RedFlow Limited

Quarterly Report
Period ending 31 December 2011
Corporate Directory

Board of Directors
Mr Phillip Hutchings (CEO)
Mr Chris Winter (CTO)
Ms Anne-Marie Birkill (Non-exec)
Mr Ken Smith (Non-exec)

Company Secretary
Mr Paul Clarke

Patent Attorneys
Fisher Adams Kelly

Solicitors
Thomsons Lawyers

Bankers
Commonwealth Bank of Australia
ANZ Banking Group Limited

Auditors
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Listed on ASX – Code RFX
Ordinary shares on issue
81,541,672
Total options on issue (unlisted)
6,798,896

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Share Registry
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Company Overview

RedFlow manufactures and sells energy storage systems (ESS) based in its IP-protected 5kW / 10 kWh zinc-bromine flowing electrolyte battery module (ZBM).

For more information, please refer to our website www.redflow.com
Highlights of the Quarter

The December 2011 quarter marked a year since the listing of RedFlow on the ASX. RedFlow continued to show solid progress as a leader in advanced energy storage.

Highlights of the December 2011 quarter were:

- Record sales for the six month period ending December 2011 of $2.45 million (unaudited).
- Record production of zinc bromine battery modules (ZBMs) for the quarter.
- Delivery of all sixty R510 residential energy storage units to Ausgrid as part of the Smart Grid, Smart City project, with completion of the first forty installations in Newcastle.
- Strong progress on the outsourced ZBM manufacturing transition, with commercial supply of initial components underway, first sub-assemblies being evaluated and design and fit-out of production equipment in progress at the selected factory site in Singapore.
- Formalisation of the ZBM ‘cost-down’ project in collaboration with the outsourced ZBM manufacturing partner with the aim of market leadership in manufacturing costs for stationary energy storage.
- Third party ZBM testing underway at leading US laboratory Sandia National Labs along with RedFlow’s own testing producing results in line with expectations.
- Manufacture of the first 90 kW M-class energy storage system underway for demonstration in conjunction with Australia’s largest rooftop solar PV array from Q2 2012.
- Design and manufacture of the US version of the R510 residential energy storage system as the first step for the US product launch in 2012.

RedFlow enters 2012 in a strong position and is progressing well with a clear strategy to expand production, reduce ZBM unit costs, demonstrate cycling performance and broaden its markets for advanced energy storage.

The Gen 3.0 electrolyte tank (bottom) is a significant cost-saving feature over the Gen 2.0 version (top).
Manufacturing of ZBMs

RedFlow is amongst the most advanced companies worldwide in the flow battery field. The current Generation 2.0 RedFlow zinc-bromine flowing electrolyte battery module (ZBM) can deliver up to 10 kWh of energy with a peak power rating of 5 kW.

In 2011, RedFlow introduced new machines and processes for ZBM manufacture at its own Phase Three Brisbane factory. Early in the December quarter, those steps were successfully commissioned.

ZBM production and quality responded accordingly, with record output for the quarter. A number of these ZBMs were retained within RedFlow for testing and quality analysis.

RedFlow’s ERP (enterprise resource planning) system is capturing costs and providing better management of the supply chain.

Outsourcing

The transition to outsourced ZBM manufacturing continued on track with specialist electronics contract manufacturing company Jabil Circuit, Inc. This step is designed to significantly reduce the ZBM manufacturing cost and provide the benefits of high and consistent quality along with the ability to ramp production rates to levels required to address international markets.

Following a review of alternative locations, RedFlow agreed that the best initial ZBM factory location would be Jabil’s existing plant in Singapore. This has the benefit of proximity to many specialist plastics manufacturers as sub-suppliers along with deep manufacturing and quality experience.

Commercial supply of conductive plastic electrodes began at planned rates during the quarter. That meant that RedFlow’s own production of these components was ceased, marking the first tangible step towards the outsourcing of the complete ZBM. RedFlow maintains its own R&D capability into these components and their manufacture.

The next step, achieved later in the quarter, was first sample sub-assembly supply. This sub-assembly is currently undergoing qualification with initial positive results.

The planning for the rest of the outsourcing transition is mostly completed. There is close interchange between RedFlow’s project managers and industrial engineers and their Jabil counterparts.

The capacity plan, production line and manufacturing floor layout in the new Singapore plant was completed, along with the establishment of the test bay area for completed ZBMs.

Early in the current quarter, RedFlow supplied three ZBMs to the Singapore plant. These will allow commissioning of the test area and will serve as completed reference units for the production team there.

The benefits of RedFlow’s association with a specialist manufacturing partner are beginning to be realised. These include positive testing of
alternative production processes for both lower costs and improved yield along with better sourcing of components and raw materials.

Localisation of material supply is continuing with sample materials due in Brisbane early in the current quarter for qualification.

**ZBM ‘Cost-Down’ Underway**

With the Brisbane factory operating strongly and the outsourcing well underway, RedFlow has now commenced the ‘ZBM cost-down’ project. This is a staged process to shift the direct production cost of the ZBM downwards so that its full competitive position is realised.

One of the core attributes of the ZBM is its potential for low production cost viz-a-viz competitors. The ZBM is light-weight, has no expensive metals or materials and is mostly made of plastics.

RedFlow’s unit costs for ZBM production to date have been relatively high. This is due in part to low volumes, limited purchasing power with suppliers and unsophisticated production techniques.

All of those matters are now being addressed as part of the ‘cost-down’ project, which has participation and support of our outsourced manufacturing partner.

One element of the ‘cost-down’ process is improved component design to reduce the complexity and individual parts count.

For example the Generation 3.0 tank was successfully developed and tested during the quarter. That single sub-assembly reduces the ZBM parts count, eliminates some skilled labour in manufacturing steps, and simultaneously allows improved quality at lower cost.
Energy Storage Installations

Kilowatt scale

At the kilowatt scale, RedFlow produces the R510 residential energy storage system, rated at 5 kW.

These R510 units are the size of a large refrigerator and are typically installed under the eaves, close to the meter box with a simple electrical connection. With built-in communications and a remote terminal unit, the systems are all capable of remote control and monitoring. They have one RedFlow ZBM with a 10 kWh capacity and a bi-directional inverter (DC to AC and AC to DC) with a 5 kVA rating.

That means the units can be remotely instructed to discharge energy into the grid or take energy off the grid and store it for later use.

The R510s were designed by RedFlow’s own engineering team and manufactured at its systems assembly factory in Brisbane.

RedFlow is a key supplier to the Smart Grid, Smart City project being installed on the Ausgrid electricity network in Newcastle and Scone in the upper Hunter Valley in New South Wales. This is a $100 million initiative to provide a testing ground for new energy supply technologies. At least 30,000 households will participate in the project over three years.

During the quarter, RedFlow completed the supply of sixty R510 systems as part of this project. Forty units were installed during the quarter with the balance to be installed early in 2012. These installations were all completed safely and with no incidents.

More information about the Smart Grid, Smart City project is available at www.smartgridsmartcity.com.au

RedFlow sees future Smart Grid installations around the world as an important large scale market opportunity for its ZBM battery modules.

In addition, RedFlow supplied some lead-acid battery based energy storage systems during the quarter.
M-class (90 kW and up)

There is also substantial demand for larger scale energy storage systems in the 100 kW class and up to the low MW range. RedFlow designates this class of products as M-class.

The “generation one” RedFlow prototype in this category was manufactured early in 2011. It has been installed and operating in conjunction with Australia’s largest rooftop mounted solar PV array at The University of Queensland campus in Brisbane. That unit has the footprint of a 20 foot shipping container (see photograph on back cover).

RedFlow has reached agreement with The University of Queensland to replace that unit with the first true M-Class unit – an M90, rated at 90 kW. The M90 also has a shipping container profile. It comprises a number of ‘power-tower’ modules, each effectively self-contained with four to six ZBMs and with dedicated power electronics and control systems.

The design for the M90 was completed during the quarter. Control systems were developed and tested. Manufacturing of the first M90 is underway.

Following commissioning and testing at RedFlow’s factory, the M90 will be installed at The University of Queensland as an upgrade of the ‘generation one’ unit. This M90 system will then be used by UQ researchers from the second quarter 2012. This phase will assess interaction of large scale storage with utility scale solar PV and interaction with the electricity supply grid.

The ‘power-tower’ modules are also seen as building blocks. With individual ratings of between 40 to 60 kWh and up to 20 kW, they can provide a flexible unit as a base for larger system design. These are currently designed around a combination of RedFlow ZBMs, commercially available packaged power electronics and RedFlow’s own battery management and remote control units.
The OEM ZBM

To address larger volume markets, RedFlow is working with selected system integration companies. Typically, these are industrial manufacturing and distribution companies already supplying the electricity utility and telecommunication sectors with related products.

This step means transitioning RedFlow’s proprietary battery management systems towards more widely adopted standards, along with publication of ZBM installation and operating standards. These initiatives began at the end of the quarter.

ZBM Long Term Testing

Long term testing of the Generation 2.0 ZBM is underway at RedFlow's Brisbane factory.

The long term testing incorporates improved raw materials and production processes, with significant performance data accumulating in line with expectations.

Further expansion of the long term test program is planned during early 2012, so that all parameters of the charge/discharge rate and depth of charge matrix are fully explored.
International Activities

RedFlow’s sales and marketing team is progressively working in selected international markets.

RedFlow is undertaking a staged product launch in the USA in 2012. This follows RedFlow’s ongoing activity within Asia.

As the first step of entering the USA market, RedFlow supplied a ZBM to Sandia National Labs for testing as part of a multi-phase project to develop advanced performance metrics for flow battery systems.

Sandia National Laboratories is one of the world’s leading laboratories in the energy sector. This work is funded by the Department of Energy Office of Electricity, Energy Storage Program. This testing has been positive and is ongoing.

RedFlow will supply a second ZBM installed in an R510 USA system to Sandia for extensive application testing commencing in the second quarter of 2012.

During the quarter, RedFlow completed the planning for the rest of the USA market launch.

A number of system integration partners and first customers have been identified within the USA.

Up to five R510s will be delivered as demonstration systems to these foundation USA partners in the second quarter of 2012.

Under current planning, three of these systems will be installed on grid for solar PV deployments at trial sites in different locations.

Initial USA Products

The RedFlow ZBMs and systems to date have been designed for Australian markets and electrical standards (240 VAC and 50 Hz). Relatively minor modifications are required to suit USA electrical standards.

Those changes were prototyped and tested during the quarter with positive results.

This allowed the USA version of the R510 to progress into the production phase with the initial batch undergoing assembly at the end of the quarter.
During the quarter, the Australian Government released its Draft Energy White Paper 2011: *Strengthening the foundations for Australia’s energy future.*

The 295 page paper covers key issues in Australia’s energy markets and potential policy changes.

Within the electricity sector, it highlights the drivers to adopt new and smarter technologies and the high capital investment required to meet Australia’s electricity needs.

It estimates that an investment of up to $120 billion is required in Australia’s electricity distribution networks over the next 20 years.

RedFlow is one of the few companies referred to in the White Paper (see extract below).

An issue highlighted in the paper is the unseen, but real, cost of increasing peak electricity loads.

For example, peak electricity demand has more than doubled in Brisbane over the 12 years to 2010 while the number of households has only grown by 35%.

One cause of this is the uptake of household air conditioning which has associated costs to the wider distribution network that are often not recognised.

An example quoted in the Draft Energy White Paper is that the installation of a 2 kilowatt reverse cycle air conditioner costs a consumer around $1,500 on average yet imposes costs on the energy system as a whole of up to $7,000 when adding to peak demand.

That $7,000 system wide cost must then be spread across all other customers.

The need to supply peak electricity loads can be met with energy storage systems such as those manufactured and supplied by RedFlow.

### Strengthening the foundations for Australia’s energy future.

*(Extract from the Australian Government’s Draft Energy White Paper 2011)*

Successful commercialisation and deployment of intermittent and variable renewable energy technologies often needs a ‘bundled’ solution which relies on the integration of a number of distinct technologies.

RedFlow’s core intellectual property centres on its development of the zinc bromine battery module (ZBM) targeted to applications such as a companion energy storage solution for solar photovoltaic electricity generation.

The company provides a packaged solution integrating its ZBM with power electronics, remote management and control systems into a fully functioning electricity storage system for grid and off grid applications.

Key early contracts have included solar photovoltaic ZBM units for grid voltage support at peak evening times in rural areas; demonstration hybrid power supply units (solar photovoltaic, diesel generator, ZBM) to allow the overhead electricity network to be turned off in extreme bushfire weather; and demonstration of the integration of RedFlow units with smart grid technology in the Australian Government’s Smart Grid, Smart City trial.
Corporate News

RedFlow held its 2011 Annual General Meeting on 2 November in Brisbane. All resolutions were passed.

RedFlow continued work on protection of its intellectual property. The program of patent and trademark filing in selected countries continues.

Financial

RedFlow’s unaudited sales for the six month period ending 31 December 2011 were $2.45 million. Total revenue including interest income was $2.8 million.

The financial results for the half year will be published later in February 2012.

At the close of the quarter, RedFlow’s cash balance was $12.5 million.

RedFlow has no corporate debt.

Phil Hutchings,
Managing Director,
RedFlow Limited

If you have any questions, I would be pleased to assist.

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The “generation one” M-class system has been on demonstration in conjunction with Australia’s largest rooftop solar PV array at the University of Queensland since April 2011.

www.redflow.com