The Chicken and Egg Problem With Energy Metals: Scandium as a Case

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Posted on **February 4, 2015** by **Chris Berry**

One of the biggest knocks I usually get from investors when discussing energy metals is that it's too small. Lithium at 160,000 tonnes per year or cobalt at roughly half that are not big enough for the larger institutional money managers to focus on as other, more liquid metals markets are deemed safer (or likely just more familiar).

That said many of these "safer" opportunities are hampered by excess capacity and investor disinterest which continues to cast a pall over the commodities sector in general. The paradox is that despite the smaller size of most energy metals, they likely offer higher rates of return over the long-term as technology advances and quality of life between East and West slowly converges. To be fair, these metals will likely remain in niche status going forward, but avoiding learning about them risks walking away from unique opportunities.

It is this disinterest and general lack of funding availability that presents what I predict will be the seeds of the next bull market. This will be rooted in reliable access to the raw materials necessary to make technology supply chains run smoothly. As the demand for various technologies grows, these growth rates are dependent on the answer to one question:

How do you expect to build a high tech supply chain without a reliable supply of certain raw materials?

One wonders if Apple (AAPL:NASDAQ) would have been able to sell an average of 34,000 iPhones *per hour* every day of last quarter if the company wasn't able to ensure its supply chains were operating with ample raw materials. Regardless of the answer (likely yes), this doesn't mean you shouldn't be looking for weak points in supply chains. It is these weak points that can create opportunities.

Raw materials shortages, or just outright unavailablilty, present a unique challenge in that they impede innovation and growth. A perfect example of a metal crucial for growth of several large markets is scandium.

Here is an abbreviated list of companies involved in scandium exploration or development:

Source:

Company Name	Ticker	Market Cap	Shares Outstanding (F/D)
Scandium International Mining Co	SCY	16.66 M CAD	214 M
Platina Resources	PGM	10.85 M AUD	221.82 M
Orbite Aluminae	ORT	83.41 M CAD	389.7 M
Metallica Minerals	MLM	9.18 M AUD	166.8 M
Jervois Mining	JRV	4.27 M AUD	65.73 M
CleanTeq Holdings	CLQ	37.81 M AUD	241.67 M

Bloomberg, Google Finance, Company Documents

The shortness of this list is indicative of how underfollowed the scandium market is. I have written about scandium in the past many times and if there ever was a metal to be ignored, scandium is it. With

no reported primary mining of scandium around the world and no more than 15 tonnes produced per year (a $40 to $50 million market), many would ask "why bother?" with any further analysis.

Scandium's opportunity lies in its relative scarcity and outsized benefits to various technologies that have captivated major manufacturers in the aerospace and energy industries. Specifically, Airbus Group (AIR:EPA) has spent years researching how aluminum-scandium (Al-Sc) alloys can benefit aircraft economics by enhancing strength, weldability, and corrosion resistance. Airbus' unique Scalmalloy high performance alloy product is one such example on an innovation.

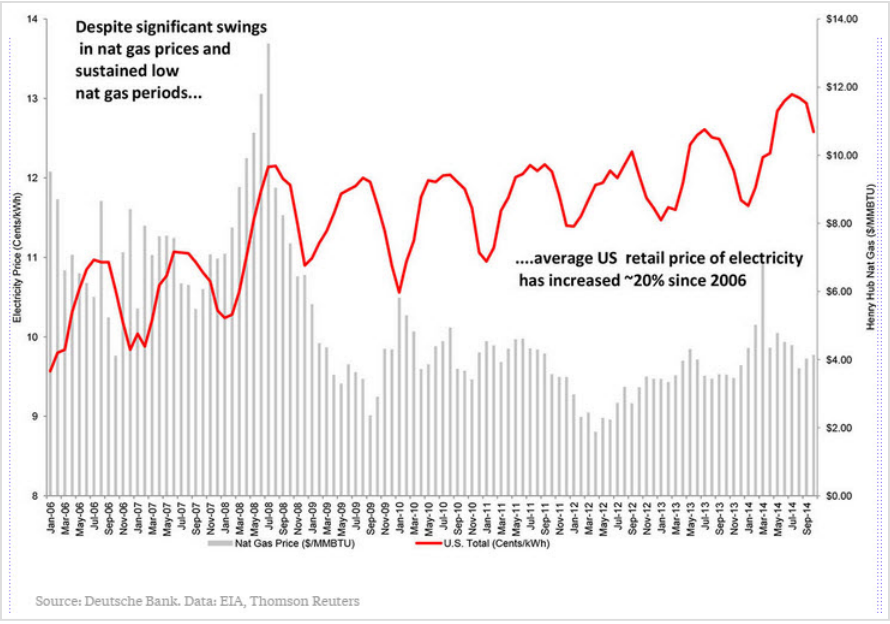
Industry sources indicate that a single aisle aircraft could use up to 70 kg of scandia (Sc_2O_3) with larger aircraft requiring substantially more. Airbus is forecasting a doubling of air traffic in 15 years and has an order backlog of over 6,300 aircraft. The company has also stated that it sees global demand for 31,400 new aircraft by 2033. Not all of these will use scandium in their design, but if even a fraction does, you can start to see the impact and need for a reliable supply.

Around 10 per cent of the weight of an airplane is accounted for by the rivets used to maintain its structure. An Airbus A380 reportedly has an empty weight of 610,000 pounds. It is believed that using Al-Sc alloy in airplanes can reduce the overall aircraft weight by 10 to 15%, so the weight reduction is substantial and would more than pay for the cost of scandium over the life of the aircraft in higher operating efficiency. As fuel is the primary cost for airlines, scandium use to lower aircraft weight should be of particular interest as it can help mitigate the effects of higher fuel prices. Clearly Airbus has seen the light.

Given the Airbus forecasts for aircraft demand growth and given a (liberally) estimated 15 tonnes per year of global scandium production, there just isn't enough to go around in the aircraft industry – never mind other industries. To be clear, there are substitutes for scandium in titanium, lithium, or carbon fiber but scandium is by far the most potent strengthener – something important to remember when in an operating aircraft.

Similarly, the solid oxide fuel cell (SOFC) business appears to be a vibrant growth avenue for scandium use. There are reportedly over 100 companies involved in manufacture of SOFCs with Bloom Energy, a privately held manufacturer of SOFCs, leading the charge. The company has raised over $1 billion dollars since its founding in 2001 and maintains an impressive list of large cap companies as its clients.

Fuel cells are of interest as they can potentially offer a highly efficient source of base load electricity using various fuel sources (natural gas or biogas) and help push towards distributed generation. Scandium use in SOFCs is important as it allows for the electrolyte in the cell to operate at a significantly lower temperature than without it. Operating at a lower temperature helps reduce component costs and makes these fuel cells competitive with other sources of electricity. With electricity prices increasing, finding a sustainable method for electricity generation is only set to increase in importance.



With Bloom Energy only one of many companies involved in SOFC research or manufacture, we again run into the same issue as in the aerospace industry – at 15 tonnes per year of global production, it is an open question by just how much the SOFC business can grow given a limited supply of such a critical component in scandium. There are lower-cost substitutes, but none which deliver the benefits that scandium does. The need to fund scandium development projects is obvious.

Despite scandium's current price (as high as $5,000 per kg depending on the purity levels), the long-term economic benefits in terms of providing either cheaper, cleaner electricity or more efficient aircraft performance are obvious. The SOFC business in particular could be much larger if more scandium were present. However, this isn't the case and presents us with the "chicken and egg" scenario in the title.

The economic benefits scandium provides to finished goods, whether they be aircraft, SOFCs, or bike frames are clear. Investment in scandium is required to enable the industries described above to grow, but the small market size for scandium and investor misunderstanding of the true size of the prize has many on the sidelines.

One factor in determining the need for additional scandium is energy prices. Despite the fact that crude oil is currently hovering around five year lows, how can anyone be sure the price will remain at these levels indefinitely? In 1998, the oil price almost fell to single digits and then by 2008 was at $140 per barrel. In short, you can't be sure which is why research and funding into materials which lower costs over the long-term is critical.

Regardless of your feelings towards niche metals, it is the current dearth of investment in the commodities sector which will position us for the next leg higher. Raw materials such as scandium are the foundation for any current or next generation supply chain and the lack of willingness to invest is likely more evidence of a cyclical bottom than anything else.

Reducing volatility in supply chains while continuing to lower production costs is of paramount importance for companies today. Pushing forward with developing secure supplies of materials is a must as access to affordable raw materials ensures innovation can continue and allow businesses and citizens to collectively prosper.

Scandium, despite all of the issues discussed above, offers the potential for exceptional upside, but this is dependent on investment. Who will make the first move? The chicken or the egg?

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About Chris Berry

Chris is a well-known writer, speaker, and analyst. He focuses much of his time on Energy Metals – those metals or minerals used in the generation or storage of energy. He is a student of the theory of Convergence emanating from the Emerging World and believes it will have profound effects across the globe in the coming years. Active on the speaking circuit throughout the world and frequently quoted in the press, Chris spent 15 years working across various roles in sales and brokerage on Wall Street before shifting focus and taking control of his financial destiny. He holds an MBA in Finance with an international focus from Fordham University, and a BA in International Studies from The Virginia Military Institute.
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George Putnam
on **February 4, 2015 at 1:35 PM** said:

You have nicely summarized the market opportunity, Chris. Scandium International issued a preliminary economic assessment in 2014, on our our Nyngan Scandium Project, in Australia. For more on our plans and timing, please see our news release dated October 24, 2014. G.Putnam, CEO, (TSX:SCY).

Jack Lifton
on **February 4, 2015 at 5:58 PM** said:

One big problem with scandium is its historical pricing. During the last few years I knew of one American company making aluminum-scandium alloys experimentally for the aircraft industry that paid as much as $15,000.00/kg for 50 kg of pure metal.

April 11, 2015
[http://investorintel.com/technolo metals-tv/lifton-on-why-this-is-the-very-best-time-ever-to-invest-in-rare-earths/]

Zink on why Rare Element Resources is simply one of the best rare earth projects on the market

April 10, 2015
[http://investorintel.com/technolo metals-intel/zink-on-why-rare-element-resources-is-simply-one-of-the-best-rare-earth-projects-on-the-market/]

Putnam on the 'real market' demand for scandium

April 2, 2015
[http://investorintel.com/technolo metals-intel/putnam-on-the-real-global-demand-for-scandium/]

Rare Earth Expert Dr. David Dreisinger on Search Minerals Direct Extraction Process Technology

March 30, 2015
[http://investorintel.com/technolo metals-intel/rare-earth-expert-dr-david-dreisinger-on-search-minerals-direct-extraction-process-technology/]

Saxon on Tasman's Prefeasibility Study and the REE-Awakening of the Rare Earth Market

March 24, 2015
[http://investorintel.com/technolo metals-intel/saxon-on-tasmans-

The transportation industry that I surveyed convinced me that one cannot make an economic case to justify scandium's weight reduction at that price. The target price is a maximum of $1,500.00/kg of pure metal. That works out to around $50.00/troy ounce, which would make scandium ideally priced to replace platinum group metals as a component solid-oxide-fuel cells. If scandium production as a metal ever comes about in a regular flow at more than 50 tons a year I suspect there will be a battle between the aircraft and the alternate energy industries for the material, but this does NOT mean that scandium's price will simply go up; it is not gold, and like the rare earths its price will be governed by the law of supply and demand. Do not be fooled by spot prices gleaned by publicists who love to quote each other as in the rare earths markets. There is today no market for scandium, so there is no way to "discover" its price. Some of the scandium projects mentioned here have great potential, but for the small investor it is important not to get caught up in spot prices that the real world cannot maintain.

prefeasibility-study-and-the-ree-aw-market-and-rare-earths-market/]

Randy Scott on the Market and Wyoming State support for Rare Element Resources

March 23, 2015
[http://investorintel.com/technolo metals-intel/randy-scott-rare-market-and-wyoming-state-support-for-rare-element-resources/]

Lifton on Rare Earths and American Security: 60 Wasted Minutes

March 22, 2015
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Adrian Griffin on the Rare Earth, Lithium and Graphite Market