

Proactive Investors Australia

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Vanadium prices remain strong into 2019 as further new energy applications are developed

Vanadium was the best performing battery mineral in the last 12 months, based on price increases, with most of global supply going to steel production.

Present vanadium supply is largely dominated by coke production in steel markets, with vanadium use in batteries growing from a 1% share in 2015 to 2% in 2017.

In that same period, however, vanadium consumption from steel also increased its share from 68% to 76%.

More than 90% of vanadium consumption goes towards steel where an addition of 0.2% vanadium increases steel strength up to 100% and reduces weight by up to 30%.

Rising vanadium prices over the last three years have been partially caused by lower global inventory levels as total supply remains under pressure, as well as growing demand in traditional and new markets.

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Produced primarily as a by-product, vanadium demand in standard applications such as strengthening steel will continue to grow and will be diversified through potential energy storage applications.

The mineral itself is derived from vanadium-titanium-magnetite (VTM) deposits, shale-hosted deposits or as secondary products from fossil fuels and uranium.

Near-term growth will be driven by steel production in developing countries as well as higher standards in rebar which will require more vanadium.

CSA Global principal consultant Tony Donaghy said vanadium consumption still had substantial room to grow in Asian steel markets due to further improvements in grade and purity.

Demand for vanadium use in rebar is increasing 6% annually and new Chinese

rebar standards have doubled to reach the rest of the world.

Donaghy pointed out that analysts had predicted a significant deficit in vanadium by 2027, based on current projects in the pipeline and expected demand trends.

He also noted that a substantial downscaling of fossil fuel reliance in vanadium production was projected by 2050, potentially focusing global production on magnetite and shale-hosted deposits.

READ: Vanadium critical for renewable energy storage, hears Technology and Low Emission Minerals Conference

DJ Carmichael director of corporate finance Oliver Morse told Proactive Investors that it was always unusual to see a strong commodity price performance over one year considering vanadium's history of spikes and dramatic falls.

Noting the typical skepticism around vanadium prices, Morse said we might see some volatility in the price this year but due to structural changes in the demand side it won't fall as it had done in the past.

Morse said: "Battery consumption is the big unknown - the view is that at some point vanadium redox batteries will take off.

"Will that be in the next 24 months? Who knows.

"Nonetheless, it gives a nice blue sky element to vanadium, a diversification away from the steel market which is helpful if you are a developer like AVL.

"On the supply side it's also very interesting - environmental regulations in China ... have clearly had an impact and I think the price movement is well-explained by that."

Morse said there were currently only three specialist vanadium producers - Largo Resources Ltd (TSE:LGO), Bushveld Minerals Limited (LON:BMN) and Glencore PLC (LON:GLEN) - and that it was an interesting time for developing companies to be coming into the market.

He continued: "From a market point of view it's hard to have a lot of visibility.

"A lot of the information you can get is by word-of-mouth from those who have spent time in China's marketplace - it's not an LME price matter which partly explains the volatility, but structural changes will allow developers to get their projects funded."

Vanadium redox flow battery

An emerging application for vanadium is its use in the energy storage sector through vanadium redox flow batteries (VRFB).

The VRFB is a rechargeable flow battery that uses vanadium in different oxidation states to store energy, utilising vanadium's unique property to exist in four different oxidation states when in solution.

The flow battery has unique advantages including high lifecycles, no capacity loss over time, simple scalability, improved safety and immediate and rapid energy release.

It is estimated by Roskill that vanadium demand in VFRB markets could rise to 31,000 tons by 2025, an enormous

increase on the 1,000 tons that went to battery users in 2014.

Source: Bushveld Minerals

Low supply, high demand

Speaking to Proactive Investors, Australian Vanadium Ltd (ASX:AVL) managing director Vincent Algar explained vanadium's strong price levels in terms of supply and demand.

Algar said: "Last year we saw the price move significantly up - it started at the end of 2015 and really bottomed-out at about \$2.20 a pound [before moving] up principally because of the supply and demand imbalance that was occurring.

"[This] stemmed from an event about a year before that ... where South African company High Veld Steel went into receivership and that cut a whole lot of tonnes out of the vanadium market and those tonnes are basically never to return.

"Demand was low so you ended up drifting down in price - as soon as you got to \$2 a pound, you started to put a lot of people under pressure.

"So we basically had a gap in supply and an increase in demand all happening at the same time, that's really what has driven the price up so high.

"It rose up to near-long term highest ever pricing last year, nearly touching \$30 a pound, but that was an unsustainable peak and it started to come down."

Positive price outlook into 2019

After a rallying run across 2018, the vanadium price saw a slight decrease at year-end, however this was seen by most analysts as a short-term dip.

Increasing demand in steel alloys and further development of vanadium battery applications, coupled with limited supply until 2022, is expected to sustain higher prices into 2019.

Algar continued: "We've seen the price come off and we that there's a band between \$10-\$15 which we think the vanadium price is going to settle into.

"If it settles into that band it will effectively have moved off its long-term band which is about \$5-\$7 as a bottom band.

"If you look at vanadium over the last 15 years, it's got two peaks.

"The most common peak is around \$8 and the second peak is around \$13 - so those are the two common pricing areas that the price will live in.

"The pre-feasibility study (PFS) we did at Gabanintha was done at \$8 - we looked at the pits at \$8 - but then we [also] reported \$13 and \$20.

"We think that over 25 years [the price] sits at \$8 but at the moment it's going to be comfortably sitting at the \$10-\$15 range because there's simply no new supply."

Flow batteries critical for renewable energy

In his presentation at the Technology and Low Emission Minerals (TLEM) Conference at Perth in November, ScandiVanadium Ltd (ASX:SVD) director and Bannerman Resources Ltd (ASX:BMN) managing director Brandon Munro briefed the audience on the critical role VRFBs will play in renewable energy.

He told investors and stakeholders that understanding renewable demand, and the role renewables can play, was intrinsically linked to his understanding of nuclear power demand.

Referring to the role of VRFBs and their energy storage solution, Munro said: "There's a key piece missing, and that is that intermittent renewables, without a storage solution, are hugely destructive to the existing grid infrastructure that we have spent the last 100 years building."

Munro added that without storage capacity to back-up intermittent renewables, he believed our societies would start to reject renewables because they would mess with grid infrastructure.

This leaves only two viable storage solutions for grid power - pumped hydro, which has a number of constraints, and the vanadium redox flow battery.

Multiple new energy applications

Algar shared Munro's views on vanadium's crucial place as a new energy mineral, highlighting the high-volume market potential for vanadium in batteries as well as its application in other developing technologies.

Speaking to Proactive, Algar noted the potential to use vanadium as part of the cathode process in lithium-ion batteries, which has significant benefits.

Explaining other avenues being explored for potential product development using vanadium, Algar detailed an innovation using vanadium oxide-based film as a window tint.

He said: "Vanadium has got this really bizarre property - like a photo effect - where if it's put in a film on a window and gets over a certain temperature it becomes opaque.

"[This] is a huge energy-saver from the building's point of view and has a huge implication not only for vanadium consumption but for energy use.

"There's a lot of innovation happening in the vanadium space which involves other energy applications.

"For us as new companies, looking at new developments in our processing design, we have to consider where our markets will be.

"With the VRFB, its special place in grid energy storage and the growth of that market ... is an incentive for us to stay involved with that side of it because it diversifies our ability to supply to disconnected markets.

"It means you can be selling to flow battery producers, energy retailers and producers, and you can be selling to the steel market - and because they're in different cycles you're in a good position."

Increasing penetration of VRFB technology

Algar detailed several developments in the vanadium battery space including VRFBs that are being installed or tendered.

redT Energy has installed a VRFB at Monash University late last year as part of the Smart Energy City Project, supported by ARENA.

A VRFB is being installed by Juwi on Heron Island for the University of Queensland's research station and the University of Adelaide has recently tendered a 500 kilowatt, 2-megawatt-hour system.

Protean Energy Ltd (ASX:POW) is commercialising its patented V-KOR vanadium battery energy system and holds a multi-energy mineral project in South Korea.

Algar also mentioned Robert Friedland's current 3 megawatt, 12-megawatt-hour battery as part of a larger 10 megawatt, 40-megawatt-hour system.

Algar added: "We're seeing lots of innovation around welded stacks, new innovations in the technology to make the production of the battery cheaper to offset the rise in the price of vanadium.

"You really have to have the right load profile to actually justify a battery - once you put solar in almost all of your problems are gone.

"The domestic battery is a great opportunity when someone comes up with the right type of flow battery and we think that a company called Volterion from Germany has got the right idea.

"They've got a cheap, welded aluminium stack they can rapidly reproduce which is light and easy to fit."

READ: Australian Vanadium's pre-feasibility study confirms robust economics for Gabanintha deposit

AVL has completed a baseline pre-feasibility study (PFS) for its Gabanintha Vanadium Project in Western Australia, which estimates a net present value (NPV) range for the project that has an upper end of US\$2.37 billion when assuming a US\$20 per pound vanadium price.

The base case demonstrates robust project fundamentals featuring competitive product costs and financials and will allow AVL to move quickly into piloting and a definitive feasibility study.

In November last year the company updated Gabanintha's resource, reporting 183.6 million tonnes grading at 0.76% vanadium pentoxide.

The resource is 50 kilometres from the town of Meekatharra and includes a massive high-grade magnetite zone featuring 96.7 million tonnes at 1% vanadium.

Drilling in 2018 at Gabanintha focused on a consistent 3-10-metre-thick zone grading more than 1.2% vanadium in 10 of 11 holes.

The massive magnetite layer averages 14 metres in thickness.

Besides vanadium, Gabanintha also features titanium and iron, as well as cobalt, copper and nickel in sulphide minerals.

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