The MORNING CALL
Industry Update
JUNE 21, 2011
Mackie Research Capital Corporation

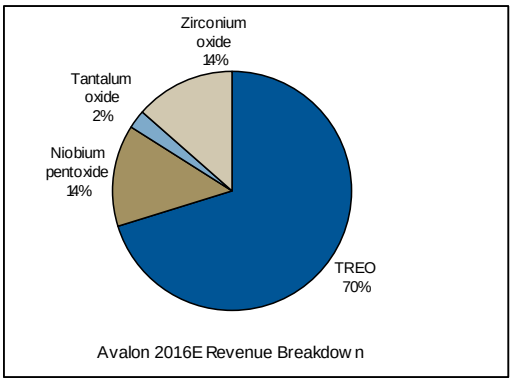
Don't Forget About Tantalum and Niobium Exposure

HIGHLIGHTING AVALON'S BY-PRODUCT REVENUE SOURCES

As we have addressed in previous notes, certain events and stock price weakness in the REE sector have created buying opportunities, in our view. Avalon could generate about 30% (~ $240mm) of its annual revenues from by-products by 2016. **Niobium (Nb) and Zirconium (Zr) are expected to be the largest contributors, each generating over $110mm in revenues. We forecast that Tantalum (Ta) will contribute an additional $20mm per annum.** In this note, we discuss the outlook for the Niobium (Nb) and Tantalum (Ta) industries. This includes a discussion on uses, demand growth drivers, supply and demand analysis and pricing outlook for Nb and Ta.

WE REMAIN BULLISH ON BY-PRODUCTS DEMAND AND PRICES

Minor metals form an industry that has generally been overlooked by investors due to its relatively smaller size compared to base metals and precious metals. This has led to a lack of investment in the space. There is a growing concern that, like rare earth consumption, demand for many minor metals such as tantalum and niobium may outstrip supply in the near term. **This suggests these metals should experience additional upward pressure, and bodes well for companies such as Avalon Rare Metals Inc (AVL-TSX, SPEC. BUY, $11.80 target).**



Avalon 2016E Revenue Breakdown

Tantalum: Almost half of tantalum is used in the electronics industry in the form of powder and wire for capacitors. It is favoured in space sensitive high-end applications.

Primary tantalum mining has historically been a low-margin business. As a result, several tantalum producers were forced into shutting down mining operations in the wake of the 2008-2009 economic down-turn. The decline in production did not have an immediate impact on tantalum prices due to the large inventories held by tantalum processors such as Cabot Corporation (CBT US, Unrated) and HC Starck (Private). However, a subsequent rebound in tantalum (Ta_2O_5) demand and drawdown of inventories have resulted in a sharp increase in Ta_2O_5 price. The spot price of Ta_2O_5 has increased from $37/lb to over $130/lb since the start of 2010. We forecast Tantalum average selling price to reach $165/lb by 2015.

Strategic importance: About 30% of the current supply is coming from conflict mining in DRC. Global efforts are currently underway to curb this supply. As this production is eliminated, the importance of Avalon's by-product could be further enhanced.

Niobium: It is used primarily in the form of ferroniobium (FeNB) by the steel industry and as niobium alloys and metals by the aerospace industry. The market size is estimated to be about $3 billion.

Strategic importance: CBMM (Private) in Brazil has a monopoly over this market, producing about 90% of the world's niobium demand. As a result, CBMM is in a position to control the pricing and the supply of niobium to the world. This has resulted in niobium being declared a strategic metal by the US Department of Energy and the EU governments outside of Brazil have taken notice of this supply imbalance and are encouraging new domestic sources of niobium production. This further enhances the value of Avalon's niobium by-product as it is a North American potential producer of Niobium.

Also, China is expected to play a key role in the growth of niobium demand. According to IAMGOLD (IMG-TSX, BUY/$27.00 target – Barry Allan), ferroniobium CAGR has averaged 17% between 2002 and 2008. We note that China currently only uses 20 grams of Nb per ton of steel, which is much lower than the consumption in developed countries of about 100 grams per ton of steel.

Matt Gowing, CFA 416.860.8675, mgowing@mackieresearch.com
Raveel Afzaal, Associate 416.860.7666, rafzaal@mackieresearch.com

TANTALUM

Characteristics

Tantalum's key properties include high electrical capacitance per unit mass, a high melting point and excellent resistance to chemical attack.

Uses

Tantalum is used in several high-growth applications such as hard drives, mobile phones, capacitors and computers. According to USGS, demand is expected to grow at a 6% CAGR. However this growth rate may prove conservative, given tantalum's use in the electronics industry which is expected to experience double-digit growth. Future growth in tantalum demand is expected to come from use in micro capacitors and medical technology.

Figure 1: Uses

Tantalum Product	Application	Technical Attributes/Benefits
Tantalum carbide	Cutting tools	Increased high temperature deformation, control of grain growth
Lithium tantalate	Surface Acoustic Wave (SAW) filters in mobile phones, hi-fi stereos and televisions.	Electronic signal wave dampening provides for clearer and crisper audio and video output.
Tantalum oxide	- Lenses for spectacles, digital cameras and mobile phones - X-ray film - Ink jet printers	- Ta_2O_5 provides a high index of refraction so lenses for a given focal strength can be thinner and smaller - Yttrium tantalate phosphor reduces X-ray exposure and enhances image quality - Wear resistance characteristics. Integrated capacitors in integrated circuits (ICs)
Tantalum powder	Tantalum capacitors for electronic circuits in: - medical appliances such as hearing aids and pacemakers; - automotive components such as ABS, airbag activation, engine management modules, GPS; - portable electronics *e.g.* laptop computers, cellular/mobile phones, video cameras, digital still cameras; - other equipment such as DVD players, flat screen TVs, games consoles, battery chargers, power rectifiers, cellular/mobile phone signal masts, oil well probes	High reliability characteristics and low failure rates, operation over a wide temperature range from -55 to +200°C, can withstand severe vibrational forces, small size per microfarad rating/electrical storage capability
Tantalum fabricated sheets and plates	- Chemical process equipment including lining, cladding, tanks, valves, heat exchangers - Cathodic protection systems for steel structures such as bridges, water tanks - Corrosion resistant fasteners, screws, nuts, bolts - Spinnerettes in synthetic textile manufacture	Superior corrosion resistance - equivalent in performance to glass
Tantalum fabricated sheets, plates, rods, wires	- Prosthetic devices for humans - hip joints, skull plates, mesh to repair bone removed after damage by cancer, suture clips, stents for blood vessels	Attack by body fluids is non-existent; highly bio-compatible
Tantalum fabricated sheets, plates, rods, wires	- High temperature furnace parts	Melting point is 2996°C although protective atmosphere or high vacuum required
Tantalum ingot	- Sputtering targets	Applications of thin coatings of tantalum, tantalum oxide or nitride coatings to semi-conductors to prevent copper migration
Tantalum ingot	- High temperature alloys for: - air and land based turbines (*e.g.* jet engine discs, blades and vanes) - rocket nozzles	Alloy compositions containing 3-11% tantalum offer resistance to corrosion by hot gases, allow higher operating temperatures and thus efficiency and fuel economy
Tantalum ingot	- Computer hard drive discs	An alloy containing 6% tantalum has shape memory properties
Tantalum ingot	- Explosively Formed Projectile for TOW-2 missile	Balance of density and formability allow for a lighter and more efficient system

Source: *Tantalum-Niobium International Study Center*

Figure 2: Growth Rate of Selected Tantalum End Markets

Powder Demand End Market[1]	Product	Average Annual Growth Rate	Approx. Number of Ta Capacitors per Device	% of Total Powder Demand
Computing	Tablet	100%	5	N/A
	Netbook	10 - 15%	10	1%
	Notebook	5 - 10%	25	24%
	Server	2 - 4%	40	11%
	Desktop	(2) - (4)%	2	2%
Communications	Smartphones	10 - 15%	9	5%
	All handsets	5 - 6%	3	7%
Consumer	Video game consoles	6 - 8%	15	5%

Source: Noventa

Pricing Outlook

Historically, tantalum production has been a low-margin business. Hence, during the downturn, significant production was taken offline led by Sons of Gwalia (Wodgina project) in Australia. The lower production did not have an immediate impact on tantalum prices as major users of tantalum such as Cabot Corporation and HC Starck were holding significant inventories of tantalum.

However, with the rebound in demand and subsequent drawdown of inventories, the spot price of Ta2O5 has increased from $37/lb since the start of 2010 to over $130/lb. We expect prices to continue to increase as:

- Large share of production (about 30%) is currently coming from conflict mining in the DRC. This has resulted in political backlash around the world. With companies having to disclose the origin of the tantalum used, we expect less and less production to come from DRC.
- Recycling is limited and tantalum is difficult to substitute.
- On review of Figure 5, the reader will note that Tantalum surplus production begins in 2013. For this reason, we are estimating prices gain of another $30/lb by 2015. This represents a deceleration of the considerable price increases that we have seen in the last 18 months.

NIOBIUM

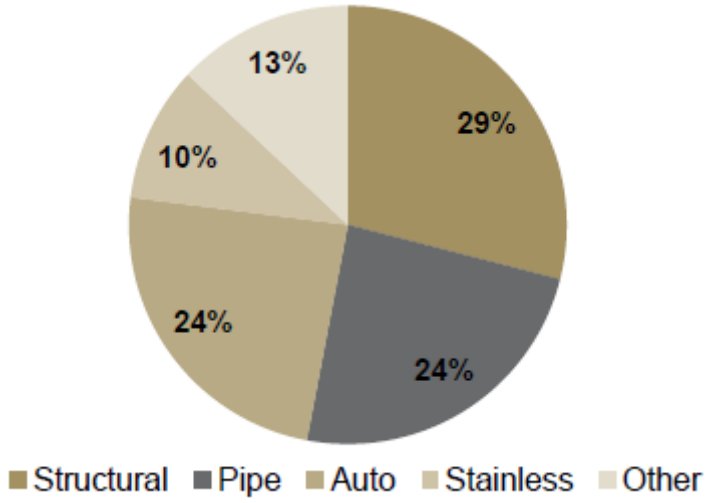
Characteristics

Niobium's key properties include heat resistance, high thermal conductivity and elasticity.

Uses

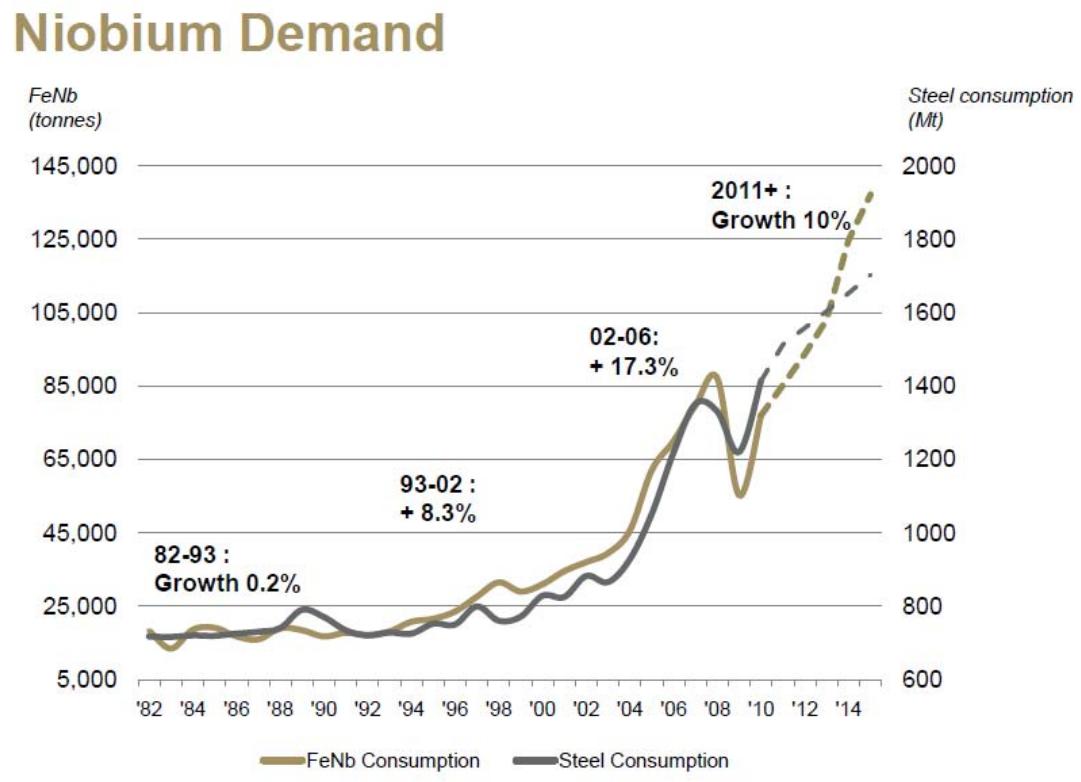
Given its key properties, about 77% of Niobium is used in high-strength low-alloy steel as ferroniobium. We expect China to be a significant driver of future Niobium consumption. China currently consumes about 20 grams of Niobium per ton of steel, which is much lower than the consumption in developed countries of about 100 grams/ton of steel. Figure 6 shows that Niobium consumption in China has experienced a strong upward trend over the last decade. While the recession resulted in a decline in niobium consumption's growth rate in China, we believe this to be temporary phenomena. We expect niobium consumption to grow by about 12% CAGR over the next 5 years.

Figure 3: World Consumption of Ferroniobium By End-Use (2010)



Source: Niobec management, IAMGOLD, Roskill

Figure 4: IAMGOLD Demand Growth Rate Forecast



Source: *IAMGOLD, Roskill, World Steel Association.*

Importance of CBMM: Companhia Brasileira de Metalurgia e Mineração (CBMM) in Brazil is a private company which has complete dominance over the production of Niobium. It produces enough niobium to meet about 90% of the world demand. As a result, CBMM is in a position to dictate the supply and the price of this vital metal. As a result, US Department of Energy has declared Niobium as a strategic metal.

Pricing Outlook

We do not foresee a surge in niobium prices similar to what we have seen for tantalum for two primary reasons:

- CBMM's deposit contains 440 million tons of niobium reserves which is sufficient to meet the world demand for the foreseeable future.
- According to USGS, niobium can be substituted for molybdenum and vanadium as alloying elements in high strength low-alloy steel. As a result, any spike in niobium prices relative to molybdenum and vanadium prices could result in partial substitution away from niobium. However, we understand that the substitution of niobium for molybdenum and vanadium may have adverse impacts on the strength of the alloyed steel.

Figure 5: Tantalum Snapshot

Tantalum

Characteristics: Tantalum's key properties include high electrical capacitance per unit mass, a high melting point and excellent resistance to chemical attack.

Applications

Cutting Tools | Capacitors | Mobile Phones | Hard Drives | Computers

Growth Rate

Emerging technologies driving demand growth for Tantalum include micro capacitors and medical technology. It is favored in space-sensitive high-end applications. Almost half of tantalum is used in electronics industry, mainly as powder and wire for capacitors. Tantalum demand is expected to grow at a 6% CAGR

Demand Forecast in Mlb - Base Case 6%

	2010	2011	2012	2013	2014	2015
Demand @ 4%	4.6	4.7	4.9	5.1	5.3	5.5
Demand @ 6%	4.6	4.8	5.1	5.4	5.8	6.1
Demand @ 8%	4.6	4.9	5.3	5.7	6.2	6.7

Current demand estimated using Noventa presentation. China is currently in an infrastructure build out phase to become a consumer driven economy. Once complete, demand for tantalum can significantly increase. Scarcity of tantalum may have also contributed to the historically low growth rate. Higher production rate could in turn lead to a higher growth rate.

Production Forecasts in Mlb

Country	Project	Owner	2010	2011	2012	2013	2014	2015
Eygpt	Abu Dabbab	Gippsland (2013)				0.65	0.65	0.65
Malawi	Kanyika	Globe Metals & Mining (2013)				0.42	0.42	0.42
Canada	Crevier Deposit	MDN (2013)				0.40	0.40	0.40
Saudi Arabia	Ghurayyah	Tertiary Minerals plc (unknown)					-	-
DRC	Conflict Mining		0.90	0.90	0.90	0.90	0.90	0.90
Australia	Wodgina	Sons of Gwalia - Talison Minerals		0.78	0.78	0.78	0.78	0.78
Mozambique	Marropino	Noventa	0.05	0.20	0.60	0.60	0.60	0.60
Ethiopia	Kenticha	EMDSC	0.40	0.40	0.40	0.40	0.40	0.40
Brazil	Pitinga	Paranapanema Sa	0.20	0.20	0.20	0.20	0.20	0.20
Brazil	Mibra	Metallurg Group/CIF Mineracao SA	0.30	0.30	0.30	0.30	0.30	0.30
China	Yichun	China Minmetals	0.13	0.13	0.13	0.13	0.13	0.13
China	Nanjing	China Minmetals	0.12	0.12	0.12	0.12	0.12	0.12
Canada	Tanco	Cabot Corp	-	-	-	-	-	-
			2.09	3.02	3.42	4.89	4.89	4.89

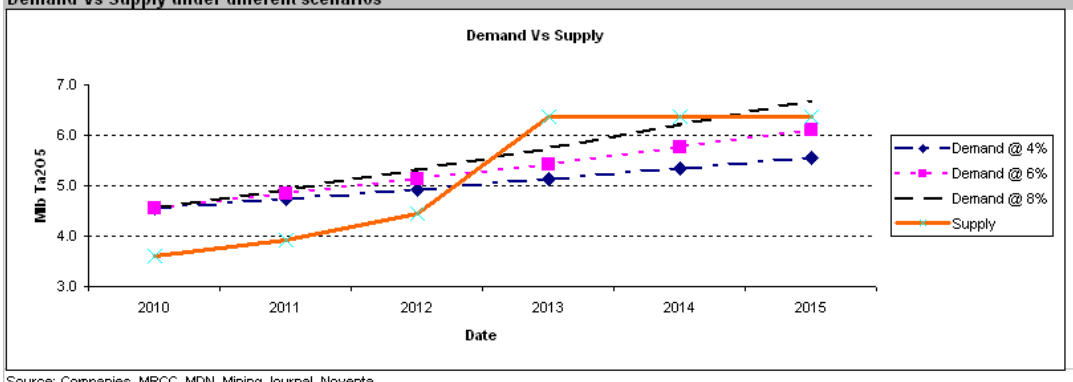
Noventa' capacity includes additional capacity from the under-development Morrua and Mutala projects. We estimate that 30% additional supply is going to come from tin slag/recycling and synthetic concentrates.

Demand Vs Supply (Mlb)

	2010	2011	2012	2013	2014	2015
Demand @ 6%	4.6	4.8	5.1	5.4	5.8	6.1
Supply	3.6	3.9	4.4	6.4	6.4	6.4
Increase/(decrease) in industry inventories	(1.0)	(0.9)	(0.7)	0.9	0.6	0.3

Given Tantalum's use in the electronics industry which is expected to experience doubig-digit growth, our 6% CAGR estimate (widely quoted in the industry - USGS, Noventa) may prove conservative.

Demand Vs Supply under different scenarios



Source: Companies, MRCC, MDN, Mining Journal, Noventa

Ta2O5 Price Forecast ($/lb)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Supply (Mlb)	4.8	3.4	3.8	4.3	1.7	3.6	3.9	4.4	6.4	6.4	6.4
Demand	4.6	5.6	5.7	6.1	4.3	4.6	4.8	5.1	5.4	5.8	6.1
Prices	32	35	50	52	38	100	130	142	165	165	165

Important Price Drivers: Large share of production coming from conflict mining in DRC which is currently having political backlash. Recycling is limited. Also Tantalum is difficult to substitute, and where possible, can result in a loss of performance.

Sources: MRCC

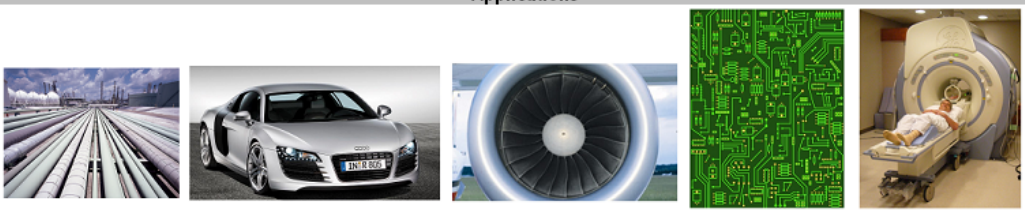
Source: *Noventa, USGS, Mackie Research Capital*

Figure 6: Niobium Snapshot

Niobium

Characteristics: Niobium's key properties include heat resistance, high thermal conductivity, elasticity, corrosion resistance, and the ability to form a stable and adhesive layer of oxide.

Applications



Oil & Gas pipelines | Cars | Jet Turbines | Electric Circuits | MRI

~ 77% of Nb is used in high strength low alloy steel as Ferroniobium (24% in pipes, 24% in automobiles and 29% to build structures). 10% in Stainless steel, 8% in Other Steel & Iron, 5% in Nb Metal & Alloys

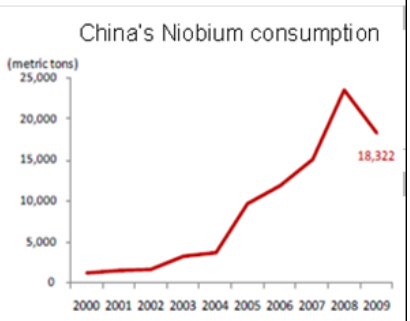
Growth Rate

Demand for Niobium is driven by use in growth industries as well as increasing penetration in growth industries. We expect China to be a significant driver of future Niobium consumption as its current consumption of 20 grams of Nb per ton of steel is much lower than the consumption in developed countries of about 100 grams/ton of steel. FerroNiobium CAGR (2002-2008) has averaged 17%. Therefore, we assume Niobium consumption is going to grow by 12% as a conservative base case.

Demand Forecast in Tons - Base Case 12%

	2010	2011	2012	2013	2014	2015
Demand @ 8%	73,228	79,086	85,413	92,246	99,626	107,596
Demand @ 12%	73,228	82,015	91,857	102,880	115,225	129,052
Demand @ 15%	73,228	84,212	96,844	111,370	128,076	147,287

Current demand derived using IAMGOLD presentation



Supply Forecasts in Tons

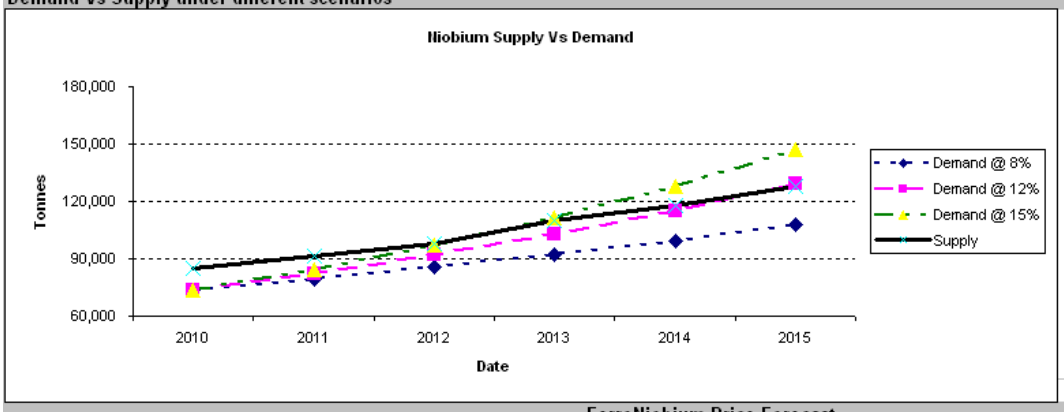
Country	Project	2010	2011	2012	2013	2014	2015
Brazil	CBMM (In production)	74,800	80,784	87,247	94,226	101,765	109,906
Canada	Niobec (In production)	4,400	4,532	4,668	4,808	4,952	5,101
Brazil	Catalao (In production)	3,500	3,605	3,713	3,825	3,939	4,057
Brazil	Pitinga (In production)	2,200	2,200	2,200	2,200	2,200	2,200
Malawi	Global Metals & Mining				3,000	3,000	3,000
Australia	Alkane Resources				2,000	2,000	2,000
Canada	Avalon Rare Metals Inc.						1,700
		84,900	91,121	97,828	110,059	117,856	127,964

Source: Companies, MRCC

Demand Vs Supply

Tons	2010	2011	2012	2013	2014	2015
Supply	84,900	91,121	97,828	110,059	117,856	127,964
Demand @ 12%	73,228	82,015	91,857	102,880	115,225	129,052
Increase/(decrease) in industry inventories	11,672	9,106	5,971	7,179	2,631	(1,088)

Demand Vs Supply under different scenarios



Source: Companies, MRCC

FerroNiobium Price Forecast

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
FeNb Demand @ 12%	53,046	64,985	76,308	77,538	77,415	77,538	86,843	97,264	108,936	122,008	136,649
Ferroniobium $/ton	14,640	14,022	21,918	34,398	37,298	37,500	42,000	47,040	47,040	47,040	47,040

Over the last 10 years (2000-2010), FeNb consumption and price have both grown at about 12% CAGR. However, as the price is essentially controlled by CBMM, the price increases have not been consistent. We assume a 12% CAGR for demand but are forecasting flat prices 2012 onwards, given CBMM's capacity to meet any excess demand. While we expect long-term prices to resemble our forecast, short-term prices may vary. However, our analysis of historical supply and prices suggests that as CBMM increases its capacity, it also increases the prices to offset its capital expenditure. Therefore, any future increases by CBMM could result in increases in FeNb prices above our forecast.

Sources: USGS, IAMGOLD, UN Comtrade, MRCC

***Source: IAMGOLD**, USGS, UNComtrade, Mackie Research Capital*

IDENTIFYING OTHER NAMES THAT PROVIDE TANTALUM/NIOBIUM EXPOSURE

- We note that **Commerce Resources Corp** (CCE-TSXV, Unrated) has an advanced stage Ta/Nb project. The Upper Fir Deposit in BC contains an indicated mineral resource of 36.35 million tonnes containing 195 ppm Ta2O5 and 1,700 ppm Nb2O5. The Inferred resource is 6.40 million tonnes at a similar grade. Mineralization is hosted by a poly-folded carbonatite sill swarm averaging 30m thick with a 1,000m strike length. A PEA should be released in the very near-term. The company is targeting production of 1.5 million lbs of Tantalum by 2013.
- According to USGS, **Quantum Rare Earth Development Corp's** (QRE-TSXV, Unrated) Elk Creek's project has the potential to be one of the largest global resources of niobium. Quantum released a NI 43-101 compliant inferred resource estimate of 80mm tonnes grading 0.62% Nb2O5 (using the 0.40% base case cut-off grade on April 28th,2011). This implies that the deposit could contain 493,000 tonnes of Nb2O5.
- **Noventa Limited** (NTA-TSE, Unrated) is a Mozambican miner and producer of tantalum concentrate. It is currently producing at a rate of 200,000lbs per annum. It expects to increase its production of 600,000lbs per annum with-in the next 12 months at an all-in cost of below $37/lb. It is also worth noting that it has guaranteed off-take agreements for 470,000lbs/pa.
- **MDN Inc.** (MDN-TSE, Unrated) owns a 72.5% interest in its Crevier Nb/Ta Project with IAMGOLD owning the remaining. According to a NI 43-101 compliant resource estimate published in June 2010, the deposit contains 25 million tonnes of measured and indicated resource grading 0.196% Nb2O5 and 234ppm Ta2O5. It contains an inferred resource of 15 million tonnes grading 0.17% Nb2O5 and 252ppm Ta2O5. The feasibility study on the project is expected to be completed in 2011.
- **Niobec** is one of few operational niobium mines outside of Brazil. It is owned by IAMGOLD. The deposit holds 458 million tonnes of measured and indicated resource grading 0.42% Nb2O5 and inferred resource of 336 million grading 0.37% Nb2O5. The facility produced 4.4 million kg of niobium in 2010.
- **Critical Element Corporation** (CRE-TSXV, Unrated) has a 100% ownership of its Rose Rare Metals Property which is said to host tantalum, lithium and beryllium resources. The deposit contains indicated resources of 11 million tonnes grading 1.34% Li2O, 165ppm Ta2O5 and 337ppm BeO. It contains an inferred resource of 2.2 million tonnes grading 1.27% Li2O, 138ppm Ta2O5 and 331ppm BeO.

RISKS TO TARGET

1. Avalon Rare Metals Inc. - Risks include rare earth price cyclicality, possible technological substitution away from rare earths, and actions by the Chinese government that impacts the rare earth marketplace.

RELEVANT DISCLOSURES

1. Within the last 3 years, Mackie Research Capital Corporation has managed or co-managed an offering of securities by the subject issuer and has received compensation for investment banking and related services from Avalon Rare Metals Inc.

ANALYST CERTIFICATION

Each analyst of Mackie Research Capital Corporation whose name appears in this report hereby certifies that (i) the recommendations and opinions expressed in this research report accurately reflect the analyst's personal views and (ii) no part of the research analyst's compensation was or will be directly or indirectly related to the specific conclusions or recommendations expressed in this research report.