

Critical Metals for the energy transition

25th Sep 2024 at the University Women's Club, Audley Sq.

The Discussion was introduced by Jeff Townsend, founder of The Critical Metals Association. The CMA's goals are to:

1. Increase the self-sufficiency of supply chains for our industrial strategy
2. Provide peer-to-peer support on best practice for critical mineral companies
3. Improve societal/ government perception of the critical minerals sector - including the sector's importance for our industrial strategy and its ability to maintain high ethical standards
4. Provide a direct line of communication between industry and government and create a unified influence of industry.

Jeff's father is a mineral processor and Jeff grew up on a mine in S Africa and many other mine sites around the world. As an adult, he spent almost 20 years in politics where he became deeply frustrated by governments which set industrial strategies without mention of supply chains and there has been little or no communication between these two groups. The CMA was founded to ensure that the voice of the supply chain is heard in the corridors of power.

In terms of critical minerals, It is worth starting with a look at the Chinese market, where the downturn in its rate of growth means that house building in China is nowhere near what it was. China has a controlled economy and society and it believes that it needs a 5% GDP increase per year i.e. doubling its GDP by 2032. If it can maintain a 5% growth its society will be happy, because there's a social contract between the government and its people, because they believe their leaders will generate an income and a life for its citizens.

However, they realize that's not going to happen through house building anymore, so it intends to flood the domestic market with Chinese built products, which means the critical minerals that were going into the world are increasingly being used domestically in China. And this in turn is why the western world is on this big charge for critical minerals.

And of course, once China has increased its market with its own downstream products, it can also start exporting those products a lot cheaper than we can produce. As an example of one critical metal, antimony (used for superalloys and hardening ammunitions) the supply of which China has recently reduced its exports significantly.

Putting this into context, 18 months ago, Australia, UK, and US created AUKUS in order to collaborate and build 5 hunter-killer submarines to control the southeast China Seas. The problem with this is that you need over 22 tonnes of rare earth elements (REE) and the only place you can get that much at the moment, is from China.

So, we're going to build submarines to keep you in check, but please can you give us the REE so we can build them, which is absolute madness. Therefore, China can kill off Western critical mineral

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projects like it did with Lithium; the price of Lithium carbonate in 2012 was \$6,000, in 2022 it was \$68,000 and has been up to \$82,000 since. The vastly increased price of Li opened a whole range of projects in the Western world and then suddenly, China collapses the price, there is little domestic need for lithium anymore, 65% of lithium projects collapse with it, which China then buys up. That is the model for gigantic price changes in the mineral markets.

China has done the same thing with Nickel recently, and they will continue to do it because they have control and there's nothing stopping them - until you build your own supply chain. And I think this is where I've always said to the UK government, we will never stop China from dominating the 'critical mineral space', but you can stop them from controlling the critical 'middle' space. Critical minerals make up a highly geopolitical environment and we need to define what we want to achieve in the next 20 years. It seems we can do that only with some kind of control of production 'cells' or be utterly beholden to China.

For the UK, the new government does not seem interested in manufacturing wind turbines just placing them here (and much of that on land), and buying them from China instead, albeit ignoring China's ESG Standards.

The comment about antimony from China being critical for our defence sector, reminds one of the anecdote from WW1 - we needed high quality optical lenses (to locate enemy artillery) and the Germans wanted rubber (for vehicle tyres), so we swapped these supplies during the war!

Perhaps the equivalent these days is to use Scandium (a REE) in drones, which reduces the weight by about 20%, which means you can fly them further and quieter. (The price for scandium metal in 2010 was a few thousand dollars, but soared to over \$15,000/Kg 10 years later).

The UK has got 4 pillars to its economy - an ageing economy/population, building electric vehicles, aerospace and robotics, but where are our supply chains? The biggest problem is that China controls the critical metals yet some of our largest manufacturers will not own up to a supply problem because of fear of a share collapse.

Critical Minerals is only one small part of the global mining industry, but the global mining industry has been awful at telling stories. Through the 1970s, eighties & nineties, there was no real communication around about what each company was doing, just publicising the share price. It was all about investor relations. And companies still, to this day, base their external affairs on investor relations, who will invest in your company and making sure that they feel happy. But society has moved on.

The biggest funding should come from ESG (environment, social, and governance) management but there are very few future projects that would meet modern ESG requirements. Mining companies don't ever talk about ESG much; consequently, society doesn't trust the mining industry because it doesn't engage in an open and frank way. Too often we just get 'green washed' – which doesn't talk to indigenous communities. We don't use the same language and since society is sceptical, so are

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politicians and it's easier to say no than spend time to fully engage and understand needs. We need dialogue if we are to meet our future requirements AND go forward.

Young people get their news from instant media, they don't necessarily care about the company, i.e. how much money it's making, they talk about social capitalism, the idea that there is a moral value to what a company produces, but they can't go out to buy an electric vehicle because they're not paid enough. However, when they are in their thirties and a forties, they will have that purchasing power, and they will put a moral and ethical value on that company. For the automotive sector, that is going to be problematic because they're the ones under the spotlight, and therefore need to follow their supply chains all the way through, particularly as a given critical mineral may come from the Singapore metal market, but in reality, it will be sourced from China.

Some companies have indeed followed their own supply chain back to source and suddenly realised that it needs up to 6,000 parts on a car and some items have a supply chain of more than 3 stages, which is terrifying. So now you've got the car maker lawyers yelling at supply companies saying you have got to change the way that we communicate around critical minerals.

For example, in 2021 a BEIS (Business, Energy & Industrial Strategy) minister came to an event when there were 2 very smart people talking about the electrical conductivity of graphite in lithium-ion batteries. This debate went on for about an hour. Unsurprisingly, the minister left after 5 minutes. Those speakers must have been incredibly badly briefed. Politicians clearly don't care about such technical arguments and that situation set back the dialogue with government about 6 months. What they wanted to know was where can we get it from and how much is it going to cost?

The language that we use, the things that we talk about, the way that we engage, and the way that we show our industry to people, has got to change fundamentally if we are meet the climate change agenda. Otherwise protest groups like Extinction Rebellion and Just Stop Oil will dominate the news and on top of that, you have a massive problem with the time it takes to get a permit to mine: 15+ years?

By contrast, the US government has tackled the green agenda about security of supply for the defence sector, which is absolutely right, but that has not helped win over the local communities who are blocking planning applications; they are not yet tied into the net zero agenda and in Nevada lithium projects in are being blocked by Democrats while there's a Democrat government in power! The barrier is often that people use such different language and come at the net zero goal from many different ways and focus on their own issues, that we fail to understand where there is common agreement and do not know how to push that forward.

The big thing 2-3 years ago was that lithium-ion batteries were promoted for everything from house storage, cars and even trucks, but for grid storage a lithium-ion battery is not going to help because it loses charge; vanadium batteries, on the other hand, do not and they are inherently safe (water based). Lithium batteries are both flammable and can be explosive.

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Copper is really easy to recycle. Other metals, however, are exceptionally hard to recycle, although we are starting to see a lot more effort going into recycling. Ideally, we should extract less, but we must increase recycling massively over the next 20 years and substitute some of that raw material with the recycled. We need to get over the 50 - 60% recycling mark to have real impact.

How you define a critical mineral varies around the world. Canada has its critical minerals list, all 30 of them are based on what they have themselves and what the world needs. The UK says there's 18 critical minerals, and these are the ones we need for our domestic market. Japan by contrast, has gold in its critical mineral list.

In the US, the Department of Defence has a different critical mineral list from the Department of Energy. In UK the Labour government is changing its critical mineral strategy from the one the Conservative government had, and it's going to put critical minerals inside its industrial strategy. So critical minerals will become a key pillar of the industrial strategy of the UK. Great. But the term critical mineral still means different things in different countries and even different Departments. We rarely talk of silica as a critical mineral, but there are only 2 mines in the world that produce silica of a higher enough quality to make silicon chips: one is in Northern Spain and the other is in the US.

John Bennett
30 Sep 2024