



# Redflow

Investor Presentation

June 2020

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# Company Overview

**Headquartered**  
In Brisbane, Australia

**Company owned** manufacturing  
facility in Thailand

**Redflow designs and manufactures zinc-bromine flow batteries**

**Major Target Markets**  
Telco  
Commercial, Industrial & Utility  
Remote Area Power Systems  
High end Residential

**Key Geographies**  
Southern Africa  
Australia  
New Zealand  
China and Selected Asia

**~90** current deployments across multiple countries\*



***Redflow is redefining energy storage in our target markets***

\* Deployments with Redflow batteries operational as of 25<sup>th</sup> May 2020 or active in the last 90 days

# Investment Thesis



**Market leading flow battery energy storage provider with deep technical competence**



**Growing diversified blue chip client base with addressable spend in growing 4m+ mobile tower market and other industries**



**40% growth in deployments over the last 12 months**



**Strategic growth opportunities in adjacent applications and markets**



**Independent testing shows no changes in the capacity or performance over sustained cycling\***



**\$120m invested over 15 years in proprietary technology and commercialisation**



**Move to Thailand manufacturing facility has reduced manufacturing costs by 40% (current Gen2.5 battery)**



**Strategies in place targeting a further 30% reduction in manufacturing cost (Gen 3 battery), with further cost reduction opportunities depending on scale**

\* See Appendices. Independent Australian government funded testing show sustained performance after 600 cycles

# The Opportunity for Redflow

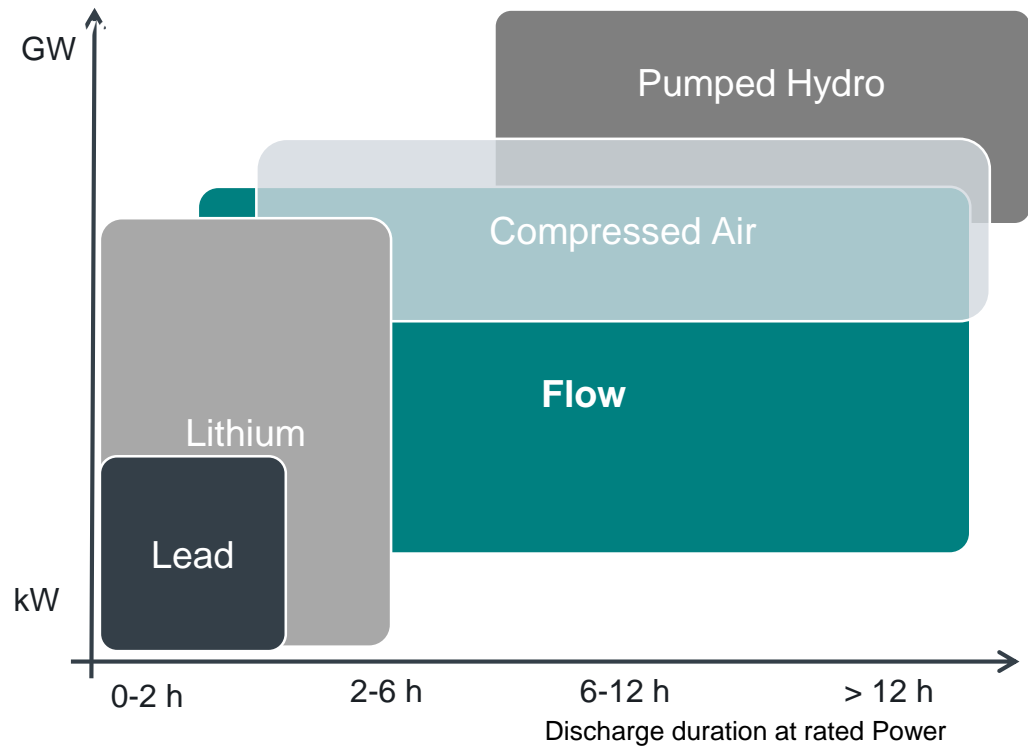
- The world is transitioning to a lower carbon energy system
- Storage sits at the core delivering reliable, affordable, low-carbon electricity
- Flow batteries have a specific role in the energy storage ecosystem

**“Flow batteries are potentially going to be a big contributor in stationary energy storage, like the grid-level stationary energy storage”**

Australia Chief Scientist Dr Alan Finkel<sup>1</sup>

- ✓ Flow batteries suited for 10kWh applications up to multi MWh
- ✓ Comfortable with discharge times of up to 15 hours (at rated energy)
- ✓ Chosen for versatility, adaptability and robustness

Stationary Storage Market by Type (Illustrative)



Market for redox flow batteries forecast to be worth **US\$4.5 billion** by 2028<sup>2</sup>

# Patent protected technology with unique features



Gen2.5  
(Current)



Gen3.0  
(Target Customer trials Dec2020)

**Competitive position is protected through 10+ years investment in an IP portfolio across multiple countries plus trade secret knowledge**



Flow chemistry is like a reversible electroplating process



Unlike conventional batteries, it is **happy to run flat and repeatedly use 100% of its energy capacity**



**Excellent tolerance for high ambient temperatures** without external cooling



**Compact Flow battery**; this modular design enables scalability  
10kWh → multi-MWh



**Smart battery** including Battery Management System (BMS) with remote monitoring and diagnostics plus self-protection features



**Strong environmental credentials** recyclable HDPE plastic and re-usable electrolyte



**A number of theft mitigation features**, incl. software and hardware innovations



**Robust long life battery**



**Not susceptible to thermal runaway**

# Redflow Zinc Bromine Target Applications and Advantages

1

## Minimise Diesel Use

*Generator only used to recharge batteries and/or as a backup solution*

2

## Maximise Renewable Consumption

*Store excess energy generated through renewables to be deployed when needed*

3

## Mitigate peak demand costs

*Battery discharge targets the load peak to avoid extra charges related to peak demand*



Ability to go to empty and discharge to 0V repeatedly without damage



Ability to utilise 100% of the capacity of the battery and won't kill battery by over-discharging



Ability to turn the battery off without damage, and no float current required



Ability to "park" a system and use it as required (e.g. like a back-up generator)



No material electrochemical degradation up to 50C battery operating temperature



Potential operational cost savings, especially in warm climates – no air conditioning required



Not susceptible to thermal runaway



Low risk of causing fire, and avoid fire suppression costs



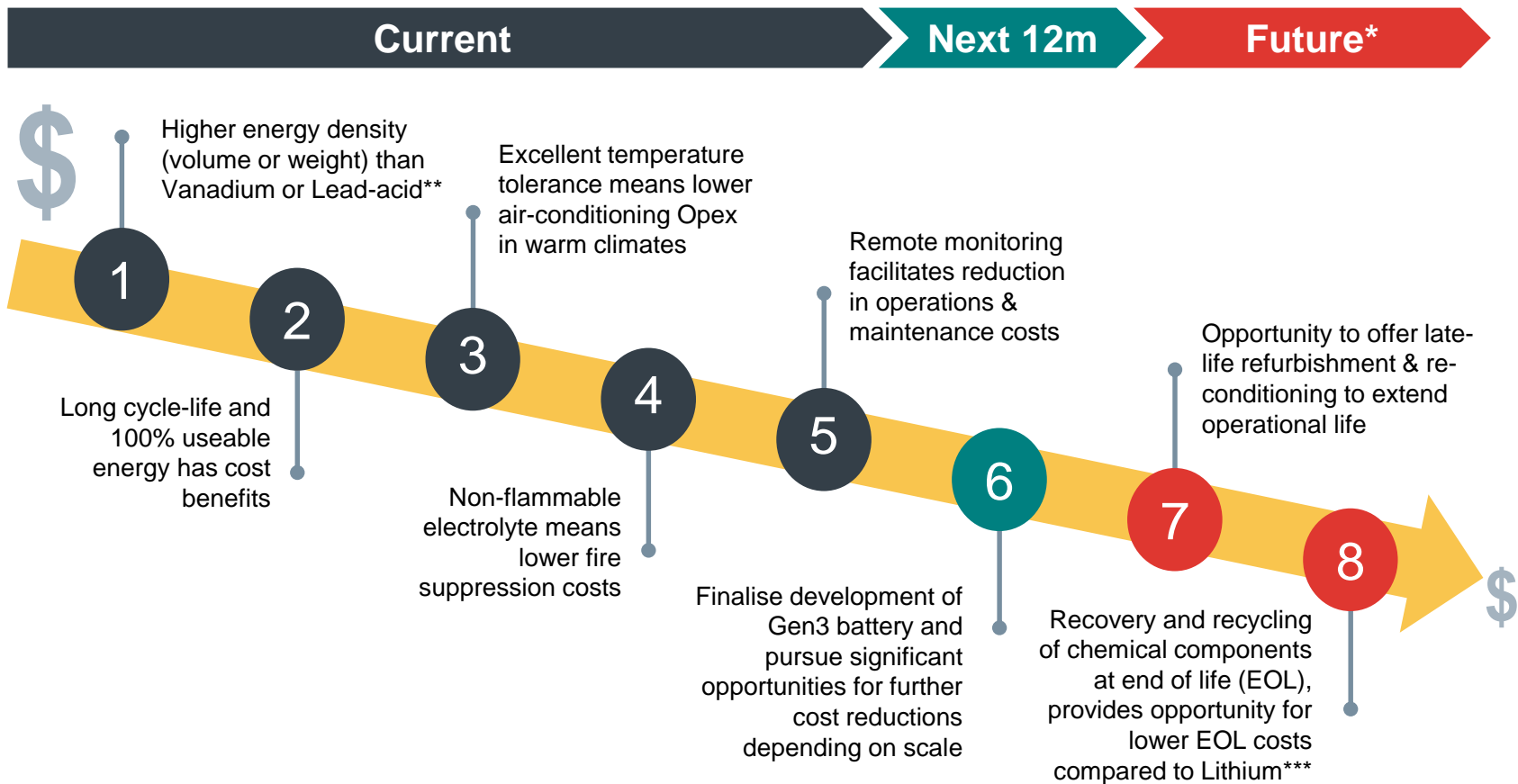
Straight forward to recondition, repair and recycle



Strong environmental credentials and minimal end-of-life impact



# Decreasing life-time cost proposition



## Target future customer benefits in development

- Increase in core battery capacity currently undergoing testing (customer \$/kWh benefits)
- Additional software based functionality to increase application specific performance

\* Timing will be dependent on customer demand for service

\*\* See CSIRO Report *Electrical Energy Storage: Technology Overview and Applications*, July 2015

\*\*\* Referenced from Renew Economy, 'Battery recycling could generate billion-dollar industry for Australia, push down prices.'



# Markets and Outlook

# Major target markets

Our sweet spots include...

Energy-focussed applications

Frequent cycling

Warm climates that rapidly degrade other batteries

## Present Focus



### Telco

- >4m mobile towers globally
- Power costs a major factor
- Load shedding / weak grids increase demand for long duration batteries
- Increase in infrastructure sharing and tower companies
- Battery theft plus commercial and environmental concerns over diesel use

***Provide technical and commercial value proposition across off-grid, weak-grid and back-up power supply applications***



### Remote Area Power Systems (RAPS)

- Battery Energy Storage System crucial to RAPS with renewable energy sources and can improve efficiency of fossil fuel generation.
- Needs high temperature tolerance, and frequent deep cycling. Minimal capacity decline, like ZBM, highly desirable to maintain optimum operation over life.

***Redflow technology is well suited to these applications and offers an attractive commercial proposition***



### Commercial, Industrial & Utility

- Multiple industries where stable and cost efficient power is critical
- Key issues include intermittent power, high peak demand tariffs and maximising renewable use
- Address solar curtailment
- Sub-station support as demands on grid increase.

***Reduce energy costs by replacing / supplementing grid power and avoiding demand tariffs through storing off peak energy***

# Near term target market – Telco sector

**4 million**

telco base stations globally with  
**4.6% CAGR** growth 2019-2024<sup>1</sup>

**120,000**

new base stations are deployed  
yearly – mostly in countries with  
poor grid infrastructure<sup>2</sup>

**1 million +**

off-grid and bad-grid towers by 2020  
with **over 90%** using diesel as main  
power source<sup>2</sup>

- **Major growth in markets and geographies with no or weak grid environments plus resiliency programs in developed markets such as Australia**
  - Growth expected in areas of poor or limited grid connection and concentrated in Africa & Asia<sup>2</sup>
  - Government sponsored initiatives to improve telco resiliency/back up<sup>3</sup>
- **Base stations energy use are a major cost component for Telcos**
  - 160,000<sup>4</sup> base stations in Africa. Existing engagements cover ~37k towers
  - 21,000<sup>4</sup> base stations in ANZ & Pacific. Existing engagements cover ~16k towers
  - 407,000<sup>4</sup> in Asia (excl China, India & Japan). Existing engagements cover ~18k towers
  - Expected increase in power consumption due to 5G. Widespread upgrades of mobile base station power systems is anticipated
- **Growth of tower companies and infrastructure services**
  - Focus on efficient energy management and emergence of energy as a service models
- **Renewable Energy Commitments**
  - Global telco operators have clear and ambitious renewable energy goals e.g. replace use of diesel<sup>5</sup>
  - Government driven and funded initiatives to reduce blackspots in key countries
  - Government programmes to fund, subsidise or mandate build out of towers in rural or remote locations

1. Mordor Intelligence, *Telecom Towers Market, Growth, Trends and Forecast (2019 - 2024)*

2. GSMA Report, *Green Power for Mobile*, December 2014

3. For example, Australian government AUD\$37m Telecommunications Emergency Resilience Package to improve the resilience of communications networks, 2020

4. TowerXchange 2019 Market Reports (Africa and Asia)

5. Vodafone Group *Sustainability Report*, 2019

# Strategy and Objectives

# Material progress achieved over last 12 months

<b>Sales</b>	<ul style="list-style-type: none"> <li>✓ Sales up 166% for the 9 months to 31 March 2020 versus prior corresponding period (\$1.7m v \$0.6m)</li> </ul>
<b>Pipeline</b>	<ul style="list-style-type: none"> <li>✓ Engaged with global telco and tower operators with &gt; 70k towers under management with the requirement, budget and capacity to drive material orders</li> <li>✓ Growing interest in off grid &amp; rural deployments – 50 kWh to 500 kWh systems</li> </ul>
<b>Deployments</b>	<ul style="list-style-type: none"> <li>✓ 40% increase in total deployments globally including Vodacom and RCG</li> <li>✓ Growing set of deployments for rural and agricultural market in Australia</li> <li>✓ Reference demonstration deployment in China Qinghai province with Zbest</li> </ul>
<b>Engineering</b>	<ul style="list-style-type: none"> <li>✓ Significant progress on Gen3 battery including new stack, Mk12 Board, new tank</li> <li>✓ On target for Dec 2020 customer trial</li> </ul>
<b>Manufacturing</b>	<ul style="list-style-type: none"> <li>✓ Thailand factory achieved ISO9001 certification July 2019</li> </ul>
<b>Partner Network</b>	<ul style="list-style-type: none"> <li>✓ Developed new partners in Western Australia and South Africa</li> <li>✓ Strong engagement across additional potential partners in Africa, Asia and Australia</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>✓ New features launched including anti theft features and standby power mode</li> </ul>
<b>Performance</b>	<ul style="list-style-type: none"> <li>✓ Proven performance after 600 cycles through ongoing government sponsored testing (see Appendices)</li> <li>✓ Key telco reference site in NZ now delivered &gt;60 MWh of energy</li> </ul>
<b>Cost Mgm't</b>	<ul style="list-style-type: none"> <li>✓ Ongoing focus on cost management resulting material reduction in staff and operating costs in response to COVID-19. Additional government support measures secured.</li> </ul>

# Key Geography Update

## South Africa and other Africa



- On-going national grid issues in South Africa and poor or limited grids in other countries. High cost of running diesel generators and endemic battery theft are major challenges in the telco sector. Additional opportunities in C&I sector, especially for Remote or Stand-alone Power Systems.
- Jan 2020 Vodacom commences deploying Redflow batteries to ~30 base stations to reduce high diesel opex costs. Expected completion over the next 2-3 months. Note - COVID-19 dependent
- Moropa – remote tower infrastructure provider commenced rolling out Redflow batteries in 2019
- New engagements/discussions with seven additional telcos and tower operators in South Africa and other markets such as Nigeria.

## Australia, NZ and SE Asia



- Selected by New Zealand Rural Connectivity Group to provide energy storage for a number of off-grid sites with an initial order in December 2019 and repeat order in April 2020 (22 batteries in total). We have been advised that Redflow batteries are a reference technology in a closed tender to select an installation partner for all RCG's remaining off-grid telecommunication towers
- Key reference deployment with Optus for remote site in Queensland
- Growing set of reference deployments in Australia for commercial and off-grid sites including Knox City Council, Yallalong Station in WA, Base 64 (Simon Hackett\*), agricultural sector plus limited residential
- Growing pipeline for rural solutions in Australia plus initial discussions with other telco operators
- Active discussions with telcos and tower operators in Thailand, Myanmar, Indonesia and Cambodia

## Other Markets



- Collaboration agreement with ZbestPower. Demonstrated Redflow's 100 kWh battery system at the Zbest Power Haidong Transport Project site. Will continue to explore potential strategic opportunities in China with COVID-19 recovery.
- 120 kWh Demonstration system with Swansea University, a research-led British university
- Regular enquiries from other markets – Middle East, Caribbean, etc. We will selectively explore where appropriate

\* Simon Hackett is currently Redflow's largest shareholder and is currently engaged as a Systems Integration Architect

# Case Studies – Australian Deployments

## Optus



- Deployed in April 2019. Commissioned May 2019.
- Consisting of 6 ZBM2 batteries and diesel generator (previously running 24 hours per day)
- Deployed in environmentally sensitive high temperature Daintree rainforest deployment in Queensland, Australia
- Redflow selected due to sustained energy storage capacity, tolerance of warm temperatures, remote management capability and environmentally-friendly design

**Total energy throughput since commissioning:  
7.4MWh (70% diesel runtime reduction)\***

## Knox Children and Family Centres



- Deployed and Commissioned in May 2019
- 36 ZBM2 batteries across two centres combined with 180 kw PV solar panels storing up to 360 kWh of energy
- Children and Family Centre Bayswater Winner - Architectural Design/Green Architecture category in the 2019 International Architectural MasterPrize Awards *“It is Australia’s first civic-wellness centre with a 100+ year design life, setting a new benchmark for council and government bodies nationally”* See press release [here](#)
- See Knox City Council White Paper [Designing a 100+ year Community Building Bayswater Early Years Hub](#)

**Total battery energy throughput since commissioning:  
75.2MWh\***

\* Internal Redflow estimate of total energy output since commissioning to 2<sup>nd</sup> May 2020. Based on data received from Redflow Battery Management System

# Case Studies – International Deployments

## Moropa & Mobax – Vodacom Mobile Towers



- Redflow batteries deployed at Moropa's rural base stations on Vodacom network since 2019 for standby power. New deployments ongoing.
- Mobax commenced deployment of 68 batteries on approx 30 Vodacom-owned towers in Dec 2019. Deployment ongoing but delayed due to COVID-19
- Two sites with Redflow batteries have been targeted by thieves in last 3 months. Attempted theft of the Redflow units was abandoned in both cases.
- Redflow selected due to anti-theft, modular sizing and long duration discharge.

**Moropa remote site back up power – 695 kWh of energy used during site power outages since installation (approx. 70 outages since May 2019)**

## Vodafone New Zealand



- Installed April 2016. Batteries commissioned June 2016
- Vodafone telecommunications off grid tower in remote area of New Zealand
- System uses wind, solar and Redflow batteries as primary energy sources for the tower. Diesel generator only for minimal backup power during low radiation days.
- For full case Vodafone endorsed study see [here](#)

**Since installation in 2016, the Redflow batteries have supplied more than 60 MWh (megawatt-hours) of energy**



# Current Status and Our Pathway Forward

## Current Position

- In early 2020 we were informed that our battery was an identified candidate for a large deployment (>1,000 batteries) by a significant mobile network operator
- COVID-19 has impacted this and other opportunities and delayed our ability to execute on our growth strategy
- This has provided confidence of our addressable market opportunity. It also highlighted that further price competitiveness and reducing the effort of installing and commissioning our battery will significantly increase our value proposition
- Accelerating Gen3 development is therefore critical to future sales and drive commercial margin

## Commercial Strategy

- Progress current end customer and partner engagements with ability to order batteries in volume in next 12-18m following COVID-19
- Primary focus on telco for next 12 – 24m
- Emphasis on off grid and poor grid environments with extensive use of renewables, diesel generators and additional issues such as battery theft
- Develop reference deployments in adjacent markets such as Remote Area Power Systems. Leverage similarities with telco and establish readiness to pursue adjacent markets
- Staged introduction of Gen3 – initial trials in late 2020. Target product launch early 2021
- Sales ramp up dependent on COVID-19 recovery incl. travel restrictions and position of end customers/partners

## Cost-down Strategy

- Achievement of battery cost down is critical to deliver sales strategy and delivering commercial margins.
- Significant opportunities exist to drive down cost with Gen3 and increasing sales. Existing Thailand facility provides platform for achieving economies of scale
- Cost-down strategy is based on four key components:
  1. **Battery design:** Reducing components, materials and design for volume manufacturing and more efficient deployment
  2. **Supplier Pricing.** Negotiate volume pricing with key suppliers of materials and components
  3. **Improve Productivity:** Increase production throughput and reduce labour cost through various efficiencies
  4. **Battery Performance:** Improve performance of battery to increase energy capacity and reduce customer \$/kWh

# Our Commercial Strategy

- We are currently engaged with global telco and tower operators which represent over 70,000 towers under management at various stages of the sales cycle. We estimate that 25-30% of this total is addressable by a Redflow based solution
- Based on current telco and other engagements, Redflow assesses our immediate addressable market to be 5,000+ batteries in the next 3-4 years. This does not include demand from new customers in this period.
- Sales and timing dependent on COVID-19 recovery and ability to serve key markets

## SCALE AND EXPAND INTO ADJACENT MARKETS

- Continue Telco deployments. Expand telco partner ecosystem
- Expand into new markets – Middle East, LATAM
- Develop and launch utility scale system (MWh) - solar shifting/grid support

## RAPID SCALE UP IN TARGET MARKETS

- Scale up Gen3 roll out with existing customers – focus on Telco
- Initiate Gen3 deployments with subsequent Telco adopters – MNOs and TowerCos
- Establish Gen3 pilots/trials with Remote Areas Power Systems (RAPS) & adjacent non-telco applications & customers
- Target agriculture, mining and other remote power industries/communities
- Explore insurance and financing options in target markets for end customers

## STAGED RECOVERY AND COMMISSION GEN3

- Service existing customers and contracts
- Continue deployments of current ZBM model in telco and RAPS
- Maintain Key Account Relationships
- Position for accelerated trials, initial deployments and scale up orders following COVID-19 measures being relaxed – Australia, SE Asia and other Africa
- Develop new engagements in markets in selected Africa and SE Asia markets

Next 12m

12 - 24m

3+ years

# Our Cost Down Strategy

## Redflow Thailand Manufacturing

- Thailand officially began producing complete batteries in April 2018
- Over 40% manufacturing cost savings achieved through Thailand facility (at 150 batteries per month)\*
- Production of 150 batteries in Dec 2018 provides evidence of scale capability
- ISO9001 accreditation achieved July 2019.
- Quality metrics far exceed previous metrics achieved with previous outsourced manufacturing model
- Adjusted production given current stock levels. Focus on testing, development and retooling for Gen3

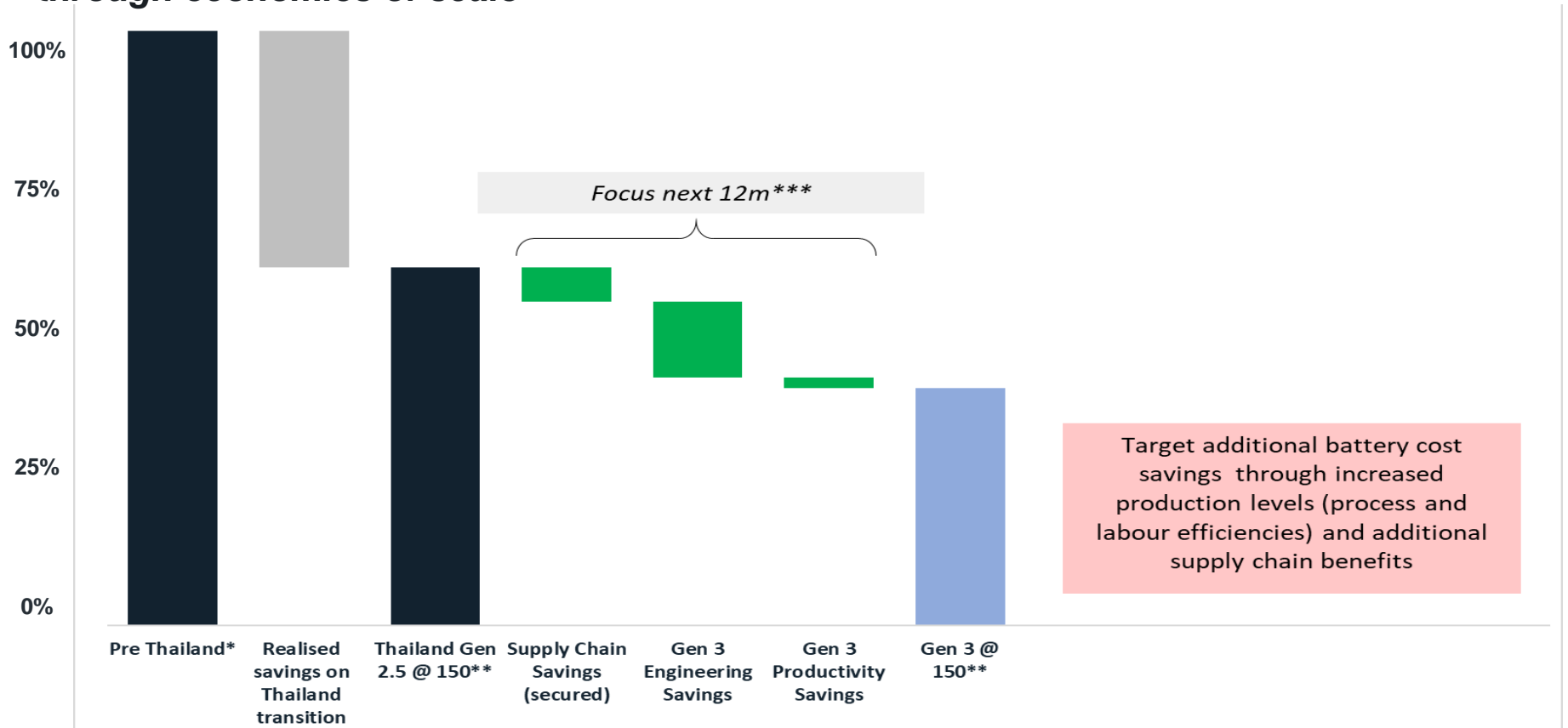
<b>Phase 1 – Product Development &amp; Gen3 Customer Trials</b>	<ul style="list-style-type: none"> <li>▪ Initial Gen3 customer trials targeted December 2020 based on execution of current engineering program</li> <li>▪ Ability to initiate Gen3 manufacturing early 2021. Will be predicated on confirmed customer demand</li> </ul>
<b>Phase 2: Gen3 ramp to ~150 per month (p.m.)</b> <i>18 MWh per annum capacity (p.a.)**</i>	<ul style="list-style-type: none"> <li>▪ Ability to ramp production to 150 Gen3 batteries per month within ~12 weeks of confirmed demand</li> <li>▪ Plan to deliver &gt;30% cost down compared to current Gen2.5 at 150 manufactured per month in Thailand</li> <li>▪ Cost down estimates based on 1) Supplier volume discounting (secured), 2) delivery of key engineering projects including Gen3 Stack, Mk12 and new tank deliver targeted savings and 3) increased productivity from Gen3 manufacturing</li> </ul>
<b>Phase 3: Scale to ~300 batteries pm</b> <i>36 MWh capacity p.a.</i>	<ul style="list-style-type: none"> <li>▪ Requires double shift in some processes ~12 week ramp up and minimal capex (\$&lt;500k)</li> <li>▪ Additional battery unit cost down targeted</li> </ul>
<b>Phase 4: Ramp to ~500 batteries p.m.</b> <i>60 MWh capacity p.a.</i>	<ul style="list-style-type: none"> <li>▪ Moderate levels of capex required for existing facility to reach ~500 batteries /month (\$ 2-3M)</li> <li>▪ Additional battery unit cost down targeted</li> </ul>
<b>Phase 5: Ramp beyond 500+ batteries p.m.</b>	<ul style="list-style-type: none"> <li>▪ Expand Thailand and/or additional facility required to reach 1k batteries per month (144 MWh p.a.).</li> <li>▪ Additional battery unit cost down targeted</li> <li>▪ Significant productivity improvements through selected automation at sufficiently high volumes</li> </ul>

- Pre Thailand costs based on 3<sup>rd</sup> party manufacturing partner last quotation March 2017 at 90 batteries per month plus electrolyte and electronics board (outside of quotation). Compared with fully allocated Thailand Gen2.5 manufacturing at 150 batteries per month

\*\* Per annum manufacturing capacity based on monthly production of 10 kWh batteries

# Thailand and Gen3 Cost Down

**Gen3 expected to deliver significant unit cost benefits. Further progress targeted through economies of scale**



\* Pre Thailand costs based on 3<sup>rd</sup> party manufacturing partner last quotation March 2017 at 90 batteries per month plus electrolyte and electronics board (outside of quotation). Excludes Battery Management System costs and any required external enclosures

\*\* Thailand Gen2.5 and Gen3 costs at 150 batteries per month estimated. Fully allocated costs. Excludes Battery Management System Costs and any required external battery enclosures

\*\*\* Focus next 12m consisting of (a) Supply chain savings secured agreed end 2019 with supplier; (b) Gen 3 engineering savings assumes engineering changes currently being developed and trialled are successful; and (c) productivity savings assumes engineering changes are successful and result in a reduction in manufacturing working

# Investment Strategy

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*Redflow will focus on enhancing engineering capabilities and progressing strategic opportunities over the next 12 months*

## **Funding is required for the following:**

1. Accelerating key engineering projects to deliver a more cost competitive product through Gen3
2. Further development of enhanced battery features – e.g. external housing, Standby Power Supply mode, and anti-theft
3. Orientate Redflow Thailand to focus on testing, development and retooling for Gen3
4. Progress sales and business development efforts with customers and potential customers to convert pipeline of current and future opportunities as COVID-19 related measures are relaxed
5. Progress strategic growth opportunities, particularly across Africa
6. Progress current and alternative supplier discussions
7. Pursue options for further strategic investment and other non-equity financing options as Redflow hits further growth and targets break even position

# Entitlement Offer Summary

# Entitlement Offer – Overview

<b>Offer structure and size</b>	<ul style="list-style-type: none"><li>• Pro-rata, non-renounceable Entitlement Offer to raise up to approximately \$22.9 million (before offer costs) with an immediate target of around \$6.25 million.</li><li>• The Entitlement Offer will be conducted on the basis of 1 new share for every 1 share held at 7pm (Sydney time) Tuesday, 16 June 2020 (<b>Record Date</b>), at an issue price of 2.5 cents per new share.</li></ul>
<b>Offer pricing</b>	<ul style="list-style-type: none"><li>• The issue price of 2.5 cents per share represents a discount of approximately:<ul style="list-style-type: none"><li>• 18% to the 30 day VWAP up to and including 10<sup>th</sup> June 2020; and</li><li>• 14% to the last price traded on 10<sup>th</sup> June 2020</li></ul></li></ul>
<b>Eligible shareholders</b>	<ul style="list-style-type: none"><li>• Participation in the Entitlement Offer will be open to shareholders in Redflow on the Record Date with a registered address in Australia, New Zealand, Hong Kong or Singapore</li></ul>
<b>Additional new shares available</b>	<ul style="list-style-type: none"><li>• Eligible Shareholders may apply for new shares in excess of their entitlement. If demand for Additional New Shares exceeds the number of Additional New Shares available, Directors will scale back applications on a pro rata basis.</li></ul>
<b>Ranking</b>	<ul style="list-style-type: none"><li>• New shares issued under the Entitlement Offer will rank equally with existing shares.</li></ul>

# Entitlement Offer – Use of Funds

	If Entitlement Offer raises \$6.25 (Amount \$m)	If Entitlement Offer is 50% subscribed (Amount \$m)	If Entitlement Offer is 70% subscribed (Amount \$m)	If Entitlement Offer is 100% subscribed (Amount \$m)
Support sales and business development, support infrastructure and general working capital activities	1.11	2.86	2.86	2.86
Support cost down and product development and research activities	3.27	4.61	4.61	4.61
Capital for Product Development , Gen 3 Factory retooling and IP Protection	1.34	2.39	2.39	2.39
Funding supply chain raw materials and finished good inventory	0.33	0.92	1.26	1.26
Cash Reserves	-	0.37	4.61	11.47
Capital Raising Expenses	0.20	0.30	0.30	0.30
<b>TOTAL</b>	<b>6.25</b>	<b>11.45</b>	<b>16.02</b>	<b>22.89</b>

This use of funds is illustrative only of Redflow's present intention. The precise activities that will be undertaken and the allocation of total funds raised may change without notice depending on market conditions and circumstances generally from time to time. There is no guarantee that funds raised will be applied precisely in the manner set out above or in the amounts described, or that they will be adequate to meet the ongoing funding requirements of Redflow under its current business plan.



# Entitlement Offer - Timetable

Event	Date / Time
Announcement of Entitlement Offer	Thursday, 11 June 2020
Existing shares quoted on an 'ex-entitlement' basis	Monday, 15 June 2020
Record Date	7pm (Sydney time) Tuesday, 16 June 2020
Entitlement Offer opens Entitlement Offer Booklet and acceptance forms despatched to Eligible Shareholders	Friday, 19 June 2020
Entitlement Offer closes	5pm (Sydney time) Friday, 10 July 2020
Announcement of shortfall (if any) under the Entitlement Offer	Wednesday, 15 July 2020
Allotment date of new shares issued under the Entitlement Offer	Friday, 17 July 2020
Despatch of holding statements for New Shares issued under the Entitlement Offer	Monday, 20 July 2020
Normal trading of New Shares issued under the Entitlement Offer	

# Investment Risks

# Investment Risks

## GENERAL

There are a number of factors, both specific to the Company and of a general nature, which may affect the future operating and financial performance of the Company, its products, the industry in which it operates and the outcome of an investment in the Company. There can be no guarantee that the Company will achieve its stated objectives or that forward-looking statements will be realised.

This section describes certain, but not all, risks associated with an investment in the Company. Each of the risks set out below could, if it eventuates, have a materially adverse impact on the Company's operating performance, financial performance, financial position, liquidity and the value of its Shares.

Before deciding to invest in the Company, potential investors should read the entire Entitlement Offer Booklet and the risk factors that could affect the financial performance of the Company.

You should carefully consider these factors in light of your personal circumstances and seek professional advice from your accountant, stockbroker, lawyer or other professional adviser before deciding whether to invest.

## SPECIFIC RISK FACTORS

The Directors believe that there are a number of specific factors that should be taken into account before investors decide whether or not to apply for Shares. Each of these factors could have a materially adverse impact on the Company, its expansion plans, operating and product strategies and its financial performance and position. These include:

### Impact of COVID-19

The ongoing COVID-19 pandemic has had a significant impact on the global and Australian economy and the ability of businesses, individuals and governments to operate. Emergency powers and restrictions have been enacted on an international, Federal and State level in Australia which, amongst other things, has restricted travel and the ability of individuals to leave their homes and travel to places of work.

The Company has already experienced a material adverse impact on the Company's sales opportunities and its ability to progress various customer engagements over the second half of Q3 FY2020. Ongoing international and domestic travel restrictions, government lock down measures in key markets such as South Africa, and broader global uncertainty around a recovery of business activity has led to delays in progressing key sales opportunities and orders that were expected for Q4 FY2020.

COVID-19 has already increased unemployment in Australia and New Zealand and it could reduce further consumer and business discretionary spending and demand for the Company's products.

Given the high degree of uncertainty surrounding the extent and duration of COVID-19, it is not currently possible to assess the full impact of COVID-19 on the Company's business.

However, a number of aspects of the Company's business may be directly or indirectly affected by government, regulatory or health authority actions, work stoppages, lockdowns, quarantines and travel restrictions associated with COVID-19, including disruption to the Company's supply chain and workforce, particularly the availability of products and logistics (including shipping of materials and finished goods) and government imposed shut downs of manufacturing and distribution centres affecting the supply of products to customers.

There is a risk that if the duration of events surrounding COVID-19 are prolonged, the Company may need to take additional measures in order to respond appropriately (eg restructuring to reduce further costs from its business and raising additional funding).

There are also other changes in the domestic and global macroeconomic environment associated with the events relating to COVID-19 that are beyond the control of the Company and may be exacerbated in an economic recession or downturn. These include but are not limited to (i) changes in inflation, interest rates and foreign currency exchange rates; (ii) changes in employment levels and labour costs; (iii) changes in aggregate investment and economic output; and (iv) other changes in economic condition which may affect the revenue or costs of the Company.

### Sales and Revenue Risk

The Company currently operates on a negative cash operating basis in that its operating expenses exceed its revenue. The Company's revenue depends on the extent and timing of future product sales. There is a risk that sales may take longer than expected to materialise or not be realised at all, including as a result of COVID-19. For example, there are no guarantees that battery trials, system demonstrations or initial deployments will be successful or, even if successful, will convert into firm orders on a timely basis.

### Manufacturing Cost Reductions

The Company's business prospects are dependent on its ability to ramp up manufacturing capability and reduce the production costs of its batteries. In April 2018, the Company completed the relocation of its battery production facilities to Thailand. The Company is targeting the introduction of its new Gen3 product in the next 12 months, which has an objective to reduce manufacturing unit costs by 30% compared to the current Gen2.5 battery costs at 150 batteries per month production levels. The Company believes this can be achieved via key engineering projects, supplier cost reductions and manufacturing, plus productivity and process improvements

# Investment Risks

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There is no guarantee that this programme will be successfully implemented or that the necessary cost reductions will be achieved. If the Company is unable to reduce its cost of production sufficiently, the Company may not achieve profitability.

## Funding Risk

There is no guarantee that the monies raised under the Entitlement Offer will be adequate or sufficient to meet the ongoing funding requirements of the Company under its current business plan or to achieve a breakeven point.

If the Company requires access to further funding at any stage in the future, there can be no assurance that additional funds will be available either at all or on terms and conditions which are commercially acceptable to the Company. If the Company is unable to obtain such additional capital, it may be required to reduce the scope of its anticipated activities, which could adversely affect its business, financial condition and operating results.

## Product Risk

The Company's products are complex and now includes a battery which is capable of being deployed for various applications (including telecommunications, residential, small-scale and large-scale commercial use and application by utilities), a battery management system and a physical enclosure for its residential and commercial storage system. The Company is planning to introduce its new Gen3 product in the next 12 months, with customer trials targeted for December 2020.

There is an inherent risk that the products and enhancements (including the new Gen3 product) will contain defects or otherwise do not perform as expected (for example in terms of battery life and reliability). The Company undertakes product testing under laboratory and simulated field conditions, which aims to identify such problems before their release for field trials or use. Even after pre-release testing, there remains the risk of manufacturing or design defects, errors or performance problems that may only emerge over time and use in the field under operating conditions.

The Company provides a product warranty which is subject to a range of technical and operating conditions. However, the Company has not tested its battery over its full operating life either in the field or in simulated conditions.

If the Company's products fail to perform as expected or if production of the Company's products is subject to delays (including delays in the rollout of the Gen3 product), the Company could lose existing and future business and its ability to develop, market and sell its battery and energy storage systems could be harmed. Product defects or non-performance may also give rise to claims against the Company, diminish the brand or divert resources from other purposes, all of which could have a materially adverse impact on the Company financially and reputationally.

The Company's products will frequently be deployed in remote locations where reliability is important, and these problems could result in expensive and time-consuming design modifications or warranty charges, delays in the introduction of new products or enhancements (including the new Gen3 product), significant increases in service and maintenance costs, exposure to liability for damages, damaged customer relationships and harm to the Company's reputation, any of which may adversely affect its business and the Company's operating results.

The Company is dependent on the supply of raw materials for a number of different parts and components. While the Company follows a quality control process there are possible situations where the quality of raw materials supplied will adversely affect the performance of the product.

## Commercialisation risk

Rapid and ongoing changes in technology and product standards could quickly render the Company's products less competitive, or even obsolete if it fails to continue to improve the performance of its battery, its chemistry and battery management systems.

The Company continues to research, develop and manufacture zinc bromine flow batteries. The market for advanced rechargeable batteries is at a relatively early stage of development, and the extent to which the Company's zinc bromine batteries will be able to meet its customers' requirements and achieve significant market acceptance is uncertain.

One or more new, higher energy rechargeable battery technologies could be introduced which could be directly competitive with, or superior to, the Company's technology. Competing technologies that outperform the Company's battery could be developed and successfully introduced, and as a result, there is a risk that the Company's products may not be able to compete effectively in its target markets.

If the Company's battery technology is not adopted by its customers, or if its battery technology does not meet industry requirements for power and energy storage capacity in an efficient and safe design, the Company's battery will not gain market acceptance.

Many other factors outside of the Company's control may also affect the demand for its battery and the viability of adoption of advanced battery applications, including:

- performance and reliability of battery power products compared to conventional and other non-battery energy sources and products;
- success of alternative battery chemistries; and
- cost-effectiveness of the Company's products compared to products powered by conventional energy sources and alternative battery chemistries.

# Investment Risks

## **Reliance on system integrators as strategic partners**

The Company relies on key system integrators as strategic partners providing channels to market. A key part of its business plan is predicated on a steady expansion of the customer bases through development of its strategic system integrator relationships.

There may be a materially adverse effect on the Company if one or more of these strategic system integrator relationships is lost and not replaced or if a dispute arises between the Company and a systems integrator. There are also risks associated with being one step removed from the ultimate customer and end user.

The Company's system integrators may operate in multiple jurisdictions which are subject to differing regulatory requirements. There is a risk that these regulatory frameworks may expose the Company to obligations, claims and additional compliance costs in relation to its products, including storage, handling and disposal of chemicals.

## **Manufacturing risk - general**

There are risks which are inherent in manufacturing operations including machinery breakdowns, damage from flood and fire, below standard workmanship or materials, employee issues (including accidents), workplace health and safety and so on. Any adverse impact on production could have a materially adverse impact on the Company's ability to meet customer needs and the risk of customer claims and the Company's ability to achieve its expansion plans or its financial performance.

## **Manufacturing capacity risk**

As the Company will build its manufacturing capability based on its projection of future supply agreements, its business revenue and profits will depend upon its ability to enter into and complete these agreements, achieving competitive manufacturing yields and drive volume sales consistent with its demand expectations.

In order to fulfil the anticipated product delivery requirements of its potential customers, the Company will invest in capital expenditures in advance of actual customer orders, based on estimates of future demand. If market demand for the Company's products does not increase as quickly as it has anticipated and align with the Company's manufacturing capacity, or if the Company fails to enter into and complete projected development and supply agreements, the Company may be unable to offset these costs and to achieve economies of scale, which could materially affect its business and operating results.

Alternatively, if the Company experiences sales in excess of its estimates, it may be unable to support higher production volumes, which could harm customer relationships and overall reputation. The Company's ability to meet such excess customer demand could also depend on its ability to raise additional capital and effectively scale its manufacturing operations.

If the Company is unable to achieve and maintain satisfactory production yields and quality, its relationships with certain customers and overall reputation may be harmed, and its sales could decrease.

## **Manufacturing production and outsourcing risk**

The manufacturing and assembly of safe, long lasting batteries is a highly complex process that requires extreme precision and quality control throughout a number of production stages. Improving manufacturing processes will be an ongoing requirement both to reduce cost and improve battery performance and reliability by minimising manufacturing errors.

The Company has adopted a combination of outsourced and insourced component manufacturing of its battery parts to achieve the benefits of scalability, quality control, and cost efficiencies and to reduce its overall manufacturing risks (including the risk of damage to finished products when they are delivered from the factory to the customer).

The outsourced component of the Company's manufacturing strategy has associated risks. It means the Company is unable to directly control delivery schedules, quality assurance, manufacturing yields and production costs.

Any defects in battery packaging, impurities in the electrolyte or electrode materials used, contamination of the manufacturing environment, incorrect welding, excess moisture, equipment failure or other difficulties in the manufacturing process (including as a result of COVID-19) could cause batteries to be rejected or to fail in the field, thereby reducing yields and affecting the Company's ability to meet customer expectations.

Problems in the Company's manufacturing and assembly processes could limit its ability to produce sufficient batteries to meet the demands of potential customers.

## **Regulatory and compliance risk**

The Company uses hazardous substances including zinc bromine, zinc chloride and hydrochloric acid in the manufacture of its ZBM2s. Various regulatory requirements apply to the storage, handling and disposal of such chemicals. The Company must also comply with prescribed product standards in the various jurisdictions in which it operates, that are relevant to the manufacture, installation and operation of its battery.

There is a risk that the Company will be unable to comply with the regulatory requirements imposed on its batteries or that the cost of compliance will exceed expectations and have an adverse impact on the financial position of the Company. This may prevent the Company from accessing markets in certain jurisdictions.

# Investment Risks

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## **Sovereign Risk**

The Company's manufacturing operations in Thailand and a number of overseas battery deployment projects (including in South Africa) are subject to the risks associated in operating in foreign emerging countries. These risks may include economic, social or political instability or change, hyperinflation, or changes of law affecting foreign ownership, government participation, taxation, working conditions, rates of exchange, exchange control, export duties, capital controls, repatriation of income or return of capital, environmental protection, labour relations and government regulations that require the employment of local staff or contractors or require other benefits to be provided to local residents. No assurances can be given that the co-operation of such authorities, if sought by the Company, will be obtained, and if obtained, maintained.

It cannot be ruled out that the government of Thailand (or any other foreign jurisdiction in which the Company operates) may adopt substantially different laws, policies or conditions relating to foreign investment and taxation. The Company may also be hindered or prevented from enforcing its rights with respect to a governmental instrumentality because of the doctrine of sovereign immunity. Any future materially adverse changes in government policies or legislation in Thailand (or any other foreign jurisdiction in which the Company operates) in relation to foreign investment and ownership may affect the viability and profitability of the Company.

## **Supply risk**

The Company's manufacturing operations depend on obtaining raw materials, parts and components, manufacturing equipment and other supplies, including services from reliable suppliers in adequate quality and quantity, in a timely manner.

It may be difficult for the Company to substitute one supplier for another, increase the number of suppliers or change one component for another in a timely manner or at all due to the interruption of supply or increased industry demand (including as a result of COVID-19). This may adversely affect the Company's operations.

The prices of raw materials, parts and components and manufacturing equipment may increase due to changes in supply and demand. In addition, currency fluctuations and the weakening of the Australian dollar against foreign currencies may adversely affect the Company's purchasing power for raw materials, parts and components and manufacturing equipment from foreign suppliers.

If the Company is unable to secure key supply inputs in a timely and economically acceptable manner, it could have a materially adverse effect on its ability to meet customer demand and sell batteries profitably.

## **Thailand manufacturing personnel**

The Company's manufacturing facility depends on the recruitment and retention of skilled employees to produce quality batteries and meet customer demand. As at 30 April 2020, the facility was staffed to produce up to 80 batteries per month. Recently, to reflect the Company's current strategy to bring forward the introduction of the Gen3 product and as part of cost conservation measures (including as a result of COVID-19) the Thai workforce was reduced from 48 to 21. If the Company receives commercial scale orders, it will need to re-engage a number of personnel. There can be no assurance that the Company will be successful in attracting and retaining the skilled personnel necessary to meet any future demand for product. The inability to attract and retain qualified personnel could have a materially adverse impact on the Company.

## **Residential product risk**

The Company has developed a residential product. This is a maturing and price sensitive market, and the ongoing uptake in this market will depend upon the residential demand for green low carbon electricity generation and storage. Uptake may be affected by the future ability of the Company to meaningfully participate in various Australian state and federal battery schemes.

There is a commercial risk that the residential demand will not be as strong as expected and that changes in government policy will have an adverse impact on that demand.

## **Warranty risk, product liability and extended life cycle testing risk**

There is an inherent risk of defective workmanship or materials in the manufacture of the Company's products and for exposure to product liability for damages suffered by third parties attributable to the use of the product.

Defective products may have a materially adverse impact on the Company's reputation, its ability to achieve sales and commercialise its products and on its financial performance due to warranty obligations. It may also give rise to product liability claims. The Company will mitigate this risk via the usual contractual provisions which exclude liability for consequential loss and so on, but it is not possible to protect the Company against reputational loss.

The Company provides a product warranty which is subject to a range of technical and operating conditions. The battery has not however been tested over its full operating life either in the field or in simulated conditions.

# Investment Risks

## Intellectual property and patent risk

The ability of the Company to maintain protection of its proprietary intellectual property and operate without infringing the proprietary intellectual property rights of third parties is an integral part of the Company's business.

To protect its proprietary intellectual property, the Company has patents through its wholly owned subsidiary, Redflow R&D Pty Ltd. In addition, the Company has patent applications in various stages of the examination process in various jurisdictions. There is a risk that some or all of the patent applications will not be accepted, either in Australia or overseas and that other persons may be able to commercially exploit the proprietary intellectual property.

The granting of protection such as a registered patent does not guarantee that the rights of third parties are not infringed or that competitors will not develop technology to avoid the patent. Patents are territorial in nature and patents must be obtained in each and every country where protection is desired. There can be no assurance that any patents which the Company may own or control will afford the Company significant protection of its technology or its products have commercial application.

Competition in obtaining and sustaining protection of intellectual property and the complex nature of intellectual property can lead to disputes. The Company has, and may in the future, enter into commercial agreements under which intellectual property relevant to the Company and its ZBM2s, and which is created by the counterparty or jointly created by the Company and the counterparty, will not be owned exclusively by the Company. In these circumstances the Company will seek to negotiate an appropriate licence to use any such intellectual property.

There is a risk that such newly created intellectual property not exclusively owned by the Company, will be material to the Company and there is no guarantee that the Company will be able to enter into appropriate agreements to use it either at all or on commercially acceptable terms and conditions, or on a timely basis. The inability to secure rights to use such intellectual property could have a material impact on the Company's ability to sell or otherwise commercialise its products, and its financial performance.

## Reverse engineering risk and trade secret risk

There is a risk of the Company's products and battery management system being reverse engineered or copied. Redflow relies on trade secrets to protect its proprietary technologies, especially where it does not believe patent protection is appropriate or obtainable. However, trade secrets are difficult to protect. The Company relies in part on confidentiality agreements with its employees, contractors, consultants, outside scientific collaborators and other advisors to protect its trade secrets and other proprietary information.

These agreements may not effectively prevent disclosure of confidential information and may not provide an adequate remedy in the event of unauthorised disclosure of confidential information. Costly and time-consuming litigation could be necessary to enforce and determine the scope of the proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect the Company's competitive business position.

## Personnel risk

Redflow may not be able to successfully recruit and retain skilled employees, particularly scientific, technical and management professionals.

The Company believes that its future success will depend in large part on its ability to attract and retain highly skilled technical, managerial and marketing personnel who are familiar with its key customers and are experienced in the battery industry. Industry demand for employees with experience in battery chemistry and battery manufacturing processes exceeds the number of personnel available, and the competition for attracting and retaining these employees is intense. This competition will intensify if the advanced battery market continues to grow, possibly requiring increases in compensation for current employees over time.

The Company cannot be certain that it will be successful in attracting and retaining the skilled personnel necessary to operate its business effectively in the future. Due to the highly technical nature of its battery, the loss of any significant number of the Company's existing engineering and project management personnel could have a materially adverse effect on its business and operating results.

The Company relies heavily on its senior executives and engineering team. There can be no assurance that the Company will be able to retain its key personnel or recruit suitable technical staff as replacements. The loss of key personnel could have a materially adverse impact on the Company.

## Information technology

The Company relies heavily on its computer hardware, software and information technology systems. Should these not be adequately maintained, secured or updated or the Company's disaster recovery processes not be adequate, system failures may negatively impact on its performance.

## Dividends

There is no guarantee as to future earnings of the Company or that the Company will be profitable at any time in the future, and there is no guarantee that the Company will be in a financial position to pay dividends at any time in the future.

# Investment Risks

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## Exchange rates

The Company is potentially exposed to movements in exchange rates. The Company's financial statements are expressed and maintained in Australian dollars. However, a portion of the Company's income and costs are earned in foreign currencies and this proportion may increase materially. Exchange rate movements affecting these currencies (including as a result of the circumstances surrounding COVID-19) may impact the profit and loss account or assets and liabilities of the Company (to the extent the foreign exchange rate risk is not hedged or not appropriately hedged) and the general competitiveness of the Company's products in the market.

## GENERAL RISK FACTORS

### Share market

On completion of the Entitlement Offer, the New Shares may trade on the ASX at higher or lower prices than the Issue Price. Investors who decide to sell their New Shares after the Entitlement Offer may not receive the amount of their original investment. The price at which the New Shares trade on the ASX may be affected by the financial performance of the Company and by external factors over which the Directors and the Company have no control.

These factors include movements on international share and commodity markets, local interest rates and exchange rates, domestic and international economic conditions, government taxation, market supply and demand and other legal, regulatory or policy changes.

### Dependence on general economic conditions

The operating and financial performance of the Company is influenced by a variety of general economic and business conditions, including levels of consumer spending, inflation, interest rates and exchange rates, access to debt and capital markets, government fiscal, monetary and regulatory policies.

A prolonged deterioration in general economic conditions (whether or not due to COVID-19), including an increase in interest rates or a decrease in consumer and business demand, could be expected to have a materially adverse impact on the Company's business or financial condition. Changes to laws and regulations or accounting standards which apply to the Company from time to time could adversely impact the Company's earnings and financial performance.

### Tax risk

Any change to the company income tax rate in jurisdictions in which the Company operates will impact on shareholder returns, as will any change to the income tax rates applying to individuals or trusts. Any change to the tax arrangements between Australia and other jurisdictions could have an adverse impact on future earnings and the level of dividend franking.

## Legislative and regulatory changes

Legislative or regulatory changes in jurisdictions in which the Company operates, including property or environmental regulations or regulatory changes in relation to products sold by the Company, could have an adverse impact on the Company.



# Appendices

# Redflow Battery Performance

## *Independent Australian government funded testing show sustained performance*

- Redflow is part of a Australian federal government funded testing of multiple batteries through the Canberra Institute of Technology. Managed by ITP Renewables
- After some earlier challenges with battery manufacturing faults, Thailand manufactured Redflow battery has been on test since Feb 2019
- The battery is cycled twice per day close to 100% Depth of Discharge charging at approximately 2.7kW and discharging at approximately 2.0kW.
- April 2020 report shows a State of Health of 100% after ~600 cycles. See report [here](#)
- Latest Redflow internal analysis of battery on ITP test bay shows no changes in the capacity, performance and behaviour of the battery can be determined after more than 700 equivalent cycles (>7000 kWh out). Analysis conducted 23<sup>rd</sup> May 2020.

## Redflow Battery Test – Delivered Energy

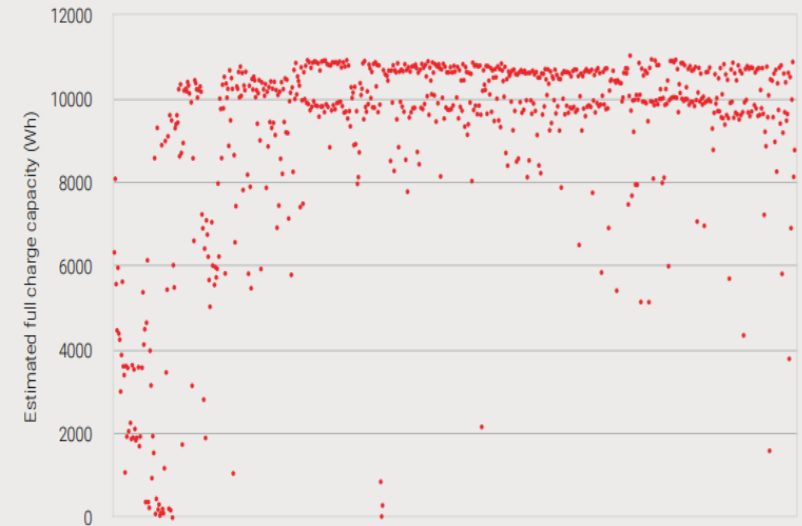


Figure 8: Estimated full charge capacity per cycle by the Redflow battery pack

Graph extract from ITP *Public Report 8 Lithium-ion Battery Testing*, April 2020 which shows energy discharged from the battery during testing cycles. See report [here](#).

# ZBM2 Technical Specifications

## ZBM2 Technical Specifications

<b>Voltage</b>	48 Volt DC nominal batteries (typical operating range 40-60V)
<b>Capacity</b>	Maximum 10kWh energy output per daily cycle No reserved battery capacity requirement – full 10kWh cycle depth available
<b>Dimensions</b>	845 L x 823 H x 400 W (mm) 33 L x 32 H x 16 W (in)
<b>Weight</b>	240 kg (530 lb) with electrolyte 90 kg (198 lb) without electrolyte
<b>Electrolyte volume</b>	100 L (26Gal)
<b>Energy efficiency</b>	80% DC-DC Max
<b>Internal (electrolyte) operating temperature</b>	Operating electrolyte temperature range of 15°C to 50°C (59°F to 122°F), ZBM2 can typically operate at ambient temperatures outside this range for extended periods
<b>Communication</b>	MODBUS RS485
<b>Safety data sheet</b>	DG Class 8 for electrolyte
<b>Power rating</b>	3kW (5kW peak) 3kW continuous: current up to 75A (40V disconnection point) *1 5kW duration depending on the State of Charge (SOC): current up to 125A (40V disconnection point) *1, 2
<b>Regulatory compliance marks</b>	CE and RCM
<b>Performance</b>	No cycle depth limitations – battery performance and lifetime is not sensitive to cycle depth



\* 1 Values reported for ZBM2 at 100% state of health (SOH) and room temperature

\* 2 Redflow internal testing shows a 5kW supply for approximately 45 minutes before disconnection, for a ZBM2 starting at 100% state of charge (SOC)

Source: <https://redflow.com/products/redlow-zbm2/>