Vanadium – Heard it on the Grapevine

In the mining sector if one hangs around long enough, that which was once a subject of excitement and then fell from favour eventually comes around again. In the case of Rare Earths though one had to wait from the 1960s until the early 2000s to see them return as a talking point.

Last decade Vanadium surfaced as a subject of interest primarily tied to the fortunes of the then-booming steel industry. Now Vanadium is coming back with a vengeance for its potential in mass electricity storage devices, namely the Vanadium Redox Battery (or VRB). At the recent Natural Resources Forum event at the London Stock Exchange, which I attended, the guest speaker was Robert Friedland and he was in a Vanadium-induced ecstasy. Never could we have imagined the metal having such a euphoric effect. In any case it gave the Friedland *imprimatur* to a metal which most metals watchers have rarely paid any attention to due to it (largely) being a by-product of other mining and curiously of the petroleum refining industry.

It was not just Friedland though that has latched onto this bandwagon as we have heard Vanadium name-checked at a number of recent events recently as the next best thing now that Lithium has somewhat done its dash with promoters overcooking the soufflé.

VRB – Go with the Flow

The current end use of the bulk of Vanadium production is well-known with its strict correlation with steel consumption. New uses are potential X factor for the Vanadium space. While aerospace has been growing organically and increasing its share of the usage of the metal the area with the best

potential for a quantum leap is in battery applications.

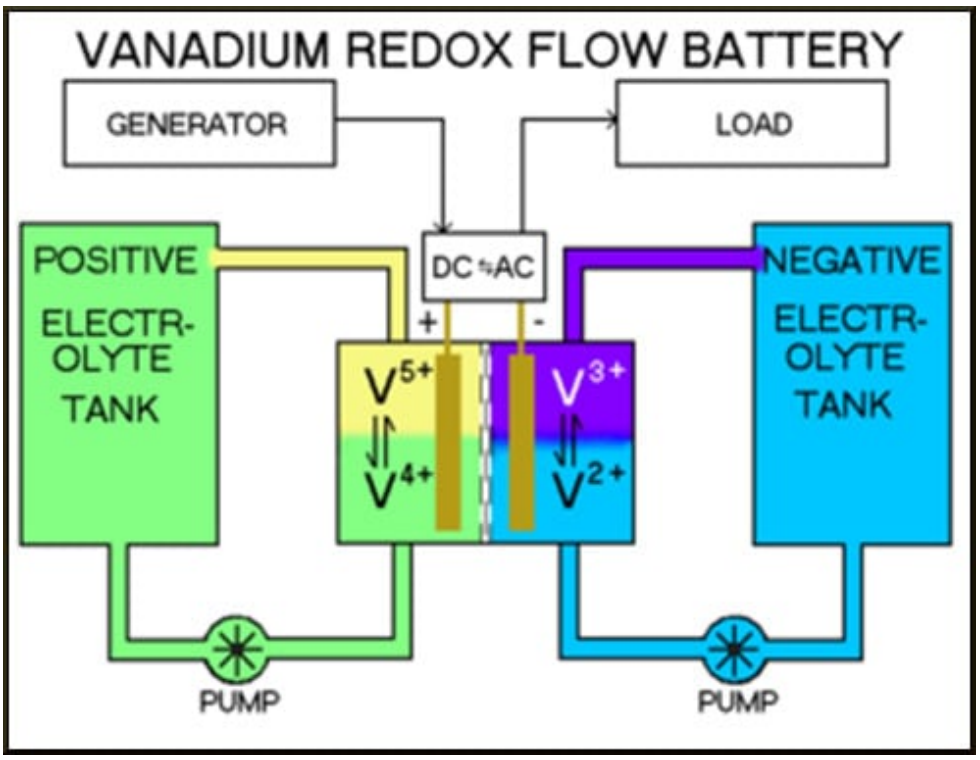
Chief amongst these is the Vanadium Redox (and redox flow) battery (VRB), which is a type of rechargeable flow battery that employs Vanadium ions in different oxidation states to store chemical potential energy. The present form (with sulfuric acid electrolytes) was patented by the University of New South Wales in Australia in 1986 where scientists carried out the first known successful demonstration and commercial development of the all-vanadium redox flow battery employing vanadium in a solution of sulfuric acid in each half in the 1980s. Although the use of vanadium in batteries had been suggested back in the 1970s by a number of scientists including some at NASA.

There are currently a number of suppliers and developers of these battery systems including Ashlawn Energy in the United States, Renewable Energy Dynamics (RED-T) in Ireland, Cellstrom GmbH in Austria, Cellennium in Thailand, and Prudent Energy in the United States and China. The vanadium redox battery results from over 25 years of research, development, testing and evaluation in Australia, Europe, North America and elsewhere.

The image that follows gives a good idea of one of the more practical applications of such batteries. In this case the solar panels collect energy during the day and store it in the battery for release during the period when the solar panels cannot access sunlight.

Source: Cellstrom GMBH

A vanadium redox battery consists of an assembly of power cells in which two vanadium-based electrolytes are separated by a proton exchange membrane. The battery exploits the ability of vanadium to exist in solution in four different oxidation states, and uses this property to make a battery that has just one electroactive element instead of two.



Source: Vanadiumsite.com

The main advantages of the vanadium redox battery are that it can offer almost unlimited capacity simply by using larger and larger storage tanks, it can be left completely discharged for long periods with no ill effects, it can be recharged simply by replacing the electrolyte if no power source is available to charge it, and if the electrolytes are accidentally mixed the battery suffers no permanent damage. The VRB has also been shown to have the least ecological impact of all energy storage technologies.

The main disadvantages with vanadium redox technology are a relatively poor energy-to-volume ratio, and the system complexity in comparison with standard storage batteries.

Another emerging technology is the use of lithium-vanadium phosphate or fluorophosphate cathodes and lithium-vanadium oxide anodes in rechargeable lithium batteries. These batteries exhibit greater safety compared with the more generic lithium-cobalt oxide type cathodes seen in cellular telephone or laptop batteries (which have higher operating voltages and higher rates of energy storage). The vanadium

phosphate cathode material can support 20% more energy storage than the conventional cobalt oxide, as much as 26% more than iron phosphate, and 56% more than manganese oxide. However, in order for such a battery to be practical, the cost of the battery is critical.

Source: Subaru

Several years ago Subaru developed a prototype of its G4e electric car (pictured above), powered by lithium-vanadium phosphate batteries. This concept car has a 200-km range that is provided by a relatively small vanadium phosphate battery pack, double what their earlier R1e concept car could achieve. However, it would appear that Subaru have done little with the concept of late. Maybe the patents need dusting off in the light of Cobalt's perilous surge in price.

Largo Resources – the Primary Exposure

The most obvious pure exposure to Vanadium mining (rather just a project is Largo Resources Ltd. (TSX: LGO | OTCQB: LGORF) with its Maracas mine in Brazil. This has been in operation for several years now and has been growing

impressively in terms of production (see table below), meanwhile its production costs have been falling (helped by the weakness of the Real against the US dollar) and the Vanadium price has been rising.

Maracas Production & Pricing

	Production	Production	Cost per pound		
	Tonnes	Pounds (Equiv)	CDN$	US$	R$
1st Quarter 2017	2,062	4,545,926	$5.19	$3.90	R$12.31
4th Quarter 2016	2,304	5,079,444	$4.82	$3.60	R$11.90
3rd Quarter 2016	2,182	4,810,481	$4.67	$3.59	R$11.61
2nd Quarter 2016	2,311	5,094,877	$4.19	$3.25	R$11.40
1st Quarter 2016	1,169	2,577,201	$6.52	$4.75	R$18.51
4th Quarter 2015	1,654	3,646,441	$5.97	$4.47	R$17.20

The company has given guidance that production in FY17 should be around 9,361 tonnes (equivalent to ~ 20.6 mn lbs). The company expects monthly output of 840 tonnes of V_2O_5 from May 2017 onwards.

This virtuous circle has replaced a rather vicious cycle that had previously reigned for the company producing some quite eye watering losses (see earnings table below) in the not too distant past. Producing more meant greater losses while now producing more signals that profitability is within shouting distance.

As the table shows the gross loss has shriveled to levels at which it is most likely to turn a profit at that level fairly soon and hopefully at the bottom line by the end of the current fiscal year.

Largo Resources
In Millions of CAD

	1Q17	FY16	4Q16	3Q16	2Q16	1Q16	FY15	FY14	FY13
Revenue	29.43	81.23	31.48	20.76	18.95	10.05	7.60	0.00	-
Cost of Revenue, Total	29.6	113.17	30.15	29.95	29.74	23.33	29.38	0.00	-
Gross Profit	-0.18	-31.94	1.33	-9.20	-10.79	-13.28	-21.78	0.00	-
Selling/General/Admin. Expenses	2.87	13.28	3.29	4.63	3.29	2.06	12.31	12.56	5.13
Research & Development	0	0.1	0	0	0.02	0.07	0.71	0.22	-
Depreciation/Amortisation	-	-	-	-	-	-	-	-	-
Interest Expense (Income)	-	-	-	-	-	-	-	-	-
Unusual Expense (Income)	-	0	0	-	-	-	6.75	14.76	0
Other Operating Expenses, Total	0.63	3.08	0	0	0	0	0.85	10.02	2.06
Total Operating Expense	33.1	129.63	33.44	34.59	33.05	25.46	50	37.56	7.19
Operating Income	-3.68	-48.4	-1.96	-13.83	-14.11	-15.41	-42.4	-37.56	-7.19
Gain (Loss) on Sale of Assets	-	-	-	-	-	-	-	-	-
Other, Net	-	-	-	-	-	-	-	-	-
Income Before Tax	-9.72	-55.63	-11.65	-24.7	-9.66	-9.61	-129.96	-52.62	-11.58
Tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income After Tax	-9.72	-55.63	-11.65	-24.7	-9.66	-9.61	-129.96	-52.62	-11.58
Diluted Weighted Average Shares	455.57	387.03	423.98	415	412.65	296.06	167.11	100.93	89.61
Diluted EPS Excluding Extraordinary Items	-0.02	-0.14	-0.03	-0.06	-0.02	-0.03	-0.78	-0.52	-0.13
Diluted Normalised EPS	-0.02	-0.14	-0.03	-0.06	-0.02	-0.03	-0.74	-0.38	-0.13

Conclusion

It's a long while since I (at Hallgarten) wrote my *magnum opus* on Vanadium back in early 2012. Strangely the field of players has not expanded (nor contracted) too much since then. It is the same hardy group of survivors with the producer being Largo Resources (only a project back then) while others like NextSource (back then called Energizer Resources) with its Green Giant in Madagascar and the perpetual bridesmaid of the space, American Vanadium. Back in those days Neometals (then Reed Resources) was expounding on the Vanadium potential of Barrambie (now refocused as a Titanium project) and we had been talking, as far back as 2010, to Apella Resources (name changed to VanadiumCorp) about its Iron-T deposit that has now moved into the camp of Alix Resources (spoiler alert: I sit on the advisory board of Alix).

With Vanadium Redox being the intelligent chatter of the day (or year) it won't be long before these players start to reappear on the radar and others join them. Largo definitely has the jump on most of them and has had an expensive learning curve behind it. Not all Vanadium deposits are the same though so some of the lessons learnt by Largo may not translate for

all wannabes on the scene. In any case, this opens up the battery metals debate to another realistic alternative. The more the merrier, we would say.

Largo’s Mark Smith on processing the best vanadium ore in the world

Mark Smith, President, CEO and Director of Largo Resources Ltd. (TSX: LGO | OTCQB: LGORF) in an interview with InvestorIntel’s CEO Tracy Weslosky discuss Largo’s fully operational vanadium project in Brazil. Providing an overview on the Maracás project in Bahia, Brazil that is now turning a profit, Smith explains how Largo’s ore grade is two to three times higher than any other available mines in the world. He also goes on to explain how Largo’s processing facility is only a kilometer away, close to the Salvador port and the six-year off take agreement with Glencore. An expert on vanadium supply and demand, Mark will be presenting at InvestorIntel’s 6th Annual Cleantech and Technology Metals Summit on Monday and Tuesday, May 15th and 16th in Toronto, Canada at the Omni King Edward Hotel.

Tracy Weslosky: Mark, can you give us an update please?

Mark Smith: It is pretty exciting. We’ve been working very hard at Largo. We had to take a facility that wasn’t running well and we’ve got it running at nameplate capacity consistently right now. We have the best ore in the world to run through our facility, our operations team is in sync the way they need to be. They’re smart. They’re efficient at what they do. We are now producing some of the highest quality

vanadium pentoxide in the world. We couple that with a market that has really turned around and prices have more than doubled since December of 2015. We're actually making positive EBITDA, positive cash flow at Largo. We've got to tell you that the mood at the facility, the mood in the company is just very different because when you see that first profitable month it's amazing what that does for morale.

Tracy Weslosky: Based on that, Largo is making money, you're achieving milestones as you said you were going to do. I'm going to back you up just a little bit and have you explain to the audience out there: vanadium prices have actually doubled since last year – things have really changed and turned around, you might say for Largo?

Mark Smith: They have. That's due to two things, good operations and the price of vanadium. Let's not forget that although we talk about it doubling right now versus last year, last year we hit the lowest point in the history of vanadium pricing. Yes it is twice as good as it was last year and we are positive cash flow, positive EBITDA. We think the market has a long ways to go yet to really demonstrate what the supply and demand fundamentals are in the vanadium world…to access the complete interview, click here

Disclaimer: Largo Resources Ltd. is an advertorial member of InvestorIntel Corp.

Largo Resources' Mark Smith on producing the highest

quality vanadium in the world today

September 8, 2016 – In a special InvestorIntel interview, Sr. Editor Fred Cowans speaks with Mark Smith, President and CEO of Largo Resources Ltd. (TSX: LGO | OTCQB: LGORF), a growing strategic mineral company presently focused on the production of vanadium at their Maracás Menchen Mine. Mark explains that vanadium is mainly used to manufacture rebar that provides resistance to seismic events in addition to hundreds of other uses. They talk about Largo's Maracás Menchen Mine in Brazil, which Mark believes has the highest ore grade and the lowest unit cost of production in the world – explaining further that the material produced at Largo's Brazilian mine is the highest quality vanadium being produced in the world today.

Fred Cowans: You've got a great story in vanadium. Just for the benefit of those of us that don't deal with vanadium on a regular basis could you explain its uses please?

Mark Smith: Vanadium is actually quite widely used in the economy and has just literally hundreds and hundreds of uses. I think to just kind of quantify it easily so that people can feel like they understand this market better, just think of vanadium as something that strengthens steel. Over half of the vanadium that's produced in the world today is actually used in the form of rebar, which provides seismic protection and, you know, strengthen and safety for us as human beings. That's obviously one of its largest uses. The second largest use would probably be in steel tools. Again, it's all about making that steel tool hard and stiff and strong so that when you and I are chiselling something or grinding something we've got a very hard material to work with, which makes our job a lot easier.

Fred Cowans: We've been accustomed at InvestorIntel of hearing stories about strategic metals and industrial metals being controlled in one market and being consumed in another market. What are the supply and demand geographic logistics for vanadium?

Mark Smith: Vanadium is a little different than some metals in that there's basically four countries that produce the material so it's a little better than some, a little worse than others. The four countries that produce vanadium today would be China. China produces about 50% to 55% of the world's production. The second country in terms of large production used to be South Africa, but through some bankruptcies as a result of the resource industry and tough times for vanadium pricing last year we've now probably made Russia the number two producer in the world. And it's probably 17% to 20% or so. South Africa and Brazil are roughly tied in terms of capability to produce and we're probably somewhere in the 10% to 12% each in those categories. So the problem with that Fred is of course the numbers don't add up to 100%. That's largely because China is actually higher than 55% right now as a result of the South African material coming off the market. China may be upwards of close to 65% at this point in time.

Fred Cowans: Now your deposit and you're in production. You've been in production, commercially since the last quarter of—calendar quarter of last year. You're unique though. You've got the largest resource and the highest quality.

Mark Smith: This is an unbelievable resource. One of the things that I like to do is, both as an investor and an executive, is to start out with having a world-class resource before I engage in any of anything with any company and Largo clearly meets that standard. I mean this resource at our Maracás Menchen Mine in Brazil is massive, 45-kilometer long strike length 150 meters wide. We only drilled down to about 350 meters. We've got a very continuous homogenous ore body in this area….to access the complete interview, click here

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InvestorIntel Report: The big cobalt catch-up; Cruz makes another move; Investor excitement; Top performers

Here's the big cobalt question: why did it take so long? By that, I mean, why did it take so long for the market, and miners, to realize that – with the expected huge surge in demand for lithium-ion batteries – there would also be a large rise in demand for cobalt.

Sure, some people were aware of it. Back in 2007, for example, the CEO of a small Australian exploration junior (that had a copper-cobalt project in Finland but was subsequently taken over), gave a speech to some mining conference in which he foresaw the cobalt trend.

At the time Alistair Cowden (who has gone on to run a bigger mining company) said this: "*Cobalt is the metal for now – it gives you your toys and salves your conscience. You can go out and buy your iPod and your Toyota Prius, and they use lots of cobalt. Cobalt demand has been going very, very strongly.*" He went on to argue that, given Europe's introduction of a carbon cap on vehicle emissions, he expected demand for green vehicles – which are a major user of rechargeable batteries – to increase, which could cause greater need for cobalt in the future.

But, really, warnings about the need for more cobalt were few and far between.

I would go so far as to say that InvestorIntel's John Petersen has a good deal to do with the sudden surge of interest in cobalt. After all, it was he who really rang the bell earlier this year that suddenly made people sit up and take notice about cobalt and the looming shortage due to (a) falling production of the base metals of which cobalt is a by-product and (b) the need for more of the metal for batteries in all the new applications being developed.

A few companies knew all about the situation. **Formation Metals Inc. (TSX: FCO | OTCQB: FMETF | Frankfurt: FOQ)** has a cobalt project that has two advantages: one, it is one of the few global primary cobalt projects (most cobalt is now produced as a by-product) and, two, it is located in Idaho which is a stable mining jurisdiction.) And it was predicting demand growth for cobalt was running at 5.4% a year but supply growth was running at just 2.4%. Cobalt is expected to go into deficit this year. Formation expects mine closures and other factors to mean global output will decline 11% this year. Now, again people are sitting up and taking notice.

As I remarked here a short time ago, "search Google News for 'cobalt exploration' and you'll find scant information". Well that is certainly changing. Just in recent weeks we have a slew of announcements about companies picking up cobalt leads. Two juniors in Australia have this month jumped aboard the bandwagon while an Australian copper miner, Tiger Resources, has announced this month that it has hired consultants to look at adding cobalt to its product mix. At its Kipoi mine in the Democratic Republic of Congo it has a measured and indicated cobalt resource of a contained 40,400 tonnes and another 6,000 contained tonnes at a nearby deposit.

Suddenly the mine world is waking up to cobalt. And investors and customers, too. Earlier this month customers were active

through the London Metal Exchange, some seeking forward contracts for large tonnages. And last week there was also activity from hedge funds and investors trying to lock in forward contracts.

InvestorIntel is starting to be the go-to place for cobalt leaders.

Cruz Capital Corp. (TSXV: CUZ | Germany: A2AG5M) was among the first movers by acquiring the War Eagle cobalt prospect in the Fort Steele mining division of British Columbia. Cruz had realized that no one much had been looking for cobalt of late – but they will soon be as people realize that there's a looming shortage and this could inhibit the production of lithium-ion batteries.

On Friday Cruz lifted the pace again by adding another six cobalt projects, four located in Ontario and two in British Columbia. The company has entered into a share purchase agreement with Cobalt Locaters Inc. As Cruz President Jim Nelson commented, "*we believe we are at the earliest stages of a significant cobalt boom and we feel all these assets in one company will put Cruz at the forefront of this exploding sector.*"

Green Swan Capital Corp. (TSXV: GSW) has acquired the Copper Prince project in the Sudbury Basin, an area renowned for its world-class polymetallic sulphide ore deposits. The 16 contiguous mining claims lie within the Huronian Gold Belt, a prolific zone of past gold producers that extends a distance of roughly 120km. Mining infrastructure, labour and knowledge are easily accessible in this mining-friendly jurisdiction. "If you're excited about lithium then you must be excited about cobalt," says Green Swan President and CEO, Peter M. Clausi.

A great many people are getting excited by cobalt. And now they're scrambling to catch up those who had the foresight to

position early in the game.

Investors keen on metals

Warwick Grigor, who runs Far East Capital out of Sydney, Australia, and who has played a part in many a financing of a junior explorer, reports on his recent experience at a mining conference in Queensland. What he tells is that investors are back, big time, in the mining business. He wrote:

> *"Last week I attended the Noosa Mining Conference for the first time. Whereas Diggers and Dealers, held in Kalgoorlie each August, is regarded as the number one mining conference for industry, the Noosa Conference seems to offer the best concentration of serious investors when it comes to high net worth investors (as opposed to institutions and international investors).*
>
> *What was particularly noticeable was the crowded auditorium. Seats were hard to find in every session, right until the end. More importantly for the companies presenting, the better stories were immediately bid up in the market. There were obviously plenty of cashed up investors looking for opportunities. This is further confirmation that the mining stocks are looking better and, barring disasters from left field, should continue to perform for some time yet."*

Performers of the week

Two members of InvestorIntel had a strong week.

Largo Resources Ltd. (TSX: LGO | OTCQB: LGORF) announced it had entered into a non-binding memorandum of understanding with Vionx Energy Corporation ("Vionx"), a company that develops, produces and sells vanadium redox flow batteries for utility grid applications. The companies will continue discussions that may lead to the supply by Largo of vanadium electrolyte to Vionx to further the research and development of advanced VRBs utilizing VNX Grid Energy Storage

Systems. Largo's Toronto-listed shares were up 21.28% on the week.

The news out of **Signature Resources Ltd. (TSXV: SGU | OTCPK: SGGTF)** was low key – the completion of a capital raising bringing in a total of $1.066 million. But its shares rose 45.45% in Toronto. Even with the easing of the gold price last week, there seems to be unwavering interest in gold stocks. Signature is assessing the historic Lingman Lake mine property in northwestern Ontario which hosts a historic gold estimate contained in four major zones of 234,000 ounces in-situ. Signature's immediate goals are to up-grade the historic estimate to compliant resource reporting, and then expand it by drilling down-dip and along strike.

Mark Smith on Largo raising $26.8 million for the only pure producer of vanadium in the world

April 1, 2016 – In a special **InvestorIntel** interview, Publisher Tracy Weslosky speaks with Mark Smith of Largo Resources Ltd. (TSXV: LGO), the only pure producer of vanadium in the world, on their recent USD$26.8 million raise. Mark credits Largo's "truly phenomenal resource", which has the highest known vanadium ore grade, a well-known technology and a fantastic team as the reason "this one has to win."

Tracy Weslosky: For starters I'd like to congratulate you.

You've just completed a private placement. Closing at what, 26.8 million U.S.?

Mark Smith: Correct.

Tracy Weslosky: This is obviously very challenging in these current markets. Can you tell us how you did this?

Mark Smith: Well, you start out with a great project, but also let me say that this was a recent financing that we announced. About 9 months ago we had completely refinanced the company so we've actually done this twice now in 11 months. I say that not to pat our team on the back for being able to raise the money. I say it because it speaks volumes about the project. This is a truly phenomenal resource. The technology is well known. The people are fantastic that work at this company. This one has to win.

Tracy Weslosky: I think indeed that being able to close this financing shows confidence from your investors. Of course, all of you investors at InvestorIntel that are seeking companies that have capital, management and, of course, you're the only pure producer of vanadium in the world. Is that correct? Can you talk to us a little bit about your production?

Mark Smith: Well, the production is continuing to ramp up. We've been in that ramp up phase for probably about 16-17 months now. As you look forward sometimes it feels like it's taking a long time, but as you look backward, I like the progress that we continue to make every day. Every day we learn something new about our process. We incorporate those learnings into what we do and we're continuing to ramp up as we go. That's what we want to see.

Tracy Weslosky: I also want to ask you about the grade as you have the highest grade vanadium in the world as well.

Mark Smith: That's correct.

Tracy Weslosky: Can you talk to us about why this is advantageous for not only Largo and your shareholders, but in general?

Mark A. Smith: You know it's a real simple calculation actually. We're sitting there at about a 1.34% ore grade for our V2O5. Similar ore grades are probably half of that. That means that we have to process less than half the material to get the same amount of product that we get to sell to our customers. It's a huge economic advantage for you as a mining company. Now the other thing about vanadium though, which a lot of people don't understand or even realize, is that there's two concentrations that are very important in the vanadium industry. One is the ore grade cause that tells you how much material you have to process. The second one is, how high of a percent V2O5 can you create in your concentrate? We're also the winner in that category. We have the highest ore, ore grade…to access the rest of the interview, click here

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Anglo American – Baby out with the Bathwater

Corporate theory these days is driven by the grand gesture. Just as in the good days we saw overblown acquisitions because small deals just didn't "move the dial", now in the reverse phase the baby goes out with the bathwater.

Latest candidate for the grand gesture is Anglo-American which

is throwing out bath as well as bathwater and baby.

Some History

I am an unalloyed fan of demergers. If the asset does not fit in the corporate family then demerge it to the shareholders and let them makes their own choice what to do. So many times we have seen companies vend core assets to just have the money vanish into the black hole or "corporate expenses" or "restructuring charges " or "debt reduction".

The concept of demergers is not unknown at Anglo-American as last decade (in July 2007) it spun-out Mondi, its international packaging and paper division. Employing around 25,000 people across more than 30 countries. Our key operations are located in central Europe, Russia, North America and South Africa. Mondi is fully integrated across the packaging and paper value chain – from managing forests and producing pulp, paper and compound plastics, to developing effective and innovative industrial and consumer packaging solutions. In 2014, Mondi had revenues of €6.4 billion and a return on capital employed of 17.2%.

With this in its history its surprising that Anglo American have not been more skillful as slicing and dicing their own product mix to create different companies that might whether this current storm better. A demerger of the De Beers entity with its stellar brand name and potential to trade as a luxury goods stock (with attendant ritzy ratings) rather than as a miner seems like the elephant in the room. Obviously some shibboleths are too touchy to even be considered. Pushing it out the door with a goodly chunk of debt attached to it would lighten the load on the mainstream mining business and seems like a win-win outcome.

Likewise the iron ore business, Minas Rio, should be a candidate to go in a demerger. We always marveled during the go-go days of the BOVESPA as to why more foreign miners did

not go for a Sao Paulo listing from their Brazilian assets to capitalise on the Carnival atmosphere while it lasted. Too late now to spin it out with a premium rating but still NOT having iron ore in one's asset mix these days is better than having this mineral around emitting a noxious vibe guaranteed to scare investors away.

I reiterate my thesis that while base metals, and even precious metals, might see better days in the near to medium term, the massive oversupply of iron ore and the end of the Chinese steel boom is likely to leave iron ore in the doghouse for a decade.

Niobium

As we have covered Niobium here in the past it is useful to note that Anglo American is one of the world's top three Niobium producers with its Catalao mine in Brazil.

There had been talk about selling this asset early in the current decade but in March 2011 it abandoned these plans. However the latest presentation (which accompanied the massive shrinkage announcement) published this chart which by a process of deduction shows Niobium no longer in the mix.

First you see it, now you don't. This raises some questions as to who the likely buyer would be. Does Magris want it? Probably yes but as a fledgling fund does it really want to be that overweight in Niobium, which is linked with the troubled steel industry, after having already shelled out $500mn for Niobec? CBMM buying the asset would bring a whole raft of anti-trust problems at the international level, though the Brazilian government probably would not care.

That leaves two other names to conjure with, and both include

Mark Smith. These are Largo Resources, which is already positioned in Brazil and Niocorp which has Niobium as its specific brief. Might we ponder a merger of the two listed entities, and then buying Catalao, with Anglo accepting stock in the new combined entity? We can only suppose at this point but it does have an interesting logic.

Down She Goes

Below can be seen the stock price performance since 2010. While we all know mining has not been the happiest of places since 2011, it appears the rot set in early here as many majors managed to hold up as they had a better mix of metals than your average one-trick pony miner and because they had cash-flow. In addition Anglo American owns De Beers and while diamonds are not exactly sparkling at the current time they have not been as dire or as undisciplined as the rest of the mining industry.

However, at Anglo American the mood has been almost unrelievedly downbeat (downhill?). It’s no wonder that shareholders want blood.

Conclusion

While big caps like Anglo American are not the usual fodder for my musings on Investorintel this case strikes a chord because it is yet another example of a trend that not too many have applied logical thinking to. In the past we have noted that there was a horde of gold juniors thinking that a handful of majors were going to buy their properties to which our response was “they can’t buy all your projects” and in fact since the (many) debacles of Kinross, the majors have been buying hardly any properties from juniors. Now the boot is on the other foot, somewhat, with a bunch of cash-strapped majors (Anglo, Glencore etc) trying to divest assets to companies lower down the mining totem-pole. So far precious few deals

have been done. The very largest of the first tier have mines that are so large and (in theory) so valuable and thus with such big ticket price tags that how can one imagine that everything that is on the "for sale" rack is going to be picked up. Who are the buyers supposed to be? How many cash-rich minor majors are there? And in any case even in the smaller majors bought one or two of Anglo's cast-offs then who is going to buy the rest. There is a fundamental mismatch between the number of foreseeable buyers and the number of assets being cleared out.

Majors are showing themselves to be just as wedded to outdated paradigms as juniors with their "put it for sale and they will come" attitude. While much criticism is made of BHP these days, we can't help but think that its spin-out of South32 at the beginning of this year was one of the smartest deals of 2015. It allowed some unwanted assets to find their one way in life without having to resort to a Filene's Basement-style "automatic markdown" policy. Still we have the suspicion that both Glencore and Anglo-American are creating the "assets for sale" lists to pander to bankers and institutional investors that want to see managements in full fire-fighting mode and yet the companies are probably just hoping for a turnaround in metals fortunes and then hanging onto the assets they never wanted to dispose of in the first place!

Tungsten – When the Tough Get Going

It's a useful moment to revisit the dynamics of some of the metals we write about in specific companies and instead look at the broader picture. Tungsten has featured in our recent

thoughts on Almonty and its activities so what about the factors driving the metal itself?

A look at Argus Minor Metals, one of the most important sources of pricing shows that prices have been under renewed pressure. In their edition of the 13th of October they noted that Ammonium Paratungstate (APT – the main Tungsten product) resumed its downward slide after a two week hiatus. Prices fell to $175-185 per MTU from $180-190 per MTU (metric ton unit = 10kg). They said "prices had been at their lowest levels since 2009, but with the latest decline have fallen to levels not seen since 2005". It's interesting to note that most, if not all the current crop of producers were not even around in 2005, so this is a novel experience for them.

So what are the main dynamics at work?

The China Syndrome

Tungsten has shown some of the same dynamics that other specialty metals have experienced over recent decades.

During the 1980s and the 1990s, China, with the world's largest reserves and lowest cost of production, flooded the world market. This drove down the price of both APT and WO_3 concentrates to below the production cost of most other producers. Amongst the distortions this produced was that APT prices, driven downwards by Chinese processors, were only marginally above the price of concentrates at about USD$50 per MTU.

The distressed price in the world market quickly drove many tungsten mines and APT producers in the Americas, Asia and Europe out of business and led to their closure. Moreover, outside of China, exploration and mine development programs were quickly abandoned.

However, the distressed market price for tungsten concentrates

and its products began to change in 2003 and more markedly in 2004-2005 propelled by the rapid growth and emergence of the Chinese economy in the world marketplace. As in other metals the rapid growth of Chinese demand for tungsten products for its domestic market triggered a tightening of the availability outside of China which was coupled with the Chinese government's policy curtailing mining projects and taxing the export of tungsten concentrates in order to conserve resources for future domestic needs. This led to a price surge in 2005 with the price of APT moving rapidly from below $80 to nearly $300 per metric tonne unit (MTU). This in turn sparked a recovery in Tungsten recycling, so the price stayed in the $250 range for the ensuing five years.

However, with recycling at its max (37% of global supply in 2010 according to the USGS) and demand for Tungsten still high, the APT price went on a tear upwards to the $460 range.

After that high-water mark the price has been on a slide, briefly rebounding at times on the way down but now down to the level less than half the 2011/2 highs.

Just as in Rare Earths and other specialty metals the Chinese government has indulged in curtailment of mining programs and was strongly "encouraging" downstream processing of concentrates to higher value added products such semi-finished and finished tungsten products.

Roskill's latest Tungsten survey commented that they believed primary tungsten supply will continue to be dominated by Chinese mine production in the years to 2018. However, the share of global supply which China provides is forecast to fall from 80% in 2013 to 78% in 2018, caused by an increase in production from mining operations in Vietnam, Australia and Europe.

Supply

Over the last few years, sources of supply have shifted totally. In 1986, the USSR was the world's largest consumer but, by 1992, the reformed CIS was exporting tungsten and by 1996 was the world's second largest supplier. In the late 1990s and at the beginning of the new millennium, China had risen to dominate production with 90% of the world market for tungsten production and supply. This was despite China supposedly having about 75% of the world's tungsten resources.

This shifting dynamic makes it hard to identify where exactly the future production will be coming from. The calculation of global reserves leaves something to be desired in our view. On the Chinese side we, as in so many other things, have no verification of how large reserves are or the pace at which they are being consumed (something that has been an issue also in Rare Earths and Antimony in recent times).

On the Western side we have reserves of Tungsten that are the result of decades of low focus on exploration. The fact that several relative newcomers to the space can come up with substantial new resources rather swiftly after beginning exploration might imply that the West's share of global Tungsten resources is severely underestimated (as it has been in Antimony and Rare Earths).

Secondary production of tungsten, according to Roskill, accounted for 22% of global tungsten supply in 2013, predominantly from recycling facilities in Europe and North American. Greater adoption of tungsten recycling technologies is expected, particularly in Asia, with tungsten from secondary sources forecast to account for 28% of global supply by 2018. The tungsten price will however have a significant bearing upon the volume of secondary tungsten available, as recycling facilities may stockpile material for periods of high pricing.

We also have the fascinating phenomenon that the Iberian Peninsula producers that ruled Western production for decades (and were very strategic in WW2) faded in the 1980s and are now resurging in both Portugal and Spain. Australia is also on the comeback trail and even South Korea's important Sangdong mine looks likely to return to production. That England has also recently joined the ranks of producers shows that the Chinese will not have their own way in this metal.

The Tungsten Lifecycle Chart

Our all-purpose Lifecycle chart serves particularly well, in the case of Tungsten, to show the state of progress of the various players vis-à-vis each other on the exploration-production continuum (not that some players, irrespective of which metal, imagine themselves production-bound).

This chart raises the interesting question of how to deal with juniors. During the years of the Supercycle any junior in a given metal could be seen as a potential player. As it wended its way through the Resource/PEA/PFS/BFS continuum there was always an assumption that financing would be forthcoming by hook or by crook for a worthy project. That is now not the case. So do we position a no-hope junior on the Lifecycle Chart at all or just cast them into the outer darkness?

The second issue relates to "naming names" because it is not particularly a company that it somewhere on the timeline but rather individual projects. A good example is Almonty, which has a producing mine in Spain, a near producing mine in Australia and a more distant prospect in South Korea. The stricken North American Tungsten has a producing mine in the Yukon and a project that is way at the other end of the lifecycle and likely to stay there because of its owner's travails.

Looking back at the Lifecycle Chart (below) we published in

2011, the companies at the very right were Malaga and North American Tungsten, now both in administration or bankruptcy, and Malaga's property is in the hands of new owners.

Geodex sold its project to Northcliff. Largo mothballed its Brazilian mine almost as soon as it got into operation. Woulfe was bought by Almonty and the "other" Wolf has advanced mightily. King Island Scheelite had a management and project reconfiguration (for the better) but that has put it no further ahead of where it was. Colt has oscillated around trying to decide if it will be a Tungsten project or a gold venture. Almonty did not even figure on our radar screen!

Conclusion

In the grim current environment for metals, even Tungsten cannot escape the generalized price weakness. As we have shown the ranks of potential producers have thinned and several producers have come to grief. The best projects are clearly the reboots of past producers because the capex is a quantum lower than the $400mn plus price tags on projects like Sisson and MacTung. Prices will have to move higher substantially and for a prolonged period to even move these projects off the starting blocks.

So while being a producer currently might be somewhat of a thankless occupation, those with production will be the ones to reap the best profits once a price upswing occurs and will have a good run of years before any "new projects" appear as realistic competition with actual output.