

# V-KOR Vanadium Battery Technology

## Further Information for Investors

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

## Disclaimer

Certain statements contained in this presentation may constitute forward looking statements. Such forward-looking statements involve a number of known and unknown risks, uncertainties and other factors which may cause the actual results, performance or achievements of Protean Energy Limited (the Company) to be materially different from actual future results and achievements expressed or implied by such forward-looking statements. Investors are cautioned not to place undue reliance on these forward-looking statements. The information contained herein has been prepared solely for informational purposes and is not an offer to buy or sell or a solicitation of any offer to buy or sell any security or to participate in any trading strategy or to enter into any transaction.

## Minerals Exploration in South Korea

This presentation may describe Measured, Indicated and/or Inferred Resources. Inferred Resources have a greater amount of uncertainty as to their existence and greater uncertainty as to their economic feasibility. It cannot be assumed that all or any part of any Inferred Resource will ever be upgraded to a higher category. The potential quantity and grade of the Daejon Uranium Project Conceptual Exploration Targets is conceptual in nature and there has been insufficient exploration to define a Mineral Resource and it is uncertain if further exploration will result in the determination of a Mineral Resource.

Exploration is an inherently risky proposition and investors are advised that most exploration projects fail to identify economic resources. The Company has at present not confirmed the economic viability of any resources at the project. The Company plans further drilling programmes and studies with the objective of confirmation of any deposits and ultimately completing a feasibility study to demonstrate the economics of the resources.

## Competent Person Statement

The information contained in this ASX release relating to exploration results and Mineral Resources has been compiled by Mr Ian Glacken of Optiro Ltd. Mr Glacken is a Fellow of The Australasian Institute of Mining and Metallurgy and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2004 and 2012 editions of the “Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves”. Mr Glacken consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

## Research and Development

There are many risks inherent in the development of technology of products like the V-KOR range of batteries, particularly as these products are in the pre-commercial stage of development. The development of the V-KOR ESS can be delayed or fail to demonstrate any benefit, or research may cease to be viable for a range of scientific or commercial reasons

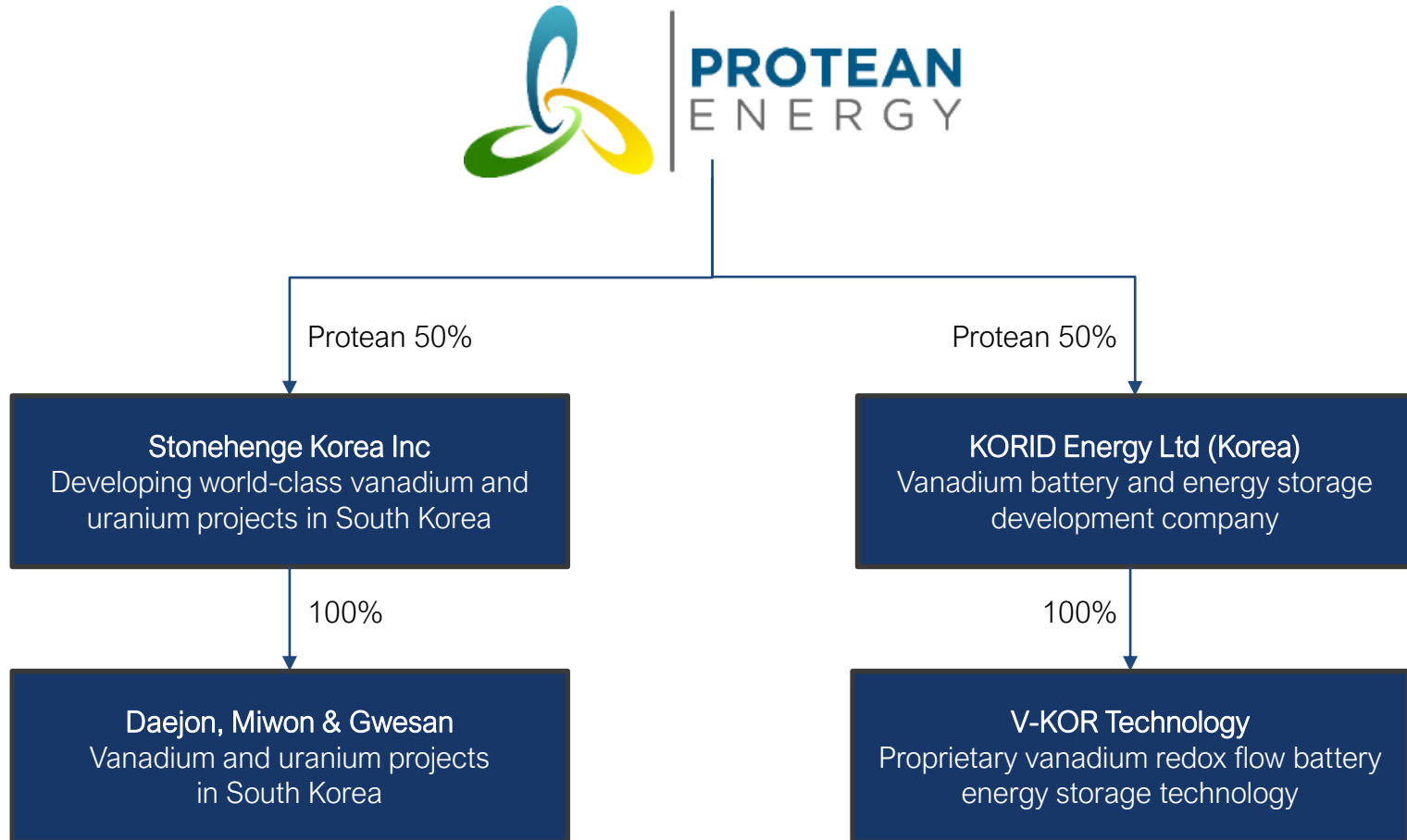
1	Protean Energy Overview	4
2a	V-KOR Vanadium Battery Technology	7
2b	V-KOR Perth Trial	15
2c	VRFB and Energy Storage Market	18
3	Korean Vanadium Projects	25
4	Appendix	31



## (1) Protean Energy Overview

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

Protean Energy Limited (ASX: POW) is a vertically integrated, vanadium resource and battery development company. The Company is focused on advancing its South Korean vanadium mineral projects and the commercialisation of its vanadium battery and energy storage technology.



## Market Capitalisation and Enterprise Value<sup>1,2</sup>

Ordinary shares on issue	Number	299,199,841
Share price (18 May 18)	A\$/share	0.034
<b>Market Capitalisation</b>	<b>A\$m</b>	<b>\$10.2m</b>
Cash (as at 31 Mar 18) <sup>3</sup>	A\$m	\$3.1m
Listed Securities (DST: Korean listed) <sup>4</sup>	A\$m	~\$1.7m
<b>Enterprise Value</b>	<b>A\$m</b>	<b>\$5.4m</b>

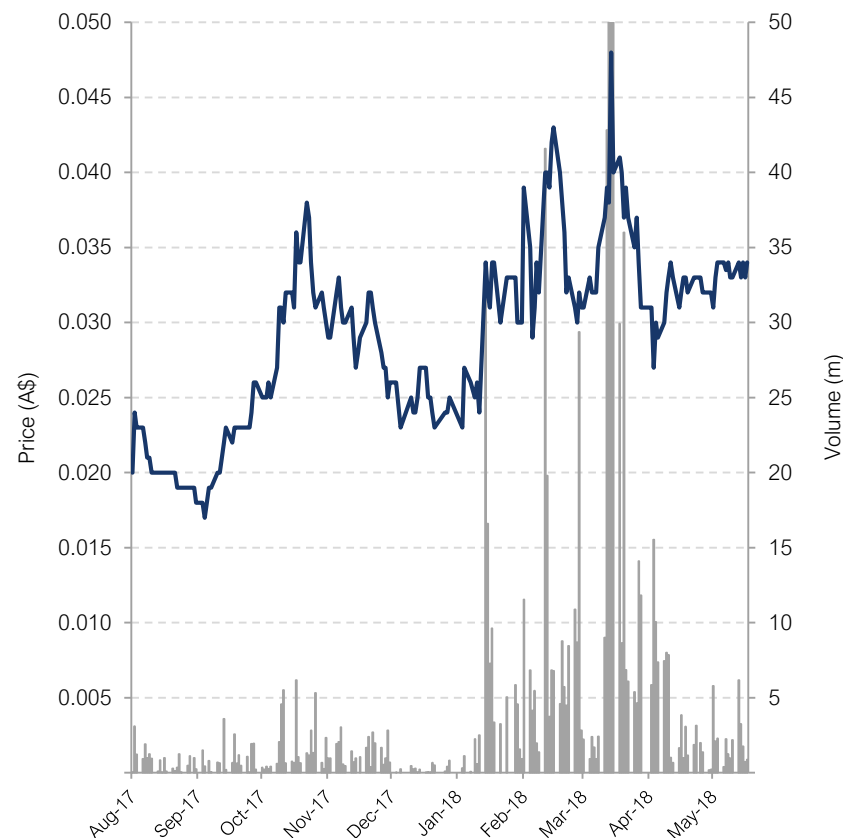
## Board of Directors

Name	Position
Bevan Tarratt	Non-Executive Chairman
Wayne Loxton	Non-Executive Director
Young Yu	Non-Executive Director
Dave Wheeler	Non-Executive Director

### Notes:

1. Excludes 5,265,996 Performance Rights, 5,316,666 Performance Rights subject to vesting and 8,202,796 Unlisted Options.
  2. Excludes 47,000,000 adviser options and 38,000,000 options issued to the Directors of the Company. As per the Notice of General Meeting dated 5 April 2018.
  3. Comprising cash as at 31 March 2018 of A\$2.79 million and R&D tax rebate receivable of A\$323,229.
  4. Based on the closing share price of DST Company Limited (KOSDAQ: 033430) on 18 May 2018 and KRW:AUD exchange rate of 810.25.
- Source: Bloomberg as at 18 May 2018, Company Announcements.

## Share Price / Volume History (A\$; millions)





## (2a) V-KOR Battery Technology

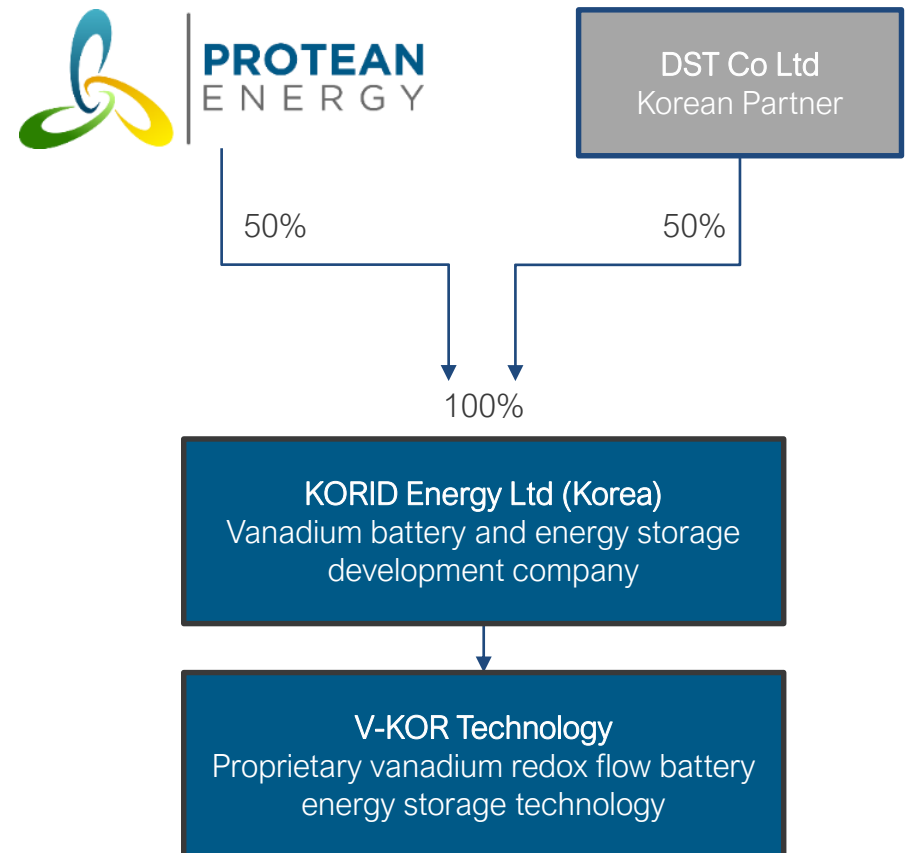
**Image:** Rongke Power's factory that produces vanadium redox-flow batteries for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

# VANADIUM REDOX FLOW BATTERY TECHNOLOGY

Protean (50%) and its Korean partner, DST Co Ltd (50%), own 100% of KORID Energy Ltd. KORID is developing proprietary vanadium redox flow battery (VRFB) energy storage technology.

- ⚡ Protean and DST, via KORID Energy, are developing VRFB technology, known as V-KOR
- ⚡ V-KOR is a commercial ready rechargeable flow battery technology that stores energy for longer and with a greater life expectancy than existing battery solutions
- ⚡ V-KOR systems are fully scalable with built solutions from 2kW to 20MW and larger to suit customer specific requirements
- ⚡ V-KOR has been developed over the last ten years and the technology is patent protected
- ⚡ ~AUD\$120,000 grant from a Korean government agency, KETEP, utilised to fund the V-KOR trial (25kw/100kWh) in Western Australia

## Ownership Structure of V-KOR Battery Technology



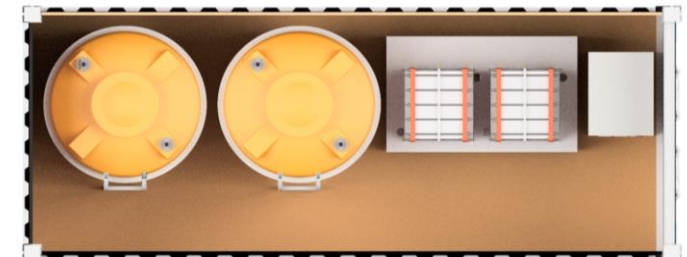


KORID's VRFB technology is a modular "plug and play" containerised utility scale storage solution.

## Composition of Korid Energy's V-KOR VRFB



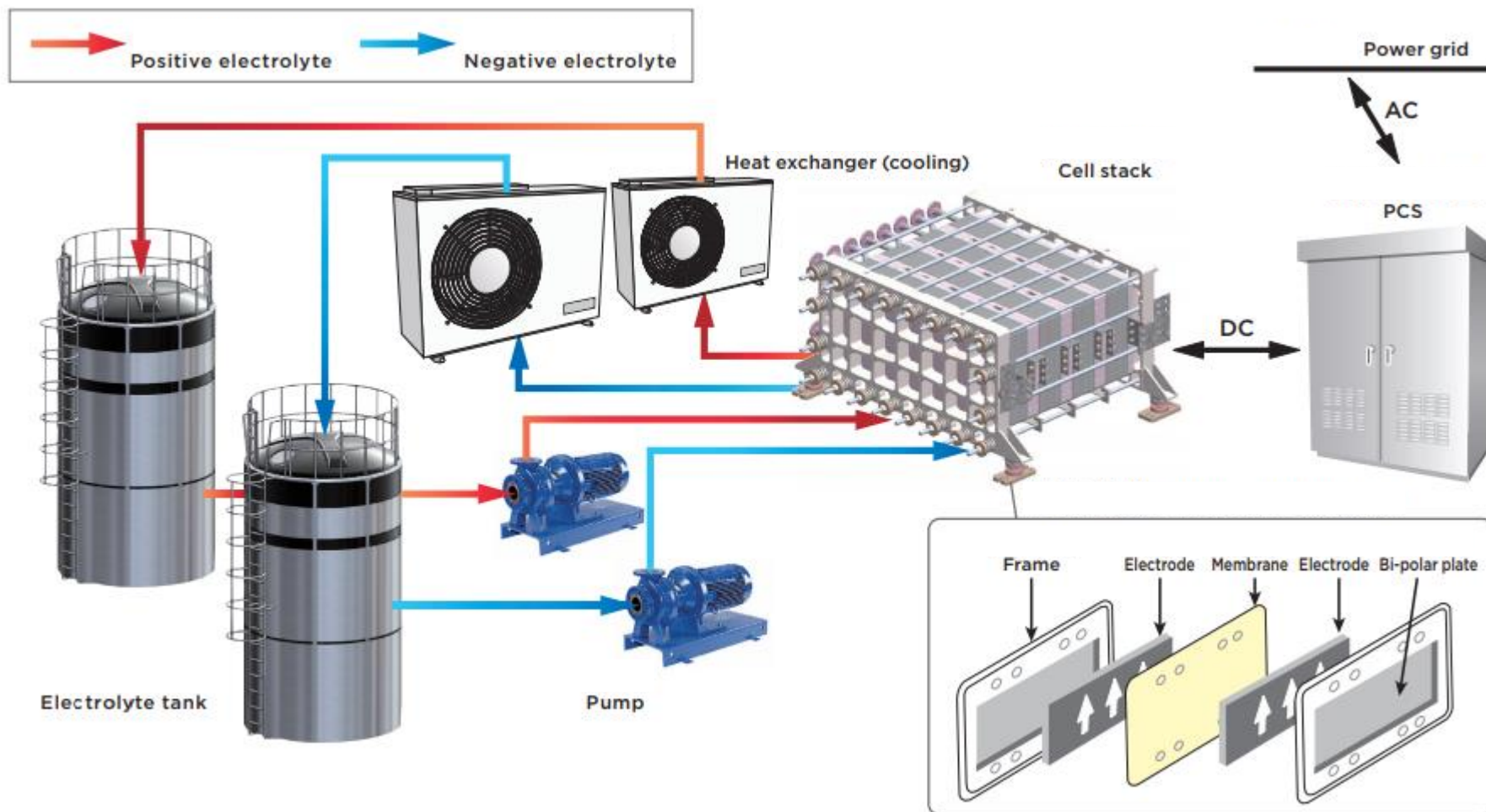
V-KOR components contained within a standard 20ft shipping container



- 1 Electrolyte tanks
- 2 Cell stacks / membrane
- 3 Pumps and other balance of plant equipment
- 4 Power conversion system (including control system, communications, inverter, electrical wiring, etc.)
- 5 Standard size shipping container

# COMPOSITION OF STANDARD VRFB

VRFB use a circulating electrolyte solution of vanadium pentoxide to store the charge in tanks.



Source: Sumitomo website.

# HOW DOES VRFB TECHNOLOGY WORK?

VRFB use a circulating electrolyte solution of vanadium pentoxide to store the charge in tanks.



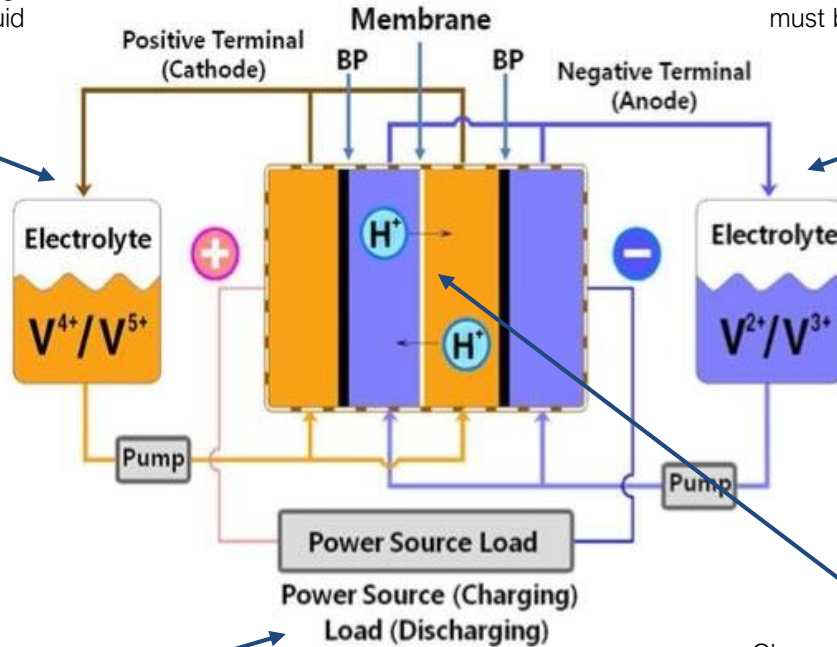
V-KOR Electrolyte tank (+VE)

Energy is stored in tanks as charged vanadium liquid electrolyte



V-KOR Electrolyte tank (-VE)

When electrolyte has released energy, it must be recharged



V-KOR power conditioning system

Sends electricity to grid when demand is needed. Process is reversed and solar energy or other energy sources (wind etc.) recharge battery when demand is low



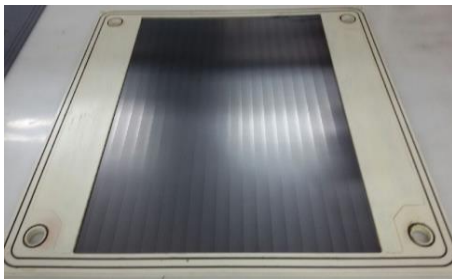
V-KOR cell stack

Charges are transferred across the cell stacks/membrane from one liquid to the other, depending on whether the battery is storing or releasing electricity

# V-KOR STACK TECHNOLOGY

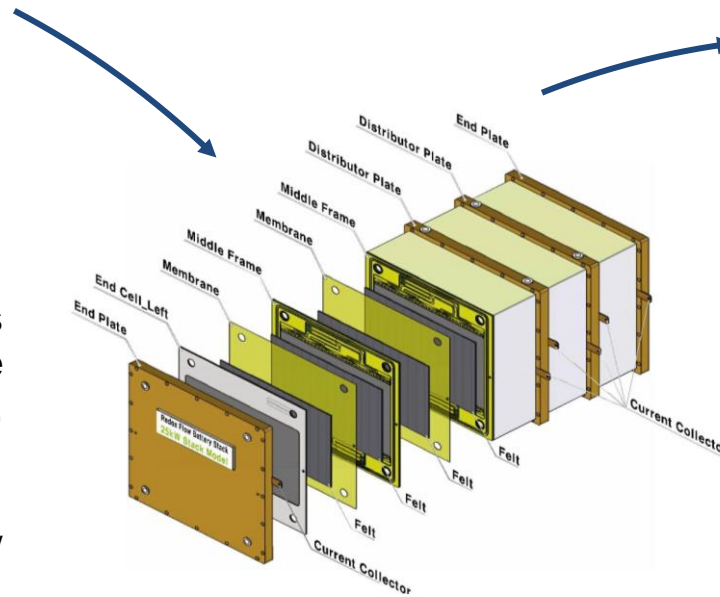
The V-KOR stack technology is aimed at improving battery performance and lowering manufacturing costs compared to conventional VRFB technology.

- ⚡ Each VRFB stack is made up of a series of multi cell frames
- ⚡ Cell frames are stacked up in repeating series to form a number of cells within the overall battery stack



V-KOR cell frame

- ⚡ Four stack sizes of batteries have been developed to date by Korid including a 2.5kW, 5kW, 10kW and 25kW
- ⚡ Developing and testing new stack system up to 50kW



Structure of V-KOR VRFB stack

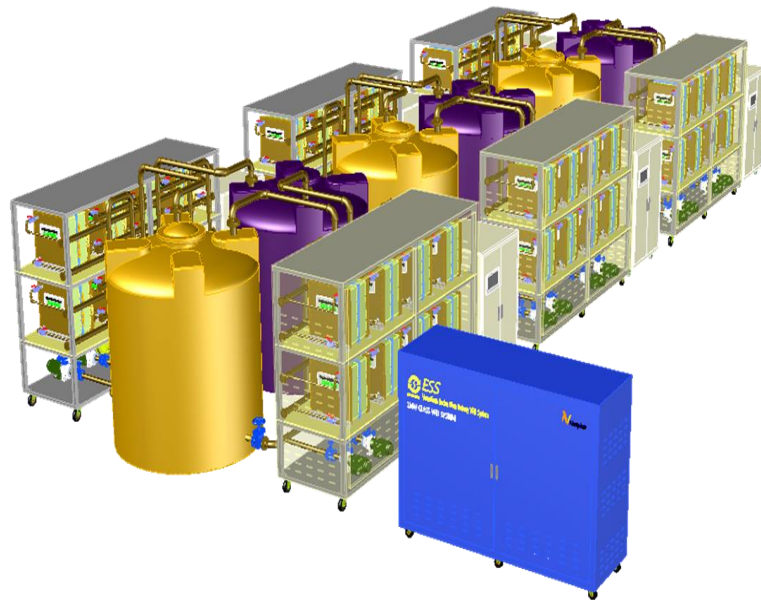


V-KOR 25kW class stack

The V-KOR battery solutions are built to order for commercial, industrial and grid scale applications.

- ⚡ V-KOR has been developed over the past ten years and patents are granted to protect the design
- ⚡ Four stack sizes of batteries have been developed to date including a 2.5kW, 5kW, 10kW and 25kW
- ⚡ Technology is expected to drive the adoption of clean energy solutions

V-KOR: 3.6MW large scale grid battery concept



V-KOR: off-grid battery concept

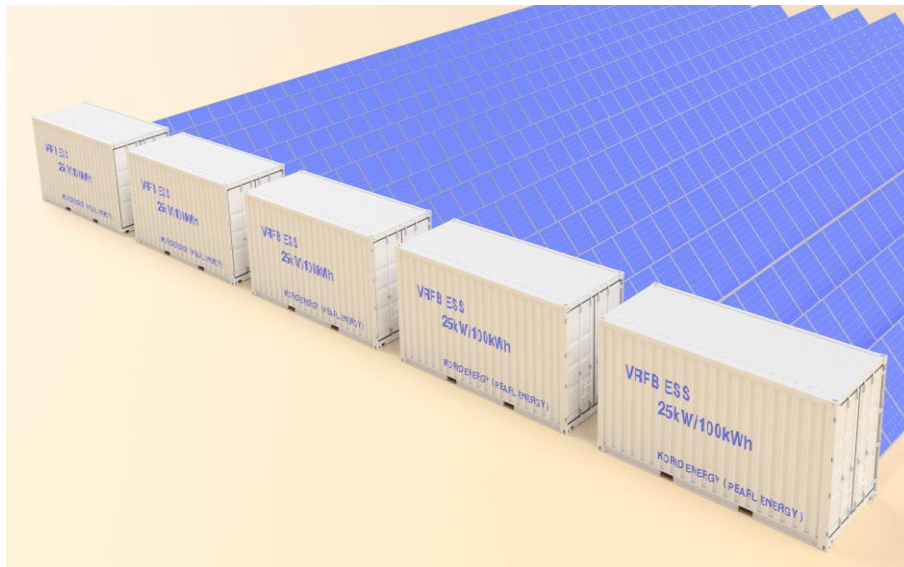


# ABILITY TO SCALE V-KOR TECHNOLOGY

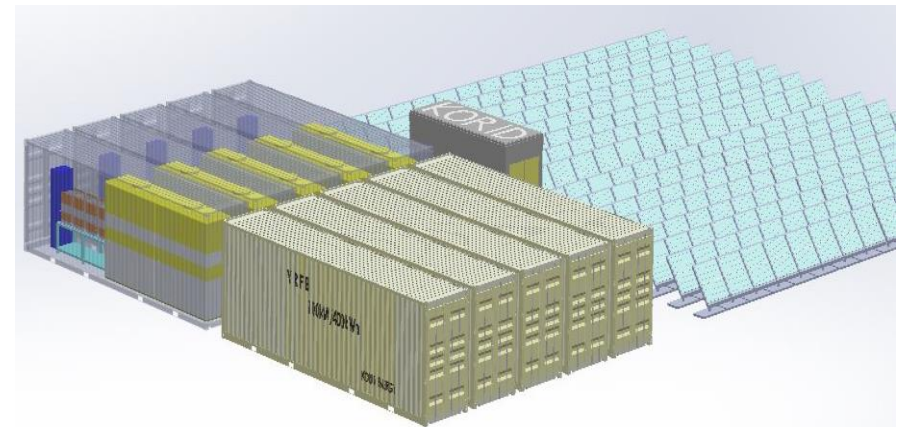
An important attribute of VRFB systems is that their energy capacity is independent of the power rating, allowing them to be designed for highly specific energy and power requirements and making them well suited to applications with large energy capacity specifications.

⚡ Whether in combination with solar pv, wind power or grid power – the vanadium redox flow energy storage system aims to ensure uninterrupted power supply

Illustrative V-KOR system (25kw/100kWh) being utilised via a solar PV



Illustrative V-KOR system (1MW/4MWh) being utilised via a solar PV



## Bloomberg

“In China, vanadium-flow batteries are emerging as an alternative to lithium-ion, according to Gary Yang, founder of UniEnergy Technologies” Bloomberg (26 January 2018)



## (2b) V-KOR Perth Trial

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

# PERTH TRIAL COMMENCING JUNE 2018

The V-KOR trial battery has arrived in Perth from South Korea for 1<sup>st</sup> Australian deployment. Trial to commence in June 2018 at Ozlinc Industries and will run for 4 months.

- ⚡ 25kW (100kWh) V-KOR vanadium redox flow battery arrived in Perth in May 2018 for a trial deployment
- ⚡ The V-KOR trial battery consists of 2 electrolyte tanks, 2 battery stacks of 12.5kW, one 25kW inverter, associated electrolyte pumps and a power management system. The battery is housed in a 20-foot container, oversized to allow for ease of inspection during the trial period



V-KOR 25kW (100kWh) unit



- ⚡ Trial to commence at OzLinc Industries in O'Connor, Perth
- ⚡ OzLinc is a supplier of pipe, fittings, flanges, valves and hosing to the Australian marine, industrial and resources sectors
- ⚡ The V-KOR demonstration battery will be charged by a 21.1kW rooftop solar PV grid connected system



# V-KOR: UPCOMING NEWS FLOW

Significant upcoming news flow as a result of 1<sup>st</sup> V-KOR installation project in Western Australia.

Details	Stage	Timing
Completion of acquisition of 50% interest in KORID Energy Ltd	✓	March 2017
V-KOR secures ~AUD\$120,000 in grant funding from the Korean government	✓	June 2017
Announced 1 <sup>st</sup> V-KOR battery (25kW/100kWh) deployment in Western Australia	✓	April 2018
Installation of V-KOR battery in Western Australia	Battery arrived in Perth	May 2018
Trial to commence (battery trial terms) at OzLinc Industries in O'Connor, Perth, Western Australia	✓	June 2018
V-KOR battery trial interim progress report	✓	H2 2018
Results of Western Australia V-KOR battery trial	✓	H2 2018



## (2c) VRFB and Energy Storage Market

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

Vanadium redox flow batteries are fast becoming a preferred choice for suppliers and there are a number of companies worldwide which are commercialising this technology.

⚡ Redox flow batteries are rechargeable batteries that are charged and discharged by means of the oxidation-reduction reaction of ions of vanadium or the like

Advantage over other systems include:

- ✓ Scalability
- ✓ Lifespan of 20 years
- ✓ Immediate energy release
- ✓ Excellent charge retention (up to 1 year)
- ✓ Suitability for grid connection
- ✓ Ability to discharge 100% with no damage
- ✓ Key feature of using only one element in electrolyte;  $V_2O_5$

⚡ This makes them useful for grid scale applications, including grid balancing, and storing energy from variable output sources, including wind turbines and solar cells

## Vanadium redox flow battery technology

*Sumitomo 60MWh power generation and storage facility, installed in Hokkaido, Japan*



## Bloomberg





“The dominant form of energy storage is lithium-ion technology, but there are advantages to vanadium-flow batteries. They last longer and can be charged and discharged repeatedly without any significant drop in performance”

**Bloomberg (10 April 2018)**

# THE BATTERY MARKET

Vanadium redox flow batteries have a number of advantages compared to existing and competing battery technologies. VRFBs last longer and can be charged and discharged repeatedly without any significant drop in performance.

## Select battery technology comparisons

Details (USD)	Vanadium Redox Flow	Zinc Bromine Flow	Lithium-ion	Lead Acid
Image				
Upfront cost (USD/kwh)	\$580-820 <sup>2</sup>	\$800 –875	\$600 –1,100 <sup>2</sup>	\$100 – \$200 <sup>2</sup>
Lifetime cost (USD/kWh LCOE)	\$0.25 - \$0.45 <sup>3</sup>	\$0.20 – \$0.30	\$0.15 – \$0.75	\$0.25 – \$0.50
Storage capacity	Unlimited <sup>4</sup>	Medium 3 – 10hrs	Short 1 – 4hrs	Medium-high 4 – 100hrs
Battery life span	>20 years <sup>2</sup>	>10 years <sup>1</sup>	5-10 years	5-10 years
Cycle	>10,000	1,000 – 10,000 <sup>1</sup>	500 – 5,000	1,000 – 5,000
Depth of discharge	100%	100%	75%	50%
Safety	Low risk	Low risk	Fire risk	Low risk

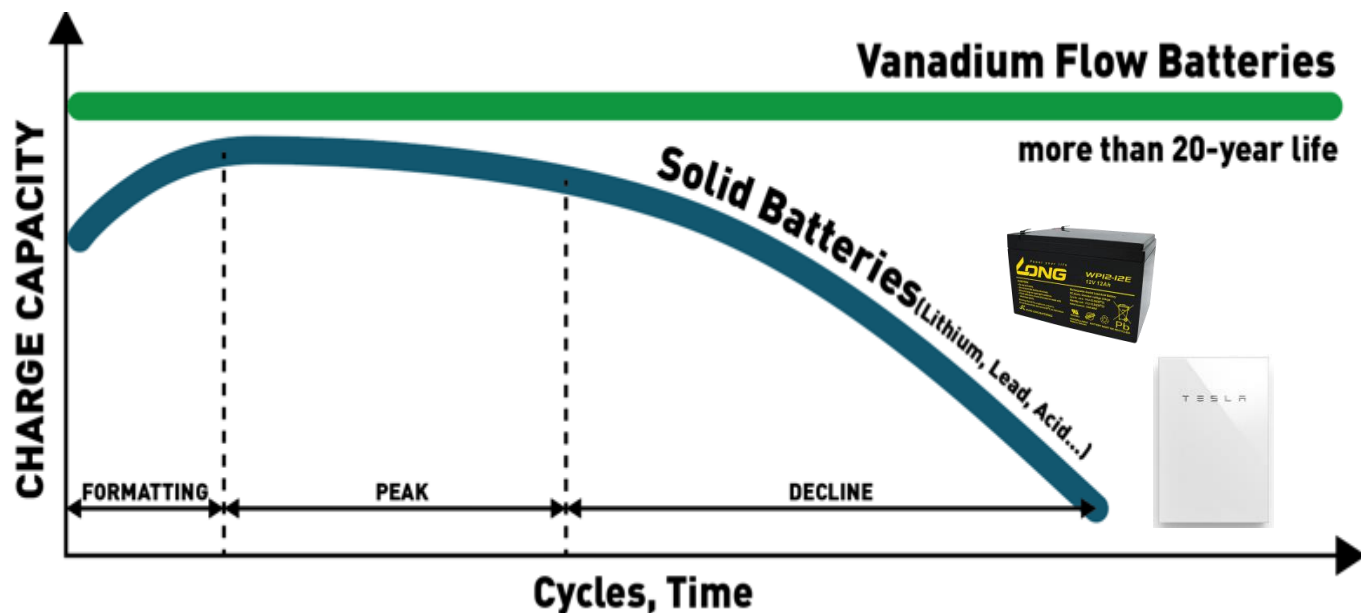
Notes:

1. ZBM2 expected stack life of 10 years / 40,000 kWh regardless of cycle depth.
- Source: Redflow Limited (ASX: RFX) investor presentation.
2. Energy Exchange conference presentation, Pacific Northwest National Laboratory, August 1 2017
3. SA Energy Storage conference 2017, Mott MacDonald Africa (Pty) Ltd
4. Storage capacity is limited only by the volume of electrolyte

# VRFB VS LITHIUM-ION

Lithium-based batteries are well suited to consumer electronics and electric vehicles, their lifetimes can be limited.

- ⚡ VRFB technology can be fully discharged over an almost unlimited number of charge and discharge cycles without degrading
- ⚡ This is an important factor when matching the daily demands of utility-scale solar and wind power generation



## Bloomberg

“I don’t think anyone would dispute that it’s (VRFB) superior to lithium-ion in large-scale grid applications”  
**Bloomberg**  
(25 January 2018)

Source: [www.vrbenergy.com](http://www.vrbenergy.com)

# LEADING TO MASSIVE DEPLOYMENTS OF VRFBs








Technical and economic fundamentals are leading to massive deployment of VRFBs, especially in Asia - large scale VRFB projects being delivered in Japan and China.

Details	Sumitomo's 60MWh in Japan	Rongke Power's 800MWh in China	Pu Neng's 500MWh in China
Image			
Location	Hokkaido, Japan	Dalian City, China	Hubei province, China
Stage	Commenced operations in 2015	Approved by China National Energy Administration in May 2016	3-phase project to be finished by 2020
Developer			
Scale	60MWh (15MW for 4h)	800MWh (200MW)	<b>Phase 1:</b> 12MWH (3MW) <b>Total Project:</b> 500 MWH (100MW)
Application	Stabilise the flow of wind and solar power on the northern island of Hokkaido	Project will provide peak-shaving as well as form another load center for the Dalian peninsula, enhancing grid stabilisation	Project will serve as a critical peak power plant, delivering reliability and emissions reductions

These large VRFBs are part of China's new National Development Plan's "focus includes 100MW-grade, vanadium redox flow battery energy storage stations"

Source: Company Announcements.

# VRFB – SELECT MARKET PARTICIPANTS

Company	KORID Energy	UET	Pu Neng	Sumitomo Electric	Rongke Power	Bushveld Energy	VSUN Energy
Image							
Business location	South Korea	USA	China	Japan	China	South Africa	Australia
Business description	<ul style="list-style-type: none"> <li>Founded in 2012</li> <li>Korea based VRFB technology developer and manufacturer</li> </ul>	<ul style="list-style-type: none"> <li>Founded in 2012</li> <li>USA based VRFB technology developer and manufacturer</li> </ul>	<ul style="list-style-type: none"> <li>China based VRFB technology developer and manufacturer</li> <li>Chairman is Robert Friedland</li> </ul>	<ul style="list-style-type: none"> <li>Part of Sumitomo group, one of the largest general trading companies</li> </ul>	<ul style="list-style-type: none"> <li>Founded in 2008</li> <li>China based VRFB technology developer and manufacturer</li> </ul>	<ul style="list-style-type: none"> <li>Subsidiary of Bushveld Minerals (AIM: BMN)</li> <li>Focused on delivering VRFB solutions across Africa</li> </ul>	<ul style="list-style-type: none"> <li>Subsidiary of Australian Vanadium (ASX: AVL)</li> </ul>
Valuation	Owner of 50% of KORID = Protean with Mkt Cap of A\$10m	Private >US\$350m in funding	Private >US\$90m in funding	Sumitomo Electric Mkt Cap of A\$17bn	Private	Bushveld Minerals Mkt Cap of A\$413m	Australian Vanadium Mkt Cap of A\$64m
Develop VRFB systems?	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>Utilise other manufacturers systems</li> </ul>	<ul style="list-style-type: none"> <li>Utilise other manufacturers systems</li> </ul>
Projects	<ul style="list-style-type: none"> <li>Commercial ready technology</li> <li>Perth trial commencing Jun-18</li> </ul>	<ul style="list-style-type: none"> <li>88MW/350MWh of systems deployed, contracted or ordered</li> </ul>	<ul style="list-style-type: none"> <li>Developing 3 phase project in Hubei 500MWh (100MW)</li> </ul>	<ul style="list-style-type: none"> <li>Large number of installations dating back to 2000</li> </ul>	<ul style="list-style-type: none"> <li>Developing project in Dalian City, China (800MWh)</li> </ul>	<ul style="list-style-type: none"> <li>Announced in November 2017 first utility VRFB deployment with Eskom and IDC (120Kw/450kWh)</li> </ul>	<ul style="list-style-type: none"> <li>Installation and operation of first VRFB in Western Australia during Sep-16</li> </ul>
Other	<ul style="list-style-type: none"> <li>V-KOR range of batteries has been developed over the last ten years and the technology is protected by a suite of patents</li> </ul>	<ul style="list-style-type: none"> <li>Operate a 60,000 ft<sup>2</sup> manufacturing facility in USA, scaling up to produce 100 megawatts p.a.</li> </ul>	<ul style="list-style-type: none"> <li>Secured investment from HPX in May-17</li> <li>HPX is a fund led by Robert Friedland</li> </ul>	<ul style="list-style-type: none"> <li>60MWh power generation and storage facility, installed in Hokkaido, Japan</li> </ul>	<ul style="list-style-type: none"> <li>Strategic partnership with UET</li> </ul>	<ul style="list-style-type: none"> <li>UET is producing the VRFB for the Eskom and IDC project in South Africa</li> </ul>	<ul style="list-style-type: none"> <li>Successfully installed electrolyte pilot plant at UWA during Jan-17</li> </ul>

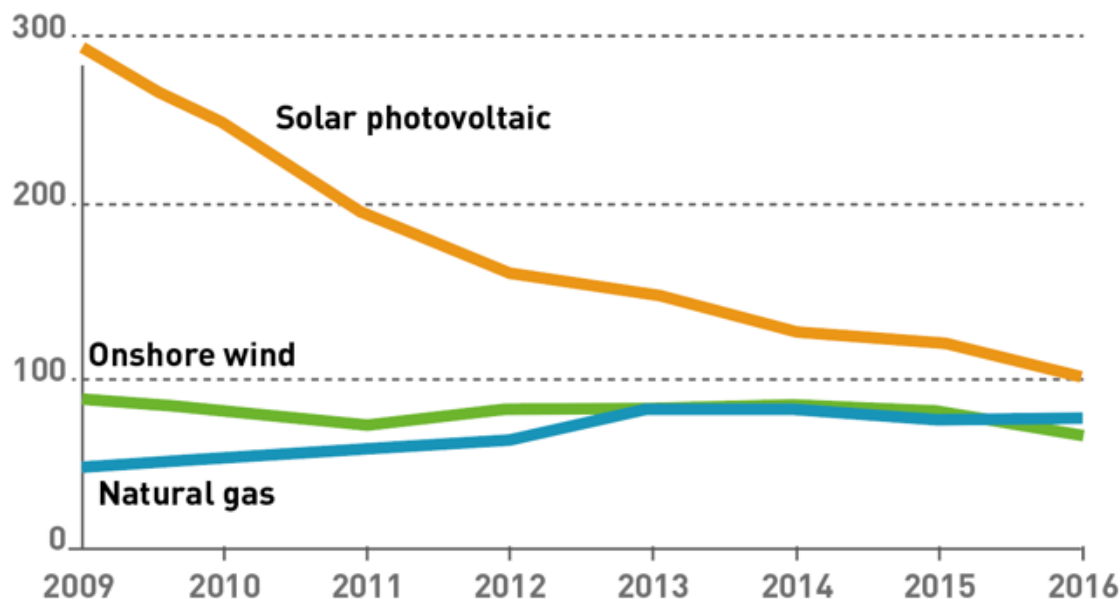
Source: Company Announcements.

# GROWTH IN RENEWABLE ENERGY SECTOR

The global renewables sector is experiencing unprecedented growth due to sharp reductions in the cost of wind and solar power generation and enhanced policy efforts by governments.

- ⚡ For example, the cost of building utility-scale solar power plants has fallen by 50% in the past five years
- ⚡ The International Energy Agency projects that renewables will remain the fastest-growing source of electricity generation, with their share growing to 28% in 2021 from 23% in 2015

Levelised cost of electricity (US\$m per megawatt)



Source: Bloomberg New Energy Finance.





### (3) Korean Vanadium Projects

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

# SOUTH KOREAN VANADIUM PROJECTS

Potential world-class sediment hosted vanadium and uranium projects.

- Protean Energy, via its 50% interest in Stonehenge Korea Ltd (**SHK**) is advancing a suite of vanadium projects in Korea
- Daejon (22.8km<sup>2</sup>) is our flagship asset with further exploration ground held at Miwon (16.6km<sup>2</sup>) and Gwesan (24.8km<sup>2</sup>)
- Daejon is a sediment hosted shale vanadium project which has the potential to produce high purity vanadium pentoxide (V<sub>2</sub>O<sub>5</sub>)
- Approximately 5% of vanadium mineral occurrences are sediment hosted and 95% are magnetite hosted (as discovered in Western Australia, South Africa etc.)

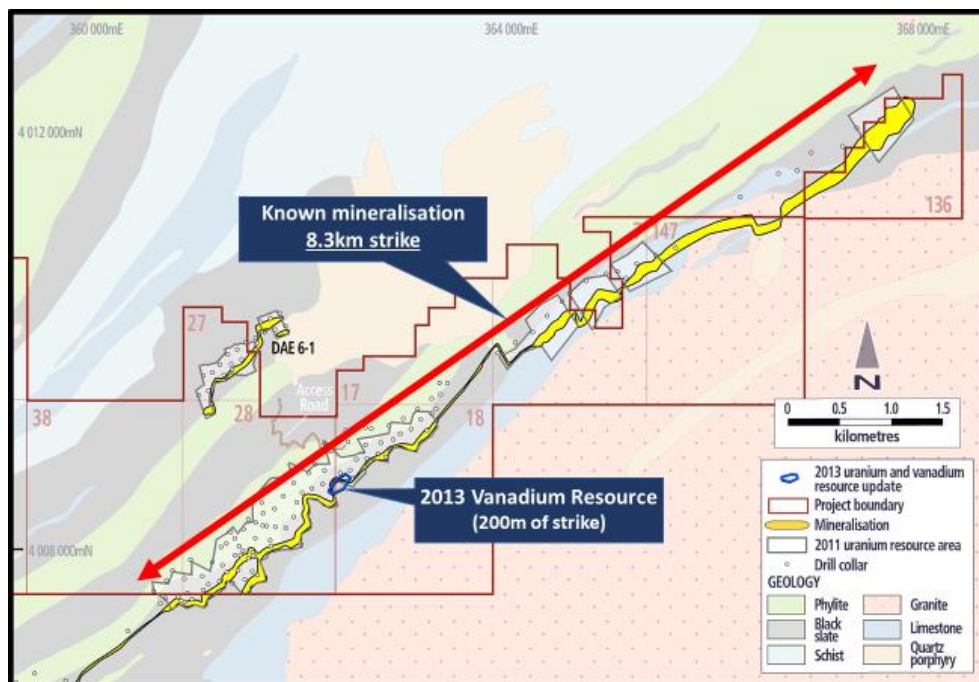
## Protean Energy's South Korean Vanadium Projects



# DAEJON PROJECT (50% INTEREST)

Daejon project strike length of 8.3km with the current Mineral Resource Estimate covering just 200m (2.4%) of the known mineralised host rock strike length.

## Daejon Project Area



✓ Interim JORC 2012 Mineral Resource upgrade anticipated Q2 2018

### Note:

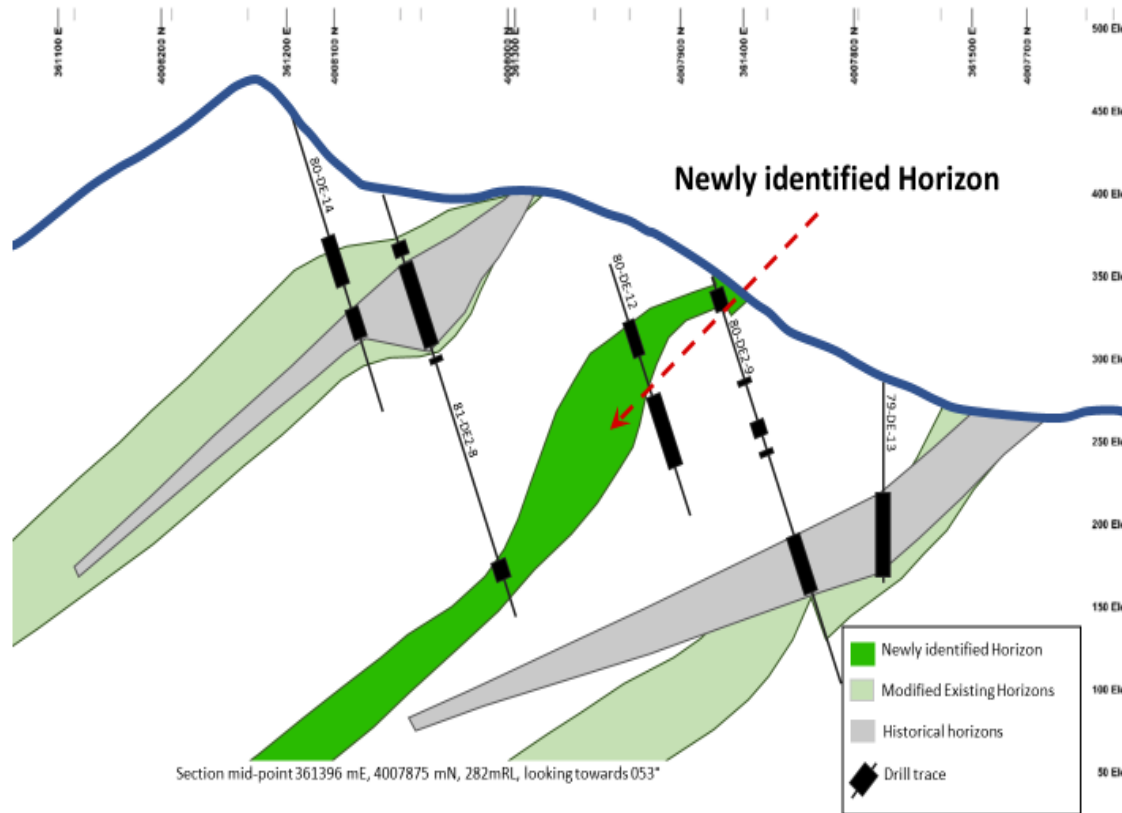
1. These estimates were prepared and first disclosed under the JORC Code (2004). They have not been updated since to comply with the JORC Code 2012 on the basis that they have not materially changed since release.

- Daejon is a unique sediment hosted shale/slate bed vanadium deposit which has the potential to produce high purity vanadium pentoxide ( $V_2O_5$ )
- Significant uranium credit associated with the deposit
- Access to 36,000m (>220 holes) of historical untested drill core. Drilled by the Korean Government in the 1970s and early 1980s
- Historical drill core was not systematically assayed for vanadium
- Maiden Mineral Resource Estimate<sup>1</sup> of 2.5Mt @ 0.32%  $V_2O_5$
- Vanadium Exploration Target of between 70-90Mt @ 0.25-0.35%  $V_2O_5$
- The potential quantity and grade of the Exploration Target is conceptual in nature, there has been insufficient exploration to define a Mineral Resource, and it is uncertain if further exploration will result in the definition of a Mineral Resource.

# NEWLY IDENTIFIED HORIZON AT DAEJON

Modelling has identified an additional black shale horizon that potentially could host additional vanadium mineralisation at Daejon project.

## Additional mineralised shale horizon identified within geological modelling program



- A 3D geological modelling program of the Daejon Vanadium project completed as a precursor to an upcoming Mineral Resource estimation
- During the remodelling process an additional black shale horizon was identified from the existing geological data which is expected to host additional vanadium mineralization
- An interim Mineral Resource estimate over approximately 40% of the known 8.3km strike length has commenced following the completion of the Stage 1 p-XRF work

# DAEJON: UPCOMING NEWS FLOW

Significant upcoming news flow following extensive historical core study work program.

Details	Stage	Timing
Approval by KIGAM to conduct pXRF assaying on historical core	✓	January 2018
Positive correlation between new pXRF assays and 2013 wet assays is confirmed	✓	January 2018
Commencement of KIGAM core pXRF testing program	✓	Commenced January 2018
Protean commence metallurgical test work targeting high purity vanadium pentoxide ( $V_2O_5$ ) precipitate (suitable for VRFB electrolyte)	✓	Commenced April 2018
Completion of Stage 1 of KIGAM pXRF test work	✓	May 2018
Commencement of Stage 2 pXRF test work	✓	Commenced May 2018
Vanadium Mineral Resource (JORC 2012) interim upgrade (post Stage 1)	✓	By Q2 2018
Results from tests targeting high purity $V_2O_5$ precipitate	✓	Mid June 2018
Vanadium and uranium Mineral Resource (JORC 2012) over the entire 8,300m of estimated mineralisation strike length (post Stage 2)	✓	By Q3 2018
Commence vanadium off-take partner discussions	✓	H2 2018
Commence PFS on Daejon	✓	Q1 2019

# VANADIUM RESOURCE ESTIMATE

Vanadium Exploration Target of between 70-90Mt @ 0.25-0.35% V<sub>2</sub>O<sub>5</sub>.

## Mineral Resource Estimate @ 0.20% V<sub>2</sub>O<sub>5</sub> cut-off<sup>1</sup>

Category	Tonnes (Mt)	V <sub>2</sub> O <sub>5</sub> Grade (%)	Contained V <sub>2</sub> O <sub>5</sub> (Mlbs)
Indicated Resources	2.3	0.321%	16.5
Inferred Resources	0.1	0.279%	0.8
<b>Total</b>	<b>2.5</b>	<b>0.319%</b>	<b>17.3</b>

## Vanadium Exploration Target<sup>2</sup>

Tonnes (Mt)	V <sub>2</sub> O <sub>5</sub> Grade (%)	Contained V <sub>2</sub> O <sub>5</sub> (Mlbs)
70 – 90	0.25% - 0.35%	385 - 695

### Notes:

1. These estimates were prepared and first disclosed under the JORC Code (2004). They have not been updated since to comply with the JORC Code 2012 on the basis that they have not materially changed since release.
2. The potential quantity and grade of the Exploration Target is conceptual in nature, there has been insufficient exploration to define a Mineral Resource, and it is uncertain if further exploration will result in the definition of a Mineral Resource. The vanadium exploration targets are based on exploration results from the 2013 drilling at Chubu (refer to announcements 15 July and 13 November 2013) that demonstrated vanadium mineralisation through the black shales. The geology in the Okcheon belt consists of a meta-sedimentary sequence that comprises three formations, Wunkyori, Hwajeonri and Guryongsan. Stonehenge Korea will test the validity of the exploration target now that access to historical drill core has been obtained and the Company can analyse the core for vanadium mineralisation.

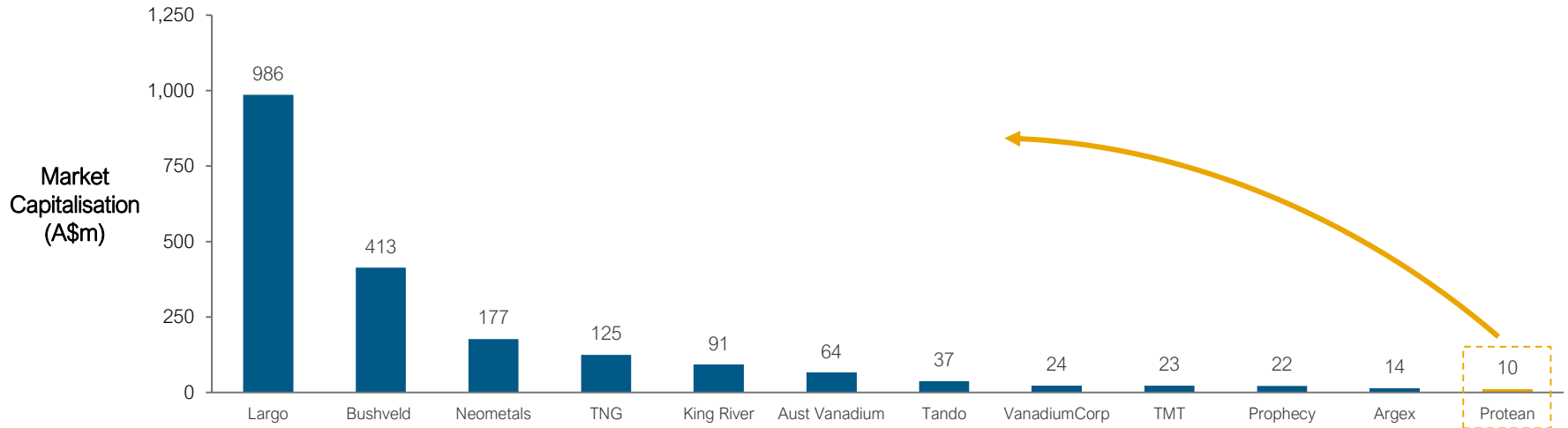
## (4) Appendix

**Image:** Rongke Power's factory that produces vanadium redox-flow batteries destined for the world's largest battery site: a 200-megawatt, 800-megawatt-hour storage station in China's Liaoning province.

# VANADIUM PEERS

Protean is well placed for growth comparatively with listed vanadium peers.

## Market Capitalisation of Vanadium Peers (A\$m)



Ticker	TSX: LGO	AIM: BMN	ASX: NMT	ASX: TNG	ASX: KRC	ASX: AVL	ASX: TNO	TSX: VRB	ASX: TMT	TSX: PCY	TSX: RGX	ASX: POW
Flagship asset	Maracas (100%)	Vametco (59%) & Mokopane (64%)	Barrambie (100%)	Mount Peake (100%)	Speewah (100%)	Gabanimtha (100%)	SPD (74%)	Lac Doré (100%)	Gabanimtha (100%)	Gibellini (100%)	La Blache (100%)	Daejon, Gwesan, Miwon (50%)
Sediment Hosted Deposit	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
Country	Brazil	South Africa	Australia	Australia	Australia	Australia	South Africa	Canada	Australia	USA	Canada	Korea
Asset Stage	Producing	Producing	Feasibility	Feasibility	Scoping	Feasibility	Exploration	PEA	Feasibility	Feasibility	PEA	Exploration
Vertically Integrated?	✗	✓	✗	✗	✗	✓	✗	✗	✗	✗	✗	✓

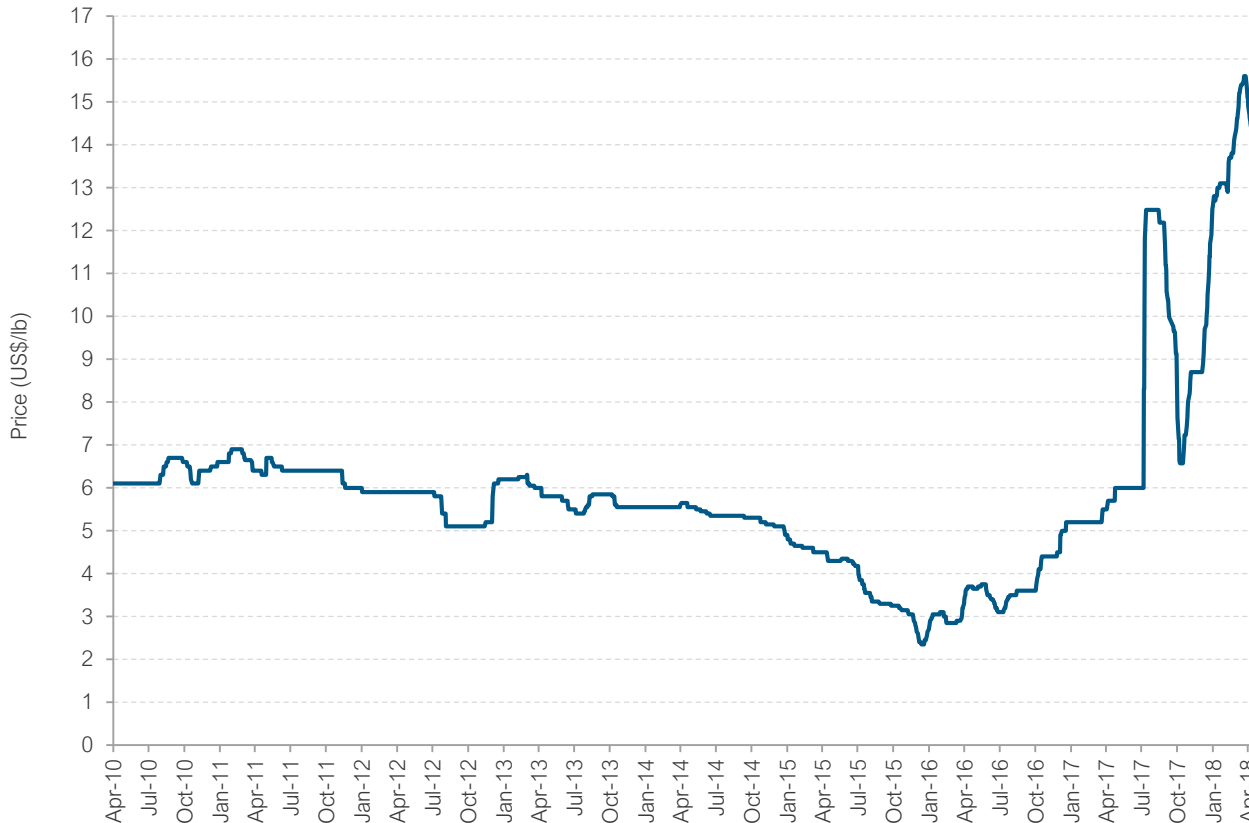
Source: Bloomberg as at 20 May 2018. Company announcements.



# VANADIUM PRICE UP 137% IN THE LAST 12 MONTHS

$V_2O_5$  prices rose strongly in the past 12 months. Future demand is expected to rise due to supply constraints, increased intensity in steel production and usage in energy storage, principally VRFB's.

Vanadium Pentoxide Flake (US\$/lb) China 98% FOB



Source: Bloomberg as at 20 May 2018. Asian Metal Inc.

## Bloomberg

“Vanadium, mainly used in steelmaking, can also be used in industrial-scale batteries, which help to even out daily peaks and troughs from renewables such as wind energy” **Bloomberg** (25 January 2018)

“We think there’s revolution coming in vanadium redox flow batteries... You’ll have to get into the mining business and produce ultra-pure vanadium electrolyte for those batteries on a massive scale” **Robert Friedland, May 2017**

## Contact Information

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