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Vanadium Supply and Demand Trends

(or, why the World Needs Windimurra)

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PRECIOUS METALS AUSTRALIA LIMITED

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Slide 2 – Title "Vanadium Demand and Supply Trends"

Slide 3 – Presentation Overview

In the past, the world vanadium industry has been opaque and hard to analyse. The largest producer, Highveld, didn't publish separate figures for steel and vanadium and a significant portion of world production and consumption was concealed behind the iron and bamboo curtains. The US Bureau of Mines publishes estimates, but withholds US figures. Only in recent years have Highveld and Evraz opened up, and Chinese producers listed on the stock market, revealing more information.

I will talk about the use of vanadium and developing markets, key factors underlying the long-term demand outlook, an overview of key suppliers and factors that may restrict future supply.

Shortages of vanadium in the last few years since the Windimurra mine last operated have been met by growth in high cost co-production, substitution by other metals and a plethora of small environmentally unsustainable, high cost producers in China.

Future demand cannot be met in this way, and you will see that there is a likelihood of demand growing at a rate faster than supply, clearly establishing the need for substantial, sustainable, environmentally responsible new production.

Lastly therefore, you will hear how, whether existing producers welcome the fact or not, Windimurra must, and will, meet that growing demand.

The World needs Windimurra!

Slide 4 – Precious Metals Australia Limited (ASX code PMA)

PMA is based in Perth Western Australia, home of the world's strongest growing mining economy. GDP growth was 14% last year, eclipsing even China!

The company's technical team is very strong, drawing its members from around the world, from competitors and former Windimurra personnel.

The Company has raised over $100m in equity in the past year and is finalising debt financing for the balance of the Windimurra redevelopment cost.

The company's largest shareholders are UK and Australian institutions who are very supportive of the Company and its development.

Slide 5 – Rebirth of Windimurra

Windimurra was prematurely closed in 2004 due to low vanadium prices, flaws in the original design of the plant and differences between the owners.

This has been resolved with a strong marketing agreement with Noble Group, which underwrites the operating costs for the life of mine; ensuring temporary pullbacks in the vanadium price will not cause short term cash flow problems. Noble is an ideal partner for us, with huge penetration into the rapidly growing Chinese steel industry. Noble is not a competitor to Windimurra, unlike our former partner, and is absolutely committed to the success of the mine.

The project has been completely re-engineered, drawing on the experience of three years operating the mine, addressing past operating constraints. Detailed engineering has been completed, work has begun at site on the rebuilding of the operation, and long lead capital items have been purchased or ordered, ensuring that we will be able to meet our commitments to customers.

Windimurra will produce both ferrovanadium 80 and vanadium pentoxide, with the mix being determined by market needs. The total output will be 5,000 tonnes of contained vanadium.

Slide 6 – Windimurra Resource Expansion

The Windimurra ore body is like no other. It is already the world's largest Proven Reserve which includes only a fraction of the gigantic structure identified.

In the last few months, drilling has shown that the minable width is even greater than that currently planned.

This cross section shows the current final pit design and shows the extent of mineralisation that continues westward (to the left). A new reserve calculation taking account of all this new data will not be completed for several months, but is expected to increase greatly the minable tonnage based on an even wider, deeper pit than currently planned. This will increase recovery and lower unit cost still further.

I draw your attention to the scale across the bottom. You can see that material can be bulk mined across several hundred meters. The largest existing vanadium mines are restricted to a minable width of only several meters.

Slide 7 – Uses of Vanadium

Vanadium is indeed a 20th century miracle metal. As mankind strives to make products stronger, lighter, and safer and more fuel efficient there will be ever increasing demand for the metal and the need for significant increases in sustainable, cost effective vanadium production.

Unlike other metals whose markets are fully developed, commercial production of vanadium only arose in the 1960s, and so new applications continue to be found for the metal's useful chemical and physical properties.

Its principal use is as a strengthening addition to carbon steel and high strength steels in structural applications, oil and gas pipelines, buildings and cars. Tool steels and stainless steel use are also important.

Titanium aluminium vanadium alloys are used in aircraft components, air frames, rocket motors and gas turbines. Non-steel uses include superalloys, welding and hard-facing, magnets and alloys used in nuclear engineering and superconductors. Vanadium chemical catalysts are used in the manufacture of sulphuric acid, maleic anhydride, EPDR rubber and desulphurization of sour gas and oil.

Steel will remain the key end-use market, although growth in aerospace alloys and the emergence of new uses for titanium-vanadium will see this sector grow the fastest.

Slide 8 – Steel is Driving Vanadium Demand

The graph illustrates the clear historic link between vanadium demand and steel demand.

Vanadium demand has been growing at a faster rate than crude steel production.

The maturing of the Chinese and other emerging steel markets will result in an increase in the intensity of use. The forecast growth of vanadium use is therefore higher than the forecast growth in steel consumption alone.

Slide 9 – Steel in China is a Major Influence

Vanadium in construction steels (particularly "rebar") adds significantly to load-bearing strength. In 2003, Chinese construction authorities required the use of vanadium-added rebar for use in earthquake-affected areas.

The top chart shows how the per capital consumption of steel in China has risen to equal that of North America but is still way short of Japan and South Korea. This is because China is still building the massive infrastructure required to support the urbanisation of 65 million people every year. America and other developed economies largely have their infrastructure in place. India is yet to take of.

The lower chart illustrates how historically the Asian countries have added less vanadium to their steel than the world average. Chinese consumption of engineering and alloy steel has also grown over the last few years as an increased proportion of manufacturing is for higher-value, more complex machinery.

Growing intensity of use in China will result in vanadium consumption growing at a faster rate than steel consumption.

Slide 10 – China is driving steel demand

In 2006 China's production of steel grew by 17.7% while specialty steels which contain vanadium grew by 22.5%[1], far outpacing the 8.8% growth in total global crude steel production.

This trend is projected to continue for an extended period, on a global level, as emerging economies (China, India and others) continue to industrialise.

Macquarie Bank forecasts[2] total world steel production to grow at an annual 5.8%, with China increasing her share to 40% by 2010.

Increasing intensity of use, coupled with increasing steel production, will see vanadium consumption in steel use grow by at least 7% per year.

Slide 11 - Titanium Vanadium Alloys Soar

In most uses, titanium is alloyed with vanadium, most often at a 5% – 6%. Used extensively in the aerospace sector, this alloy imparts strength and improves performance at sustained high temperatures.

The drive to produce aircraft that are lighter, longer range and more fuel efficient is driving greater use of light weight alloys, dominated by vanadium and titanium.

Each generation of new aircraft uses increasing amounts of titanium / vanadium alloy as shown in the graph. The new generation of aircraft led by Boeing's 787 Dreamliner and Airbus' 380 contain use 91 tonnes and 77 tonnes respectively in their manufacture; more than double that for a 747.

An excellent paper by John Monahan at the Titanium 2006 Conference[3] predicted the doubling of titanium vanadium alloy consumption over the next 10 years. Titanium processors have been frantically installing additional sponge titanium production capacity to service this demand.

The makers of titanium alloys require a stable source of high purity vanadium pentoxide to meet demanding quality standards. Windimurra was previously the largest producer of high purity material, and was widely used in this sector. The standard Windimurra process fulfils this demanding premium grade, due to a competitive advantage in the use of natural gas to roast the ore, which introduces fewer impurities than does the coal used by competitors.

Now let me turn to the supply side of the vanadium equation.

Slide 12 - Vanadium Production Sources

The majority of vanadium is sourced from the small proportion of iron ores that are vanadiferous magnetites. Low levels of vanadium are also found with carbon either in coal or oil. Some vanadium is recovered from oil residues and uranium ores.

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[1] Chinese Govt Chian *Metallurgical Newsletter*, July 2006
[2] Macquarie Bank Limited, Research, *Commodities Outlook,* October 2006
[3] Commercial Aerospace Outlook for Titanium, John Monahan, VSMPO, Titanium 2006 Conference 1 – 3 Oct 2006

While occurrences of vanadium-bearing minerals are relatively plentiful, reserves of economically recoverable vanadium are not. Several publicised potential vanadium resources suffer from poor access to ore, high strip ratios, low grade, unweathered ore resulting in high mining costs, or a combination of these.

There are three major groups of vanadium producers. An understanding of these is important to an understanding of the vanadium industry.

- **Primary Producers** – extract vanadium directly from vanadiferous titanomagnetite, mined only for this purpose.
- **Co-Producers** – process vanadiferous titanomagnetite primarily to make steel and produce a vanadium-containing slag as a co-product of steelmaking.
- **Recovery** – extract vanadium from wastes such as fly ash, oil residues or spent catalysts.

Due to high demand and high prices over the last three years, production is currently at full effective capacity.

Slide 13 – Vanadium Primary Producers

Magnetite ore containing vanadium is crushed and ground, beneficiated by magnetic separation, roasted in a rotary kiln with a sodium flux until the vanadium is leached out. This “salt-roast water-leach” process is used by all primary producers. The vanadium is produced as either vanadium pentoxide or vanadium trioxide and is then “converted” or reduced by aluminothermic reduction to ferrovanadium.

Rhovan is a subsidiary of Xstrata that mines hard-rock titanomagnetite ore for two-stage crushing and milling before upgrading by magnetic separation to a magnetite concentrate containing around 2% vanadium. The plant was built in 1997 originally with a capacity of 4,800t of vanadium pentoxide. Since closing Windimurra and exhausting Vantech’s ore in 2003, Xstrata has expanded production capacity at Rhovan to a maximum 9,300t of V_2O_5.

Rhovan booked solid profits of US$181.1m in 2005 and US$105m in 2006. The current plant is producing at maximum capacity and any further increases in production would require substantial capital of up to US$150m, including the building of a new rotary kiln.

Highveld’s Vanchem plant is also a primary producer because most of the vanadium it produces comes from fine magnetite ore (<6mm) from the Mapochs mine, mixed with 20% vanadium-bearing slag produced from the steel making plant. The three rotary kilns have a total capacity of 11,000 tpa V_2O_5 from both ore and slag. However, production has been around 10,000 tpa V_2O_5 due to low plant availability.

Vametco is a subsidiary of Strategic Minerals Corporation of USA (Stratcor). It produces Nitrovan (a nitrated vanadium alloy) at its facility in Brits, South Africa. Vametco is not able to meet all its ore needs from its own mine. Slag from Highveld is used to supplement the ore. Production in 2005 was 6,300t tonnes of V_2O_5 of which 1,300t were from slag and 5,000t from ore. Vametco's output is currently limited to this level by the limited availability of ore and unavailability of more slag.

Russian steel producer Evraz acquired 73% of the Stratcor business in 2006 and later an interest in Highveld Steel Division, with an obligation to divest the Vanadium Division.

"Backyard" producers in China numbering more than 150 have sprung up in the last three years of high prices, extracting over 6,000 t of vanadium from magnetite and stone coal in 2005. There is growing pressure from the Chinese central government to close down these backyard operators as part of a programme to rationalise much of the country's mineral and metal production and to reduce rampant pollution and energy consumption. Some closures have already been reported. China imposed a new resource tax on primary vanadium mines in September 2006, in what the government said was an attempt to prevent "irrational" mining. The tax of US$1.50 per tonne of ore has added over US$1 per pound to the cost of vanadium pentoxide. A 10% export duty has also been applied to vanadium products.

These measures alone have started to bite, with shortages of vanadium and increasing prices reported in China in recent weeks.

We believe these producers would be uneconomic and unlikely to remain in production at prices sustained below US$5/lb V_2O_5.

Being larger scale and vastly more efficient, Windimurra will be able to assume at least part of the market left by these small producers as they close down.

Slide 14 - Vanadium Co-Producers

There is a popular myth that the co-producers get their vanadium as a free by-product from the process of making steel. They are in fact, relatively high cost steel **and** high cost vanadium producers.

These steel makers use, very low (iron) grade titanomagnetite as a source of iron. The ore also contains vanadium and titanium. Some of these ores cannot be smelted in conventional iron blast furnaces. The vanadium is removed in an extra processing step as a slag in the steel-making process. The titanium is partly removed either during the beneficiation stage (Panzhihua and Chengde), or removed in a waste titanium slag, during iron-making (Highveld).

The vanadium bearing slag contains between 10 and 20% V_2O_5 and is processed in the same salt-roast – water-leach process that is used on ore by primary producers.

There are only five relatively small steel plants worldwide producing steel from these ores, because they are a very low grade source of iron (15% - 30% Fe), compared to the more common 60 - 68% Fe haematite. Plus the titanium content is harmful to steel-making plant, and the huge volume of slags generated compared to using high grade haematite, blows out energy costs.

Not surprisingly, less than 1.5% of global steel was produced from titanomagnetite containing vanadium. These are often small steel producers that lack the economies of scale of their competitors. They nevertheless account for more than half of current vanadium production.

Steel Production of Vanadium Co-Producers –2006					
Steel and Vanadium Co-Producer	**Region**	**Ore Type**	**In situ Iron Grade**	**Annual Crude Steel Production**	**In situ Vanadium Grade (% V_2O_5)**
Chengde Xinxin (Chenggang)	Hebei Province, China	Vanadiferous Titanomagnetite	31% Fe	2.7 Mt	0.3%
Panzhihua Iron and Steel Group	Sichuan province, China	Vanadiferous Titanomagnetite	31% Fe	4.7 Mt	0.3%
Chusovoy (ex NTMK)	Perm region, Russia	Vanadiferous Titanomagnetite	15% Fe	0.8 Mt	0.13%
Vanady Tula (ex Nizhni Tagil)	Kachkanar, Russia	Vanadiferous Titanomagnetite	16% Fe	5.6 Mt	0.14%
Highveld Steel & Vanadium Corp	Witbank, South Africa	Vanadiferous Titanomagnetite	38% Fe	0.87 Mt	1.7%
New Zealand Steel (to Chengde)	Waikato North Head, New Zealand	Vanadiferous Titanomagnetite sands	57% Fe (in concentrate)	0.59 Mt	0.5% (in concentrate)
Total Vanadium Co-Producers steel output				**15.26 Mt**	
Total World Steel output				**1,240.00 Mt**	

Vanadium co-producer plants were built to operate on low grade iron ores in the closed economies in the 1960's in Russia, China and South Africa, when imports of haematite were not possible. No new plants of this kind have been built since. The easing of international boundaries, the opening up of these domestic economies to overseas competitors, and availability of enormous tonnages of titanium-free, vanadium-free high grade iron ore from new mines in Australia, Brazil and South Africa have allowed a 35% growth in steel production in 5 years without attendant growth in vanadium co-production.

Slide 15 – Prominent Co-Producers

Highveld Steel and Vanadium Corporation Limited produces around 70,000 tpa of slag grading 22% V_2O_5 . Highveld is the world's largest vanadium producer.

Around 14% of the slag is sold to Stratcor's Vametco plant, where it is processed to produce Nitrovan. Another 14% is transferred to Highveld's Vantech primary vanadium plant to improve the ore blend. The remainder is sold to Treibacher and shipped all the way to the processing facility in Austria.

Highveld has enjoyed good profits in the last three years due to record vanadium and steel prices, with almost all the profit made from vanadium rather than steel. Over the previous 20 years of the operation Highveld has done little better than break even, with average annual profit from 1996 to 2003 of just US$9m. Steel production has remained constant, and vanadium slag production has slowly fallen over time, even in the recent years of high prices.

Highveld's 2006 profit was 31% less than the previous year with profits from vanadium and ferroalloys down 64% due to relatively "low" vanadium prices - despite the price being double the long-term average. The group was cash flow negative in the same period and output of vanadium actually fell[4].

The EU has recently directed Evraz to sell the Vanadium Division as a condition of approving Evraz's purchase of the majority of shares in Highveld. It is understood that the vanadium-bearing slag will be produced by the steel mill and sold to existing customers. However, the vanadium business may lose many of the synergies that previously resulted from the integrated operations.

Panzhihua New Steel and Vanadium is a very astute and technically competent Chinese producer that mines local low grade titanomagnetite. The local iron ore must be blended with higher quality haematite ore that is imported principally from BHP in Australia, at a ratio is 7 t to 3 t,. Pangang is located in a remote mountainous region in the south west of China. Rail costs from the port to Pangang are a significant impost at USD32 – 40 per tonne.

Despite their high efficiency, Pangang did little more than break even in the quarter end December 31, 2005[5] during a period of historically high steel and vanadium prices.

Vanady Tula is a subsidiary of Tulachermet which is a major pig iron producer in Russia. It extracts vanadium from slag purchased mostly from Evraz's Nizhni Tagil steelworks, but does not mine any vanadiferous ore itself. Its ability to expand is limited by its ability to buy more vanadium-bearing slag. Evraz mines a vanadiferous titanomagnetite grading 16% Fe and 0.13% - 0.14% vanadium pentoxide at Kachkanar (KGOK). The ore is treated at the Nizhni Tagil Steelworks (NTMK) and the vanadium bearing slag from this ore is sold as feedstock to Vanady Tula and, to a smaller extent, to Chusovoy.

Vanadium production is not a significant part of Evraz's revenue. Sales of NTMK slag returned $83m in the first half 2006, for 2.2% of Group revenue[6]. Any increase in Russian slag output, and hence vanadium production, is likely to relate more to the economics of mining and steel making at Nizhni Tagil, than demand for vanadium.

Evraz have recently acquired an interest in Highveld and Stratcor giving them access to the finished vanadium market and technical know-how.

Unfortunately for the co-producers, the price of vanadium and the price of steel are very closely correlated. When vanadium is low, steel is typically not high enough to absorb the costs of production. Past data suggests that when the ferrovanadium price is below US$20kg, historically corresponding with steel prices below USD275 t, vanadium co-producers are sub-economic.

Whilst co-production of vanadium from steel-making slag is likely to remain an important source of vanadium, it is not likely to grow significantly in the future as vanadium prices retreat to long term historical levels.

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[4] Highveld Steel and Vanadium Corporation Limited, Interim Report June 2006
[5] *China Daily* February 15, 2006
[6] Evraz Group SA Interim Results 2006

Chusovoy is a subsidiary of OMK that buys and smelts ore from Kachkanar. It supplements the vanadium steel-making slag from its plant with slag purchased from Nizhni Tagil to produce ferrovanadium.

Slide 16 – Recovery from Residues and Catalysts

Vanadium catalysts used in petrochemical and chemical industries can be processed to remove the vanadium and other deposited metals once they have reached the end of their useful life,. The burning of vanadium-containing fuel oil such as the Venezuelan product Orimulsion® produces a fly ash containing vanadium which can be treated. Coal stone in China provides another source of vanadium raw materials. Processing many of these materials is usually complex and costly.

A number of small, high cost, high polluting processors of spent catalysts and oil residues as well as small mines have sprung up in China in the last three years to capitalise on vanadium prices that allowed high-cost production to be profitable. They produced over 3,000t in 2005, but are unlikely to be sustainable in the long term. Chinese Government policies to reduce pollution and energy consumption are likely to combine with short resource life and high costs to result in closure during the next 1-2 years. Several are reported to have closed in the last few months helping to create a shortage of vanadium in China.

Strategic Minerals Corporation (Stratcor) is the leading US supplier of vanadium products including ferrovanadium for the steel and alloys sector and a wide range of chemicals. Capacity at Hot Springs is approximately 5,500t pa V_2O_5 equivalent. Evraz now owns about 75% of the company, including its Vametco primary processor facility in South Africa.

The high price of vanadium in recent years and more stringent environmental regulations preventing burial of spent catalysts and other wastes, has meant that almost all potential feedstock is already being utilised with the ability to source more feedstock limiting expansion.

Metallurg is a long-term vanadium processor that treats residues in USA and is building a plant in Alberta to process spent catalysts from the oil sands refineries.

Gulf Chemical are reported to be the largest processor of spent catalysts at its plant adjacent to the Texas oil fields.

Slide 17 – Substitution

Substitution of niobium can take place at very high vanadium prices, or alternatively, a greater quantity of (weaker) non vanadium-containing steel may be used.

The high price of ferrovanadium after 2003 saw many Chinese steel makers increasingly use ferroniobium to replace ferrovanadium as far as metallurgical considerations allowed. In 2006 China imported 11,900 t of ferroniobium, 32% up on 2005. Ferroniobium pricing had been very consistent for many years and was seen as a lower cost alternative. Steelmakers in other regions tended not to substitute to the same degree, preferring not to alter product formulations and processing plant settings.

This graph shows the growth in niobium imports to China compared to the growth that would have taken place if the normal intensity of niobium use had been maintained.

Ferroniobium is only 60 wt% effective when compared to ferrovanadium. Consequently, in 2006 approximately 8,000 t of ferroniobium in effect displaced approximately 4,800 t of FeV.

This substitution will begin to reverse in the immediate future (i.e. FeV will be re-substituted for FeNb) because the price of ferroniobium has soared following growth in demand that has exceeded installed production capacity and increasing vanadium production, principally from Windimurra, will enable steel makers to switch back and reduce their costs.

The elimination of niobium substitution in China alone could absorb all of Windimurra's planned output.

Slide 18 – Vanadium Supply/Demand Balance

A summary of our discussion of supply and demand outlook comes together in this graph.

The long term growth in steel production and in titanium alloy consumption fell back in 2000 and 2001 just as vanadium supply increased, resulting in a surplus, and falling prices. Over 15,000 t of vanadium was built up in inventory in slags in South Africa, and by traders that held the material. A number of ill-considered closures were undertaken, just as demand increased strongly again from 2004. The traders were able to sell the inventory into the higher-priced markets in 2004/05

The market remains in a tight supply situation at present due to continued strong demand and limited short-term ability to increase supply.

Demand is forecast to grow 5% - 7% per year over 2006 - 2015 due to the combination of increasing demand for steel, increasing intensity of use in steel in developing countries, increasing intensity of use of vanadium also in developing countries and a buoyant aerospace market. Once re-substitution and likely small, polluting plant closures are added to the equation, demand may again outstrip supply, causing short term shortages and strong pricing.

To put this picture into perspective, annual organic growth in demand from growth in steel consumption will be enough to account for half of Windimurra's capacity while the combined vanadium quantity associated with re-substitution and the closure of small, polluting processors is enough to demand additional annual production in excess of the capacity of Windimurra in its first phase.

Slide 19 – Windimurra Video

Following is a short video of the Windimurra operation in 2002.

Slide 20 – Windimurra, a Vast World Resource (fly-through)

The reserve envelope you see depicted in this imagery will give you an insight into the huge scale of the Windimurra deposit. I stress though, it was made prior to the recent drilling which has greatly widened the known orebody.

The world-class Windimurra Vanadium deposit is located in the heart of one of Western Australia's fastest growing mining provinces - the Mid West

The enormity of the vanadium mineralisation at Windimurra is hard to comprehend. 26km long, the deposit is so large it can be seen from space, within a massive system of vanadiferous titanomagnetite protruding from the earth.

Only 15% of the deposit has ever been drilled, giving what is already the world's largest Proven Ore Reserve of vanadium.

The extent of the current known Ore Reserve is shown in green - the entire zone averaging half percent vanadium. Remarkably, it can be seen that every hole drilled at Windimurra has proven ore, with no barren holes. Drilling now complete has extended the deposit in all directions.

A small open pit exists at Windimurra from which 7 million tonnes was mined in the early 2000s. Note the absence of waste rock dumps – every tonne mined was processed. Uniquely, the ore lies at the surface with no mining of barren rock required. The new Windimurra mining operation will be at a much larger scale….

Mining will extend along the entire 6 kilometre drilled reserve and, in future, well beyond.

At 350 metres thickness, the Windimurra ore body is two hundred times thicker than the world's largest operating vanadium mine, and it lies on the surface, waiting to be exploited.

Slide 21 – Windimurra, Key Advantages

Windimurra vanadium deposit is different from any other. While the vanadium is contained in a vanadiferous titanomagnetite, this is where the similarities end.

The Windimurra deposit is only one in the world that is **oxidised**. This is because it lies in the West Australian Archaean shield, within the oldest known part of the earth's surface. Chemically it is the same as ores mined in the Bushveld, Russia and China and those found in Canada and is the same or better grade. But physically it is very different, in that nature has already done a lot of the work, oxidising the ore to a depth of 40 meters. Consequently the ore is soft and cheap to mine, to crush and to grind.

The major process reagents, a sodium flux and ammonium sulphate, are available as waste products of the local alumina and nickel industries. PMA owns Australian and South African patents for the use of sodium oxalate which is available for almost nothing in WA. Competitors have to purchase expensive sodium carbonate.

The Windimurra kiln will again be fired by natural gas rather than coal, which has advantages in kiln availability, operating cost and product purity and enable it to employ heat recovery that reduces consumption by 30%.

A 365km gas pipeline has already been built to the Windimurra mine to supply natural gas.

Slide 22 – A Noble Alliance

Earlier this year, we cemented a strategic alliance with one of the world's leading commodities and supply chain managers, Hong Kong-based Noble Group Limited.

The Alliance includes a sales and marketing agreement whereby Noble has agreed to purchase the entire output of the Windimurra at prevailing market prices. During the first seven years of production, Noble will pay the higher of the current market price or the actual cash cost of production, guaranteeing cash costs are met.

Noble has taken a 10% stake in the Windimurra mine, underpinning the operation with $21.7 million in funding, and gaining a 3% holding in PMA.

Noble will exclusively market and handle all distribution logistics for Windimurra vanadium through their international network of offices.

This strong, long-term alliance will ensure the development of Windimurra as a competitive long-life, world-class operation producing high-quality vanadium at a sustainable cost.

Slide 23 - Summary

Vanadium consumption will continue to grow strongly underpinned by increasing steel production and growing intensity of vanadium use.

Because of the cost and resource constraints of existing supply sources, I believe we will see a significant and growing supply shortfall emerge over the coming years.

Shortages of vanadium have in the recent past been met by growth in high cost co-production, reduction in demand through substitution by ferroniobium and a plethora of environmentally unsustainable, high cost producers in China.

There are a number of potential sources for increased production, but only increased primary production from a new or expanded mine is feasible for the scale and timing required.

Of the possible new mines, Windimurra is the only one already under construction.

Windimurra hosts a significant and unique, world-class vanadium deposit and will support, at a sustainable cost, a processing operation that will produce the high-quality vanadium products needed for the long term.

Slide 24 - The World Needs Windimurra!