

5 June 2018

First Australian Deployment & Micro Grid Integration for ⚡ V-KOR Vanadium Battery

- 25kW (100kWh) ⚡ V-KOR vanadium battery commissioned at OzLinc Industries trial site in Perth for its first Australian deployment.
 - Micro grid integration between the ⚡ V-KOR battery, a 21kW solar PV system and a 21kW diesel generator.
 - Korean technical team inspects installation and participates in commercial project discussions in Perth.
 - Protean has received a number of enquiries regarding its ⚡ V-KOR battery and progresses towards commercial orders.
 - Valuable data from the OzLinc trial will help optimise the ⚡ V-KOR battery within hybrid systems incorporating solar PV, wind turbines, gas or diesel power generators and/or electricity grids.
 - Opportunity for network providers to save millions of dollars by utilising ⚡ V-KOR battery as an electricity network solution.
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Protean Energy Ltd (**Protean** or the **Company**) is pleased to announce that a 25kW (100kWh) V-KOR vanadium battery has been installed at the site of OzLinc Industries in O'Connor (Perth Western Australia), where it will be used in a micro grid situation (isolated from the main electrical grid), in combination with a 21kW solar PV system and a 21kW diesel generator.

Demonstrating the V-KOR vanadium battery in a micro grid situation is the first phase of the Australian trial. The next phase of the trial will be to incorporate the integration of the solar system and the V-KOR battery with the Western Power electricity grid.

The micro grid trial at OzLinc will demonstrate how the V-KOR battery operates as part of an off-grid solution in commercial/industrial premises.

The V-KOR vanadium battery is a key enabler for renewable energy and can be used in conjunction with solar systems, wind turbines or natural gas generators anywhere that the natural gas pipeline is available. The V-KOR battery offers customers energy certainty and also the option to store energy when it is either available from the grid at off peak rates or when a solar system or wind farm is generating power for free. In the event that customers are in remote areas or located off the electricity network, a micro grid solution can significantly reduce the cost of power supply. This is especially attractive to land owners or property developers who need to pay the cost for an electricity network extension or even electricity network providers who have the enormous cost of maintaining the electricity network.

In a submission made to Western Power, the Clean Energy Council estimates that a net benefit of \$388 million could be achieved by providing off-grid power supply to 2,702 candidates on its network and an extensive micro grid rollout may result in cheaper electricity prices for all Western Australians¹.

Mr Na, Chief Technical Officer for KORID Energy said: *“The trial demonstrates the V-KOR battery’s use as part of a micro grid solution and its integration with other energy technologies. The V-KOR battery is progressing towards full commercialisation for the Australian market and our technology will assist network providers to offer lower electricity costs to their customers. We are encouraged by the size of the market opportunity for vanadium batteries in Australia and the enquiry we have had from land developers, major commercial customers and recent discussions with the electricity network provider. In the future we are driving towards being able to manufacture our own vanadium electrolyte. In conjunction with our own potential supply of vanadium electrolyte utilising V₂O₅ from Protean’s Daejon Vanadium Project in Korea, our battery technology could become the most cost effective grid storage solution in the world. The time is right for our battery technology and we are strategically positioned to capitalise on a rapidly expanding battery storage market in Australia and globally.”*



Figure 1: KORID technicians oversee installation of the V-KOR battery at the Perth test site

¹ <https://www.solarquotes.com.au/blog/microgrids-western-australia-mb0548>

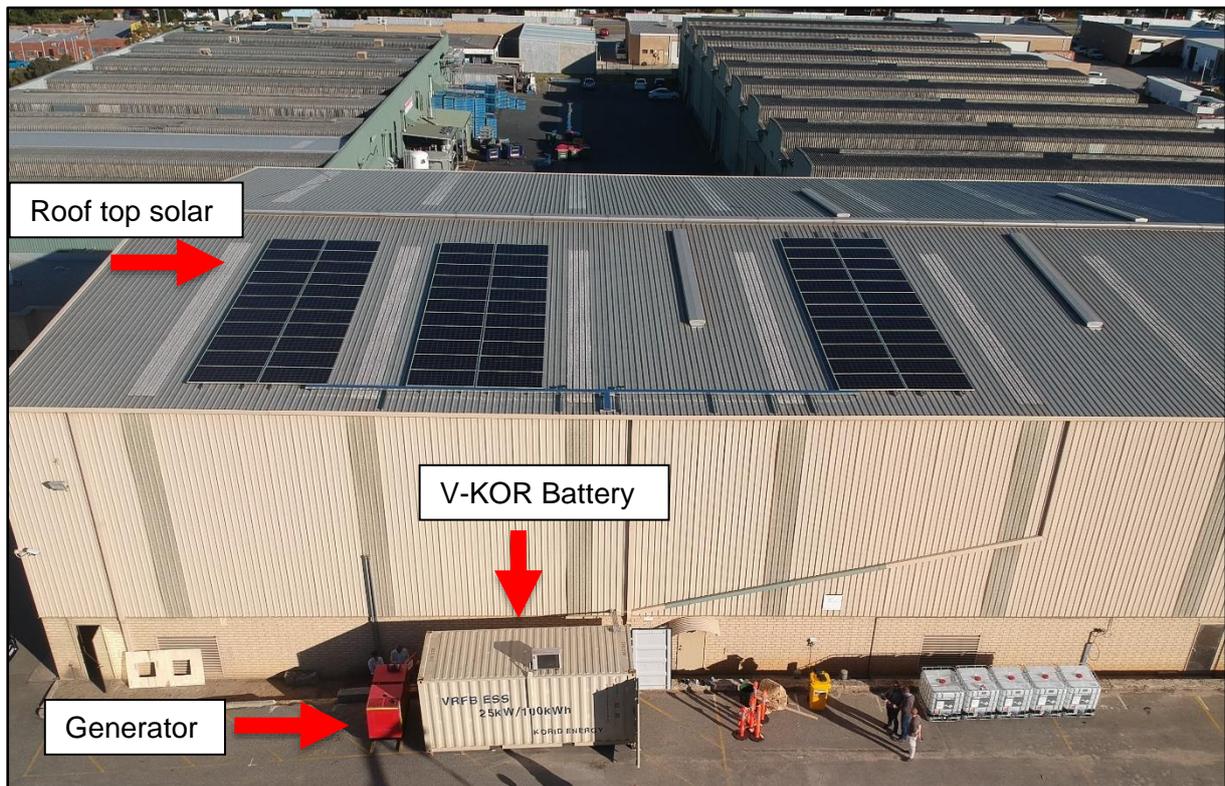


Figure 2: Micro Grid installation incorporating solar system, V-KOR vanadium battery and diesel generator

About the OzLinc installation:

OzLinc is a supplier of pipe, fittings, flanges, valves and hosing to the Australian marine, industrial and resources sectors. The demonstration unit will be supplied by a grid connected 21.1KW rooftop solar PV system. The trial will facilitate collection of representative operating data for the battery, demonstrate charging operation using both grid and solar supply and it will demonstrate automatic system power stabilisation characteristics given a fluctuating solar supply.

The proprietary V-KOR technology is 100% owned by KORID Energy (**KORID**), a battery developer, and underpinned by 15 granted patents. KORID is jointly owned by Protean (50%) and KOSDAQ-listed DST Company Limited (50%). KORID has utilised grant funding from the Korean government of approximately \$120,000 for the development and testing of the V-KOR range of vanadium 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.



Figure 3: OzLinc Industries Perth facility

The V-KOR demonstration battery consists of 2 electrolyte tanks, 2 battery stacks of 12.5kW each, one 25kW inverter and associated electrolyte pumps combined with a power management and conditioning system. The battery is housed in a 20 foot shipping container, oversized to allow for ease of inspection during the trial period. During the first phase of the trial, the battery has been used in a micro grid situation, in combination with a 21kW solar PV system and a 21kW diesel generator. The second phase of the trial will involve the battery drawing electricity from both the solar PV system and the Western Power electricity grid so that the power is stored for use by OzLinc Industries at selected times of the day.



Figure 4: V-KOR 25kW / 100kWh unit

V-KOR Vanadium Battery

The V-KOR vanadium battery technology, owned 50:50 by Protean and DST, is a proprietary vanadium redox flow battery energy storage system (VRFB-ESS). V-KOR was developed in response to the growing demand for more efficient renewable energy storage solutions. The Company offers battery solutions built to order for commercial, industrial and grid scale applications.

V-KOR is a commercial stage technology that offers 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 V-KOR technology and batteries are scalable with built solutions from 2kW to 20MW or larger to suit customer requirements.

About the V-KOR Vanadium Systems

The V-KOR systems use vanadium ions in different oxidation states to store energy in the form of 2 liquid electrolytes. VRFBs are proven to have excellent durability & life spans up to 20 years.

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. These batteries are currently used for grid scale energy storage applications where large-scale and long duration electrical energy storage is required. They are an ideal solution for rapidly growing renewable energy generation sources such as solar and wind.

The V-KOR battery has been developed over the past five years and patents have been granted to protect the design. Four stack sizes of flow batteries have been developed to date including 2.5kW, 5kW, 10kW and 25kW units to provide commercial options to customers with varying energy storage needs. VRFBs can be scaled up to provide large (1-5MW) storage units with energy capacity simply 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 laboratory 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.

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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 Company Ltd (DST) [formerly KORID] and BHI Co Ltd (BHI). SHK owns 100% of the rights to 3 projects in South Korea, including the Company's flagship Daejeon Vanadium Project.

For further information, see www.proteanenergy.com or phone: T: + 61 8 9481 2277