kasm
kiwis against seabed mining

KASM submission on Critical Minerals list

Contact: Cindy Baxter, Chairperson Privacy of natural persons

Kiwis Against Seabed Mining Inc's (KASM) submission focuses solely on the presence of vanadium on the critical minerals list for New Zealand.

The reasons are stated below. There are two important matters to state at the outset.

- Firstly, Trans-Tasman Resources (TTR) in its application for seabed mining would pay royalties only at 2% on ironsands: any vanadium would be acquired for free.

- Secondly, no clear process for extracting vanadium from the iron ore mined from the ocean can be ascertained.

Vanadium should not be included as a critical mineral for New Zealand

Vanadium is a mineral that is primarily used for strengthening steel, which has nothing to do with a transition to a low-carbon economy: strengthened steel is not a "critical" use that would contribute to decarbonising the economy.

Vanadium can also be used for grid-scale batteries, but it is far from being a technological front runner for this use.

We seriously question the addition of vanadium to the critical minerals list: it's not easily extracted, Trans Tasman Resources doesn't plan to process separate vanadium in New Zealand, and they would not pay royalties on the value of the vanadium, but rather the much cheaper iron ore.

In addition Cobalt, Copper, Manganese, Nickel and Phosphate should be excluded from the critical minerals list. The phosphate from the Chatham Rise is radioactive.

Battery technology

There are many battery technologies in use and under development: lithium iron phosphate, sodium-ion, even massive sand batteries that hold thermal heat. Manufacturers are looking to develop battery chemistries from less rare, contentious and difficult to recover elements that cause less environmental damage. While vanadium

redux batteries have some potential, there are high up-front costs and they're already being undercut by other technologies.

China and the US are already moving fast on sodium-ion batteries, both for EVs and for grid-scale batteries. China as the world's largest producer, is likely to be focussing on mass producing these rather than vanadium batteries.

Sodium and lithium iron phosphate are far better, improving in tech, and at a much lower cost - these are more likely to fill the role of grid-scale batteries into the future.

China and Japan already import ironsands from Taharoa but they don't extract vanadium from it.

How is vanadium extracted out of the ironsand?

So far, vanadium has been produced as a by-product of the smelting process at Glenbrook Steel mill. They remove the vanadium (have to do this before the ironsands are used to make steel) - it is separated out into a slag, in liquid form.

Glenbrook uses ironsands from Taharoa.

Part of the smelting process at Glenbrook is a vanadium recovery unit - a high temp process - which blasts it with oxygen leaving it as a liquid, but it still contains other metals. BlueScope sells this overseas where the vanadium is processed.

The salt

Glenbrook's ironsand is delivered from Taharoa in a slurry - the sand is taken from the river, which washes out the salt.

It's the same case for the exports at Taharoa - again, it's washed out with river water before it's put on the ship (in a slurry) and sent offshore to China and Japan, who use it to make steel. They don't separate out the vanadium.

If Vanadium has the value Trans Tasman Resources is claiming, why do our export markets not separate it out and use it? If it were worth that much, Bluescope would not have sold its holdings in Taharoa.

TTR doesn't appear to have any plan as to how to deal with the salt. At sea there is no process where it could wash the ironsands with fresh water. TTR, which has repeatedly stated it will trans-ship the minerals at sea for direct export to Asia, would be delivering iron ore full of salt to international customers, who would then have to try to extract the vanadium and get rid of the salt. This would add extra costs to the process.

Extracting vanadium in New Zealand

The only document TTR's 100% owner Manuka Resources has on its website about extracting vanadium from ironsands is a master's thesis for VUW, which looks at the process and how it can be done. Document here.

The author describes experiments with a process where the vanadium is heated at extremely high temperatures (900˚C) for a few hours. However, the results still sees manganese oxide mixed with the vanadium. And it doesn't propose a solution for this extraction.

So aside from expensive smelting, there is no clear method to extract pure vanadium from the ironsands. This process would also produce a much lower yield of vanadium compared with, say Australian Vanadium Ltd's much purer process.

In the two TTR EPA Application hearings, or the latest reconsideration application, TTR did not mention the extraction of vanadium, rather that they would directly export Iron ore to Asia, without the resource ever coming to shore in NZ.

Given that there is no method, nor stated intention from TTR, to separate vanadium from the ironsands, New Zealand would not gain royalties on vanadium - just the 2% royalties from the ironsands. The vanadium would be thrown in for free.

Iron ore prices tanking

Meanwhile the iron ore market has tanked, the commodity market rate has gone low, and is expected to drop lower as China reduces its steel production. Iron ore is NOT suitable for green steelmaking.

Vanadium is also dropping rapidly in value.

The most costly vanadium production on the planet

So ultimately, with either the smelting process, or another - as yet invented - process to extract vanadium, plus the issue of getting the salt out, it appears the South Taranaki Bight vanadium would be the most expensive on the planet.

Vanadium is readily available on-land where it's not mixed with iron ore. There are on-land mines across the world where vanadium is available: there's enough to satisfy demand without the expensive, salt-laden vanadium from the South Taranaki Bight seabed.

The table below sets out the on-land vanadium deposits around the planet. Nobody needs our vanadium. The table is from this paper.

Table 1. Grade and tonnage of selected vanadiferous titanomagnetite deposits. Other relevant information is provided where available; see the text for discussion.

Deposit	Country	Stage	Resources/reserves*					Magnetite concentrate		References
			Type	Tonnage (Million tonnes)	Grade (% V_2O_5)	Grade (% TiO_2)	% Fe_2O_3	Magnetite (%)	% V_2O_5	% TiO_2	
Maracás Menchen Mine	Brazil	Production	Measured & Indicated	63.69	0.8	8.21	N.A.	24	2.46	3.26	Largo Inc. (2021)
Vametco	South Africa	Production	Indicated & Inferred	184.2	0.78	–	–	35	1.98	–	MSA Group (2021)
			Reserves (probable)**	46.4	–	–	–	28.4	2.02	–	Bushveld Minerals (2021)
Brits	South Africa	Plan/Dev	Indicated & Inferred	66.8	0.56	–	–	29.87	1.58	–	Whitley et al. (2019)
Mokopane project	South Africa	Plan/Dev	Indicated & Inferred	284.8	0.68	5.4	34.8	–	–	–	Croll et al. (2016)
			Reserves**	28.5	1.41	–	–	–	1.75		Bushveld Minerals (2021)
Mount Peake	Australia	Plan/Dev	Measured, Indicated & Inferred	160	0.28	5.3	32.9	–	–	–	TNG Limited (2017)
Speewah	Australia	Plan/Dev	Measured, Indicated & Inferred	4712	0.3	3.3	21	–	–	–	King River Resources Limited (2021)
Gabanintha (Australian Vanadium Property)	Australia	Plan/Dev	Measured, Indicated & Inferred	239	0.73	8.9	47.3	–	–	–	Australian Vanadian Limited (2021)
Gabanintha (Technology Metals Property)	Australia	Plan/Dev	Measured, Indicated & Inferred	109.5	0.8	10.1	55.6	–	–	–	Technology Metals Australia Limited (2021a)
			Reserves (proven & probable)	29.6	0.88	–	–	–	–	–	
Yarrabubba	Australia	Plan/Dev	Indicated & Inferred	27.7	0.9	9.9	55.3	–	–		Technology Metals Australia Limited (2021b)
Lac Dore	Canada	Plan/Dev	Measured & Indicated	215	0.4	7.1	38.8	24.6	1.3	8.7	Longridge and Martinez (2020)
Bell River (Mont Sorcier)	Canada	Plan/Dev	Indicated	113.5	–	–	–	30.9	0.6	1.2	Voyager Metals Inc. (2021)
			Inferred	953.7	–	–	–	32.8	0.6		
Mustavaara	Finland	Past producer / Plan/Dev	Measured & Indicated	103.7	–	–	–	15.36	1.6	6.1	Seppä et al. (2021)
Windimurra	Australia	Past producer / Plan/Dev	Measured, Indicated & Inferred	209	0.5	–	–	–	–	–	Atlantic (2021)
			Reserves probable**	87.5	0.49	–	–	–	–	–	
Balla Balla	Australia	Plan/Dev	Measured, Indicated & Inferred	455.9	0.64	13.7	63.9	–	0.8	14.3	Forge Resources Ltd (2011)
			Reserves proven & probable**	229	0.62	13.8	–	–			
Barrambie	Australia	Plan/Dev	Indicated & Inferred	280.1	0.44	9.18	–	–	–	–	Neometals (2018)

* Resources unless otherwise stated.
** these reserves are or may be included in resource tonnage provided above.

Low carbon transition/clean and sustainable product lines

Lastly, and most importantly, in the race for low carbon solutions, such as green steel and big, grid-scale batteries to back up wind and solar farms, those developing these solutions also focus on achieving a “sustainable” supply chain.

Those working on green steel, etc, would be extremely unlikely to accept vanadium derived from seabed mining as anything like fitting their criteria of “sustainability”.

In summary, vanadium is readily available, on-land, in a clean form, where it doesn’t involve wrecking the ocean under seabed mining and then expensive and energy-intensive processes to extract the vanadium from the iron ore and get the salt out.

And it’s also very unlikely that any battery or other “clean green” product made for the clean energy revolution would see vanadium extracted from seabed mining as meeting anything like sustainability criteria.

As a result of this information, we seriously question the addition of vanadium to the critical minerals list.