

11 April 2018

## Protean Advances Australian Installation for ⚡ V-KOR Vanadium Battery

- Vanadium ⚡ **V-KOR** battery currently in transit from South Korea for first Australian deployment
- Protean and its Korean partner DST Co Ltd each own 50% of the vanadium ⚡ **V-KOR** battery IP
- A ~\$120,000 grant from a Korean government organisation, KETEP, is being utilised to fund a trial of the **V-KOR vanadium** battery in Western Australia
- The grant is made by the KOREA INSTITUTE OF ENERGY TECHNOLOGY EVALUATION AND PLANNING (**KETEP**) and is aimed at companies collaborating outside Korea to promote new energy technologies
- Deployment of the **V-KOR** vanadium battery trial in Australia is the first step towards capitalising on the Australian energy storage market opportunity for vanadium batteries
- The grant funding coincided with the Korean Ministry of Trade, Industry and Energy selecting **V-KOR** as a superior emerging technology with certification and 15 patents

Protean Energy Ltd (**Protean** or the **Company**) is pleased to announce that, in conjunction with its 50% owned Korean affiliate KORID Energy Co, it has utilised ~\$120,000 of grant funding from the Korean government for the development and testing of the V-KOR range of vanadium redox flow batteries in Australia. The grant has been issued by the Korea Institute of Energy Technology Evaluation and Planning (**KETEP**) which supports technical innovation in the energy sector.

The grant money has been used for a 25kW/100kWh vanadium V-KOR battery trial in Western Australia. The V-KOR vanadium test battery is currently being shipped to Australia and preparations for the commencement of the installation process will start in the coming month.

Bevan Tarratt, Protean Chairman said "This trial is the first major step for the Company and V-KOR to capitalise on the growing energy storage sector in Australia. The vanadium flow battery has the potential to play a crucial role in revolutionising the new energy sector and we are excited about the material advantages of the V-KOR system over other battery solutions. The vertical integration between our downstream vanadium resource and the vanadium V-KOR battery, puts Protean in a position of significant strategic advantage in the rapidly expanding battery storage market."



Fig 1: 50kW VRFB-ESS (2x25kW) deployed at solar test site



Fig 2: 2 x 10 kW VRFB-ESS

## Key Benefits of Vanadium Redox Flow Batteries

- Highly scalable and therefore suitable for large projects and grid scale storage
- Ability to retain high levels of charge for significantly longer periods
- Electrolytes are non-flammable and therefore inherently safe
- Release of energy can be instant
- 100% depth of discharge
- Long life-span (20 years+)
- Proven to operate at high ambient temperatures
- Best life cycle value energy storage system

### About V-KOR

The V-KOR technology, owned 50:50 by Protean Energy and its Korean partner DST Company Limited, is a proprietary Vanadium Redox Flow Battery Energy Storage System (**VRFB-ESS**) developed in response to the growing demand for energy storage solutions. The V-KOR battery solutions are built to order for commercial, industrial and grid scale applications.

The V-KOR is a commercial stage technology that provides a rechargeable flow battery with the ability to store high levels of energy for longer and with a greater life expectancy than existing battery solutions. The Korean Ministry of Trade, Industry and Energy has selected V-KOR as a superior emerging technology with 15 intellectual property patents. The V-KOR technology and batteries are fully scalable with built solutions from 2kW to 20MW and larger to suit customer specific requirements.

### About the V-KOR Vanadium Battery Systems

The V-KOR systems are a type of rechargeable flow battery that employs vanadium ions in different oxidation states to store energy in the form of two liquid electrolytes. VRFBs are proven to have excellent durability and life spans of at least 15-20 years.

An important attribute of VRFB systems is that the energy capacity is independent of the power rating, allowing the storage system to be designed for highly specific energy and power requirements and making it well suited to applications with large energy capacity specifications. These batteries are currently used for grid scale energy storage applications where large-scale and long duration electrical energy storage is required and are an ideal solution for the broadening renewable energy generation sources such as solar and wind.

V-KOR has been developed over the past five 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 units to provide options to customers with varying energy storage needs. VRFBs can be scaled up to provide large power (1-5MW) storage units with energy capacity increased by increasing electrolyte volume.

Extensive testing has been carried out on both the 5kW and 25kW units. Over 2,000 cycles have been tested on the 5kW stack representing over 6 years of full daily cycles for a typical solar photovoltaic (**PV**) application and over 1,000 cycles on the 25kW stack with no significant degradation in performance. Both units have been independently tested by Korea Conformity Laboratories (**KCL**), a leading state-of-the-art national testing lab established over 40 years ago.

In addition to the Australian trial, currently two 25kW stacks are undergoing field trials with KCL as part of a solar PV and VRFB-ESS combination trial.

## Capitalising on the Multiple Benefits of Vanadium Redox Flow Batteries

Vanadium redox flow batteries have the potential to play a crucial role in revolutionising the new energy sector due to the multiple benefits they offer. In contrast to consumer lithium-ion batteries, vanadium flow batteries use the movement of liquid electrolytes to enable the replacement of depleted materials and reduces the degradation of materials over time.

Several leading energy experts have cited the benefits of vanadium redox flow batteries to be used in grid-scale storage including **Robert Friedland, May 2017<sup>1</sup>**:

*“We think there’s a 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.”*

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### ABOUT PROTEAN ENERGY LIMITED (ASX: POW)

Protean Energy Limited is an energy company focused on the commercialisation of vanadium battery energy storage systems. The Company is also developing a multi-mineral project in South Korea through its 50% holding in Stonehenge Korea Limited (**SHK**). SHK is a JV company with two KOSDAQ listed industry partners being DST Co Ltd (**DST**) [formerly KORID] and BHI Co Ltd (**BHI**). SHK owns 100% of the rights to three projects in South Korea, including the Company’s flagship Daejon Project.

For further information, see [www.proteanenergy.com](http://www.proteanenergy.com) or contact:

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<sup>1</sup> [http://aheadoftheherd.com/Advertising/Sponsor\\_Page/VanadiumOne/RobertFriedland.html](http://aheadoftheherd.com/Advertising/Sponsor_Page/VanadiumOne/RobertFriedland.html)