Vanadium Sector Review

Vanadium Primer:
~ Steel Strength and the Blue-Sky of Batteries

~ OCEAN EQUITIES

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Investment Opportunity

Vanadium is one of the lesser-known metals and is used for high-strength steel alloying. The use of vanadium is becoming increasingly important and we believe developments in battery technology provide a strong investment case over and above steel-production growth.

The aim of this thematic research note is to provide the reader with a background to vanadium, its uses, and the market dynamics involved. We have also analysed a peer group of vanadium explorers and developers and highlight the trends of the sector and potential of the companies.

- **Vanadium:** Occurs in over 60 different minerals and fossil fuel deposits, most commonly in deposits of titaniferous magnetite, uraniferous sandstone and siltstone and phosphate rock.
- **Uses:** Over 87% of vanadium is used as a steel alloy for strength; other uses include chemicals and catalysts.
- **Vanadium Batteries:** Electrolyte properties of vanadium allow it to be very useful in batteries both for automotive use (vanadium-lithium) and for grid-scale storage of power in Vanadium Redox Batteries ('VRB').
- **South Africa, China and Russia produce 90% of the world's vanadium:** ~56,500t contained V is produced in total, with Evraz and Xstrata producing the lion's share.
- **Only a Handful of Greenfield Projects:** The most advanced project anticipated to next come (back) online is Atlantic's Windimurra project in Western Australia which has had a long colourful history and is expected to restart production in Q3'11.
- **Steel Strengthening Growth Demand Increasing:** Tighter regulations for high strength ('rebar') steel and the expansion of emerging economies is expected to lift consumption to pre-crisis levels from ~55,000t V currently to ~70,000t V by 2015.
- **Prices Historically Volatile:** Currently FeV is US$31/kg and V_2O_5 US$16/kg (steel grade) and we expect these prices to appreciate in the medium-term with greater consumption.
- **Battery Technology – The Game Changer:** We believe that the developments in battery technology will lead to an increase in demand for vanadium and ultimately require specific supply from new producers. VRB and automotive battery demand could collectively add another ~20,000t V by 2015 and therefore presenting a deficit in the market by at least 10,000 to 15,000tpa.
- **The Overlooked Demand:** Vanadium use in energy storage will become a key niche that will need to be filled by specific battery-grade vanadium production, the supply of which battery manufacturers will be looking to secure.
- **Keys to Unlocking Vanadium Projects:** Vanadium production is capital-intensive and requires deposits to have the right mix of characteristics for ease of processing. The 'tenor' in concentrate is a key characteristic of a project's ore once processed into a concentrate.
- **Vanadium Plays:** We have rated each of the 12 companies in our peer group according to deposit, stage, tenor, economics, end use leverage and country risk. Our investment ideas include LGO.CN, SPM.AU, EGX.CN as well as ATI.AU and AVC.CN as others to watch.

Industry Outlook and Catalysts

The vanadium industry will be underpinned by the traditional steel-growth consumption and projects will continue to run along their development curves over the short-term.

The emergence of strategic developments for the supply of high-purity vanadium will come to the forefront… and it is not a question of "if", but "when"…

Vanadium:
SECTOR REVIEW

15th July 2011

INVESTMENT IDEAS

Standouts

Largo Resources | LGO.CN | *Maracás, Brazil*

Speewah Metals | SPM.AU | *Speewah, Aus*

Energizer Res | EGZ.CN | *Green Giant, Mad*

Ones to Watch

Atlantic Ltd | ATI.AU | *Windimurra, Australia*

American Vanadium | AVC.CN | *Gibilleni, USA*

Companies Included

Apella Res | APA.CN | *Iron T / Lac Dore, Can*

Atlas Iron Ore | AGO.AU | *Balla Balla, Aus*

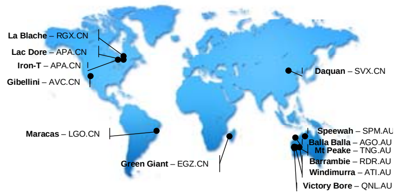
Argex Mining | RGX.CN | *La Blache, Canada*

Quest Minerals | QNL.AU | *Victory Bore, Aus*

Reed Resources | RDR.AU | *Barrambie, Aus*

Sino Vanadium | SVX.CN | *Daquan, China*

TNG Limited | TNG.AU | *Mt Peake, Aus*



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Disclosures & Disclaimer

Disclosure: All market prices included in this research report are as at 14th Jul'11 unless otherwise stated. All $ are USD by default or otherwise stated.

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VANADIUM FACTBOX

Physical Properties

Chemical Symbol: V

Atomic Number: 23

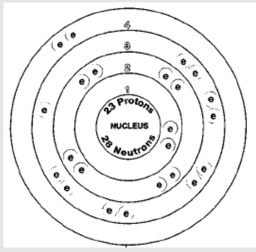
Atomic Mass: 50.9415

Melting point: 1887°C

Boiling point: 3377°C

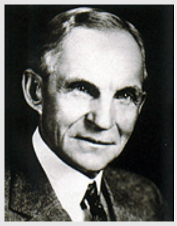
Density: $6g/cm^3$

Thermal Conductivity: 30.7 W m-1K-1 (27°C)



Vanadium History 101

Who found Vanadium? Vanadium is a metal which was discovered by the Swedish scientist Sefstrom in 1831. He named it after Vanadis the Swedish Goddess of Beauty and Fertility because of the attractive brilliant colours of the chemical compounds in which it was first found. It was well named for it has provided material for the brilliant thoughts of the fertile minds of scientists and technologists who, for over 150 years, have developed and continue to develop new materials for the benefit of humanity. (vanitec.org)



Confusing Times: Sefstrom in his painstaking study at the laboratories of the Eckersholm iron works which obtained iron ore from the Taberg iron mountain at Falun in Sweden, separated vanadium from chromium and uranium with which it had been confused. He must have considered the automobile a fiction of the imagination, flying a dream, and space travel a fantasy.

A Remarkable Steel Alloy, But it Took Time: Yet his discovery, which preceded Bessemer's process for making steel by nearly twenty years and the first production of alloy steel by Mushet by over thirty years, was essential for the development of alloy steels and titanium alloys with their remarkable properties. Without these steels and titanium alloys it would not have been possible for man to design machines which enable him to drive across the earth, fly in the sky and travel into space. Other pioneers in the isolation and use of vanadium were J. Berzelius, in Sweden, Sir Henry Roscoe and Professor Arnold in the UK.

Henry Ford a Fan: An early user of vanadium was Henry Ford in his Model T who specially highlighted the use of vanadium-containing steels as imparting twice the strength for half the weight.

Where would we be without vanadium not just in steel?

Throughout the 20th century vanadium has played an important part in industry to protect the environment, reduce pollution and produce materials of benefit to health. Vanadium protects health - provides medicines - assists surgery - controls pollution.

Vanadium in everyday applications…

- Vanadium pentoxide protects our eyes, our bodies, our food and our medicines from the sun's harmful ultraviolet rays.
- Vanadium catalysts remove harmful constituents from effluents and natural gas.
- Vanadium enables synthetic rubber to be produced from ethylene and propylene.
- Vanadium improves the colour quality of television and computer screens.
- Vanadium enables production of fertilisers.
- Vanadium improves the colour of light from mercury lamps.
- Vanadium oxide reacts with organic compounds to produce dyes for textiles and leather which resist fading in strong sunlight.

(vanitec.org)

Synopsis and Investment Case

Steel Growth Demand a Given, Batteries are the Real Charger

The future growth equation for the demand of vanadium in high strength steel is simple. We believe the development and adoption of vanadium use in batteries for automotive and power generation presents a unique demand and a space that will need to be filled specifically by junior vanadium companies.

Straight Forward EV/t Analysis Not Simple for Vanadium Peers

From our research and analysis of vanadium projects and companies, we have concluded that assessment on a simple basis of Enterprise Value ("EV")/Resource ratios do not provide a clear comparison and valuation metric. Instead we have created certain criteria that stand out on both a company and project level that will justify an investment to capitalise on the projected vanadium market growth.

Our Vanadium Equity Picks

We have rated each of the 12 companies in our peer group according to deposit, stage, tenor, economics, end-use leverage and country risk.

We believe that out of our peer analysis group, three companies stand out for different reasons:

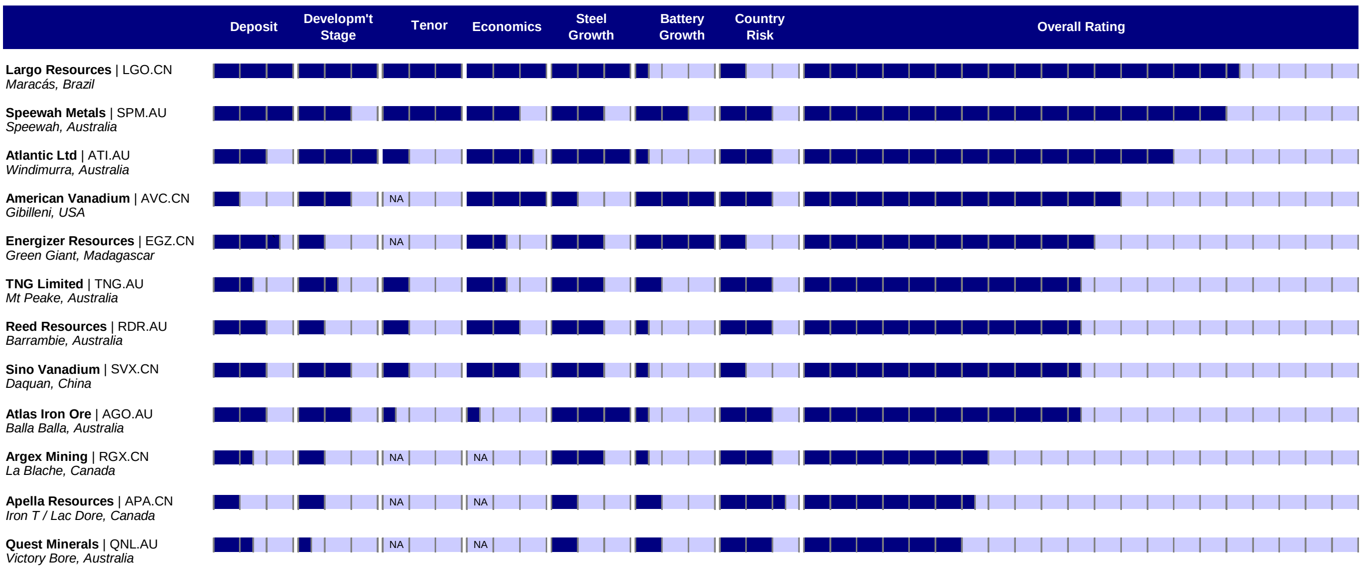
Largo Resources (LGO.CN | MCap C$174m): The Maracás Project is of exceptional quality and expected to be in production by 2012. The project is validated by the off-take agreement the company has with Glencore International plc.

Speewah Metals (SPM.AU | MCap A$39m) – Speewah is by far the largest defined resource in our peer group, if not globally. The overriding key feature of the project is the vanadium tenor of the concentrate which is ranked far above the group.

Energizer Resources (EGX.CN | MCap C$41m) – We believe EGX will be able to take advantage of increasing vanadium battery demand by directly supplying high purity grade vanadium. However, further work needs to be conducted on the metallurgy and processing to further de-risk the project.

Other companies which rate highly in our rankings are **Atlantic Ltd** (ATI.CN| MCap A$203m) and **American Vanadium** (AVC.CN | MCap C$31m).

Refer to page 22 for "*Company Summaries*".



Notes:
Country Risk: A higher score indicates less country risk
Economics for Balla Balla have been marked down due to the deposit being mined primarily for iron and vanadium as a by-product

Source: Ocean Equities Research 2011

Introduction to Vanadium

Vanadium and Its Primary Uses

The Metal – No Single Ore from which it is Recovered

Chemical symbol – V, vanadium occurs in over 60 different minerals and fossil fuel deposits.

Vanadium is a silver-grey, soft and ductile metal, with the chemical symbol, V. While vanadium in its metallic form is not found in nature, it occurs in over 60 different minerals and fossil fuel deposits, such as crude oil, coal or tar sands. There is no single mineral ore from which vanadium can be recovered. As a result, vanadium is found as a trace element in a number of different rock materials and is produced as a co-product or by-product of mining operations.

Vanadium forms stable, concentrated electrolytic solutions in four neighbouring oxidation states. The oxidation state of unreacted Vanadium is zero, whereas its fully reacted state is +5. The different states can be clearly identified by changing colours (+2 (lilac), +3 (green), +4 (blue) and +5 (yellow)).

Uses – Strength Its Key

Over 87% of vanadium is used as a steel alloy for strength.

Vanadium's main use is as a hardening additive to steel products, with 87% of its end use as a steel alloy. Apart from its strengthening characteristic, vanadium resists corrosion and combats oxidation by the formation of an oxide layer; it is a very stable and therefore highly sought-after additive. Vanadium when combined with titanium produces a stronger and more stable alloy and when used together with aluminium can be used in jet engines and high speed airframes.

Ferro-vanadium (vanadium alloyed with iron, FeV) is used in the production of carbon steel, high-strength low-alloy steel ('HSLA'), full alloy steel and tool steel. These alloys end uses include armour plating for military vehicles, and car engine parts such as pistons and crank shafts. Vanadium steel is also used to construct the frames of high-rise buildings and oil drilling platforms. High-carbon steel alloys contain ~0.15-0.25% V by weight and alloys intended for high-speed tools have a vanadium content between 1-5% V.

Vanadium's other uses include: as a superconductor in magnets; vanadium pentoxide is used as a catalyst in the manufacture of sulphuric acid as well as in making ceramics; and vanadium dioxide is used in the production of glass coatings used to block infrared radiation.

New applications in batteries is potentially a new end market.

Another use for vanadium, which is only beginning to be realised as a potential 'game-changer' in the market, is its use in renewable energy industries, specifically in battery applications. The application in electric cars and for grid-power by Vanadium Redox Batteries ('VRBs') could potentially add a significant consumer market well beyond the current levels for vanadium. We explore more of this topic and implications in "*Vanadium's 'Green' Uses – Potentially Changing Market Dynamics*", page 6.

Substitutes – A High Place in Aerospace Applications

For steels specifically, vanadium can be substituted using various combinations of other alloying elements. Metals such as manganese, molybdenum, niobium (columbium), titanium and tungsten are to some degree interchangeable with vanadium as alloying elements in steel. For catalytic uses, platinum and nickel can replace vanadium compounds in some (not all) chemical processes.

High vanadium prices in 2005-06 resulted in increasing substitution of FeV by ferro-niobium. However, this was somewhat short lived because ferro-niobium in steel applications is not a perfect substitute for FeV as it is only 60% effective. In addition the costs of producing steel using ferro-niobium are greater because of the higher temperatures required and different equipment for rolling. Customers are also constrained by specifications of the steel that they can use.

Currently there is no acceptable substitute for vanadium in aerospace titanium alloys or for the vanadium battery applications that are currently being developed.

Vanadium from Earth to Metal

Global Deposits – Usually as a Co/By-Product

Vanadium is found in magnetites, sandstones and siltstones, but is traditionally mined from magnetites.

Vanadium is habitually recovered as a by-product or a co-product, and as a result the world resources are difficult to precisely estimate. The United States Geological Survey ('USGS') estimates that world resources of vanadium are in the order of ~63mt. The world's resources are also not indicative of available supply. Deposits yet to be exploited range from 14Mt to 3,600Mt of (Refer to "*Company and Project Comparisons*", page 18).

Vanadium occurs most commonly in deposits of titaniferous magnetite, uraniferous sandstone and siltstone and phosphate rock. There is also a substantial amount of the metal found in bauxite and carboniferous materials such as coal, crude oil, oil shale and tar sands.

Titaniferous magnetite deposits are found globally in basic igneous rock and occasionally metamorphic rock. These deposits generally occur as tabular or irregular shaped orebodies or seams and veins in layers. Titanium is usually mined with vanadium, which comprises between 0.1% and 2% of the resource. Titaniferous magnetite deposits are the main source of vanadium currently being exploited and examples include: Xstrata's Rhovan mine in the Bushveld Complex, South Africa; Sino Vanadium's Daquan deposit in China; and TNG Ltd's Mt Peake deposit in Australia. The average grade of vanadium for a titaniferous magnetite deposit is ~0.3 to +1% V_2O_5.

Predominantly open pit mines.

Mining and Extraction – Processing Costs High

The majority, if not all, of the world's vanadium mines are amenable to open pit mining. Vanadium-bearing minerals are treated by means of several processes such as calcination reduction, roast/leach, solvent extraction and ion exchange to recover vanadium either as metal, ferro-vanadium (FeV), vanadium pentoxide (V_2O_5 or "blackflake"), or in the form of various chemicals. Pure vanadium is difficult to produce since it is readily contaminated by many other elements.

Titaniferous Magnetite Processing

Titano-magnetites are the main source of ore feedstock for the recovery of vanadium products. A key characteristic in the first stage of processing into a concentrate is the grade or 'tenor' of vanadium. As we discuss in "*Project Considerations*", page 19, this can vary from >1% V_2O_5 (e.g. Balla Balla deposit), up to over 2.2% V2O5 (e.g. Speewah deposit).

Beneficiation into a magnetite concentrate is the first step in processing.

Stage 1: Beneficiation for a Magnetite Concentrate

The first stage of processing is to concentrate this magnetite by crushing, grinding and low intensity wet magnetic separation.

Stage 2: Salt Roasting and Water Leaching

The magnetite concentrate is then subjected to conventional salt roasting followed by water leaching processes for the recovery of vanadium as vanadium trioxide (V_2O_3) or vanadium pentoxide (V_2O_5) (For example as at Xstrata's Rhovan operation, flow sheet Exhibit 1). This process is both capital intensive and generally has a high operating cost attached. The cost of suitable sodium salts, availability of capital and increasing energy costs and energy availability are critical factors in determining the viability of vanadium developers.

Salt roasting and water leaching produce vanadium oxides. A circuit to generate FeV products is the final step.

Stage 3: FeV Production and Additional Circuits

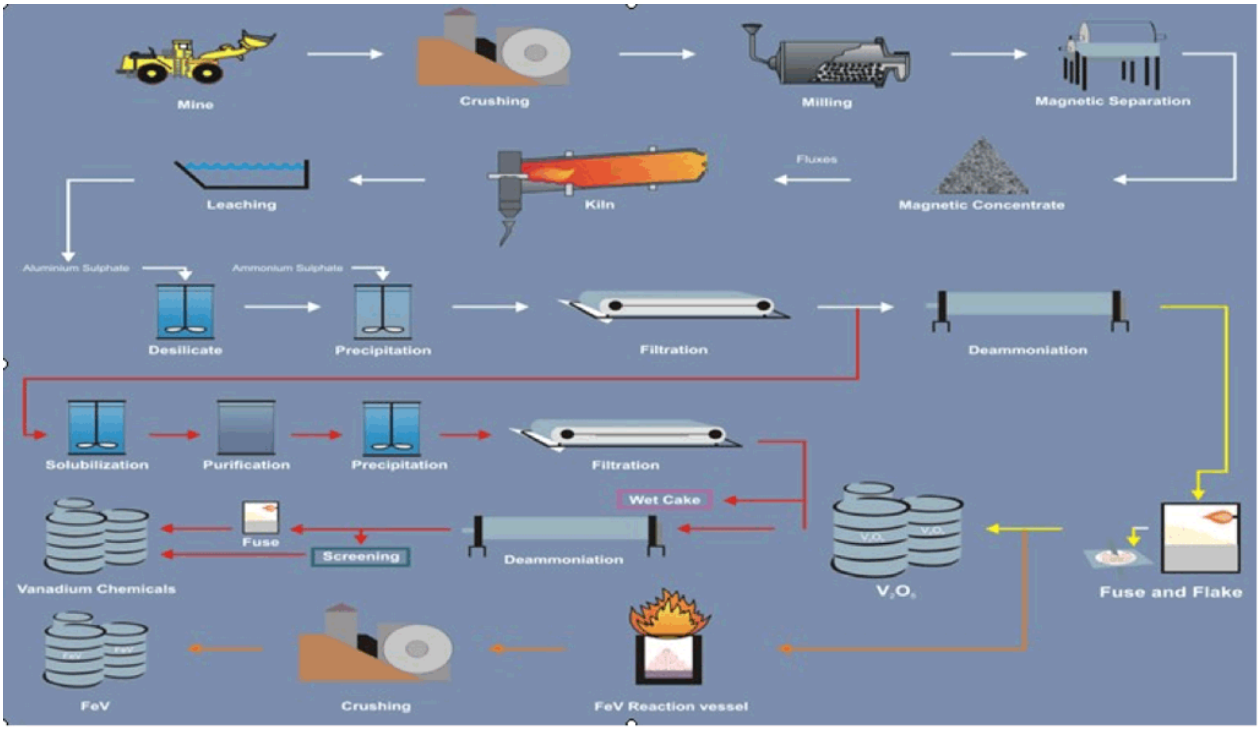
The addition of a ferro-vanadium circuit either to convert vanadium pentoxide (V_2O_5) to ferrovanadium (FeV_{80}) or generate it directly through a vanadium trioxide route, V_2O_3 as the final product or as part of a mixed product stream is becoming more common. Usually this will add significant value to the project because the ferro-vanadium product achieves a price premium over vanadium pentoxide.

New Processing Techniques - Hydrometallurgical

The alternative for processing titano-magnetites is by way of a hydrometallurgical process. This has been explored in the past; however, the challenge has been minimising the dissolution of iron in leaching without sacrificing the extraction efficiency of vanadium. The limiting factor in the process is being able to selectively separate the vanadium from the iron.

The basic process involves acid leaching combined with solvent extraction and stripping to selectively recover units of vanadium, along with titanium and iron from the magnetite concentrate. Developers exploring this technology include Speewah Metals (ASX:SPM) and TNG Ltd (ASX:TNG). Once the selective separation of the metals can be enhanced in this process, the technology has the potential to serve as a cost effective alternative to the more traditional pyrometallurgical process, also adding other valuable revenue streams from titanium and iron products.

Exhibit 1: An example of a vanadium process flow sheet – Rhovan Mine (Xstrata)



Source: Xstrata

Processing Vanadium from Sediments – Different to Magnetites

Vanadium slags are traditionally produced as a co-product in uranium processing.

The vanadium hosted in sediments and sandstones typical of the US are commonly mined firstly for uranium then vanadium as a co-product. The processing of these ores requires solvent extraction to separate the vanadium and uranium fractions which is then followed by an ion exchange stage which leaves the vanadium in the acid solution. The acidic solution is oxidised to allow the recovery of vanadium from the organic salts by means of soda ash. The resultant slag produced then undergoes a similar pyrometallurgical process to recover FeV and V_2O_5 for different uses.

Emerging players in the vanadium sector that are investigating sedimentary hosted deposits of vanadium (different to uranium-vanadium sedimentary deposits) include: Energizer Resources (TSX:EGX) with its Green Giant deposit in Madagascar; Sino Vanadium (TSX:SGX) with its Daquan project in China; and American Vanadium (TSX:AVC) which owns the Gibilleni deposit in Nevada, USA.

Vanadium's 'Green' Uses – Potentially Changing Market Dynamics

Vanadium in Batteries – the Li-V versus the VRB

New technology in batteries requires the use of vanadium for automotive applications.

Recently there has been a growing interest in the use of vanadium in renewable energy applications for batteries. Lithium-vanadium batteries as a replacement for conventional lithium-cobalt batteries for such uses un electric cars is being researched by large groups such as the electric car company BYD Company Ltd in China (which Warren Buffet's Berkshire Hathaway bought 10% for US$230m in 2008) and Valance Technology Inc in the US. Lithium-vanadium batteries are safer and more efficient at producing power (up to six times the power) than lithium-cobalt batteries and have been trialled in the automotive industry such as in Subaru's prototype G4e electric car.

There is also the potential for a large-scale use of vanadium for grid-level storage of power using Vanadium Redox Batteries ('VRB'). VRBs are flow batteries designed to store large amounts of energy in a safe manner that can be adjusted to meet variable energy loads. Its output power and its energy storage levels are scaled independently.

VRB – Huge Power, Huge Potential

VRB is a flow battery using the different oxidation states of vanadium ions in solution to produce electricity.

Specifically, a VRB is an electrochemical system that efficiently converts chemical energy to electrical energy, and vice versa, i.e. a 'flow battery' that rapidly charges and discharges (Exhibit 2). This is a patented process based on the reduction and oxidation of different forms of the element vanadium. A VRB is essentially an on-demand energy storage system where: the electrolyte never wears out and overall maintenance costs are extremely low; energy (electricity) can be stored in liquid form, at room temperature, almost indefinitely; and customers do not have to buy more capacity than they immediately need, and can easily add energy and power in modular fashion over time.

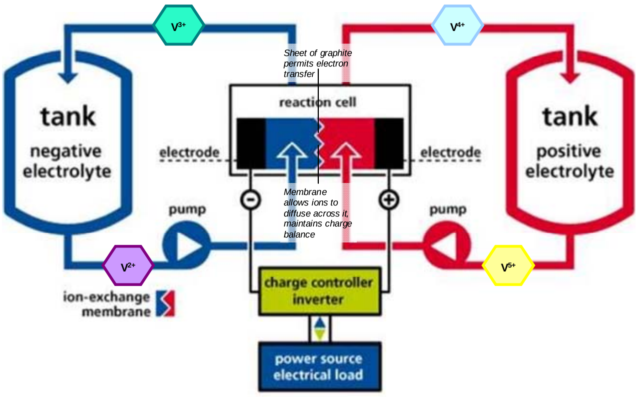
The extremely large capacities possible from VRBs make them well suited to use in large power storage applications such as grid balancing by averaging out the production of highly variable generation sources such as wind or solar power, or to help generators cope with large surges in demand. Energy from wind turbines and solar cells can also be stored in VRBs, which have many advantages over the typical lithium-based battery (Exhibit 3).

With a 35-50 year battery life, ability to operate at room temperature with low maintenance and over 35,000 life cycles with instant recharge/discharge time, the VRB is the cheapest battery solution on a kilo/megawatt hour basis. For each megawatt of storage in a VRB, ~10t of high purity vanadium is required.

The main advantages of VRB's are:

1. Operating at normal temperatures and at low pressure;
2. Redox reaction using only one material – vanadium, therefore no cross-contamination;
3. An electrolyte that never wears out, no recycling issues;
4. Long life of 20+ years;
5. 100% deep cycles (i.e. it can provide a power surge when required)
6. Energy that can be recovered instantaneously;
7. The system can be charged almost as fast as it discharges at the ratio of 1.5 to 1; and
8. Power and energy are separately scalable, can easily adapt to end-users needs from kW to MW.

Exhibit 2: Schematic representation of a vanadium redox battery (VRB) with various vanadium oxidation states



Source: Cellstrom; METS; Ocean Equities

Exhibit 3: Comparison between the typical lithium battery versus VRB application

	Vanadium	Lithium
Number of cycles (lifespan)	35,000+ (35-50 years)	~300 (3-5 years)
Low self discharge (once charged, stays charged)	✓	✗
Contains non toxic material	✓	✗
Highly expandable	✓	✗
Generate low levels of heat	✓	✗
Charges and discharges simultaneously	✓	✗
Suitable for connection to power grid	✓	✗
Small footprint	✗	✓

Source: METS

VRB Usage – Many Advantages and Even Obama is a Proponent

VRBs offer almost instant charging and a long life of +20 years and power is scalable from kW to MW capacity.

The continued growth in battery applications for vanadium is expected to provide new demand channels for the metal, especially high purity vanadium which currently is not always readily available in today's market. Proponents of the VRB (and therefore vanadium metal) believe that usage will improve the economics of wind and solar power enough to make the batteries cost-competitive with fossil fuels, specifically with their combination of scalability and recharge/discharge storage characteristics. In particular, the VRB may become a power solution for renewable resources (wind, solar) and monetise energy savings through 'peak shaving', smart grid integration and serving remote areas with reliable power sources.

One slight disadvantage of the VRB in its current form is the size of the unit itself, which depending on its power generation output, can be around 1m x 1m starting at its smallest size. However, work is continuing to refine and optimise the physical properties of the battery's stack and overall physical structure to increase power generation and decrease cost. New research indicates that modifying the battery's electrolyte solution significantly improves its performance which could improve the electric grid's reliability and help connect more wind turbines and solar panels to the grid.

Refinements to the VRB technology are being worked on to allow the use at a wider temperature range and greater power generation.

One limitation of VRBs is the range of temperature that the battery can operate in, which is generally around 10-40°C limiting its use in certain climates, seasons etc. However, electrolyte research has shown the potential to expand the temperature range to between -5-50°C by modifying the electrolyte with a hydrochloric and sulphuric acid which also holds 70% more vanadium ions than the original electrolyte, paving the way for higher power storage, smaller batteries and cost advantages.

US President Obama's Administration has a goal to generate 80% of the nation's electricity from renewable energy sources by the year 2035. A key to this strategy is the VRB itself and at a brainstorming forum in Cleveland in Feb'11, Obama championed the "multi-megawatt vanadium redox fuel cells" for mass-storage batteries as "one of the coolest things I've ever said out loud" and underpins his administrations enthusiasm and commitment to supporting clean energy solutions.

The potential demand from such an application by the US power grid in the future would add significant 'blue-sky' to vanadium's usage outlook, discussed further in "*Automotive Battery and Redox Batteries Applications – The Real Accelerator*", page 11.

Why haven't we seen the wide use of VRB's so far?...

Funding of VRB technology has been the greatest hurdle to date.

The barrier is not a technical one, it is a financial one. Whilst VRBs have been hailed for a number of years to be the 'next big thing' in clean energy storage, there are no existing utility-scale installations after more than 25 years of development.

The technology of the VRB was originally developed in Australia by Professor Maria Skyllas-Kazacos at the University of New South Wales and was patented in 1986. The financial hurdle that arose down the line was when in late 2008, VRB Power Inc ran out of cash. VRB Power Inc had previously purchased the VRB patents and technology from the University of New South Wales.

A private company called Prudent Energy in January 2009 bought all the patents and technology of VRB Power Inc. Prudent today is a clean energy company with an established customer base with numerous VRB installations around the world (as discussed further below).

VRBs are currently in use in places such as Japan for wind power.

…VRB does exist currently, just not on a large scale… yet.

Over the past decade companies around the world have developed VRB installations using licences issued by the University Of New South Wales (Exhibit 5). VRB power is being used very successfully on a small scale with Prudent Energy in China (formally VRB Power) having over 20 installations worldwide while Cellstrom based in Austria has over 100 installations of VRBs.

Prudent's latest installation is a 500kw VRB system (with a peak power of 750kw) for the China Electric Power Research Institute in Zhangbei, Hebei province in northern China. The project is part of the National Wind Power Integration Research and Test Center of China owned by State Grid Corporation of China, using 30 wind turbines. Once completed, the testing centre will be the largest such facility in the world, according to Prudent.

In 2011 Cellstrom is aiming to launch a 400 kWh VRB designed for wind and solar farms. German conglomerate, Gildermeister, acquired Cellstrom in 2010 and has manufacturing facilities and a worldwide distribution capability which signals that the commercialization of VRB batteries is one step closer.

Currently the US Department of Energy is testing a VRB with the City of Painesville, Ohio, for approved use in the US power grid. If this is approved, it could mean a huge uptake and use of VRBs on a large scale. The interest and thrust to use VRBs on a utility-scale is stronger than ever, as echoed in Obama's renewable energy plan in the US.

The other crucial factor in the wide use of VRBs is the lack of vanadium production specifically for the batteries. There has not been a guarantee of the sustainable price and quantity vanadium pentoxide required for the battery electrolyte. This differs from the ferro-vanadium used in steel strengthening (discussed further in "*Differentiating Between Vanadium for Steel and Battery Use*", page 11".)

Exhibit 4: VRB Developers… the ticket for off-takes for the junior miners?

- **Prudent Energy** – Private – Sales in Maryland US; Engineering in Vancouver; and Manufacturing in Beijing.
- **Cellstrom** – Subsidery of a+f GmbH, a division conglomerate **Geildermeister AG** – Germany
- **Sumitomo Electric Industries** – Based in Osaka, Japan
- **Ashlawn Energy** – Private – Virginia US

Source: Industry Articles; Ocean Equities

Exhibit 5: Existing VRB Mass Storage Facilities

- A 1.5 MW UPS system in a semiconductor fabrication plant in **Japan**
- A 275 kW output balancer in use on a wind power project in the Tomari Wind Hills of Hokkaido, **Japan**
- A 200 kW, 800 kW·h (2.9 GJ) output leveler in use at the Huxley Hill Wind Farm on King Island, **Australia**
- A 250 kW, 2 MW·h (7.2 GJ) load leveler in use at Castle Valley, **Utah**
- Two 5-kW units installed at Safaricom GSM site in Katangi and Njabini, Winafrique Technologies, **Kenya**
- Two 5-kW units installed in St. Petersburg, FL, under the auspices of USF's Power Center for Utility Explorations King Island, **Australia**

Source: Industry Articles; Ocean Equities

The Vanadium Market

An Opaque Industry

Access to Coherent Market Data Poses Somewhat of a Problem

Due to the small number of vanadium producers currently, market data is difficult to obtain.

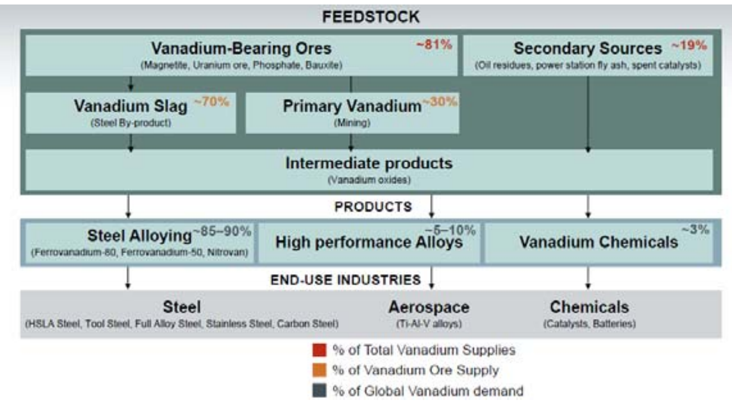
The vanadium industry is notoriously difficult to navigate in terms of hard production, consumption and costing numbers as the market is controlled by a handful of large producers. The vanadium market has also become highly volatile since China's production of steel has begun to dominate the expansion of total world steel output. China also produces around a third of the world's vanadium currently. A number of the top vanadium producers in the world (as detailed in later sections below) also form part of an integrated business for steel production where the vanadium ends up adding additional ambiguity around production numbers.

Supply

By-Products, Co-Products and Slags

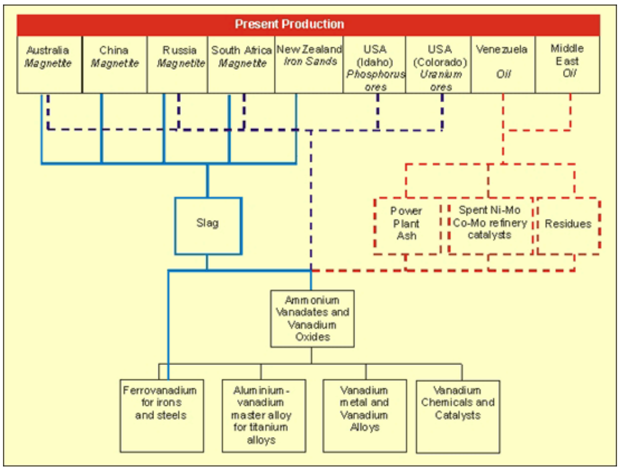
Vanadium production is dominated by three countries: South Africa; China; and Russia. Over 90% of the world's vanadium supply comes from these countries (Exhibit 8). Because vanadium can be recovered as a by-product or a co-product, the estimated world resources are not fully indicative of available supply. The end-use for vanadium dictates how it is produced (V_2O_5 for chemical applications versus FeV for steel applications). It is estimated that ~70% of vanadium produced annually is derived from slag as a by-product. One third of supply is mined as a primary product and the remaining supply is recovered from fly-ash and from oil refining, which is expensive to extract (Exhibits 6 & 7).

Exhibit 6: Vanadium Industry Structure



Source: Atlantic Ltd; CPM Group

Exhibit 7: Sources of Supply



Source: vanitec.org

A Few Large Producers Control the Market

The top producers of vanadium are:

- **Evraz**, with operations in South Africa (through its subsidiary Highveld Steel and Vanadium Corp) and in Russia (Stratcor). Evraz is a vertically integrated steel producer;
- **Xstrata**, which operates the Rhovan vanadium mine in the Bushveld Complex in South Africa; and
- **Panzhihua New Steel and Vanadium**, which is part of the larger parent company Panzhihua Iron and Steel and operates in the Sichuan Province in China.

South Africa, China and Russia produce 90% of the world's vanadium, ~56,500t cont. V is produced annually.

Collectively, it is estimated the top producers supply ~47,000t of vanadium annually, with global vanadium production ~56,500t according to the US Geological Survey (Exhibit 9).

Xstrata's Rhovan operation is one of the most recent operations to come online in 1994, for primary vanadium production. Many of the operating centres in China and Russia were developed in the 1960s under the technical, political and commercial conditions as part of integrated steel production facilities with vanadium, as a by-product. These titano-magnetite deposits require additional steps to separate out titanium from the iron ore prior to blast furnace smelting.

Short Term Supply Expected to Expand in Response to Demand

A large proportion of current vanadium production capacity is vertically integrated thus can elastically respond to changing high strength steel demand changes and prices. Due to falling market prices as a result of the global financial crisis and weaker steel demand, many of these facilities have curtailed output over the last few years due to the high cost of production from primary ore. However, coupled with these cutbacks, producers inventories have increased and it is unclear whether the more expensive primary ore production that was idled will restart.

Current supply is rigid due to few producers, however steel growth consumption is expected to lift vanadium supply in the medium-term.

However, we believe that with the positive outlook for steel growth (also see "*Vanadium Consumption Ready to Expand Past Pre-Crisis Levels*", page 11), especially in China and the other BRIC countries, vanadium demand is forecast to grow at a similar rate. With steel consumption improved from 2008/09 levels, we believe that any excess vanadium stockpiles apparent since the financial crisis are dwindling and therefore supply from the main producers should respond accordingly.

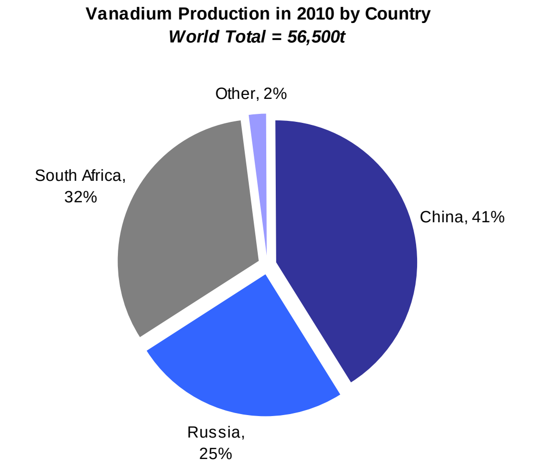
Additionally, as we see greater use of VRB's on utility-scale applications, the need for vanadium for this use will warrant a large supply response. We estimate that supply may grow to over 75,000t contained V by 2015 (currently ~57,000tpa is produced globally) ("*Green' Potential of Vanadium Usage the Key to 'Blue-Sky'*", page 12).

Only a Few New Projects to Come on line Short-Term

The most advanced project anticipated to next come (back) online is Atlantic's Windimurra project in Western Australia which has had a long colourful history and is expected to restart production of FeV for steel use in Q3'11 with a nameplate capacity of 5,700tpa V.

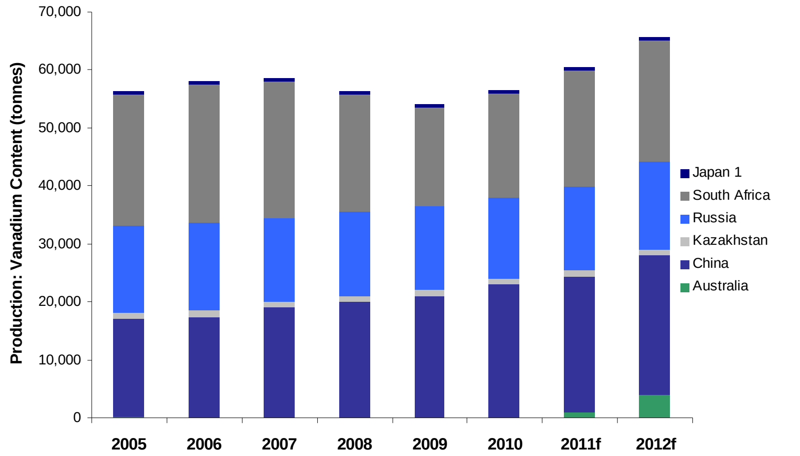
There are only a handful of Greenfield projects that are expected to come online in the near future. Largo's Maracás project in Brazil will be the next to come on line (expected 2012) and is small but high grade, with a capacity of 2,400tpa V. Also forecast to begin production in 2012 is the Daquan project in China with a capacity of 6,400tpa. Post-2012, the projects coming on line are few and far between; American Vanadium's sedimentary hosted Gibellini deposit could start producing in 2013 if the company completes a feasibility study in early 2012. Refer to 'Peer Group Discussion' on page 16 for further discussion on the production timeline.

Exhibit 8: +90% of vanadium supply is dominated by South Africa; China; and Russia.



Source: USGS; Ocean Research 2011

Exhibit 9: Vanadium supply is expected to increase with rising demand and new projects coming on line, such as Windimurra in Australia.



[1] Production within Japan mainly from recycling of petroleum residues, ash, and spent catalysts

Source: USGS; Ocean Research 2011

Demand

Consumption Directly Linked to Steel

As over 85% of vanadium is used in hardening steel alloys, vanadium consumption was growing steadily in line with steel demand before the financial crisis in 2008 (Exhibit 10). Steel demand in China as well as the BRIC countries is projected to grow both in the short and long term and steel production has rebounded strongly since 2008/09. We are yet to see the full effect of this in vanadium consumption however as stockpiles are still being drawn down. After two years since the economic downturn, we believe that we will now see an upswing in vanadium consumption hand in hand with diminishing stockpiles.

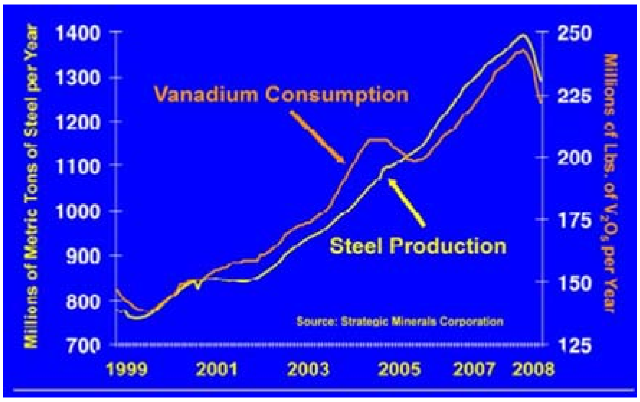
Steel hardening usage of vanadium accounts for over 85% of demand.

Since 1980 the BRIC countries have accounted for more than 90% of the growth in global steel production, which is now approaching 1.4Mtpa. Steel production rates in those countries between 2010 and 2025 are forecast to increase at a rate of 6% compared with 1% in the rest of the world and 3.35% globally (Exhibit 11).

Most recent figures that can be accessed (USGS, Roskill) point to a figure of ~58,000t of contained vanadium consumption pre-2008/09, which dropped to a low of ~54,000t in 2009, corresponding with low global steel production during the same period (Exhibits 10).

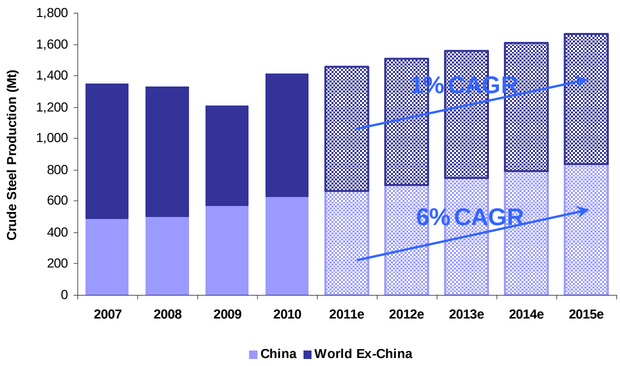
Exhibit 10: Vanadium consumption was impacted by low steel production in the 2008-09 downturn…

**Note in vanadium consumption in mlbs V_2O_5*



Source: Stratcor/Evraz, 2009

Exhibit 11: Global steel production has recovered from 2008-09 levels and is expected to grow led by the BRICs.



Source: Bloomberg, Ocean Research 2011

An Increasingly Important Steel Alloy

Recent tragic events in Japan have raised the awareness for high-strength steel usage particularly in areas of high seismic activity such as Japan and the west coast of the US. Japan already uses a large amount of HSLA steel, but this standard could be raised further in the rebuilding.

The role of vanadium as a steel strengthener in building infrastructure makes it a particularly valuable commodity, which is why China is particularly keen on keeping a steady supply and why the United States has added the mineral as part of its 2010 Critical Materials Strategy.

Vanadium Consumption Ready to Expand Past Pre-Crisis Levels

Increased regulations for rebar steel and the expansion of emerging economies is expected to lift V consumption to pre-crisis levels, ~70,000t V by 2015.

The construction of new infrastructure in China, Brazil, India and Russia will create increased demand for vanadium, especially in commercial building construction, roads and bridges, and power generation plants and transmission systems throughout those nations. If China is to increase its vanadium consumption to match the average seen throughout the western world, vanadium requirements could potentially increase by approximately 5-8% per year, up to over 70,000t contained vanadium consumed per annum by 2015.

Automotive Battery and Redox Batteries Applications – The Real Accelerator

Due to the growing level of interest in the application of the utility-scale usage of VRBs, we believe that funding towards battery development will inherently filter down to the securing of vanadium production for use in batteries. To a lesser extent, the use of vanadium in the automotive industry in lithium-vanadium-phosphate batteries, such as Subaru's prototype G4e electric car, will also add to vanadium demand in both the medium and long-term.

VRB applications will provide a game changer for consumption.

As we discuss in the forecast Supply-Demand outlook below, it is this battery technology provides blue-sky for vanadium, and we believe that policy change driven incentives will allow this technology to take off.

The Supply-Demand Outlook

Keeping it Simple, Vanadium Demand has a Bright Outlook

Bringing together the outlook for consumption factors in the vanadium industry we believe that overall vanadium demand will grow with respect to the following:

1. **Steel Consumption Growth – 'Conventional' Vanadium Consumption:** Steel consumption is forecast to grow at 6% CAGR in China and 1% World ex-China and therefore we believe vanadium supply will respond to this and, with the addition of new projects (e.g. Windimurra and Maracás will reach full capacity in 2013), vanadium supply should grow to over 75,000t contained V over the next five years (currently ~57,000tpa is produced globally);
2. **Automobile Applications a Smaller Consumption Factor:** Automakers for electric cars with the use of Lithium-Vanadium batteries could add up to ~5,000t of V demand by 2015 growing steadily from present (as estimated by Dr Jon Hykawy, Byron Bay Capital Markets, 2009); and
3. **Grid-Scale Usage of VRBs for Power:** There are many positive indicators pointing to the usage of VRBs on a utility-scale for grid power, which may first happen in the US with Department of Energy testing a VRB with the City of Painesville for approved use in the US power grid. Usage of VRBs on a large scale in the US and in other parts of the world, could see an additional ~15,000t of contained vanadium demand by 2015.

There are few new projects coming online in the next decade creating an interesting supply-demand balance.

The supply of vanadium is forecast to keep pace with steel demand as well as the application of new technology and we expect, with the addition of a few new projects coming online in the next four-five years, global vanadium supply could reach ~78,000t by 2015.

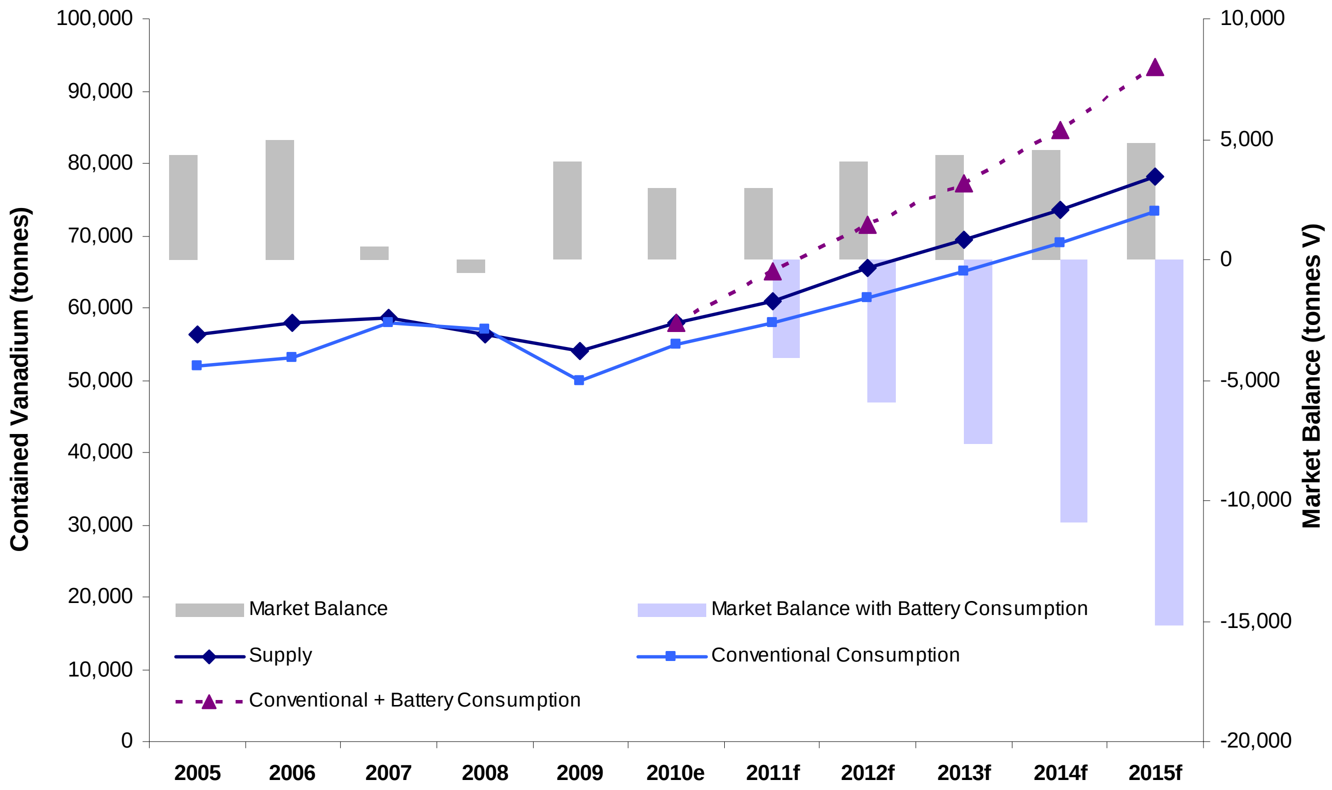
'Green' Potential of Vanadium Usage the Key to 'Blue-Sky'

The outlook for the supply-demand balance only looking at conventional steel demand driven vanadium consumption presents a market surplus in the short-medium term, if global production also increases. As outlined in Exhibit 12, over the next five years vanadium supply is expected to grow from under 60,000t at present levels to ~78,000t of contained vanadium by 2015. Vanadium consumption is conservatively expected to grow from ~58,000t to ~73,000t by 2015 from steel usage demand only. This presents a surplus of 3,000-5,000t in this period. We believe that even this could be cushioned by greater steel production in the emerging economies.

However, when taking into account the consumption that may be seen if the commercial use of VRBs on a utility scale takes off as well as from automotive battery demand, there is a very compelling story for vanadium consumption. VRB and automotive battery demand could collectively add another ~20,000t V by 2015 and therefore presenting a deficit in the market by at least 10,000 to 15,000tpa.

Whilst we recognise that there is inherit technology risk in vanadium battery applications for power and automotive use, we believe that it is likely that this will present a new source of demand in the vanadium market over the short to medium-term. However, we do also point out that there is also a question mark over how quickly these new applications will be adopted which could have an effect on timing of new sources of consumption.

Exhibit 12: The Conceptual Supply-Demand Balance for Vanadium: Battery Application the Key to Consumption Increase



Source: Roskill, USGS, Dr Hykawy, Ocean Research 2011

Pricing Environment

Historical Prices Have Been Volatile…

The price of FeV and V_2O_5 has been highly volatile in the past and haven't reflected demand levels.

Vanadium is primarily sold for steel and industrial uses in the form of ferro-vanadium (FeV) or vanadium pentoxide (V_2O_5). Vanadium does not trade on an open market like other metals and sellers negotiate privately. Prices are published by market consultants.

The prices for both FeV and V_2O_5 have been highly volatile over the past decade and are closely correlated (Exhibit 13). The price of FeV reached a peak of over US$120/kg in early 2005 and again in 2008 spiked to a price of US$88.50/kg on the back of supply disruptions and above-trend demand growth.

High purity battery grade V_2O_5 sells for a premium over steel grade V_2O_5 and FeV of between two and four times. These battery grade prices have ranged between US$29-66/kg in 2010 according to market consultants.

…And Not Always a Reflection of End-Use Demand

As the vast majority of global demand for vanadium coming from the steel industry as a steel strengthener, it is safe to assume that it is a great force in determining price. However, global steel consumption has been increasing steadily over the last decade led by China, but the FeV price has been erratic with no general trend (Exhibit 14).

Currently FeV is US$31/kg and V_2O_5 US$16/kg (steel grade) and we expect these prices to appreciate in the medium-term with greater consumption.

There are substitutes for vanadium in some application such as molybdenum and niobium that can be used for strengthening steel, but these minerals won't be a replacement until vanadium gets to a much higher price. It is important to note that not all vanadium can be replaced with these substitutes and now with stricter regulations in place for steel specifications vanadium is continuing to be in demand.

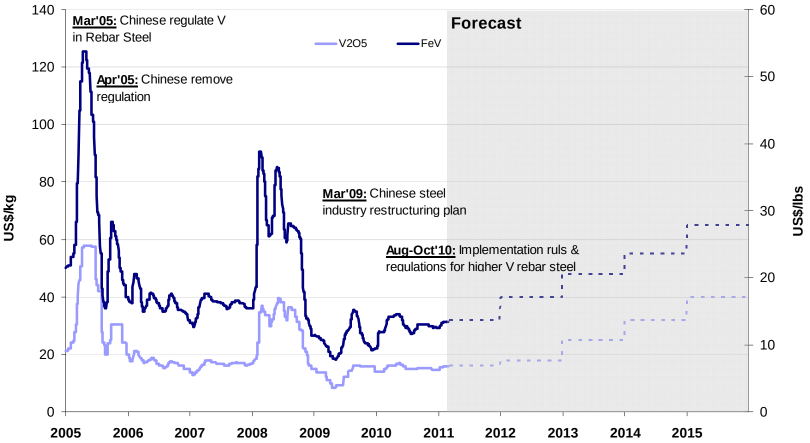
Vanadium Prices Now and Beyond – What to Expect

Vanadium prices have remained fairly constant for the last six-months with the price of FeV currently US$31/kg and V_2O_5 US$16/kg. We believe that prices will continue around these levels throughout 2011 and in the medium to longer term FeV and V_2O_5 prices may increase to US$40/kg and US$20/kg respectively, closer to pre-2008-09 levels. Independent metal experts Roskill noted recently that the long-term price for FeV was forecast to rise to $US75/kg by 2015.

We believe that there may be further upside particularly for the price of V_2O_5 as VRB and vanadium battery applications are commercialised. Under this scenario, the V_2O_5 price could appreciate well above the US$20/kg point. However we reiterate that this is the 'battery blue-sky' scenario.

In the case of lower steel prices there is a potential for existing production to be constrained by the steel industry demand unless new vanadium production is brought online. We believe that even on a worst case scenario outlook for vanadium prices (down to levels around US$20/kg FeV), this presents an opportunity for lower-cost production to come online, in particular from junior miners. We also believe that production coming online in the next five years, for example from Windimurra, should provide a more stable market and less volatility in the vanadium price.

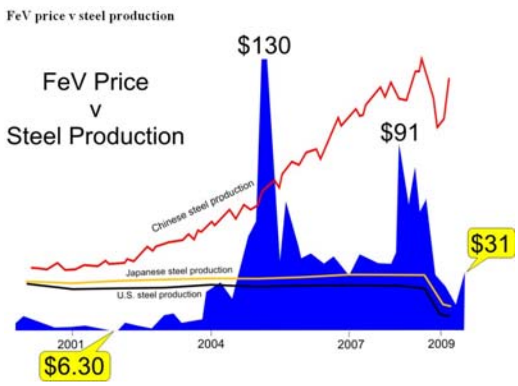
Exhibit 13: The FeV and V_2O_5 Price since 2005 – Highly volatile



Note prices are based on:
Vanadium Ore (pentoxide) Min 98% Europe (US$ per kg V_2O_5)
Ferro-Vanadium basis 70-80% V major destinations (US$ per kg FeV)

Source: Bloomberg; Ocean Research 2011

Exhibit 14: FeV price is no reflection of steel production levels, especially in China…



Source: Reed Resources, 2011

The Vanadium Players

Our Analysis Universe

Our analysis covers 12 early explorers to pre-producers with vanadium resources.

A Dozen Companies From Early Explorers to Pre-Producers

We have chosen to look at a universe that covers the most prominent vanadium explorers and developers and exclude the handful of current producers in the space (Evraz, Xstrata, Panzhihua etc) because of the diversified and integrated nature of these companies. More importantly, our analysis focuses on the vanadium titanomagnetite and sedimentary-hosted deposits around the world that would lend to the primary production of vanadium (as opposed to secondary production from uranium mining).

The companies presented in the peer group we have constructed own defined vanadium resources and vary in stages of development, from exploration drilling (e.g. Apella Resources, APA.CN) to companies with projects close to production (e.g. Largo Resources, LGO.CN and Atlantic Ltd, ATI.AU).

Up & Coming – Exploration Stage	Development & Feasibility Stage	Most Advanced – Close to Production
– Apella Resources (APA.CN)	– American Vanadium (AVC.CN)	– Atlantic Ltd (ATI.AU)
– Argex Mining (RGX.CN)	– Energizer Resources (EGZ.CN)	– Atlas Iron Ore (AGO.AU)
– Quest Minerals (QNL.AU) →	– Reed Resources (RDR.AU) →	– Largo Resources (LGO.CN)
	– Sino Vanadium (SVX.AU)	
	– Speewah Metals (SPM.AU)	
	– TNG Ltd (TNG.AU)	

Exhibit 15: World location map of the vanadium projects in our analysis

Source: Company Data; Ocean Research 2011

Investment Criteria and Ideas

Our review of the vanadium industry and peer group analysis suggests that there are certain criteria that stand out on both a company and project level that will justify an investment to capitalise on the projected vanadium market growth. These criteria are:

We have rated each of the 12 companies in our peer group according to deposit, stage, tenor, economics, end use leverage and country risk.

Deposit: Both the size and grade of the deposit are important, and which we consider in-situ V_2O_5 grade to be a key geological feature, the metallurgy and processing ability are more important.

Development Stage: Projects that are further along the development curve are therefore more 'de-risked'. Projects with at least preliminary metallurgical work conducted to date provide a starting point.

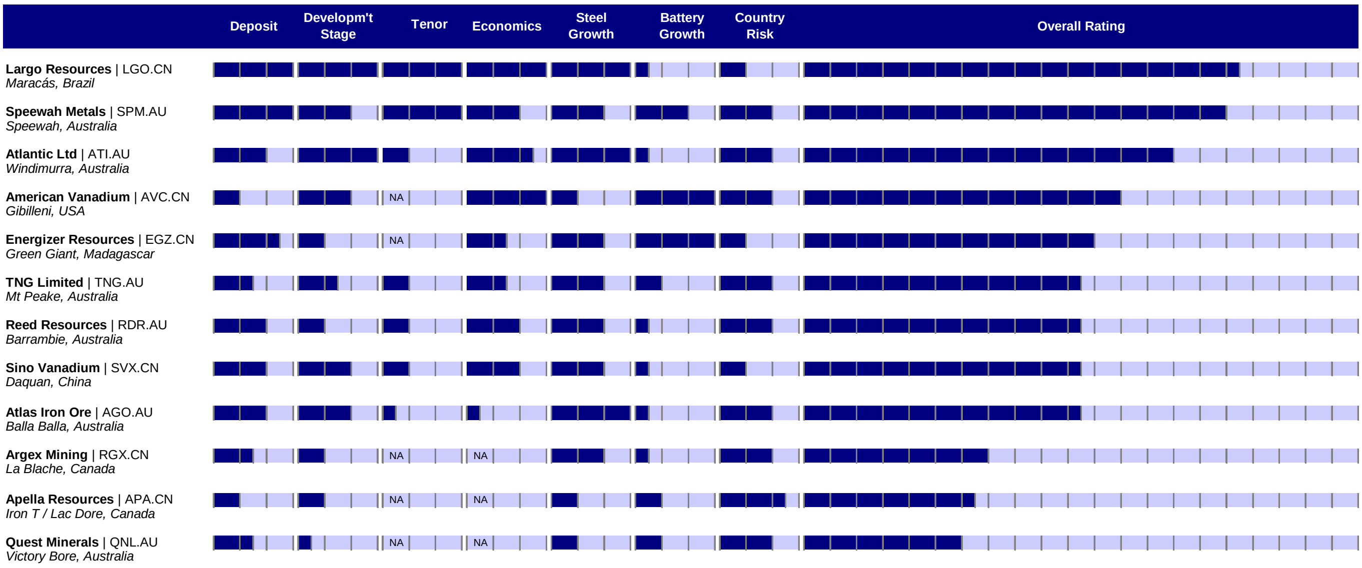
'Tenor' of Vanadium in Concentrate: We consider the V_2O_5 in concentrate a very important feature of a project. Xstrata's Rhovan operation, a world class asset, has a tenor of 2.3% V_2O_5 in concentrate and therefore sets the bar against other projects.

Ease of Mining & Capital Intensity: The margins miners make are directly linked to the bottom line. Vanadium projects are capital intensive, with some estimated to cost up to $1b and above in the future. A lower operating cost is considered more favourable.

Steel Growth vs. Battery Growth Leverage: Most of the projects in our peer group are directly linked to the steel industry given that is/will be the end use of the vanadium. Particular projects are more leveraged to take advantage of the vanadium battery demand growth.

Other Considerations: Country risk is another criterion we have graded. Most projects in our peer group are situated within relatively stable jurisdictions – Canada and Australia.

Exhibit 16: Overall rankings of our peer group according to specific criteria: deposit quality; development stage; tenor; economics; steel and/or battery growth leverage; and country risk, for each project.



Notes:
Country Risk: A higher score indicates less country risk
Economics for Balla Balla have been marked down due to the deposit being mined primarily for iron and vanadium as a by-product

Source: Ocean Equities Research 2011

We believe that out of our peer analysis group, three companies stand out for different reasons:

Largo Resources (LGO.CN | MCap C$174m): The Maracás Project is of exceptional quality and expected to be in production by 2012. The project is validated by the off-take agreement the company has with Glencore International plc.

Our investment ideas include LGO.CN, SPM.AU, EGX.CN as well as ATI.AU and AVC.CN as others to watch.

Speewah Metals (SPM.AU | MCap A$39m) – Speewah is by far the largest defined resource in our peer group, if not globally. The overriding key feature of the project is the vanadium tenor in concentrate, which is ranked far above the group.

Energizer Resources (EGX.CN | MCap C$41m) – We believe EGX will be able to take advantage of increasing vanadium battery demand by directly supplying high purity grade vanadium. However, further work needs to be conducted on the metallurgy and processing to further de-risk the project.

Other companies which rate highly in our rankings are **Atlantic Ltd** (ATI.CN| MCap A$203m) and **American Vanadium** (AVC.CN | MCap C$31m).

Company and Project Comparisons

Not a Typically Straight Forward EV/Resource Comparables

From our research and analysis of vanadium projects and companies, we have concluded that assessment on a simple basis of Enterprise Value ("EV")/Resource ratios do not provide a clear comparison and valuation metric. This is due to a number of reasons that need to be taken into account:

The typical EV/Resource ratio comparison is difficult to delineate.

1.) **Diversified Asset Portfolio Distortion** – A number of companies in our selected universe own additional assets outside vanadium and may also be producing in another commodity. We have not calculated an "equivalent" vanadium resource on these additional assets, rather we make qualitative assessments of these companies in a later section.

2.) **Specific Asset & Company Attributes Not Reflected** – There are a number of characteristics that differentiate some projects from others. For example, there are numerous processing routes that are being explored within the peer group and we note that some characteristics such as recoveries and concentrate tenor are important factors for ease and cost of processing and are not dependent on resource size.

Exhibit 17: Our vanadium peer group of 12 companies with development assets

Company	Ticker	Project/s	Location	Current Price *Local*	Market Cap *US$m*	Net Debt *US$ m*	EV *US$m*	Deposit Type	Current Status	Total Resources *Mt*	In situ Grade *%V_2O_5*	Contained V *MtV_2O_5*	EV/ cont V_2O_5 *US$/t*	EV/ cont V *US$/t*
American Vanadium	AVC.CN	**Gibilleni**	USA	1.35	31.84	(4)	28	Sedimentary	Final Feasibility	20.85	0.33	0.07	401.75	716.84
Apella Resources	APA.CN	**Iron T / Lac Dore**	Canada	0.15	20.29	(3)	17	V-Ti Magnetite	Exploration Drilling	14.38	0.42	0.06	285.11	508.73
Argex Mining	RGX.CN	**La Blache**	Canada	0.43	38.60	(1)	38	V-Ti Magnetite	Scoping	43.90	0.45	0.16	235.36	419.96
Atlantic Ltd	ATI.AU	**Windimurra**	Australia	1.80	218.28	281	500	V-Ti Magnetite	Construction	209.97	0.47	0.99	506.25	903.31
Atlas Iron Ore	AGO.AU	**Balla Balla**	Australia	3.93	3,468.03	(246)	3,222	V-Ti Magnetite	Construction	456.00	0.66	3.01	1,070.44	1,910.00
Energizer Resources	EGZ.CN	**Green Giant**	Madagascar	0.29	42.14	(13)	29	Sedimentary	Definition Drilling	59.20	0.68	0.40	72.08	128.61
Largo Resources	LGO.CN	**Maracas**	Brazil	0.43	178.15	(118)	60	V-Ti Magnetite	Development	17.26	1.45	0.25	241.63	417.83
Quest Minerals	QNL.AU	**Victory Bore**	Australia	0.03	8.16	(1)	7	V-Ti Magnetite	Exploration Drilling	151.00	0.44	0.66	10.35	18.47
Reed Resources	RDR.AU	**Barrambie**	Australia	0.42	116.60	(25)	92	V-Ti Magnetite	Development	65.20	0.82	0.53	171.66	306.29
Sino Vanadium	SVX.CN	**Daquan**	China	0.10	7.37	(1)	7	Sedimentary	Feasibility	34.20	0.93	0.32	20.79	37.09
Speewah Metals	SPM.AU	**Speewah**	Australia	0.30	41.30	(8)	34	V-Ti Magnetite	Feasibility	3,566.00	0.30	10.70	3.16	5.64
TNG Limited	TNG.AU	**Mt Peake**	Australia	0.09	27.46	(5)	23	V-Ti Magnetite	Feasibility	140.00	0.33	0.46	48.99	87.42
Median					**40**		**31**			**62**	**0.46**	**0.43**	**172**	**306**
Average					*350*		*338*			*398*	*0.61*	*1.47*	*182*	*323*

Notes to Table:
Prices as at 14/07/11
AGO - Share structure assumes take-over of GIR pursuant to the off-market takeover announced 21 Dec'10.
EV Median and Average does not include the outlier AGO
All ownership of assets is 100%
Exchange rates: C$1.04:US$, A$1.07:US$, £1.60:US$

Source: Company Announcements; Bloomberg; Ocean Equities Research 2011

Peer Group Discussion

The Median EV/t Contained V is US$406/t from Our Peer Group

The EV/t contained V ranges from $5/t to $1,910/t for our analysis group.

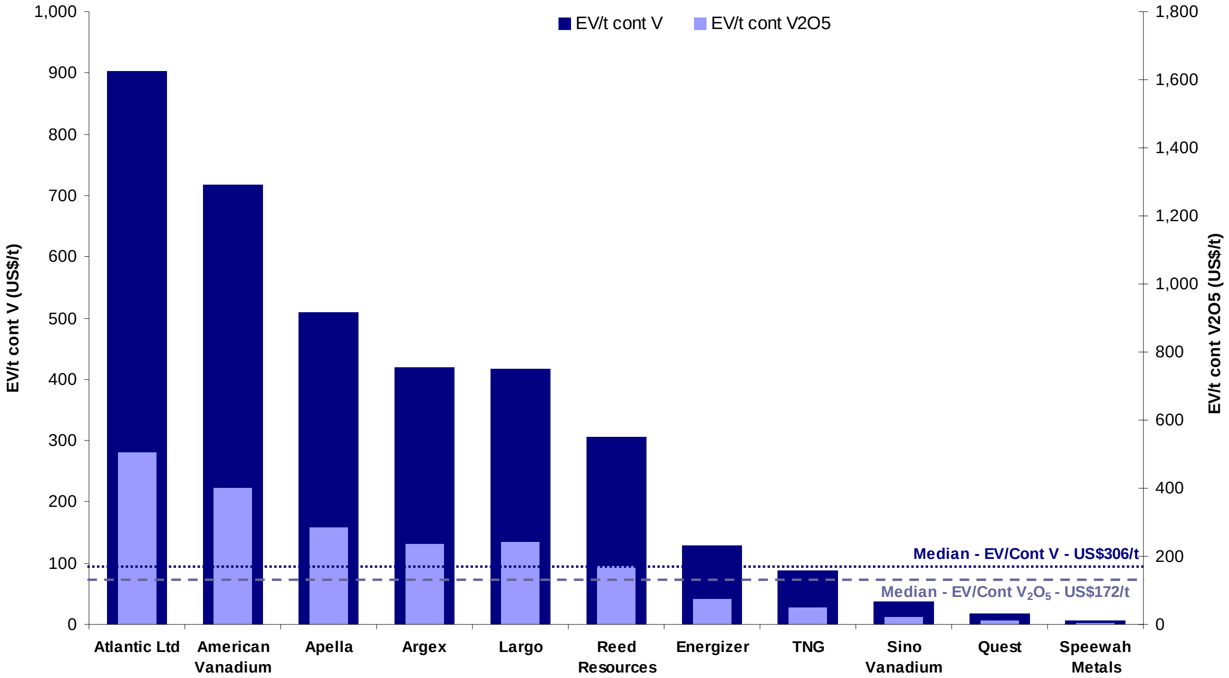
The range of EV to contained metal in our peer group proves to be very wide. Speewah Metals is the cheapest at $5.64/t V, whilst Atlas Iron Ore is the most expensive at $1,910/t V. However, we note that Atlas Iron Ore is not only at a later development stage than most of the vanadium companies in our analysis group, but the company is primarily an iron ore producer from which close to all of its value is attributed. Therefore we consider Atlas as an outlier. The most expansive peer is Atlantic Ltd at $903/t V, which is to be expected as it is the closest to production. The most expensive explorer-developer is American Vanadium which has a relatively small resource and an EV/t ratio of $717/t V.

A handful of companies within our analysis group have other assets that may distort the EV/t ratio.

There are a number of companies in the group which also have other assets with resources and some in production. These include: Atlas Iron Ore (Iron Ore, producing); Largo (Tungsten, final feasibility); and Reed (Gold, Lithium). As we have highlighted earlier, we have not calculated an "equivalent" vanadium resource on these additional assets and hence consider these companies as a separate class; i.e. diversified asset portfolios.

With the prices of vanadium products currently at around US$31,000/t for FeV and US$16,000/t for V_2O_5 it almost seems irrelevant to value a vanadium company based solely on the EV/t V ratio. We believe we need to focus on other aspects of the company such as resource base, resource and product characteristics and development plan.

Exhibit 18: The range of EV to contained metal in our peer group proves to be very wide. Speewah Metals is the cheapest at \$5.62/t V, whilst Atlantic Ltd is the most expensive at \$902.21/t V.



Source: Company Announcements; Bloomberg; Ocean Equities Research 2011

The Total Resources Base

The total resource base for our peer group varies from 0.03Mt contained vanadium (Apella Resources) to 6Mt contained vanadium (Speewah Metals). We believe it is also important to consider how these resources which directly reflects the stage of development of the project.

Generally, the resource definition of projects reflects the development stage.

Projects with proven and probable defined reserves include Atlantic's Windimurra, Atlas' Balla Balla and Largo's Maracás project, which are the most advanced projects in our analysis group. Also under development with proven reserves is Reed's Barambie project.

The next tier of companies are those which include measured and indicated defined resources, namely, Argex's La Blache project and Speewah Metals' Speewah project. American Vanadium's Gibilleni project, Energizer's Green Giant project and Sino Vanadium's Daquan project all have indicated and inferred resources, whilst at the lesser-defined end of the resources spectrum, and therefore a reflection of the early-stage nature of the projects, Apella Resources' Iron T project, Quest's Victory Bore project and TNG's Mt Peake project all exhibit inferred-only resources.

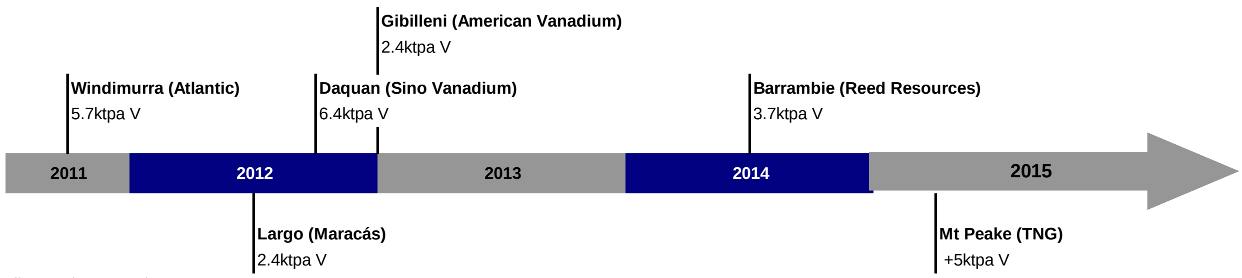
A Range of Development Stages

The peer analysis group consists of a range of projects in different geographical locations at different development stages. The most advanced is Atlantic's Windimurra project in Western Australia which has had a long colourful history and is expected to restart production in Q3'11. Prior to 2010 over c.US\$558m has been sunk into its construction and Atlantic has recently secured US\$335m in notes for the funding of production.

Atlantic's Windimurra is the most advanced project, anticipated to start production late 2011.

Largo's Maracás project in Brazil will be the next to come on line (expected 2012) and is small but high grade. After 2012, the projects coming on line are few and far between; only American Vanadium's sedimentary hosted Gibellini deposit may start producing 2013 if the company can decipher a cost-effective processing route and execute the feasibility study.

Exhibit 19: Anticipated Start-Up Project Timeline of Global Vanadium Projects



Note: Full Capacity Quoted

Source: Company Announcements; Ocean Equities Research 2011

Project Considerations

Important Factors

Vanadium production is capital-intensive and requires deposits to have the right mix of characteristics for ease of processing.

As with any commodity, there are important factors that need to be considered for a project to be economic. Once this is established, there are then milestones on the road to development that need to be met. Vanadium production is highly capital-intensive and requires a vast amount of metallurgical and processing work before an operation can be brought into production.

Ore to Processing – Tenor More Important than Resource Grade?

As we have outlined previously (refer to '*Vanadium from Earth to Metal*' page 3), the majority, if not all of the world's vanadium mines are amenable to open pit mining. Vanadium-bearing minerals are treated by means of several processes to recover vanadium either as metal, FeV, V_2O_5, or in the form of various chemicals. Pure vanadium is difficult to produce since it is readily contaminated by many other elements.

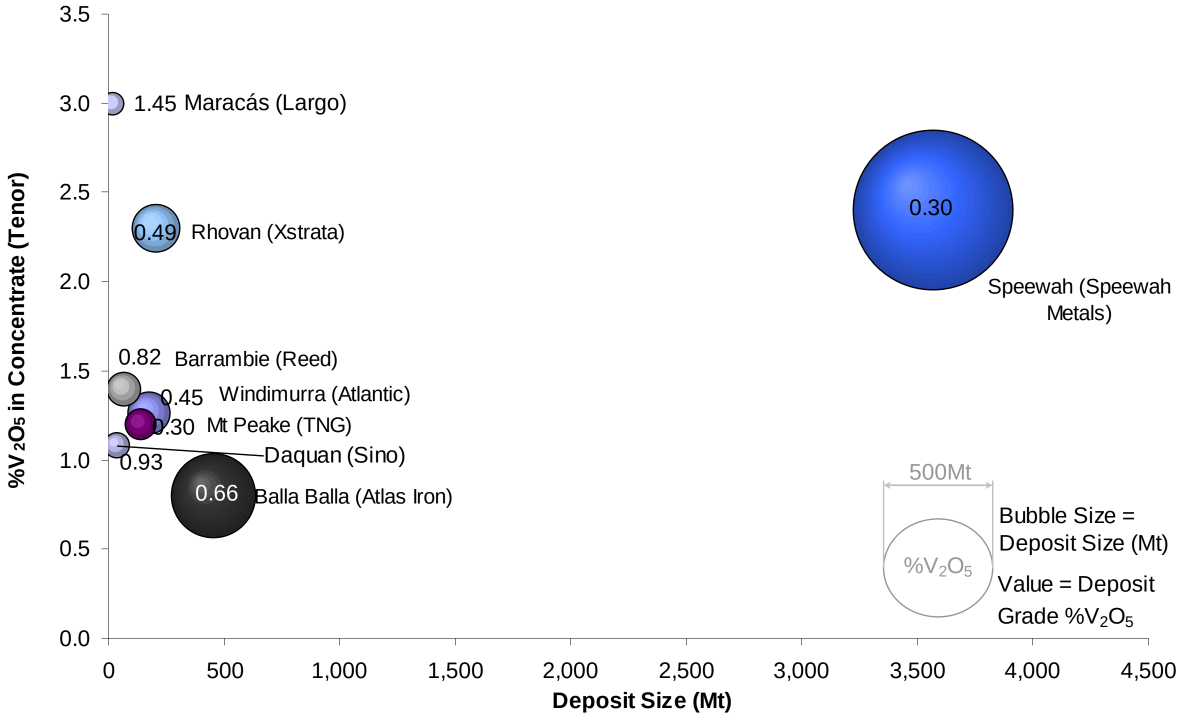
The 'tenor' in concentrate is a key characteristic of a projects' ore once processed into a concentrate.

For titano-magnetite hosted resources a key characteristic in the first stage of processing into a concentrate is the grade or 'tenor' of vanadium. Tenor refers to the amount V_2O_5 in the concentrate. In our analysis group the reported tenor for selected projects varies from <1% V_2O_5 (e.g. Balla Balla deposit), up to over 2.2% V_2O_5 (e.g. Maracás and Speewah deposits). Exhibit 20 represents seven projects for which studies and metallurgical work has been completed.

On the lower end of the tenor scale, the Barrambie, Windimurra, Mount Peake and Balla Balla deposits exhibit tenors of >0.8-1.4% V_2O_5. The higher tenor deposits include Xstrata's producing mine, Rhovan which exhibits roughly the same tenor as Speewah at 2.2% V_2O_5. The highest grade tenor is the Maracás project in Brazil.

The standout of the group is Largo's Maracás deposit which exhibits an extremely high tenor, largely reflecting the already high in situ grade of the deposit (at 1.45% V_2O_5). The surprise of the group is Speewah, which despite its in situ grade of only 0.3% V_2O_5, has a tenor comparable to Xstrata's world class deposit. This is an important factor in operating costs of the project as typically 80% of the costs are incurred after the concentrate is prepared. This offsets the costs to create the concentrate starting from a lower head grade of raw rock.

Exhibit 20: Size, Grade and Tenor Comparison of Selected Projects



Source: Company Announcements; Ocean Equities Research 2011

CAPEX – How Much Does a Vanadium Project Cost?

From our analysis group the proposed CAPEX for projects ranges from under US$100m to US$700m+.

The capital expenditure (CAPEX) of vanadium projects is intensive with the majority of capex spending on the processing facilities that vanadium production requires. From the analysis group we have defined, there are eight projects which are at the economic study level or higher from which we can look at the cost structure as presented in Exhibit 21.

As we have highlighted previously, the Windumurra project has prior to 2010 had over c.US$558m sunk into its construction and Atlantic has recently secured US$335m in notes for the funding of production. For Atlas' Balla Balla project which is primarily an iron ore project, the estimated costs will reach $1.3 billion for phase 1 and the total costs including phase 2 may well reach $2 billion. This project may not be regarded as a primary vanadium producer and therefore is an outlier.

Windimurra is expected to produce FeV at the lowest end of the cost curve at ~US$9/kg cont. V.

Reviewing the estimated project costs of the remaining projects, the average capex is approximately $500m. Largo's Maracás project enjoys the lower end of projects capital costs due to the high quality of the asset and ease of mining. American Vanadium's Gibelleni project is estimated to cost ~$90m due to its relatively small size and ease of mining.

We believe that as with any project, capital cost estimates are subject to change once the projects reach feasibility stages and cost blow-outs occur. Whilst we believe that a new FeV/vanadium project that will produce FeV will cost ~US$600m on average, we also note that projects skewed towards iron ore as a primary product or very large scale such as Speewah's will be at the higher end of the capex scale.

OPEX – How Much Does Vanadium Cost to Produce?

The historical cost curve for vanadium production is outdated and data for current producers is difficult to ascertain. Exhibit 22 defines a cash cost curve for the major vanadium producers in 2008 for the production of vanadium from slag sources. Whilst this is now outdated, it does give an idea of where the major producers sit in comparison to each other – with Chinese producer Pangang at the lower end of the cost curve (~$1.50/kg contained V c.2008) and Stratcor the highest (~$4.50/kg contained V c.2008).

A more recent cost curve analysis shows that once in production Windimurra's cash cost is expected to be at the lowest end of the cost curve producing vanadium at US$15/kg FeV or US$9/kg contained V net of iron fines by-products (Exhibit 23).

A *'high-purity' (99.5%) vanadium electrolyte is required for battery use whereas steel-grade vanadium is only 98.5% V_2O_5.*

Economic studies that have been completed recently show that the range for expected vanadium cash costs lie between US$2/kg contained V and US$20/kg contained V. However it is important to note what products are intended to be produced (FeV or V_2O_5), what process is used and if there are any by-products. Again, we highlight that this is difficult to draw a direct correlation between opex and size as it is ultimately depends on the project.

We believe that there are two very important factors to consider in relation to the OPEX of vanadium projects:

3.) **The tenor of vanadium in concentrate:** As 80% of the costs are typically incurred after the concentrate is prepared. Process costs govern the potential project margin for the production of finished vanadium.

4.) **By-Products:** Whilst this analysis has not looked at by-products of vanadium production in depth, we note that both iron and titanium metals which are typical by-products of titano-magnetites have the potential to be large revenue generators and therefore can reduce operating costs considerably.

Differentiating Between Vanadium for Steel and Battery Use

As outlined in previous sections of this report, V_2O_5 is produced first in the refining process and then converted to FeV for use in steel. For use in batteries, vanadium is required to be in a 'high-purity' electrolyte form, typically 99.5% purity. In the traditional pyrometalurgical processes used the intermediate step to produce steel grade V_2O_5 is only 98.5% purity and therefore cannot be used in battery applications.

The price of finished battery grade electrolyte currently sells between US$29-66/kg V_2O_5, compared to steel-grade V_2O_5 at US$16/kg V_2O_5.

High purity battery grade vanadium requires further processing of steel grade V_2O_5 to remove contaminants in the electrolyte and therefore has additional capital and operating costs involved. Currently this is generally converted by third parties who produce vanadium batteries and therefore represent an additional cost to the end user. The additional cash cost to produce battery grade is estimated to be ~US$4-10/kg contained V. Currently Stratcor in Arkansas is the only producer of battery grade V_2O_5.

The price of finished battery grade electrolyte therefore has a premium attached and sells between US$29-66/kg V_2O_5 according to market consultants, compared to steel-grade V_2O_5 at US$16/kg V_2O_5 currently.

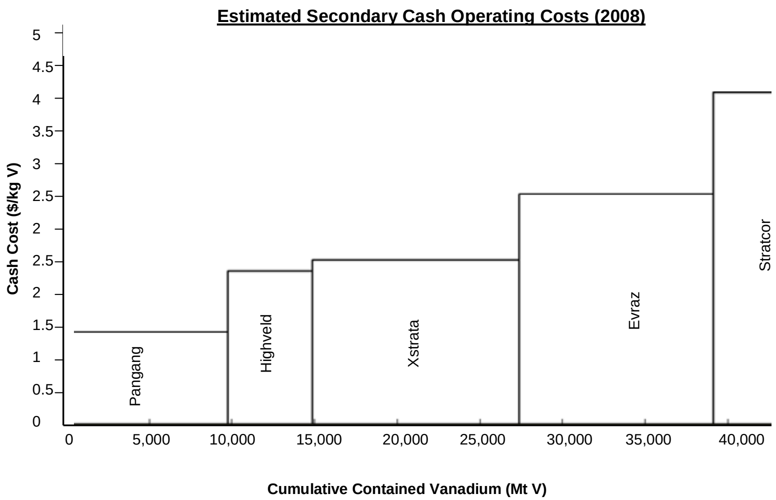
Emerging players who are aiming to take advantage of the battery demand for high purity vanadium are Energizer Resources and American Vanadium. We believe there is significant value to be made for producers of battery-grade V_2O_5 given the outlook for battery use applications but highlight the risk involved in proving the processes needed to do so.

Exhibit 21: Capital Cost and Operating Cost Parameters for Selected Vanadium Projects

Company	Ticker	Project/s	Location	Total Resources	In situ Grade	Contained V	Deposit Type	Current Status	Processing Route	Product/s	Production (or Est. Prodn)	Operating Cost	Capex	LOM	Off-Take Agreements
				Mt	*$\%V_2O_5$*	*MtV_2O_5*					*kt pa V*	*US$/kg V*	*US$m*	*Years*	
American Vanadium	AVC.CN	**Gibilleni**	USA	20.85	0.33	0.07	Sedimentary	Final Feasibility	Heap Leach	V2O5 / FeV	2.38	3.78	90.00	8.50	N/A
Atlantic Ltd	ATI.AU	**Windimurra**	Australia	209.97	0.47	0.99	V-Ti Magnetite	Construction	Pyro-Met	V2O5 / FeV / Fe	5.70	9.01	754.50	24.00	Wengfu / Element
Atlas Iron Ore	AGO.AU	**Balla Balla**	Australia	456.00	0.66	3.01	V-Ti Magnetite	Construction	Fe / Ti Con / FeV	Fe / Ti Con / FeV	2.67	10.02	2,000.00	20.00	N/A
Largo Resources	LGO.CN	**Maracas**	Brazil	17.26	1.45	0.25	V-Ti Magnetite	Development	Hydro-Met	FeV	2.38	6.14	270.57	20.00	Glencore
Reed Resources	RDR.AU	**Barrambie**	Australia	65.20	0.82	0.53	V-Ti Magnetite	Development	Pyro-Met	V2O5 / FeV / Fe	3.67	20.00	662.00	12.00	N/A
Sino Vanadium	SVX.CN	**Daquan**	China	34.20	0.93	0.32	Sedimentary	Feasibility	Hydro-Met	V2O5	6.45	1.94	450.92	20.00	N/A
Speewah Metals	SPM.AU	**Speewah**	Australia	3,566.00	0.30	10.70	V-Ti Magnetite	Feasibility	Pyro-Met	FeV	3.33	20.00	700.00	30.00	N/A
TNG Limited	TNG.AU	**Mt Peake**	Australia	140.00	0.33	0.46	V-Ti Magnetite	Feasibility	Hydro-Met	Ti-Fe-V	8.28	N/A	677.00	23.63	N/A
Median												**9.01**	**662.00**		
Average												*10.13*	*515.00*		

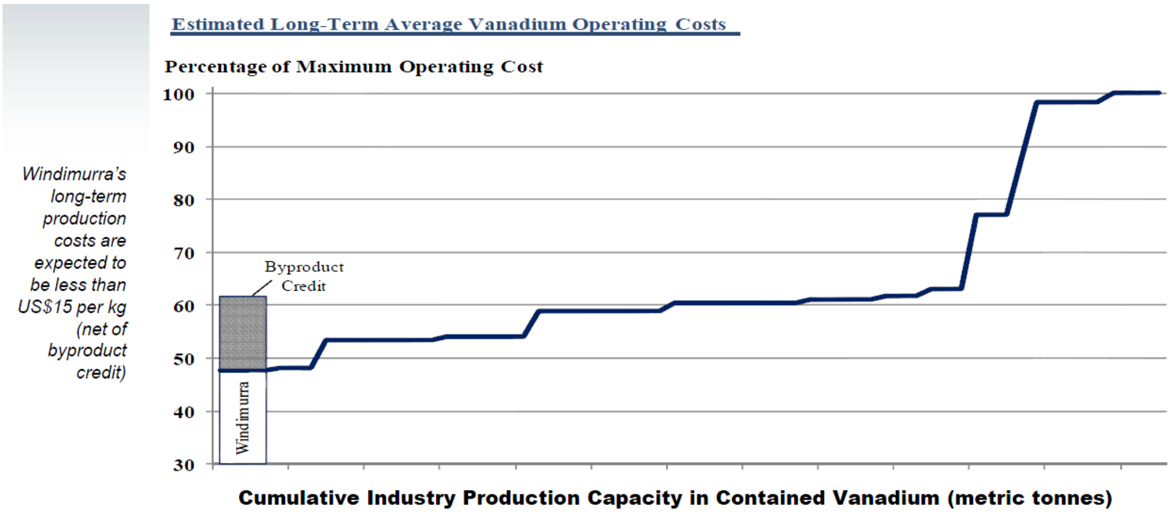
Source: Company Announcements; Ocean Equities Research 2011

Exhibit 22: Historical Vanadium Cash Cost Curve for the Major Producers



Source: Largo Resources; CPM Group

Exhibit 23: Estimated Long-Term Average Vanadium Operating Cost Curve



Source: Atlantic Ltd; CPM Group

Securing Off-Takes – What it Means for Steel and Battery End-Users

Glencore and Wengfu are two groups with which developers have obtained off-takes with.

Only a small number of our peer group have secured off-take agreements for vanadium product at least at a MoU level. Furthest up the development curve, Atlantic and Largo have off-takes in place. Atlantic has an off-take deal with Wengfu (Group) Co. Ltd. and Element Commodities Ltd for five-years and Largo has an off-take agreement with Glencore International (May 14, 2008) for all vanadium products produced at the Maracás vanadium project in Bahia, Brazil. The agreement shall remain in effect for a six year evergreen period commencing from commercial production, and shall be renewable for a further six years.

Reed Resources entered into a MoU with China Nonferrous Metal Industry's Foreign Engineering and Construction Co Ltd ("NFC") and Australian firm Arccon Pty Ltd (May'09). The MoU covers an engineering procurement and construction contract and project financing assistance for Reed's Barrambie Vanadium Project.

For junior vanadium developers aiming to target the vanadium battery growth area, no strategic off-takes have been witnessed in the industry so far. We believe that the growth in the manufacture of vanadium batteries, particularly in the US, will result in trends in off-take agreements for vanadium producers mirroring that of the lithium industry. For example Orocobre Limited (ASX|TSX:ORE|ORL, MCap A$199m) which is a lithium development company with its Olaroz project in Argentina, signed an agreement to establish a JV with Toyota Tsusho ("Toyota") in Jan'10. Toyota's strategic interest in Orocobre's project stems from the desire to increase its exposure to reliable and diversified lithium supplies as global demand for lithium batteries in the automotive sector continues to grow.

We believe this will ultimately be a trend for both vanadium battery manufacturers and users in order to secure access to competitive, low-cost vanadium. This also provides the consumer with some sort of price security. The great contenders to do this would be Prudent Energy in China and Cellstrom who have installations of VRB's around the world.

Future Trends for the Vanadium Sector

The Underlying Sector Themes Will be Traditional and New-Age

The vanadium industry will be underpinned by the traditional steel-growth consumption and projects will continue to run along their development curves over the short-term.

As our research suggests, the vanadium industry going forward will be underpinned by the traditional steel-growth consumption and therefore we believe vanadium supply will respond to this as well as with the addition of new projects. With the growing application of vanadium use in battery technology for Lithium-Vanadium batteries for automotive use and VRBs for power, we believe a niche market for battery-grade high-purity vanadium will emerge.

Companies to Leverage off Sector Trends

We believe that production growth for traditional steel demand vanadium will be slow as it has been historically. With only Largo's Maracás project in Brazil due to come on line in the short term (expected 2012) and after 2012 projects coming on line are few and far between, companies will tend to accelerate development depending on the steel market growth.

Where we see an impending surge in demand is for battery-grade vanadium once VRBs reach proper commercial use. This is being led by developments in the US testing the approved use of VRBs on the power grid. If this is approved, it could mean a huge uptake and use of VRBs on a large scale. The other crucial factor in the wide use of VRBs is the lack of vanadium production specifically for batteries thus restricting the take up of their use. The key issue is the lack of cheap vanadium pentoxide for the battery electrolyte. This differs from the ferro-vanadium used in steel strengthening and therefore opens up a gap in the market for players such as Energizer and American Vanadium who aim to produce high-purity vanadium.

Off-Takes, Strategic Stakes and M&A

The emergence of strategic developments for the supply of high-purity vanadium will come to the forefront…

In the past, corporate activity has been inactive with only developments for the re-commissioning of the Windimurra vanadium project and Atlantic's agreement that has allowed it to consolidate 100% control of the Windimurra project taking the headlines. Otherwise it has been largely been project development news by the junior vanadium companies over the past 12-months such as the merger of Atlas Iron (ASX:AGO) and Aurox Resources (ASX:AXO) which was approved on 6th Aug'10 in a A$140m deal. Aurox owns the Balla Balla magnetite-titanium-vanadium project in the Pilbara; however, Atlas was attracted to Aurox because of its Utah Point port capacity at Port Hedland, which Atlas requires to continue to grow its iron ore operations.

…and it is not a question of "if", but "when"?

For the steel-associated vanadium developments, we believe that projects will continue to run along their development curves over the short-term and as they do so this may attract strategic investment at the project level as steel-makers secure vanadium supplies – for example the Speewah project is a very large project that may attract an investment from a Chinese partner in order to progress development of the project.

As we have mentioned before, we believe the M&A action will certainly move to the forefront in the form of strategic off-takes for battery-grade vanadium as the growth in the manufacture of vanadium batteries, particularly in the US and China, becomes a reality. The trigger point is not if, it's when.

Company Summaries

INVESTMENT IDEAS

Standouts

Largo Resources | LGO.CN | *Maracás, Brazil*

Speewah Metals | SPM.AU | *Speewah, Aus*

Energizer Res | EGZ.CN | *Green Giant, Mad*

Ones to Watch

Atlantic Ltd | ATI.AU | *Windimurra, Australia*

American Vanadium | AVC.CN | *Gibilleni, USA*

Companies Included

Apella Res | APA.CN | *Iron T / Lac Dore, Can*

Atlas Iron Ore | AGO.AU | *Balla Balla, Aus*

Argex Mining | RGX.CN | *La Blache, Canada*

Quest Minerals | QNL.AU | *Victory Bore, Aus*

Reed Resources | RDR.AU | *Barrambie, Aus*

Sino Vanadium | SVX.CN | *Daquan, China*

TNG Limited | TNG.AU | *Mt Peake, Aus*

American Vanadium

Vanadium in a sedimentary deposit: possibility a low cost of production if developed successfully…

AVC.CN

MCap C$31m | C$1.35

Gibilleni Project, USA

21Mt at 0.33% V_2O_5

American Vanadium Corp ("AVC") is currently developing the Gibellini Project, in Nevada, U.S. AMC believes the low cost production capability and low cost heap leach recovery of the Gibellini project gives the Company the opportunity to become North America's first and only primary producer of Vanadium. AVC's plan for 2011 includes potentially expanding the resource base through targets to be tested on its existing landholding. Under the Base Case Scenario as defined in the Scoping Study Oct'08, the economics provide favourable operating costs of ~US$6.75/kg V_2O_5 and an NPV of US$55.6m (after tax at a 7% discount rate). Positives of the project include low capex/opex and no crushing necessary; however risks include processing success; and securing off-take agreements.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
		NA					4th

Apella Resources

Two early stage deposits: historic data that may lead to a large deposit being defined…

APA.CN

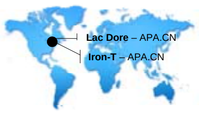
MCap C$20m | C$0.15

Iron-T / Lac Dore, CAN

14Mt at 0.42% V_2O_5

Apella Resources Inc ("APA") owns two vanidiferous magnetite deposits, Iron-T and Lac Dore in Quebec, Canada. Iron-T is currently at an early stage of exploration with an Inferred resource totalling 14.38mt @ 0.42 V_2O_5. The Iron-T project requires more definition diamond drilling before being ready for mining; this can be realized from surface drilling. The preliminary mineral processing tests of Spring 2010 included limited density tests and Davis tube testing of the Iron-T mineral deposit in view of an open-pit operation and returned results of above 79% V recovery using the Davis tube process solely.

The Lac Dore deposit may have a very large resource at compelling grades based on historic data and work carried out on pre-NI 43-101 standards as the Feasibility Study indicated. Stripping and drilling work completed in 2009 intersected massive magnetite grades with V_2O_5 as high as 1.09%, along with 54.88% Fe and 13.08% TiO_2. Further scoping study work is required to prove the economic validity of the assets. APA has potential to further expand the resource at Iron-T as well as upside with the large Lac Dore deposit estimated to have ~100mt @ 0.49% V_2O_5 (non- NI43-101 compliant).



Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
		NA	NA				11th

Argex Mining

Large historic resource certainly warrants investigation: recent metallurgical test results proving positive…

RGX.CN

MCap C$38m | C$0.43

La Blanche, CAN

44Mt at 0.45% V_2O_5

Argex Mining Inc ("RGX") is developing the Lac Dore vanadium-titanium-iron project in Quebec, Canada, along with an early stage iron ore project. RGX has recently defined a NI43-101 compliant resource totalling 43.8Mt at 0.45% V_2O_5, 18.8% TiO_2, 44% Fe (MI & I). Argex has recently completed metallurgical test work which indicated that preliminary leaching tests demonstrated high extraction efficiencies for the iron (>90%), titanium (>85%), vanadium (>90%) and chromium (>90%). Further test-work is being conducted to optimize the extraction of iron and titanium. RGX has signed a letter of intent (14th Feb'10) with Canadian Titanium Ltd (CTL) for the purchase of up to a 50.1% interest in CTL which owns proprietary technology and underlying patents that RGX plans to implement for its Phase III metallurgical testing.

RGX's La Blanche deposit is on the smaller end of the scale, however if the project is proven to be economically viable it has the potential to generate valuable revenue streams from not just the vanadium present in the deposit, but the very high grade titanium.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
		NA	NA				10th

Atlantic Ltd

A long history: Back into production in 2011…

ATI.AU

MCap A$204m|A$1.80

Windimurra, AUS

210Mt at 0.47% V_2O_5

The Windimurra project located in Western Australia has had a long up and down history dating back to before 1970. From 1998, the Xstrata JV with Precious Metals Australia produced 13,000t V_2O_5 by 2003 with the plant part commissioned by Xstrata. However the full project did not go ahead as vanadium prices fell and deemed the project uneconomic. From 2005-2009 Xstrata was replaced by the Noble group in the JV and substantial capital was injected to restart the project and the plant was modified to produce FeV. Prior to 2010 c.US$558m was invested.

Atlantic Limited ("ATI") entered into an agreement in Aug'10 that allows it to consolidate 100% control of the Windimurra vanadium project. ATI raised US$335m in senior secured notes due by 2018 in Feb'11 in order to complete the construction and commissioning of the Windimurra project. The company expects to complete construction and start operations at Windimurra in 3Q'11 and reach full nameplate capacity by the 1Q'13. The project is expected to produce about 5,700tpa of contained vanadium and once at nameplate, 1Mtpa of iron ore fines from calcine tailings (with an expected average iron content of about 55%) as a by-product of processing raw magnetite-rich iron ore into ferrovanadium.

Windimurra contains one of the larger known reserves of vanadium, with an estimated 127.6Mt of vanadium-bearing ore reserves that hold an estimated 340kt of contained vanadium. ATI has an off-take deal with Wengfu (Group) Co. Ltd. and Element Commodities Ltd for five-years and will be the only vanadium production in Australia until at least 2015.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							3rd

Atlas Iron Ore

Primarily an iron project: Vanadium to be produced in phase II with iron ore…

AGO.AU

MCap A$3.2b|A$3.93

Balla Balla, AUS

456Mt at 0.66% V_2O_5

Atlas Iron Ore ("AGO") acquired the Balla Balla titano-magnetite project through its merger with junior iron ore company Aurox Resources Ltd (ASX:AXO) (completed Aug'10). The Balla Balla project is located in the Pilbara region of Western Australia and has a total resource (MI & I) of 456Mt grading at 0.66% V_2O_5, 45% Fe and the TiO_2 in concentrate grade is 14%. AGO has long-term (15 year) iron concentrate offtake contracts in place at Hamersley Premium Fines Price (due to vanadium credits) with Chengde Iron & Steel and RockCheck Steel Group in China. The vanadium to be produced from Balla Balla will be during phase II as a FeV80 alloy with a total of 10Mtpa Fe, 0.47Mtpa TiO_2 concentrates, and 7,000tpa FeV produced. The proposed Balla Balla operation would pump iron ore concentrate to Utah Point at Port Hedland as slurry via a buried pipeline, where dewatering will occur. Initial production for phase 1 (Fe and TiO_2) will begin in 2013, with phase II full production implemented in 2017.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							9th

Energizer Resources

A uniquely hosted deposit: Low cost mining if processing is proven…

EGX.CN

MCap C$41m | C$0.29

Green Giant, Madagascar

59Mt at 0.68% V_2O_5

Energiser Resources Inc ("EGZ") owns the Green Giant property located in south central Madagascar which was previously explored for numerous other minerals since 2007 and various exploration work conducted. In late 2008, the Company discovered vanadium and has since put all subsequent efforts into defining a resource and developing the vanadium deposit. Green Giant is one of only a couple of sedimentary-hosted vanadium deposits currently being developed and has total indicated and inferred resources of 59.2Mt at a grade of 0.68% V_2O_5. Various metallurgical tests have been carried out by EGX since Q4'09 and the resource definition in Jun'10 which includes acid and alkaline leaching and salt roasting with the intention to produce the high purity (>98.4%), battery-grade vanadium pentoxide required by battery technologies. Energizer is working towards a preliminary economic assessment which will refine the metallurgy and processing to be used to produce a V_2O_5 product. We believe that the project has potential for a low-cost production, however highlight that the inherent country and processing risk.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
		NA					5th

Largo Resources

Advancing to production in early 2013: Off take already in place…

LGO.CN

MCap C$405m|C$0.43

Maracás, Brazil

17Mt at 1.45% V_2O_5

Largo Resources ("LGO") is one of the most advanced junior vanadium developers with its Maracás project in Brazil anticipated to be in production early 2013. LGO completed a feasibility study in 2008, which is based on a 5,000tpa FeV mine with a capex of US$212m, based on total resources of 17.3Mt at a grade of 1.45% V_2O_5. The deposit is of very high grade vanadium and is it predicted that production costs at Maracás will be ~US$13/kg FeV. Largo secured an off-take agreement with Glencore International (May'08) for all vanadium products produced at the Maracás vanadium project.

The Maracás project is certainly a standout in the vanadium developers peer group in terms of the quality of the asset and the proximity to production. It also has the ability to expand the resource. The initial project capex is estimated to be ~US$270m and based on the DFS the project NPV is ~US$436m. The company also owns tungsten projects in Brazil and Canada.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							1st

Quest Minerals

An early stage explorer: Close to other vanadium deposits…

QNL.AU

MCap A$7.6m| A$0.03

Victory Bore, AUS

151Mt at 0.44% V_2O_5

Quest Minerals ("QNL") owns the Victory Bore project in Western Australia and is in early exploration drilling stages. QNL recently defined a maiden resource of 151Mt at a grade of 0.44% V_2O_5. Metallurgical tests so far show positive results for vanadium and iron recoveries. Whilst QNL is still a very early-stage explorer, the initial size of the deposit is substantial and more drilling is required before scoping study level. The project is located close to Windimurra, therefore potential synergies could be possible if and when the economics are proven. QNL also holds other licences in the region that are prospective for iron ore.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
		NA	NA				12th

Reed Resources — *A high grade deposit: Awaiting further study work…*

RDR.AU

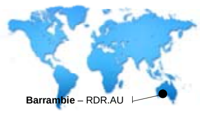
MCap A$116m|A$0.42

Barrambie, AUS

65Mt at 0.82% V_2O_5

Reed Resources ("RDR") holds a portfolio of assets all located in Western Australia including: the Meekatharra gold project which the company aims to bring back into production; the Mt Marion lithium project due to commence production in 2011; and the Barrambie vanadium project. RDR also has stakes in other iron and nickel exploration projects. The Barrambie vanadium project has total resources of 65Mt at 0.82% V_2O_5, including probable reserves of 39.7Mt at 0.82% V_2O_5. A Definitive Feasibility Study (May'09) outlined a conceptual mine with a life of 12 years at a rate of 3.2Mtpa throughput for ~6,500tpa FeV and would require a capex of ~A$630m.

RDR entered into a MoU with China Nonferrous Metal Industry's Foreign Engineering and Construction Co Ltd ("NFC") and Australian firm Arccon Pty Ltd in May'09). The MoU covers an engineering procurement and construction contract (EPC) and project financing assistance for the project. The Barrambie Project is located ~125km NE of the Windimurra vanadium project in the Murchison region of Western Australia. The updated costs and timeline for the project development is expected in Q2-Q3'11.



Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							7th

Sino Vanadium — *Small but high grade deposit: Progressing towards development in China…*

SVX.CN

MCap C$7.2m| C$0.10

Daquan, China

34Mt at 0.93% V_2O_5

Sino Vanadium ("SVX") owns 100% of the Daquan vanadium asset located in central China in the middle of the vanadium producing district with total indicated and inferred resources of 34.2Mt at 0.93% V_2O_5. The preliminary economic assessment results (Jan'10) indicated a conceptual project NPV of US$878m based on an open pit and underground mining scenario with life of 20 yrs that would produce ~11.5ktpa of V_2O_5. Daquan, while a small deposit, exhibits a high grade and is expected to start production in late 2012.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							8th

Speewah Metals — *One of, if not the, largest titanomagetite deposits in the world: High vanadium tenor in concentrate…*

SPM.AU

MCap A$39m | A$0.30

Speewah, AUS

3,566Mt at 0.30% V_2O_5

Speewah Metals ("SPM") has established a portfolio of 100% owned leases covering 575 sq kms in the East Kimberley region of Western Australia. These leases host one of the worlds largest and highest quality titanomagnetite/vanadium resources (currently JORC estimated at 3.6bt in a ~ 50m thick, flat lying, at surface, mostly unoxidised state). The leases are also prospective for many other minerals including copper/gold, fluorspar, silver, lead, zinc and platinum. Speewah has targeted to further increase Vanadium resources by ~100% over the next 6 to12 months by the drilling of other known outcrop adjacent to the current resources.

An unusually high tenor relationship with the magnetite/Vanadium crystals has enabled the establishment of much higher than average grades (up to 2.6% V) in concentrate. Titanium, vanadium and iron in this concentrate have also been shown to dissolve in some acids - opening a future potential pathway to recover metal products such as Vanadium pentoxide, Titanium dioxide and ferric chloride in large volumes. The sheer magnitude and quality of this deposit makes it an essential component of any portfolio focussed on the Vanadium sector.

Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							2nd

TNG Limited — *Exploring a hydrometallurgical processing route: Progressing pre-feasibility studies…*

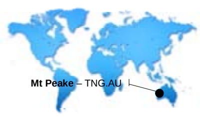
TNG.AU

MCap A$26m | A$0.09

Mount Peake, AUS

140Mt at 0.33% V_2O_5

TNG Limited ("TNG") has a multi-commodity portfolio of assets in Western and Northern Australia. Its 100% owned Mount Peake V-Ti-Fe project is located in the Northern Territory for which TNG is exploring a hyrdometallurgical process to recover V_2O_5, TiO and Fe. The Mount Peake deposit has Inferred resources of 139.1Mt at 0.29% V_2O_5, 5.3% TiO_2 and 23.7% Fe. The project is currently in the pre-feasibility stages and the Feb'11 scoping study outlined a conceptual 5Mtpa processing rate to produce ~350kt V_2O_5 over a 23 year mine life. The study also estimates a total capital cost of ~$380m and operating costs of $46.60/t ore mined. Further studies have indicated that construction of a FeV plant is estimated at A$44m. The hydrometallurgical process that TNG is exploring could potentially exhibit excellent recoveries at a lower cost than the typical pyrometallurgical processing route. TNG has a non-binding MoU with a major Chinese engineering and development company that allows for the establishment of strategic development partnership for Mount Peake finance and development, subject to entering into definitive agreements.



Deposit	Development Stage	Tenor	Economics	Steel Growth	Battery Growth	Country Risk	Overall Peer Rank
							6th

Notes

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