The Vertically Integrated Primary Vanadium Producer

March 2019 Corporate Presentation
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The technical information contained within this presentation has been reviewed and approved by Dr Luke Longridge, consulting geologist. Dr Longridge has a PhD in Geology (2012) and over 6 years’ experience working on vanadiferous magnetite deposits in the Bushveld Complex. He is a member of the Geological Society of South Africa and is a registered Professional Natural Scientist (Pr Sci.Nat.) in South Africa. Dr Longridge has sufficient experience 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 under the JORC Code (2012). Dr Longridge consents to the inclusion in this presentation of the matters based on his information in the form and context in which it appears.
Positive price outlook as a result of sustained structural deficit

The largest primary vanadium resource base (439.6Mt) combined resource ~2% in-magnetite V₂O₅ amongst the highest in the world 1st quartile cost curve position

Brownfield infrastructure create scope for low capex and quick scale-up of production capacity

Vertical integration with high quality, low cost production base allows us to be a key player in the multibillion-dollar energy storage industry through VRFBs

Management team combines more than 100 years’ experience

Concentrated global supply with South Africa as the largest host of high-grade primary vanadium resources

Shareholder Return Committed to delivering attractive returns to shareholders

Bushveld Minerals Investment Proposition
The vertically integrated primary vanadium producers
Company Overview

A leading, low-cost, vertically integrated primary vanadium mining and processing platform

1. The Company also holds a 10.04% shareholding in AIM-listing AfriTin Mining Limited and a 100% holding in Lemur Holdings

Source: Bushveld Minerals

A growing, low cost, vertically integrated primary vanadium producer

- High grade ore for primary vanadium mining & processing
- Largest primary vanadium resource base in the world

The Group is targeting a 10,000 mtV production in the medium term

An energy storage project developer and component manufacturer

- Electrolyte manufacturing
- Vanadium Redox Flow Battery (VRFB) Assembly & manufacturing
- MW scale energy storage project development
- Deployment models include PPAs, leasing models

Targeting initial 200MWh of electrolyte p.a.

Targeting 1,000 MWh opportunities by 2020
Bushveld Minerals

Bushveld Minerals share price has risen 10x in the past 2 years, underpinned by the acquisition of Vametco, a primary vanadium producer

<table>
<thead>
<tr>
<th>Listed on AIM:</th>
<th>Ticker: BMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMN share price (15 March 2019)</td>
<td>38.00p</td>
</tr>
<tr>
<td>Basic ordinary shares</td>
<td>1,119,057,953</td>
</tr>
<tr>
<td>52-Week Hi-Lo</td>
<td>48.50 – 12.00p</td>
</tr>
<tr>
<td>Market Capitalisation</td>
<td>£425,242,022</td>
</tr>
<tr>
<td>Warrants</td>
<td>nil</td>
</tr>
</tbody>
</table>

- **April 2017:** Bushveld Minerals acquired an effective interest in Vametco of 27%
- **December 2017:** Bushveld Minerals increased its effective interest in Vametco to 59%
- **September 2018:** Bushveld Minerals increased its effective interest in Vametco to 74%

Source: Bloomberg, 15 March 2019; Link Asset Services, as at 28 February 2019
Market Metrics

Strong share price performance supported by an increasing interest from institutional shareholders in the UK and US

Company Snapshot

Producing Assets
Vametco

Development Assets
Brits Vanadium and Mokopane

Vanadium

Total Production
CY19e production >2,560mtV (2018)

Total Resources
440 Mt

Net Debt (Cash) as at 30.06.2018
(US$34.6 million)

Bushveld Minerals Top Shareholders

<table>
<thead>
<tr>
<th>#</th>
<th>Shareholder</th>
<th># shares</th>
<th>% ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hargreaves Lansdown Asset Mgt</td>
<td>191,331,506</td>
<td>17.09</td>
</tr>
<tr>
<td>2</td>
<td>Halifax Share Dealing</td>
<td>111,814,403</td>
<td>9.99</td>
</tr>
<tr>
<td>3</td>
<td>Interactive Investor</td>
<td>109,278,449</td>
<td>9.76</td>
</tr>
<tr>
<td>4</td>
<td>Acacia Resources Limited</td>
<td>70,598,644</td>
<td>6.30</td>
</tr>
<tr>
<td>5</td>
<td>Yellow Dragon Holding Limited</td>
<td>67,832,778</td>
<td>6.06</td>
</tr>
</tbody>
</table>

Bushveld Minerals Top Institutional Shareholders

<table>
<thead>
<tr>
<th>#</th>
<th>Shareholder</th>
<th># shares</th>
<th>% ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Invesco Perpetual Asset Mgt</td>
<td>21,418,938</td>
<td>1.91</td>
</tr>
<tr>
<td>2</td>
<td>Canaccord Genuity Wealth Mgt</td>
<td>7,610,950</td>
<td>0.68</td>
</tr>
<tr>
<td>3</td>
<td>Amati Global Investors</td>
<td>5,713,633</td>
<td>0.51</td>
</tr>
<tr>
<td>4</td>
<td>Oppenheimer Funds</td>
<td>3,000,000</td>
<td>0.27</td>
</tr>
<tr>
<td>5</td>
<td>FIL Investment International</td>
<td>418,620</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Bushveld Minerals Coverage

SP Angel
Nominated Advisor and Broker

Alternative Resource Capital
Joint Broker

BMO Capital Markets
Joint Broker

Macquarie Capital
-

UBS (Industry expert note)
-

Source: Link Asset Services, as at 28 February 2019
H1 2018 Financial Highlights
Consolidated Results – Bushveld has transitioned from an exploration Company to a producing Company

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue$^1</td>
<td>$ 85.4 million</td>
<td>$ 0.0</td>
</tr>
<tr>
<td>EBITDA$^1</td>
<td>$ 43.6 million</td>
<td>$ 1.3 million$^3</td>
</tr>
<tr>
<td>Profit After Tax$^{1,4}$</td>
<td>$ 29.0 million</td>
<td>$ 1.4 million</td>
</tr>
<tr>
<td>Free Cash Flow$^{1,5}$</td>
<td>$ 14.0 million</td>
<td>- $ 1.8 million</td>
</tr>
<tr>
<td>Cash Balance$^2</td>
<td>$ 34.6 million</td>
<td>$ 93.1k</td>
</tr>
<tr>
<td>Gross Debt$^2</td>
<td>$ 0.0</td>
<td>$ 0.0</td>
</tr>
<tr>
<td>Earnings Per Share$^1</td>
<td>1.57c</td>
<td>0.34c</td>
</tr>
</tbody>
</table>

2. Exchange rate:30 June 2018 GBP/USD 1.3 (30 June 2017: GBP/USD 1.3)
3. EBITDA - H1 2017: Includes share of associates
4. Profit After Tax includes minority interest
5. Free cash flow: comprises net operating cash flows less net investing cash flows
Bushveld Vanadium
A growing, low cost, vertically integrated primary vanadium producer

- High grade ore for primary vanadium mining & processing
- Largest primary vanadium resource base in the world

The Group is targeting a 10,000 mtV production in the medium term

An energy storage project developer and component manufacturer

- Electrolyte manufacturing
- Co-location in Vametco process => significantly lowering costs

Targeting initial 200MWh of electrolyte p.a.

- Vanadium Redox Flow Battery (VRFB) Assembly & manufacturing

Targeting 1,000 MWh opportunities by 2020

- MW scale energy storage project development
- Deployment models include PPAs, leasing models

Source: Bushveld Minerals
1. Vametco

- Low cost primary vanadium producer
- CY19e production >2,560mtV, guidance to be provided in Q1 2019 operational update
- 26 Mt reserve average in-magnetite grade of 1.96% V₂O₅
- 142.4 Mt Resource with average in-magnetite grades of 1.96% V₂O₅

2. Brits Vanadium

- Outcropping, strike extension of the Vametco mine
- Drilling confirms V in-magnetite grades for the lower seam of 1.66% V₂O₅
- Maiden Mineral resource estimate expected in Q2 2019
- Provides the potential for additional feed tonnages for the Vametco and future brownfield processing plants

3. Mokopane Vanadium

- 298 Mt JORC, outcropping reserve and resource
- Vanadium in-magnetite grades of 1.75% V₂O₅
- Positive PFS completed January 2016: 25% IRR, US$300m capex, V price $33/kgV for 5,500mtV per annum production
- Expect to be granted a New Order Mining Right

440 Mt Quality Resource In The Bushveld Complex

Our resource in the Bushveld Complex, provides significant potential to expand production to 10,000 mtV and extend life of mine

- 440 Mt high grade open cast primary vanadium resource base
- Including ~55Mt combined reserves
- High grade of 1.5-2.0% V₂O₅ among the highest in the world
- Low cost primary vanadium processing capacity supplying ~3% of global Vanadium market
- Scalable processing platform with scope for additional brownfield capacity expansions
- Targeting 10,000 mtV of vanadium production in the medium term

Source: Bushveld Minerals
Bushveld Vametco Operational Update

Vametco generated healthy cash flows in CY18, supported by a strong vanadium price

- **Production capacity**
  CY19e production >2,560mtV, guidance to be provided in Q1 operational update.
  Expansion project to grow Vametco’s share of global market
  The Company commenced an Operational Transformation programme to enhance Vametco’s production efficiency:
  - Increase the vanadium grade in crushed ore through better mine scheduling
  - Increase vanadium grade in kiln feed through improved silica liberation
  - Sustainably increase feed grade to kiln
  - Increase kiln feed rate

- **Vanadium Price**
  Price remain elevated trading at ~US$76kgV YTD¹
  - Vametco’s realised price is based on the prior month’s average price

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1. Year to date (YTD) as at 15 March 2019
2. Following the completion of the acquisition of the remaining 55% share in Vametco in December 2017, Bushveld’s net attributable interest was 59.1%, this subsequently increased to 74% in September 2018, through a series of transactions
3. Excludes depreciation, royalties, selling, general and administrative expenses, and impact from production stoppages

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**Bushveld Vametco results**² (100%)

<table>
<thead>
<tr>
<th></th>
<th>CY18</th>
<th>CY17</th>
<th>CY16</th>
<th>CY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanadium produced (mtV)</td>
<td>2,560</td>
<td>2,649</td>
<td>2,856</td>
<td>2,419</td>
</tr>
<tr>
<td>Vanadium sold (mtV)</td>
<td>2,573</td>
<td>2,721</td>
<td>2,810</td>
<td>2,340</td>
</tr>
<tr>
<td>FeV LMB price US$/Kg V</td>
<td>81.2</td>
<td>32.6</td>
<td>18.5</td>
<td>18.6</td>
</tr>
<tr>
<td>USD/ZAR exchange $=ZAR</td>
<td>13.2</td>
<td>13.3</td>
<td>14.7</td>
<td>12.8</td>
</tr>
<tr>
<td>Revenue US'$m</td>
<td>192.2</td>
<td>79.1</td>
<td>51.7</td>
<td>49.2</td>
</tr>
<tr>
<td>EBITDA US'$m</td>
<td>107.5</td>
<td>23.9</td>
<td>3.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Production costs³ US$/kgV</td>
<td>19.7</td>
<td>16.6</td>
<td>12.9</td>
<td>14.6</td>
</tr>
</tbody>
</table>

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**Bushveld Vametco’s Global Customer Base (CY18 Sales)**

- America
- Europe
- Asia
- Oceania
- Africa
- Middle East

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Source: Metal Bulletin, Company records
Brits Vanadium Project Update
Large primary vanadium resource base with some of the highest grades in the world

- Outcropping, strike extension of the Vametco mine
- Second phase of the exploration programme completed. Maiden Mineral Resource Estimate to be provided in Q2 2019
- Drilling results have indicated:
  - Lower seam weighted average $V_2O_5$ grade in-situ of 0.66% and 1.66% in magnetite
  - the marginally lower average grade in comparison to the grades at the Vametco mine is due to the geological trend of decreasing grades in vanadium for magnetite-rich orebodies from west to east in the Bushveld Complex
- Provides the potential for additional feed tonnages for the Vametco plant and future brownfield processing plants

Ore body extends West to East and dips in northerly direction at 20 degrees
Development strategy options:

- Secure mining right
- Supply ore to China
- Supply ore to other brownfield plants
- Develop greenfield integrated mine & processing plant producing 5.3 ktV₂O₅ tpa of a >99% purity V₂O₅ product

1. The Mokopane Vanadium Project PFS, completed by MSA Group was based on the MML only which is 63Mt even though the overall project resource is 298 Mt
2. Vametco after two stage expansion from 3Mtpa to 5Mtpa. Mokopane costs based on operating costs and capital expenditure as estimated in pre-feasibility study. Mokopane project shown for illustration purposes only and does not imply judgement on Roskill’s behalf of the likelihood of Mokopane being commissioned, nor does it imply a judgement of Mokopane’s economics as compared to other brownfield and greenfield expansion projects not included in this cost curve

Cost curve of vanadium pentoxide, by cost item US$/lb²

Measured and indicated resources size (bubble size = contained V₂O₅)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Resource</td>
<td>Mt</td>
<td>298¹</td>
</tr>
<tr>
<td>Ore Reserve</td>
<td>Mt</td>
<td>28.5</td>
</tr>
<tr>
<td>Grade (in-situ)</td>
<td>%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Grade (in-magnetite)</td>
<td>%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Assumed vanadium Price</td>
<td>US$/kg FeV</td>
<td>33</td>
</tr>
<tr>
<td>Initial Capital Costs</td>
<td>US$ m</td>
<td>298</td>
</tr>
<tr>
<td>NPV @ 9% real</td>
<td>US$ m</td>
<td>418</td>
</tr>
<tr>
<td>IRR real</td>
<td>%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Source: Bushveld Minerals analysis, Roskill. The measured and indicated resources chart and the cost curve chart are based on Roskill’s 2018 Vanadium report
Bushveld Energy

Bushveld Energy is focused on developing and promoting the role of vanadium in the global energy storage market through application in VRFBs.

### A growing, low cost, vertically integrated primary vanadium producer

- High grade ore for primary vanadium mining & processing
- Largest primary vanadium resource base in the world

The Group is targeting a 10,000 mtV production in the medium term.

### An energy storage project developer and component manufacturer

- Electrolyte manufacturing
- Large, low cost vanadium processing
- Focus on expansion and enhancement of brownfield operation
- Co-location in Vametco process => significantly lowering costs
- Vanadium Redox Flow Battery (VRFB) Assembly & manufacturing
- MW scale energy storage project development
- Deployment models include PPAs, leasing models

Targeting initial 200MWh of electrolyte p.a.

Targeting 1,000 MWh opportunities by 2020

Bushveld Energy long term vision is to become a significant electricity storage provider in Africa by 2020, meeting the demand for utility scale energy storage in Africa by leveraging South Africa-mined and beneficiated vanadium.

Source: Bushveld Minerals
Bushveld Energy Overview

Our vertically integrated business model unlocks significant value and opportunities in the energy storage market.

- Bushveld Minerals’ ambition is to grow into one of the world’s most significant, lowest cost and vertically integrated vanadium companies.

- This allows Bushveld to leverage its large low cost production base and be a catalyst in the emerging energy storage industry.

- Large high grade ore for primary vanadium mining
- Significant resource base in the best areas of the Bushveld complex

- Electrolyte manufacturing
- Initial 200MWh electrolyte facility in East London, SA
- Designed to convert vanadium feedstock from Vametco

- VRFB assembly & manufacturing
- Partnership or investment with VRFB firms and local partners
- Medium term focus, once local market for storage is established

- MW scale energy storage project development & Direct VRFB sales
- Deployment models include PPAs, leasing models
- 1st battery project with Eskom installed
- Significant success to date in creating the market, especially in South Africa

Source: Bushveld Minerals

Targeting initial 200MWh of electrolyte p.a.

Targeting 1,000 MWh opportunities by 2020
The Battery Energy Storage Opportunity in Africa Is Real And Now

World Bank Group has launched a $1 Billion fund in battery storage for energy systems in low and middle-income countries

- The World Bank Group (WBG) has committed **$1 billion** for Battery Storage to accelerate investments in battery storage for energy systems in low and middle-income countries
  - Expected to mobilise an additional **$4 billion** in concessional climate financing and public and private investments
  - The program is expected to help these countries ramp up their use of renewables – particularly wind and solar power – improve energy security, increase grid stability and expand access to electricity
  - The program aims to finance **17.5GWh of battery storage by 2025**
- South Africa’s draft integrated resource plan (the country’s electricity plan) has massive opportunities for battery energy storage:
  - **15,000MW** of new renewable electricity generation by 2040
  - **9,000 MW in peaking generation capacity** with provision for alternative technologies (such as battery energy storage) to participate
  - New allocation of an **additional 200MW per annum** for small scale embedded generation that can include storage
  - South African Renewable Energy Independent Power Producer (REIPP) Procurement Programme has been restarted to continue to add renewable energy to the grid, creating opportunities for battery storage
- Bushveld Energy is well-positioned in terms of geography and capabilities to take advantage of the massive opportunities in the region:
  - Nearly **40% of WBG funding** historically has gone to sub-Saharan Africa, suggesting that a similar amount of the battery energy storage programme will be deployed there
  - State-owned electricity utility, Eskom prepares to roll-out **1400MWh** of battery energy by 2022
  - Decreasing performance of the South African power system and recent return of “load shedding” is creating significant demand from electricity consumers for self supply of electricity, including large amounts of storage

Source: Bushveld Minerals, World Bank
Bushveld Minerals Growth Plans And Upcoming catalysts

We have an exciting pipeline ahead, which should assist in the re-rate of the share price

- Outline a capital allocation framework and dividend policy in Q1 2019
- List on the Johannesburg Stock Exchange
- Develop organisational capacity to align with the Company’s growth

- Enhance Vametco’s operational performance
- Targeting a production platform of 10,000 mtVpa in the medium term
- Mokopane Vanadium Project - Secure a New Order Mining Right
- Brits, lower seam grades of 1.66% V₂O₅ in-magnetite, maiden mineral resource estimate to be published in Q2 2019
- Continued focus on enhancing value through targeting brownfield opportunities

- Delivered the first VRFB project with Eskom in CY18
- Grow the VRFB project pipeline across Africa
- Supply electrolytes to downstream stakeholders in the VRFB supply chain
- Working with the IDC to develop an electrolyte manufacturing plant
- Design and implement a vanadium electrolyte rental product
- Installing a solar/VRFB mini grid at Vametco
Vanadium Fundamentals In Steel
Vanadium Market

The current vanadium price rise is driven by structural changes in the vanadium, iron and steel markets

Russia’s vanadium material disappeared, the market price moved up and thereafter Russia restarted production.

Advent of grade 3 rebar in China
The new standard forced Chinese rebar producers to start using vanadium (grade 3) for high strength rebar applications.

Problems with production of electrical power and resulting load shedding in South Africa negatively impacted vanadium production leading to the 2008 price spike.

Highveld Steel & Vanadium stops production

Constrained supply, with short term reductions and limited new supply prospects

Robust and growing demand from steel sector with significant upside from energy storage application uses

A sustained structural market deficit, with significant price upside

Source: Metal Bulletin; 15 March 2019

FeV historical mid-price US$/kgV
Supply: Concentrated Supply
Co-production slag currently accounts for 70% of global vanadium production

Vanadium 2018 feedstock production by source

- 18% Primary
- 12% Co-production
- 70% Secondary

SALT ROAST FLOWSHEET (18% of Global Vanadium Feedstock Production)

Three key steps:
- **Salt roasting** of magnetite concentrate with sodium salts at ~1,200°C to form water soluble sodium vanadate material
- **Leaching, filtration, desilication, precipitation** followed by reaction to form vanadium pentoxide/trioxide
- **Vanadium pentoxide/trioxide** is converted into FeV or NV or other vanadium end products

STEEL PLANT CO-PRODUCTION FLOWSHEET (70% of Global Vanadium Feedstock Production)

- Magnetite concentrate is smelted in a blast furnace/EAF
- TiO₂ is extracted as a slag, while vanadium reports with hot metal
- Vanadium extracted as a slag through controlled re-oxidation of hot metal, which is further processed into pig-iron/ steel
- Vanadium slag, with elevated vanadium grade, is processed through primary vanadium extraction (salt roast flowsheet)

- Grade a key barrier to entry
- Three active primary producers – two in SA and one in Brazil
- Vanadium is the primary driver of economics
- Financing remains a challenge even for primary greenfield projects

Vanadium 2018 feedstock production by source

- 18% Primary
- 12% Co-production
- 70% Secondary

Source: Bushveld Minerals analysis, Roskill 2019 Vanadium Report
Supply: Co-production Supply Is Expected To Continue Falling

Vanadium co-production continues to face significant production constraints emanating from the steel industry.

**High input costs**
- Low Fe grade <30% deposits, require concentrating to ~60% Fe
- Higher input costs than steel plants processing haematite ores

**High operating costs**
- Complex steel plant design
- Inferior Fe grade
- Additional processing steps to remove Ti and V

**No leverage on steel prices**
- Such plants make up small share of steel production – too small to influence steel prices
- Improved margins from cheaper seaborne iron ore not available

**Environmental constraints**
- Being mostly co-producer steel plants, their environmental footprint is negative
- In the firing line of the Central Governments’ crackdown on pollution

**Three response options:**
- **Switch** – to haematite ores to blend and upgrade magnetite feed
- **Curtail**
- **Stop** – production (e.g. Highveld)

**Environmental inspections, challenging iron ore and steel market conditions, and a ban on the import of Vanadium-bearing slags will continue to impact Chinese Vanadium production**

Source: Bushveld Minerals analysis, Roskill 2019 Vanadium Report, TTP Squared
Vanadium Characteristics And Uses
Vanadium has several unique characteristics that position it well in the steel, alloys and chemicals sectors

- Vanadium (V) is a transition metal, in pure form is a grey, soft, ductile element that does not occur in native form but as a component of minerals and as an impurity amongst hydrocarbons and bauxites
- It readily forms several stable oxidation states (II, III, IV, and V)

### Characteristics
- Fabricability
- High strength-to-weight ratio
- Corrosion resistance
- Weldability
- Ability to exist in 4 different oxidation states
- Water-soluble
- Resistant to attack by alkalis, hydrochloric acid, sulphuric acid, and salt water

### Steel
- The steel industry accounts for ~93% of total vanadium consumption in 2018
- Construction steel - rebar
- Alloys for aerospace industry

### Chemicals
- Electrolyte accounted for ~3% of 2018 global vanadium consumption, but could grow up to 44% by 2027 as VRFB’s gain momentum
- Long duration utility scale batteries

Source: Bushveld Minerals analysis, Roskill
Vanadium Demand - Steel Sector Demand Drivers Are Robust

Intensity of use of vanadium in steel in China and other developing countries is below the world’s average

- Strong correlation between economic development and vanadium intensity of use in steel
- Industrialised economies, such as the USA, typically use more vanadium per tonne of steel than emerging economies such as India and China
- As emerging markets develop, the gap will narrow, driving up vanadium intensity of use and thus vanadium demand
- Greater enforcement of rebar standards will drive up specific vanadium consumption rates in China, bringing it closer to the levels of developed economies
- Implications of closing the gap between emerging economies and the developed world:
  - Steel production in China in 2018 = 923Mt
  - Improving Chinese specific vanadium consumption from 0,048 to 0,078 => 0,03 kgV/t additional vanadium demand = 23,924 mtV

Source: Bushveld Minerals analysis, TTP Squared
New Rebar Standards In China Will Increase Intensity Use Of Vanadium

The new standard will drive strong growth in vanadium demand

2010 Code for Design of Concrete Structures (GB50010-2010) issued in August 2010 and took effect from 1 July 2011

2011 Update of Code for Construction Quality Acceptance of Concrete Structures (GB 50204 – 2002) – issued in December 2010 and took effect from 1 August 2011

2015-2017 Quenching and tempering techniques used by rebar producers to minimise use of alloying elements, thus blunting impact of codes on vanadium demand

2018 China’s new high-strength rebar standard introduced in January 2018, effective November 2018

Source: Bushveld Minerals analysis, TTP Squared

China Crude Steel and Vanadium

China Rebar Product Structure

Quenching & tempering techniques among steel plants leads to lower V consumption

China crude steel production (LHS) (kt) China crude steel consumption (LHS) (kt)
China vanadium consumption (RHS) (tV)

China Rebar Product Structure

[Graph showing the percentage of China Rebar Product Structure by grade: Gr.1 - 235MPa, Gr.2 - 335MPa, Gr.3 - 400MPa, Gr.4 - 500MPa, Gr.5 - 600MPa]

2010 - 2014 CAGR 2014 - 2017 CAGR

5.2% 0.8%
3.9% 1.5%
9.8% -3.1%

2010-2017 CAGR

5.2% 3.9% 9.8% 3.77%

0.45% 19.36% 67.31% 6.49%

2015

Code for Design of Concrete Structures (GB50010-2010) issued in August 2010 and took effect from 1 July 2011

Code for Construction Quality Acceptance of Concrete Structures (GB 50204 – 2002) – issued in December 2010 and took effect from 1 August 2011

Quenching and tempering techniques used by rebar producers to minimise use of alloying elements, thus blunting impact of codes on vanadium demand

China’s new high-strength rebar standard introduced in January 2018, effective November 2018

Source: Bushveld Minerals analysis, TTP Squared
Vanadium Fundamentals in Energy Storage
“Electrification Of Everything”

The increasing role of electricity in the global energy mix will drive energy storage demand

In 1980, electricity formed just 10% of all energy use

Today, electricity represents 20% of total energy use

By 2050, electricity will be 45% of all energy use

Source: DNV GL Energy Transition Outlook 2018
Energy Storage Matters For Vanadium Demand

Navigant Research forecasts energy storage to be a $50 billion market within 10 years, with flow batteries poised to capture nearly 18%.

- Stationary energy storage demand is growing rapidly and will exceed 468GWh by 2027 on a cumulative, installed basis.
- Most projects point to 20-40GWh of storage deployed by 2025.
- Annual additions are forecast to reach 80GWh by 2025.
- Growth may appear excessive, but it is similar to solar PV growth over the past 10 years.

Note: Utility segment includes thermal storage technology.
Source: Navigant Research.
Global Energy Storage Usage Moving From Short To Long Duration

According to Navigant, the two largest market segments in utility energy storage for the next 10 years will require long duration energy storage.

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>Compound annual growth rate (CAGR) from 2018 to 2027, %</th>
<th>2027 global forecast, MWh</th>
<th>Share of 2027 market, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation Capacity</td>
<td>45.2%</td>
<td>61,596</td>
<td>64.4%</td>
</tr>
<tr>
<td>T&amp;D Asset Optimization</td>
<td>43.4%</td>
<td>24,588</td>
<td>25.8%</td>
</tr>
<tr>
<td>Renewables Ramping/Smoothing</td>
<td>52.1%</td>
<td>7,575</td>
<td>7.9%</td>
</tr>
<tr>
<td>Frequency Regulation</td>
<td>35.7%</td>
<td>1,703</td>
<td>1.8%</td>
</tr>
<tr>
<td>Volt/VAR Support</td>
<td>32.1%</td>
<td>122</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Source: Navigant
Vanadium Redox Flow Battery

- Long lifespan cycles: Ability to repeatedly charge / discharge over 35,000 times for a lifespan of over 20 years
- **100% depth of discharge**: Without performance degradation is unique to VRFBs
- **Lowest cost per kWh** when fully used at least once daily makes VRFBs today cheaper than Li-ion batteries
- **Safe**, with no fire risk from thermal runaway
- **100% of vanadium is re-usable** upon decommissioning of the system
- **Scalable capacity** to store large quantities of energy
- **Flexibility**: Allows capture of the multi-stacked value of energy storage in grid applications
- **Very fast response time** of less than 70ms
- **No cross-contamination**: Only one battery element, unique among flow batteries

VRFB Is The Simplest, Most Developed Flow Battery In Mass Commercial Operations

VRFBs are best suited for utility scale, long duration, stationary energy storage applications
1. Technical performance

- Excellent for *long duration energy applications* (4 or more hours per day)
- Lower roundtrip efficiency but longer life and *no degradation*

2. Safety

- *No risk of fire from thermal runaway*
- Electrolyte spillage is main risk

3. Cost

- Yet to experience economies of scale
- *High contribution of vanadium is both a risk and an opportunity*

4. Market acceptance

- More *nascent technology*
- Challenge from *fragmented supply market dominated by start-up companies*

---

**VRFB**

**Lithium-ion**

- Excellent for *power applications*
- Degradation accelerates with frequent use, temperature and deep discharges
- *Usage limitations* imposed by manufacturers

- *Thermal runaway creates risk of fire and smoke* that must be managed
- Restrictions on deployment in some locations

- *Significant cost decreases* in recent years due to EV-oriented R&D and capacity growth
- Cost reductions expected to slow

- *Growing acceptance from deployment in frequency control markets*
- Credibility from large, consolidated cell manufacturers
While the market share of VRFBs compared to other energy storage technologies is a key assumption, the ultimate size and growth rate of the stationary energy storage market has even greater impact.

Recent trends to revise energy storage forecasts upward imply that vanadium demand from VRFBs may be greater than expected even under “aggressive forecasts”.

Within 10 years demand for vanadium by energy storage could equate to 50-100% of today’s global market.
Vanadium Use In Energy Storage May Exceed Expectations

Energy forecasts for new technologies may significantly undervalue actual growth potential

The same phenomenon is occurring with energy storage, where Bloomberg New Energy Finance has more than doubled its 2030 energy storage forecast in two years.

<table>
<thead>
<tr>
<th></th>
<th>Vanadium In Energy Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>The VRFB market opportunity is large and has the potential to be 10 times the size of the current vanadium commodity market</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>The robust steel demand anchor for vanadium is critical to support vanadium supply development</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Bushveld Minerals is uniquely positioned to effectively address VRFB adoption hurdles</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>...and in the process to support the diversification and strengthening of the vanadium demand profile...</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>...while capturing a compelling commercial opportunity...</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>...and establishing a natural hedge for vanadium production against future vanadium price downswings</td>
</tr>
</tbody>
</table>
All VRFB Forecasts Expect Major Growth In The Medium To Long Term

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Assumption</th>
<th>VRFB demand in 2027, MWh</th>
<th>Vanadium use in VRFBs in 2027, mtV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanadium 101 - scenario</td>
<td>• VRFB forecast scenario from Bushveld Minerals May “Vanadium 101” presentation</td>
<td>9 250</td>
<td>50 875</td>
</tr>
<tr>
<td></td>
<td>• Scenario used 25% market share and Bloomberg New Energy ESS forecast</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 5.5 kg of vanadium per kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Navigant forecast</td>
<td>• Flow battery forecast from Navigant, assuming 18% market share</td>
<td>18 700</td>
<td>82 280</td>
</tr>
<tr>
<td></td>
<td>• VRFBs are the successful flow battery technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4.4 kg of vanadium per kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upside – BMI forecast</td>
<td>• VRFB forecast from Benchmark Minerals (BMI)</td>
<td>27 500</td>
<td>96 250</td>
</tr>
<tr>
<td></td>
<td>• Assumes 25% market share of Navigant’s overall energy storage forecast</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3.5 kg of vanadium per kWh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BMI, BNEF, Bushveld Minerals “Vanadium 101”, Navigant Research

Major driver for increased VRFB demand is a larger energy storage market forecast from Navigant than the BNEF forecast used in Vanadium 101 presentation assumptions.

BNEF has since more than doubled its forecast for energy storage.

VRFB manufacturers are researching ways to use more of the electrolyte to reduce costs and improve energy density. Bushveld’s scenarios assume these improvements are achieved to support market penetration.
Bushveld Minerals Board Of Directors

Ian Watson
Non Executive Chairman

Fortune Mojapelo
Chief Executive Officer

Geoff Sproule
Financial Director

Jeremy Friedlander
Non Executive Director

Anthony Viljoen
Non Executive Director

Michael Kirkwood
Non Executive Director
Bushveld Minerals Experienced Leadership Team

Fortune Mojapelo
Chief Executive Officer

- Co-founder and Chief Executive Officer (CEO) of Bushveld Minerals
- Co-founder and director of VM Investment (Pty) Ltd, a principal investments and advisory company focusing on developing mining projects in Africa
- Founding CEO of Bushveld Minerals Limited where he has played a lead role developing and executing the company’s vanadium strategy
- Played a leading role in the origination, establishment and project development of several junior mining companies
- His corporate career started at McKinsey & Company as a strategy consultant

Geoff Sproule
Financial Director

- Chartered accountant with experience spanning over 40 years in numerous financial management roles
- Prior to joining Bushveld Minerals Geoff was a partner at Deloitte and Touche

Mikhail Nikomarov
Chief Executive Officer of Bushveld Energy

- Co-founder and Chief Executive Officer of Bushveld Energy, an energy storage solutions company, part of AIM-listed Bushveld Minerals, an integrated vanadium company
- Chairman of the South Africa Energy Storage Association (SAESA)
- Chair of the Energy Storage Committee of Vanitec, the global non-profit organisation of vanadium producers
- Previously worked for McKinsey & Company in Russia and across Africa, focusing on the power sector and economic development

Lyndon Williams
Vametco Chief Operations Officer

- Previously Vametco General Manager until promotion to COO role in 2015
- Has held a range of roles with Highveld Steel & Vanadium including Metallurgist, Superintendent Vantra, Assistant Manager Steel Plant, Manager Vanchem Manager Steelmaking, Manager Ironmaking, Works Manager Steel and Vanadium, and global Vanadium sales and marketing
- Is a qualified Metallurgical Engineer
- Over 35 years’ experience in the extraction of vanadium as well as vanadium slag production and processing

Prince Nyati
Chief Executive Officer of Lemur Holdings

- Over 15 years’ experience in energy and mining with a particular focus on project development and mergers and acquisitions
- Worked in several countries including Zambia, South Africa, India, Singapore and the USA under Shell, Total Petrochemicals, Eskom, Tata Power and Oureport. As group head of Tata Power, he has evaluated over 100 coal assets and over 50 power opportunities
- Led the development of numerous infrastructure projects in sub-Saharan Africa and facilitated transactions worth approximately $1.5 billion in Zambia and South Africa
The 74% underlying interest in Vametco Alloys (Pty) Ltd was achieved with a total cash outlay of approximately US$48 million, which is the equivalent of ~1x H1 2018 EBITDA.
Bushveld Energy’s Electrolyte Rental Model

The rental model addresses the upfront cost of vanadium

**Financial Institution**
- Advances a credit facility to Intermediary

**Intermediary**
- Special Purpose Lease Co.
  - Pays interest on the credit facility
  - Settles the outstanding loan at contract termination
  - Converts vanadium into electrolyte
  - Supplies vanadium under rental contract
  - Recovers vanadium at contract expiration
  - Puts a nominal upfront deposit for electrolyte
  - Pays annual rental fee for the electrolyte (covering interest payments and a price risk premium)

**Miner - Vametco**
- Delivers required vanadium units to the Intermediary
  - Pays cash for the supplied vanadium units at market rates

**VRFB customer (Off-Taker)**

Benefits of the product to VRFB customers or manufacturers include:
- Significantly lower and predictable CAPEX for the electrolyte components of the battery
- A manageable annual fee that is added to the battery’s maintenance costs
- Overall lower total cost of ownership / levelized cost for a VRFB than if an outright purchase

Source: Bushveld Energy
<table>
<thead>
<tr>
<th>Steel sector</th>
<th>Energy storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Circa 90% of vanadium demand is underwritten by the steel industry where it is used as an additive</td>
<td>• Vanadium’s unique characteristics positions it well for large scale, long duration energy storage using VRFBs</td>
</tr>
<tr>
<td>• China is the largest market for vanadium</td>
<td>• VRFB technology is already in commercial production with large (MW) scale deployments globally</td>
</tr>
<tr>
<td>• The country’s vanadium consumption is anticipated to grow at a CAGR of 2.3% up to 2027 due to a revision of the tensile strength of steel rebar products, announced in 2017</td>
<td>• China’s new National Development Plan’s (Document #1701) focus “includes 100MW-grade, vanadium redox flow battery energy storage stations”</td>
</tr>
<tr>
<td>• China’s new standard is designed to limit and eliminate the use of inferior steels in construction (Grade 2 rebar):</td>
<td>• Impact on vanadium demand significant as vanadium comprises 30-60% of cost of VRFB systems</td>
</tr>
<tr>
<td>➢ Grade 3 (400MPa), Grade 4 (500MPa), and Grade 5 (600MPa), will require 0.03% V, 0.06% V, and more than 0.1% V respectively</td>
<td>• Commercialisation of Energy in Europe, EC report: there will be economic potential for very large amounts (about 400 GW) of storage in the EU</td>
</tr>
<tr>
<td>➢ The above may lead to an increase in Chinese vanadium demand of over 30% or 10,000 tpa in 2019</td>
<td>• The amount of vanadium used for energy storage has doubled in the past 12 to 18 months, according to Vanitec</td>
</tr>
</tbody>
</table>
Vanadium Demand Is Underwritten By The Steel Sector

Strong positive correlation between steel production and vanadium consumption

- Vanadium consumption and steel production are strongly correlated
- China’s new high-strength rebar standard effective November 2018 estimated to increase global Vanadium demand by 10-15%
- Regulatory prescriptions make it possible to estimate with relative certainty demand outlook for vanadium in the steel sector

In a nascent energy storage industry, the steel anchor is important for vanadium supply development

Source: Bushveld Minerals analysis, Roskill, World Steel Association
Vanadium Redox Flow Battery

- The flow battery, unlike conventional batteries, uses a liquid vanadium electrolyte to store energy in separated storage tanks, not in the power cell of the battery
- During operation these electrolytes are pumped through a stack of power cells, or membrane, where an electrochemical reaction takes place and electricity is produced
- VRFB is the simplest and most developed flow battery in mass commercial operations

*The unique features of VRFBs make them ideal for utility scale, stationary energy storage applications*

### Applications of VRFBs

1. **Driving grid efficiency – operational and capital expenditure**
   - Peak shaving or peaking capacity
   - Regulating load frequency and providing other ancillary services
   - Balancing PV and wind intermittency
   - Reducing and deferring capex for transmission and distribution lines

2. **Driving grid independence**
   - Storing electricity from solar PV for use at night
   - Lowering system costs for micro grids and islands

**VRFBs are ideally suited for large scale, long duration storage applications**

### Large VRFB systems currently in deployment globally

<table>
<thead>
<tr>
<th>Year Announced</th>
<th>Company</th>
<th>Location</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Rongke Power</td>
<td>Dalina, China</td>
<td>800 MWh</td>
</tr>
<tr>
<td>2017</td>
<td>VRB Energy</td>
<td>Hubei, China</td>
<td>400 MWh</td>
</tr>
<tr>
<td>2018</td>
<td>RedT</td>
<td>Austria, Germany</td>
<td>60 MWh</td>
</tr>
</tbody>
</table>

*“Vanadium has soared more than 130% in the past, outperforming better-known battery components like cobalt, lithium and nickel. Analysts are expecting a shift in uses of vanadium. The metal can be used in industrial-scale batteries, which help to even out daily peaks and troughs from renewables...”*

Bloomberg, January 2018

Vanadium Redox Flow Battery

Vanadium has outperformed better-known battery components like cobalt, lithium and nickel
### VRFB Adoption Hurdles

**Bushveld Minerals is well positioned to address the two major hurdles to VRFB adoption**

<table>
<thead>
<tr>
<th>Global challenge</th>
<th>Bushveld Minerals opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Security of supply</strong></td>
<td>• Extensive vanadium resource in South Africa of ~440 Mt</td>
</tr>
<tr>
<td>• 1,000 MWh of VRFB-based energy storage requires ~6% of global vanadium supply</td>
<td>• High grade of vanadium resources in Bushveld complex allow for low cost, primary vanadium production</td>
</tr>
<tr>
<td>• VRFBs could contribute ~44% of vanadium consumption by 2027</td>
<td>• Existing low cost cash generating and scalable production platform</td>
</tr>
<tr>
<td><strong>Stability of vanadium input cost</strong></td>
<td>• Bushveld vanadium projects are well positioned with a lower first-quartile cash cost to mitigate security of cost risk</td>
</tr>
<tr>
<td>• Vanadium input costs contribute ~40% of the cost of the VRFB systems</td>
<td>• Bushveld’s new electrolyte rental product will reduce upfront costs and allocate them over long life-span of VRFB and reduce vanadium price risk</td>
</tr>
<tr>
<td>• Vanadium prices have risen ~400% in the past 3 years</td>
<td></td>
</tr>
</tbody>
</table>
Substitution Consideration

Niobium Substitution Threat

Factors working against substitution

- Replacement of vanadium requires technical adjustments to steel production, to ensure that product specifications and quality are not compromised
- Vanadium is generally considered to require lower rolling pressures and temperatures than niobium to give equivalent steel properties
- Less energy is thus consumed in the production process when vanadium is used
- Niobium supply significantly more concentrated – CBMM controls >80% of supply with significant additional capacity

These factors combined mean that substitution is normally not considered for short-term changes in market conditions because of the considerable effort needed to implement the changes

Factors supportive of substitution

- Sustained high vanadium prices
- Vanadium price volatility – substitution occurs when the V price is 2-4x higher than Nb
- Long term niobium contracts provide reasonable price stability for steel plants
- Concentration in niobium supply means supply response better coordinated

Recent data

- China imported 45% more FeNb in 2018 compared to 2017 (35,737mt in 2018 compared to 24,644mt in 2017)
- Much of the substitution is price elastic and will be reversed as the Vanadium price normalises

Source: Bushveld Mineral analysis, Roskill
Understanding Vanadium Supply

Co-product slag currently accounts as source of most vanadium supply, but the future lies with primary vanadium ore feedstock.

There are several greenfield vanadium projects exploring hydrometallurgical processing methods to produce iron, vanadium and titanium. None of these are yet in commercial production.

Source: Bushveld Minerals analysis
Vametco Processing Steps

Vametco employs the standard salt roast and leach process to Produce Nitrovan™

Diagram of processing steps:
- Vanadium Ore from mine
- Ore Stockpile
- Crushed Ore Stockpile
- Beneficiation Tailings
- Primary Crushing
- Secondary Crushing
- Tertiary Crushing
- Milling
- Wet Magnetic Separation
- Concentrate Filtration
- Concentrate Stockpile
- Leach Tailings
- AMV Precipitation
- Desilicification
- Filtration
- Leaching
- Regrinding
- Roasting
- AMV Filtration
- AMV Drying
- MVO Reactor
- Briquette Mixing
- Sulphate Recovery
- Sodium Sulphate/Captive Stockpile (Re-used as flux in the Kiln)
- NV Despatching
- Nitrovan Shaft Furnace
- Briquette Drying
• The ore is passed through a three-stage crushing and milling circuit to produce a product sizing suitable to liberate the gangue materials in the ore, typically 20% passing 75 microns and passed through a low intensity magnetic separation circuit to produce a magnetite concentrate product.

• The concentrate is roasted with sodium carbonate and sodium sulphate in a rotary kiln at temperatures of up to 1,150°C to form water-soluble sodium vanadates. Solids exiting the rotary kiln are discharged directly into a rotary cooler that cools the solids sufficient for conveying to the leaching circuit.

• The cooled calcine is fed to a wet ball mill which grinds the agglomerated material for improved leaching and also acts as the first stage of leaching. The mill discharge slurry is pumped to belt filters to separate the vanadium rich solution and calcine tailings. The vanadium rich solution is pumped to thickeners where desilication and concentration of the vanadium-bearing leach liquor takes place. Calcine tailings are conveyed to the tailings disposal facility.

• Ammonium sulphate is added to the vanadium-bearing leach liquor which allows for the precipitation of vanadium in the form of ammonium metavanadate (AMV).

• The AMV filter cake is dried in a rotary dryer and thereafter transferred to the MVO Rotary Calciners to produce Modified Vanadium Oxide (MVO).

• Nitrovan™ production – the MVO is mixed with carbon and a binder which is briquetted and fed into an induction shaft furnace under a nitrogen atmosphere to produce Nitrovan™.
The Increasing Role Of Electricity In The Global Energy Mix Will Drive Energy Storage Demand

Total Energy Storage Market, MWh

- **Electric Vehicles**
- **Consumer Electronics**
- **Stationary Storage**

Stationary storage is the most nascent and rapidly growing energy storage sector.

Consumer electronics is the most mature energy storage segment.

Transportation

Source: Navigant
Stationary energy storage usage parallels that of transmission lines, which move electricity from one location to another. Similarly, energy storage moves electricity from one time to another.

Different types of storage and storage technologies are relevant for different applications, often determined by the amount of time stored energy that is required.

While storage is needed to stabilise and make variable generation from solar and wind dispatchable (or “base load”), the value of storage goes far beyond supporting renewable energy.

Source: International Renewable Energy Agency (IRENA)
## There Are Clear Performance Benefits To VRFBs And Lithium-ion

<table>
<thead>
<tr>
<th>Metric</th>
<th>VRFB</th>
<th>Lithium-ion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-chemistries</strong></td>
<td>H₂SO₄-based, HCl-based</td>
<td>LFP, LMO, NCA, NMC, LTO</td>
</tr>
<tr>
<td><strong>Energy Density</strong></td>
<td>20-40 Wh / kg</td>
<td>80-200 Wh/kg</td>
</tr>
<tr>
<td><strong>Discharge Time</strong></td>
<td>3-10 hours</td>
<td>0.5-5 hours</td>
</tr>
<tr>
<td><strong>DC Efficiency</strong></td>
<td>75-90%</td>
<td>92%-99%</td>
</tr>
<tr>
<td><strong>Cycle Life</strong></td>
<td>20,000-30,000 cycles</td>
<td>600-12,000 cycles</td>
</tr>
<tr>
<td><strong>Calendar Life</strong></td>
<td>20-25 years</td>
<td>3-10 years</td>
</tr>
<tr>
<td><strong>Depth of Discharge</strong></td>
<td>100%</td>
<td>80-95%</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-20 - 50° C</td>
<td>0-30° C</td>
</tr>
<tr>
<td><strong>Self-discharge (24h)</strong></td>
<td>2.5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Safety Notes</strong></td>
<td>Corrosive electrolyte</td>
<td>Susceptible to thermal runaway</td>
</tr>
<tr>
<td><strong>Applications</strong></td>
<td>Suited for energy applications</td>
<td>Suited for power and energy apps</td>
</tr>
</tbody>
</table>

*Source: Bushveld Energy, Navigant*
Bushveld Minerals Corporate Video: https://www.brrmedia.co.uk/broadcasts/5a5626af9ed50c2f9b04679c/bushveld-minerals-an-emerging-integrated-vanadium-producer
Vanadium 101 Webinar: https://edge.media-server.com/m6/p/i2wo6bk9
Energy Storage 101 Webinar: http://webcasting.brrmedia.co.uk/broadcast/5bd2eaе5b01eф6b20c2f9eb/5bd348eba21632633b00003d