or reused components, **ZBM2** batteries are intrinsically safe devices, using an inherently non-flammable electrolyte solution with minimal chance of 'thermal runaway'.

## Advantages of the Redflow zinc-bromine flow battery over lithium-based batteries

Scenario	Lithium-ion battery	Zinc-bromine battery
Full battery discharge to zero volts	Damages battery	Benefits battery
Deep daily discharge	Shortens battery life	No impact on battery life
Energy output from a full charge/discharge cycle	Declines with cycle count	Sustained
Extended time in standby	Loses stored energy over time	Retains all stored energy while in standby mode
High ambient temperature	May need active cooling to avoid life reduction	Ambient/free air cooling sufficient unless sustained ambient temperature is greater than 50C (122F)
Risk of thermal runaway	Potential	Minimal as the electrolyte is inherently non-flammable
Environmental impact	Challenging to recycle	Easy to recycle



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