

PROJECT: MANUFACTURE AND DEPLOYMENT OF REDOX FLOW BATTERIES

OPEN a toolbox, pull out a spanner and you may be holding a bit of the answer to global warming: vanadium, a metal named after Vanadis, the Scandinavian goddess of beauty. Used mostly in alloys to strengthen steel, its appearance may not live up to the romance of its name. Yet vanadium could become a vital ingredient in large clean-energy batteries, in which case it will shine a lot brighter.

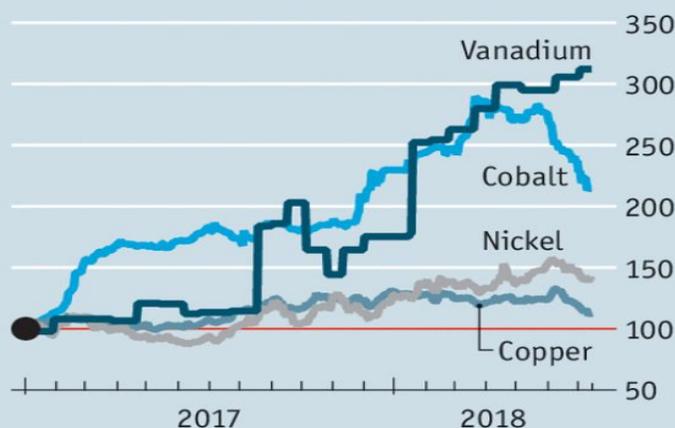
The Pain "We know the pain that is when Power just goes out, as if someone threw a switch!" **Solutions** "Duma VRFB Batteries To use anytime of the day or in case of a grid failure then simply charge the battery when it's finished, like you would with a phone battery!"

Africa presents an immense opportunity for energy storage because it suffers from insufficient energy. Across sub-Saharan Africa, +- 600 million people now live without electricity and grids are too weak to support major industries. Continuous load shedding in South Africa, despite growing tariffs and billions of Rand spent on diesel Open Cycle Gas Turbines (OCGT). Our analysis suggests that the addressable market in Africa for utility-scale storage over the next 5 years is 80-90 GWh, or \$25-\$30 billion. Demand is growing rapidly and sub-Saharan Africa will demand nearly 1,600 terawatt hours by 2040.

Duma Energy offers the VRFB Compact Storage with a nominal power rating of 5 kW and a storage

Charging ahead

Metal prices, January 1st 2017=100, \$ terms



Source: Thomson Reuters

Economist.com

capacity between 15 and 45 kWh. This makes the battery a perfect solution for private homes, small to medium size businesses, either off-grid or as a backup system. The battery will significantly reduce monthly electricity bills and dependence on the power grid. This energy independence protects against rising electricity costs and volatile fuel prices. With analysts forecasting continued increases in electricity rates, the battery remains a cost-effective solution and long-term investment in the future.

The metal is abundant; resources total about 63m tonnes. Most of it comes as a by-product from the use of iron in steelmaking, especially in China; some of it is mined in South Africa and Brazil.

The main bottleneck, says Fortune Mojapelo, boss of Bushveld Minerals, a South African vanadium miner, is processing capacity. His plan is to produce vanadium electrolyte in South Africa to be used in VRBs that Bushveld hopes to erect across Africa. A trend toward vertical integration—from raw material to battery—is also evident in news that VRB Energy,

If VRBs are as yet little known, that may be because they lack a flashy promoter, such as Tesla's Elon Musk. But vanadium has at least two backers with considerable clout. One is Glencore, the world's biggest commodities trader, which mines it in South Africa.

Duma Energy is uniquely positioned to deliver energy storage solutions to the African continent and recognises that electricity in Africa intersects paramount potential for social transformation with an immense commercial opportunity. Efforts now underway for a manufacturing plant in South Africa Eastern Cape Provinces at the East London Industrial Development Zone, initial production capacity of 10 MWh per annum that can be increased to 200 MWh. An initial capital expenditure for such a plant has been determined as R150 million, with roughly 75% of the capital cost being the balance of plant rather than production-specific equipment. Price points for VRFB is around \$300/kWh or R1500/KWh so total price for manufacturing and deployment is R10m - 1MWh for 10MWh is estimated at R100 million per annum.

South Africa energy consumption in 2017 was 51,309 megawatts (MW). Current Access Rate: 86%. Rural: 66%. Urban: 93%. Households without Power: 2.2 million. -Generation figures derived from the 2018 Draft IRP Released by the South African Department of Energy.

The typical SA home uses about 840 kWh per month and 10 080 kWh per annum. -Generation figures derived from the 2018 Draft IRP Released by the South African Department of Energy. One megawatt equals one million watts, or 1,000 kilowatts, roughly enough electricity for the instantaneous demand of 750 homes at once. So 10MWh - 7500 homes out of a potential 2.2 million households without Power. **Duma Energy seeks a Capital Investment of R150 million, and the break-even expected in 16 months thereafter.**