

VANADIUM MINING INVESTOR PRESENTATION

“Building new vanadium supply chains”

Hardey Resources Limited (ASX: HDY) (“HDY” or “the Company”) releases a further investor presentation on the second acquisition to be read in conjunction with the first presentation released to the market on 4 July 2018. This presentation outlines more details on the proposed acquisition of six highly-prospective vanadium assets across Queensland and the Northern Territory (refer HDY ASX Release 19 July 2018).

For the full context of HDY’s two proposed vanadium transactions, shareholders are encouraged to read the Vanadium Mining release in conjunction with Nelly Vanadium Mine presentation (refer ASX Release 4 July 2018).

These releases will also be uploaded to the Company’s web site:
<http://www.hardeyresources.com.au/>

For and on behalf of the Board



Terence Clee
Executive Chairman

Vanadium Mining

“Building new vanadium supply chains”

Investor presentation

July 2018



Building new vanadium supply chains...

➤ Supply bottlenecks in China, coupled with accelerating new demand from the re-chargeable battery sector at the margin, have propelled the vanadium price to 10-year highs

➤ To meet this demand, Vanadium Mining (VanMin) has six projects across Queensland and Northern Territories which are highly prospective for vanadium mineralisation[†]



➤ Moreover, they are close to neighbours that have proven total resources, with supporting mining infrastructure and ready access to ports

➤ Australia is well-regulated, stable jurisdiction with low sovereign risk and comparative advantages for emerging vanadium suppliers aiming to fast track production

[†] Refer HDY ASX Release 19 July 2018

...from Queensland and Northern Territory...

- **QLD:** There are four prospects in west QLD near to Intermin Resources (ASX: IRC) globally significant Richmond project[^] (Inferred Resource* – 2,579Mt @ 0.32% V₂O₅ cut-off grade of 0.29% V₂O₅ grade), while Liontown Resources (LTR) acquired two prospects with historic resources[↵]
- **NT:** The two prospects are contiguous to TNG Ltd's (TNG) Mt Peake project (Total Resource* – 160Mt @ 0.28% V₂O₅ cut-off grade of 0.10% V₂O₅ grade), while TNG has a binding mine-life off-take and technology transfer agreement with Korea's Woojin Metals^{^^↵}

↵ Refer HDY ASX Release 19 July 2018

^ Refer IRC ASX Release 20 March 2018; ^^ TNG ASX Release 28 November 2017 * Mineral Resources reported to the JORC (2012) Code

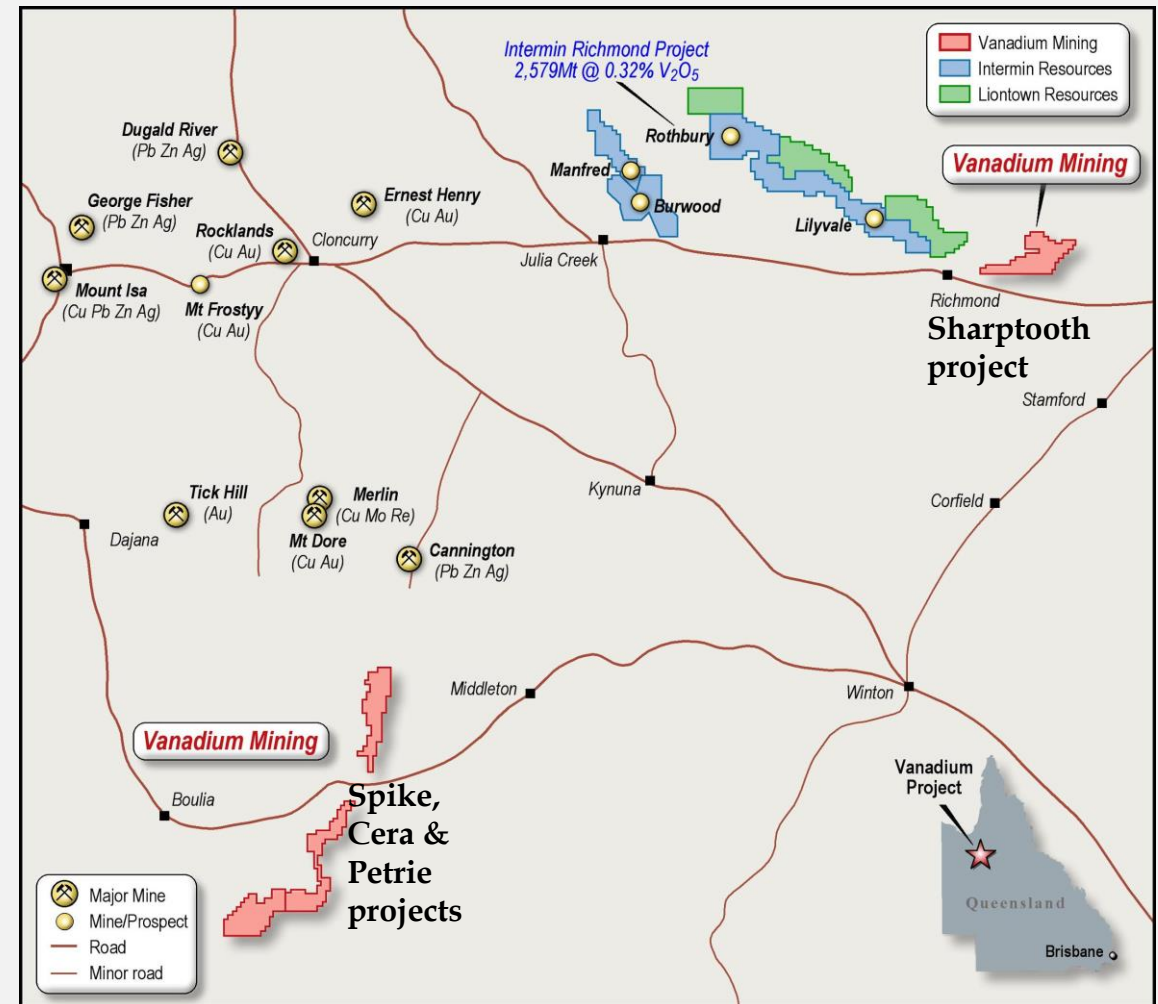


...for fast-growing renewable battery sector

- China, which supplies around 50% of global vanadium, has started using more of its output following new rules to double reinforcing bar requirements, following recent earthquakes that caused considerable structural damage
- At the same time, the Chinese authorities have shut polluting mines, reducing output materially thereby propelling a search for new supply chains
- Traditionally, the steel industry consumes 90% of global vanadium, but demand from the renewable battery sector is starting to grow rapidly (Appendix A)
- In short, with demand for scalable energy storage accelerating, reflecting wider renewable energy adaptation, Vanadium Redox Batteries (VRBs) are an emerging solution end-users prefer[^]
- Key VRB positives[^] include: scalability, suitable for grid connection, 20-yr lifespan, instant energy release, excellent charge retention / discharge and using only one element in electrolyte form: V_2O_5

QLD: highly prospective for vanadium

- VanMin's four projects in west Queensland – Sharptooth, Spike, Cera and Petrie – are in an area that favours shallow surface mining large tonnages of low-grade vanadium mineralisation
- They are near to IRC's globally significant Richmond project (Inferred mineral resource* 2,579Mt @ 0.32% V₂O₅ cut-off grade of 0.29% V₂O₅) and ground held by LTR[^]
- However, while LTR's tenure contains historic vanadium resources, they do not comply with the JORC (2012) code

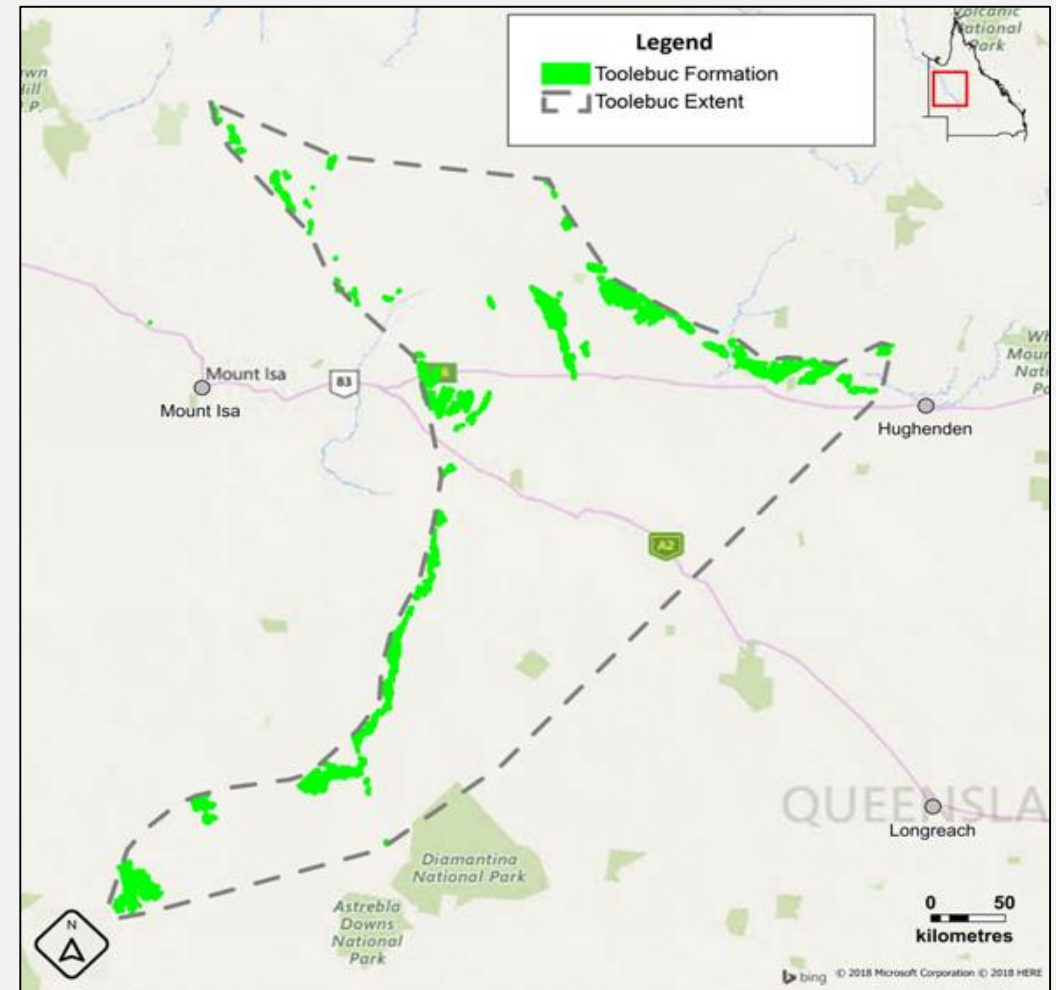


– Refer HDY ASX Release 19 July 2018

[^]IRC ASX Release 20 March 2018 & LTR ASX Release 28 November 2017 * Mineral Resources reported to the JORC (2012) Code

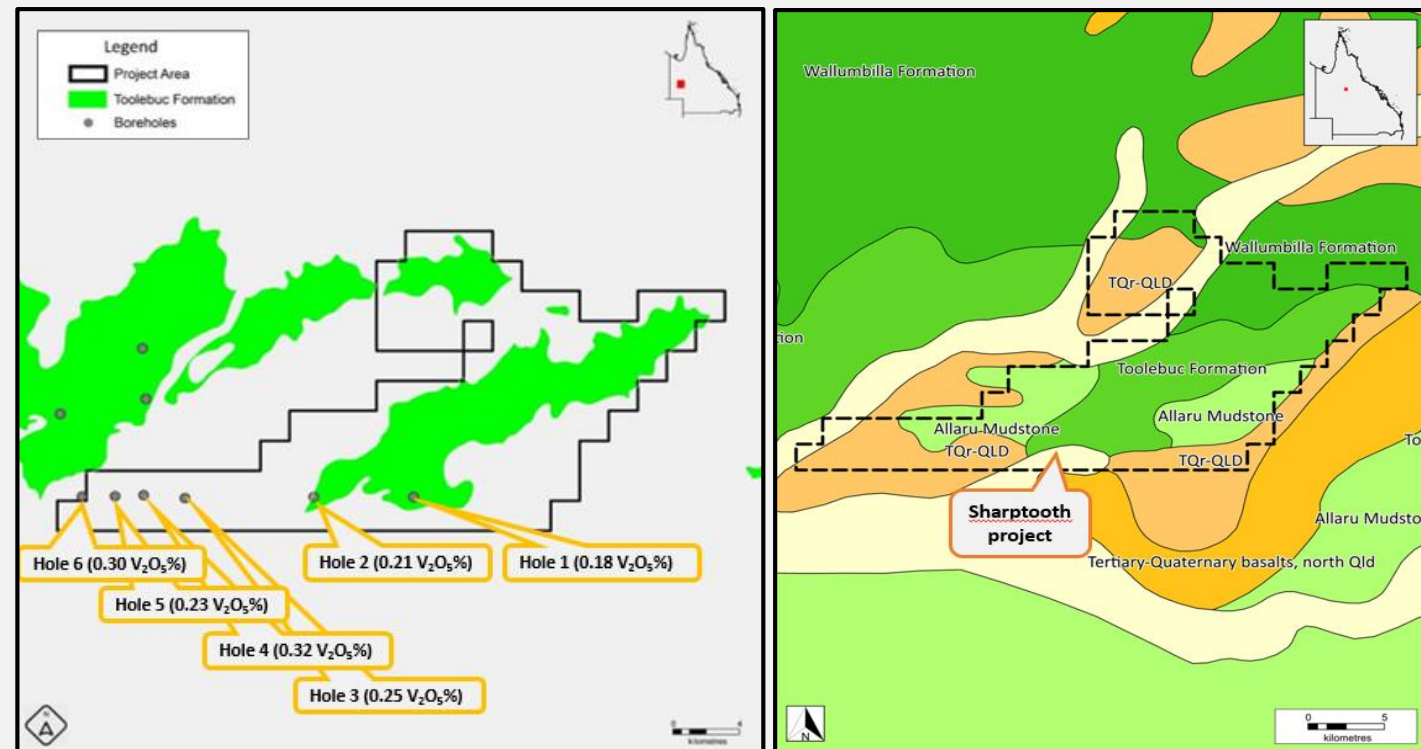
QLD: regional geology – Toolebuc Formation

- Within the Mt Isa region, areas known for the prevalence of oil shale usually have occurrences of vanadium and uranium mineralisation
- This combination of mineralisation is typically found within the Toolebuc Formation (TF), which can have grades up to 0.5% V_2O_5
- This is consistent with the underlying geology apparent at IRC and LTR's respective projects



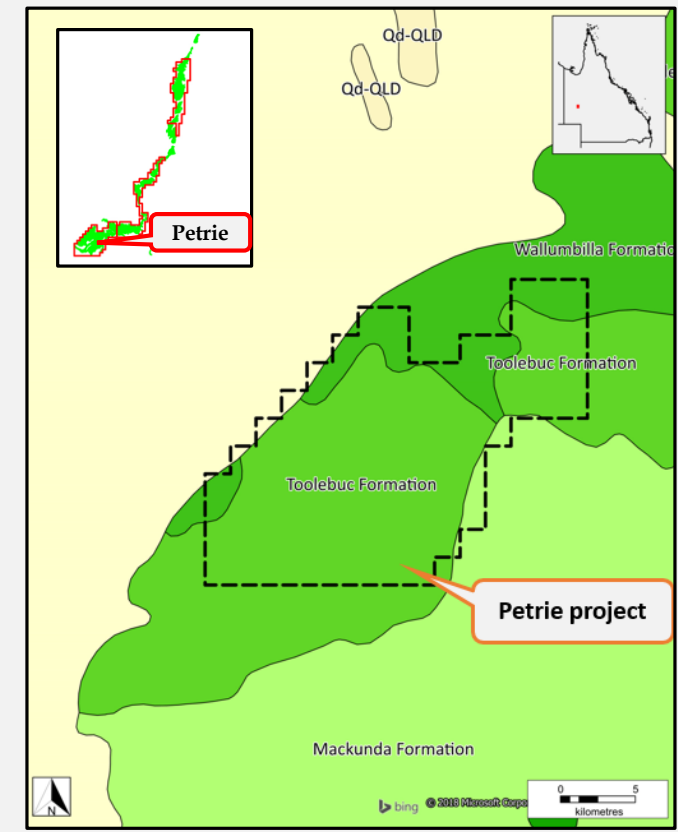
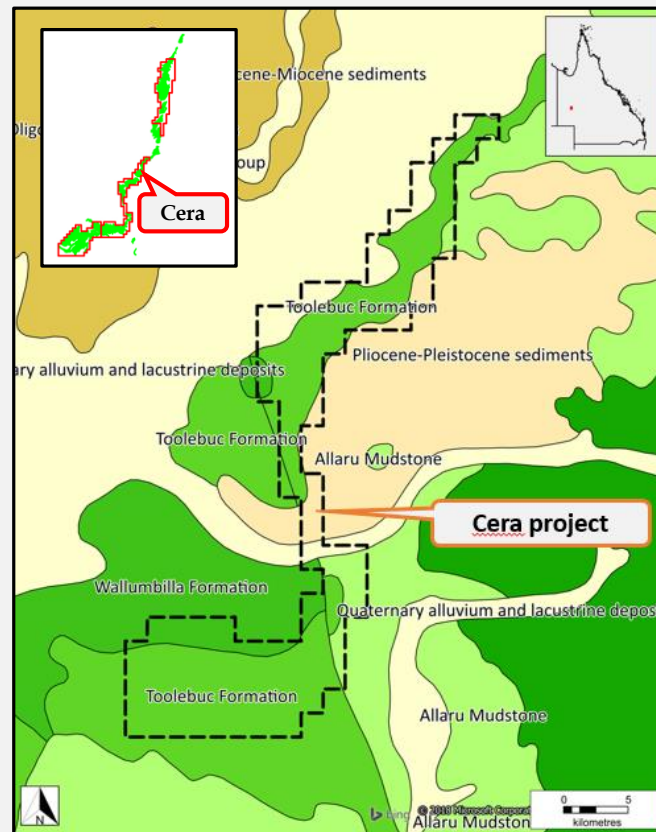
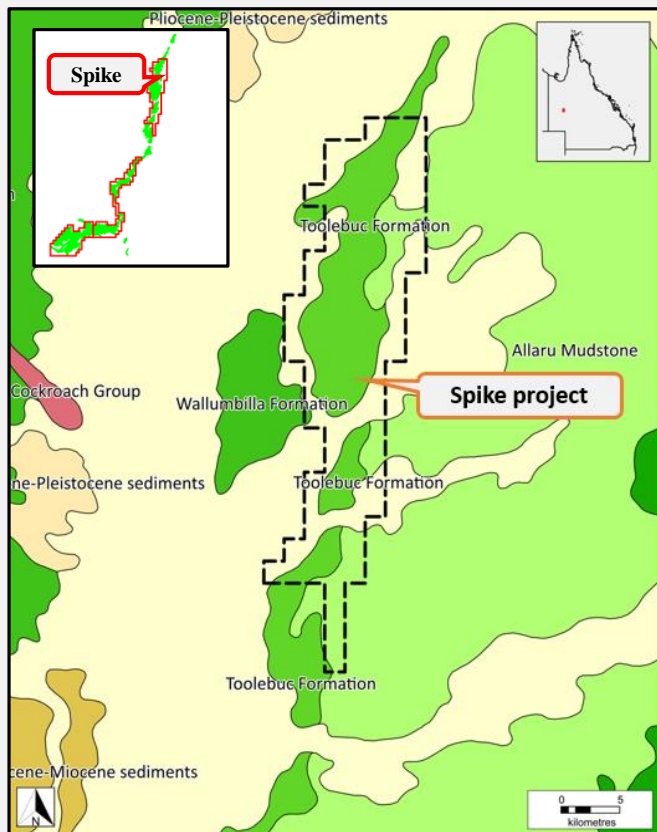
Sharptooth project overview & legacy drilling

- Sharptooth is close to IRC's Richmond project, while legacy exploration reports highlight multiple boreholes (in/external to the tenure) with elevated vanadium linked to TF subcrop & outcrops
- All five boreholes within the tenure have historic vanadium results
- Holes 3 to 5 targeted TF at depth that will potentially be amenable to open pit mining
- No further drilling was completed in the outcropping formation
- In the north of the tenure where TF is outcropping, shallow vanadium mineralisation is likely to be apparent



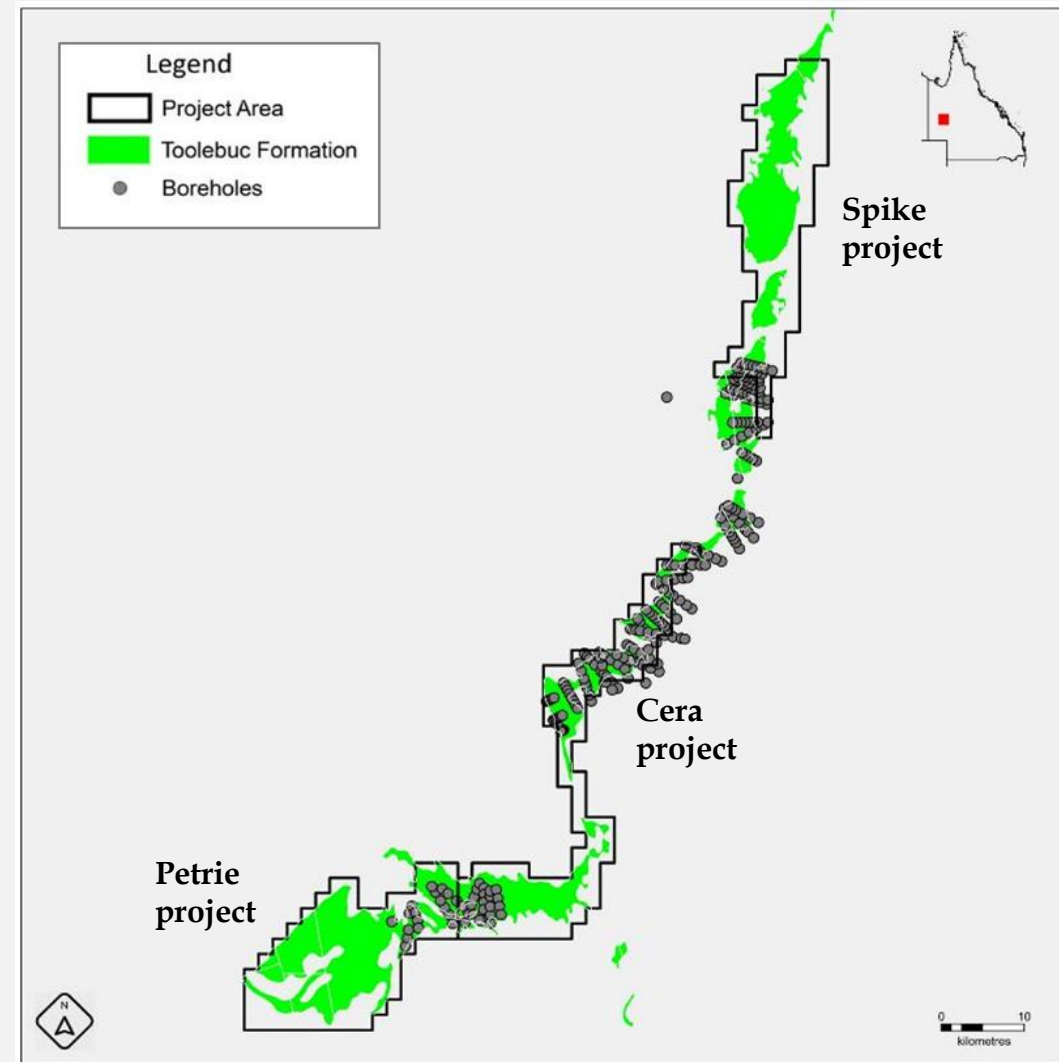
Spike, Cera, Petrie: project overviews

- For Spike/Cera/Petrie legacy reports highlight 30/122/18 boreholes respectively targeting the TF for elevated vanadium, molybdenum and uranium within the tenures
- Numerous historic reports and research confirm the projects and greater region are highly prospective for vanadium mineralisation



Spike, Cera, Petrie: historic drilling

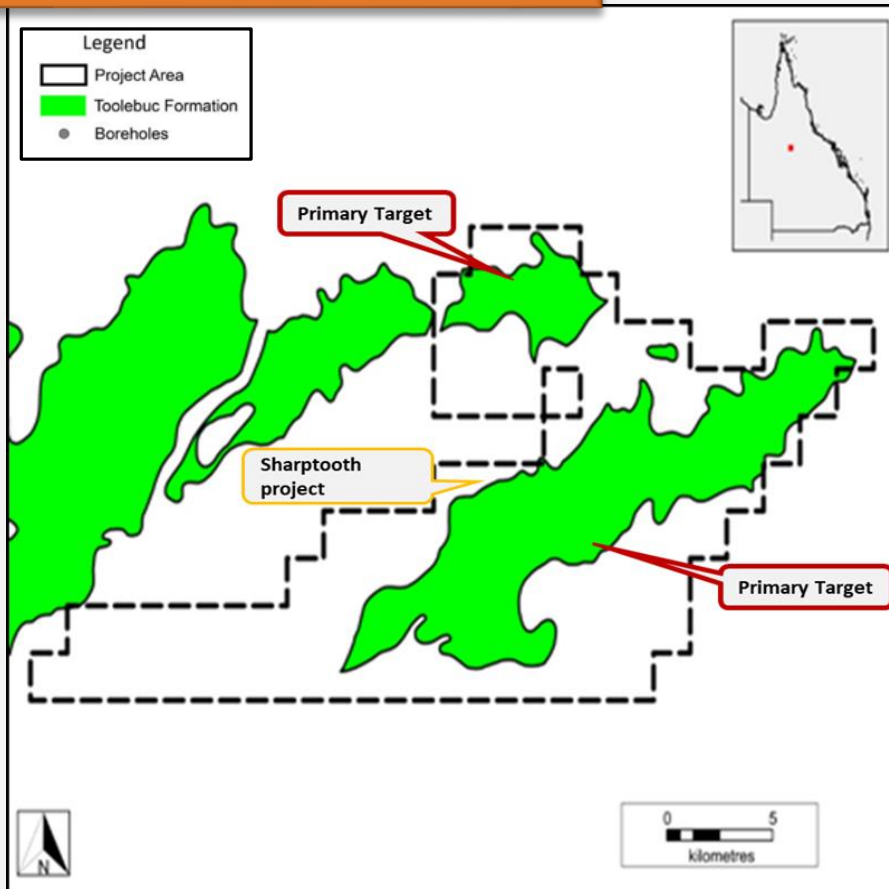
- There are numerous legacy drill-holes across the three projects
- All have been assayed and confirm elevated vanadium levels
- Potentially, utilising this legacy data and reviewing historic reports, there is an opportunity to fast-track modelling an inferred vanadium resource that complies with the JORC (2012) code



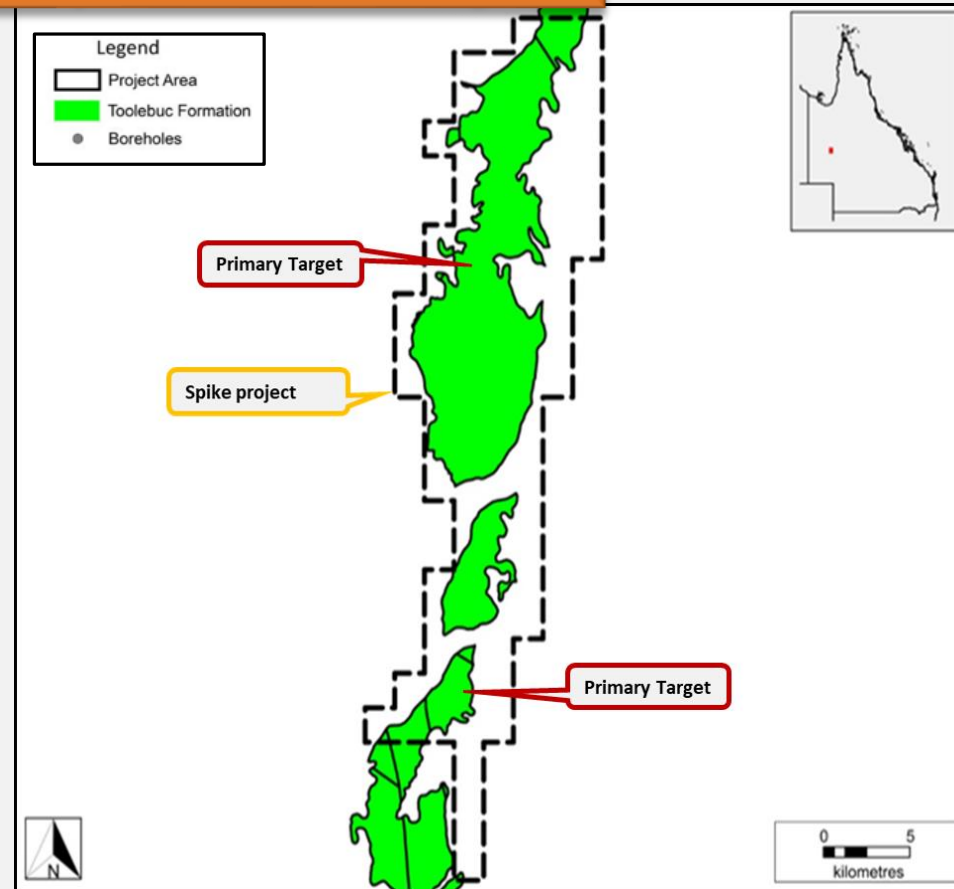
Sharptooth / Spike projects: vanadium targets

➤ Vanadium targets selected from desktop work identified TF subcrop & outcrops

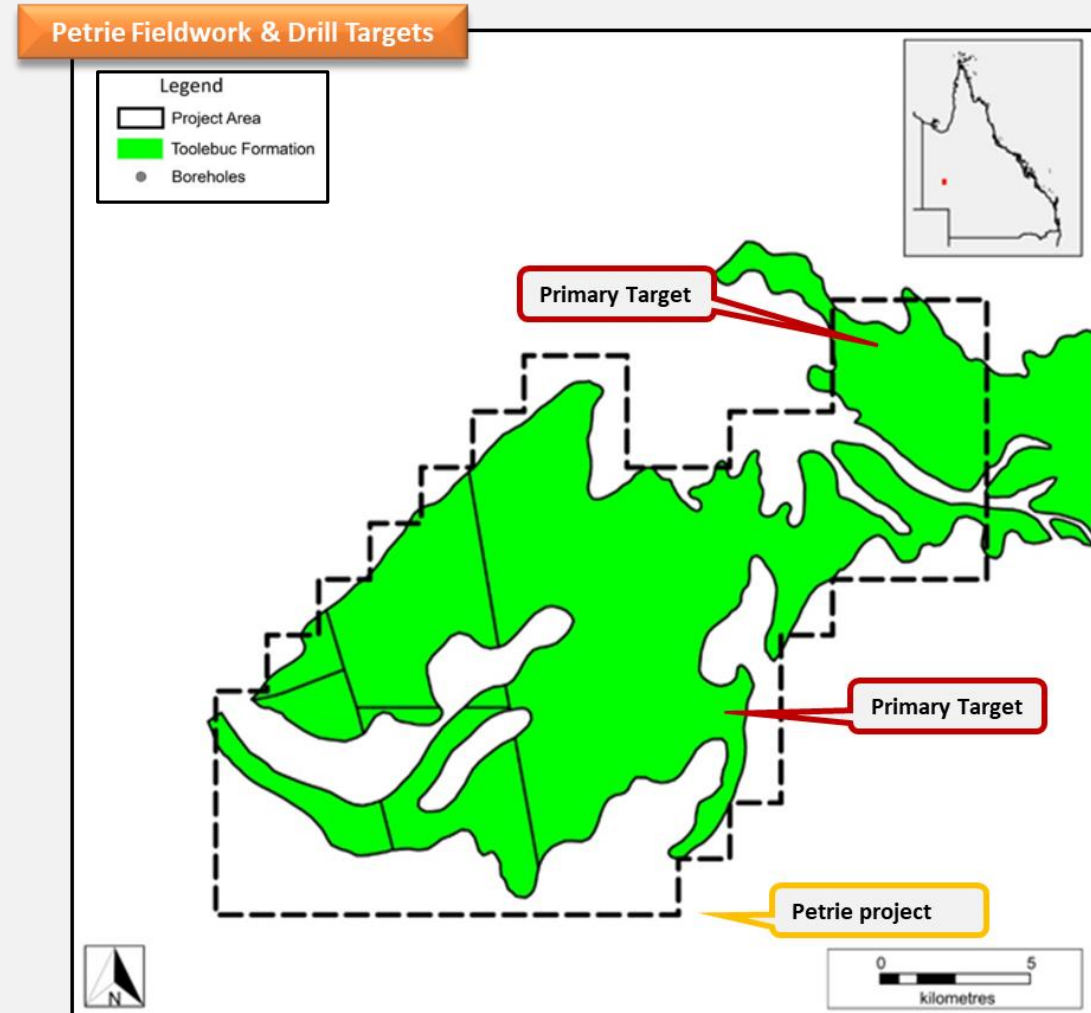
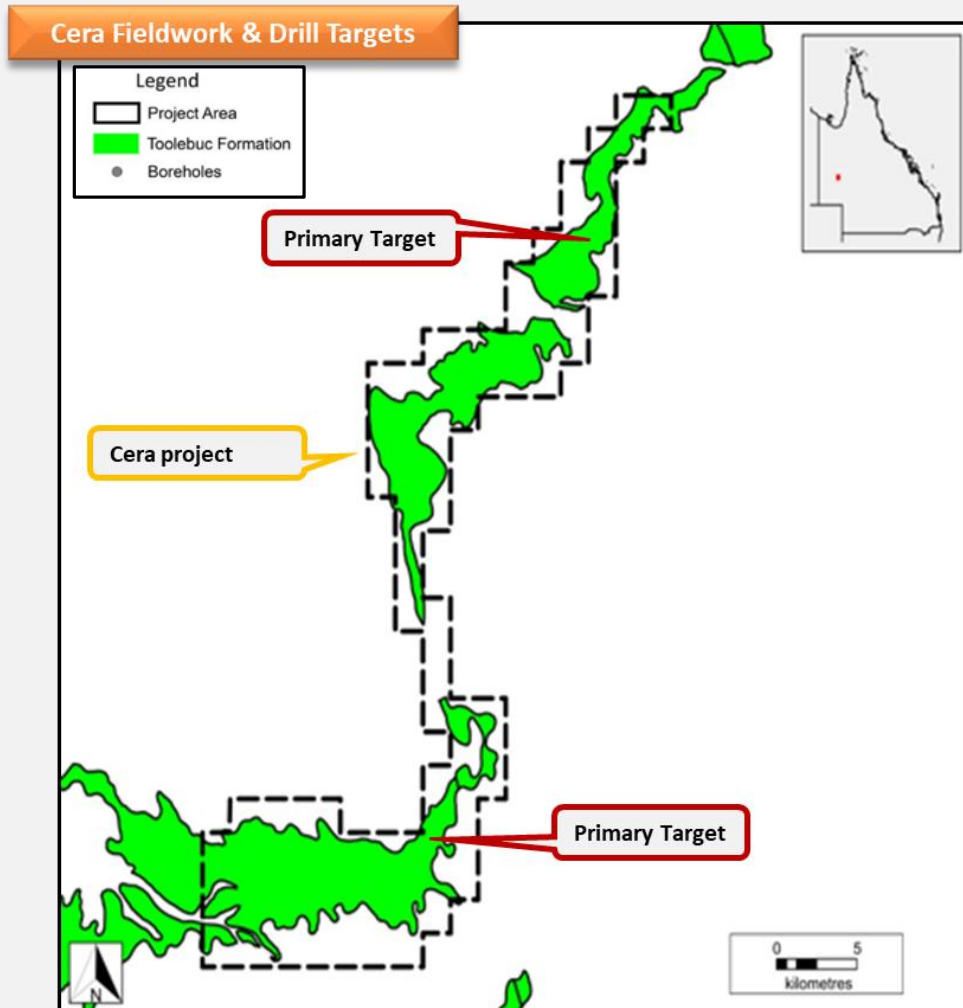
Sharptooth Fieldwork & Drill Targets



Spike Fieldwork & Drill Targets

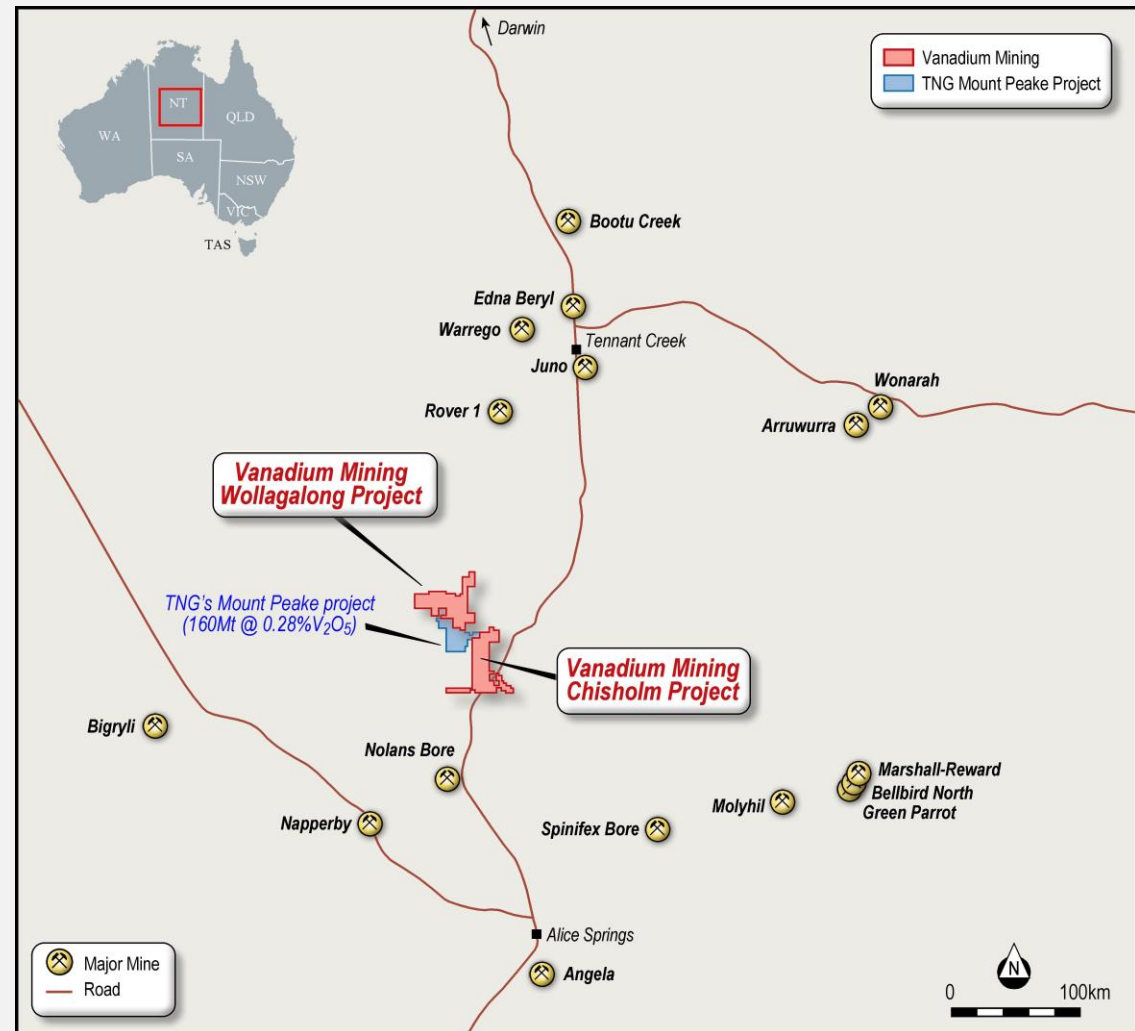


Cera / Petrie projects: vanadium targets



NT: prospective for high-grade vanadium

- The two NT prospects, Wollagalong and Chisholm, are contiguous to TNG's Mt Peake project
- They are in an area with higher-grade mineralisation associated with ore bodies that have the potential to be selectively mined by open pit methods
- Mt Peake is the most advanced vanadium project in the region, with a defined resource (Total Resource^{^^} 160Mt @ 0.28% V₂O₅ cut-off grade of 0.10% V₂O₅ grade* →) and completed feasibility study
- TNG have a mine-life off-take agreement with Woojin Metal (Korea) and technology transfer agreement*



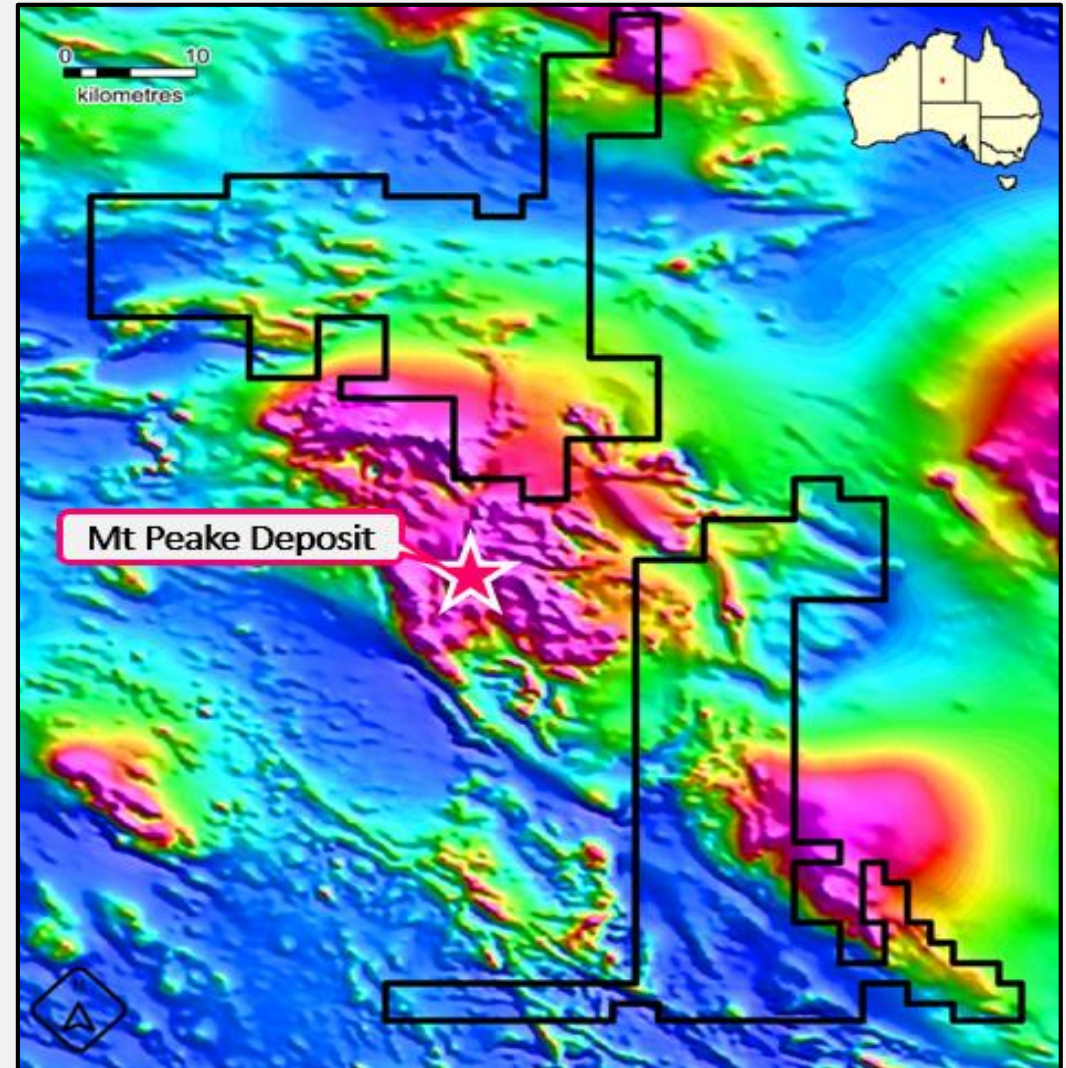
→ Refer HDY ASX Release 19 July 2018

• TNG ASX Release 20 November 2017 & TNG ASX Release 26 March 2013

^^ Mineral Resources reported to the JORC (2012) Code

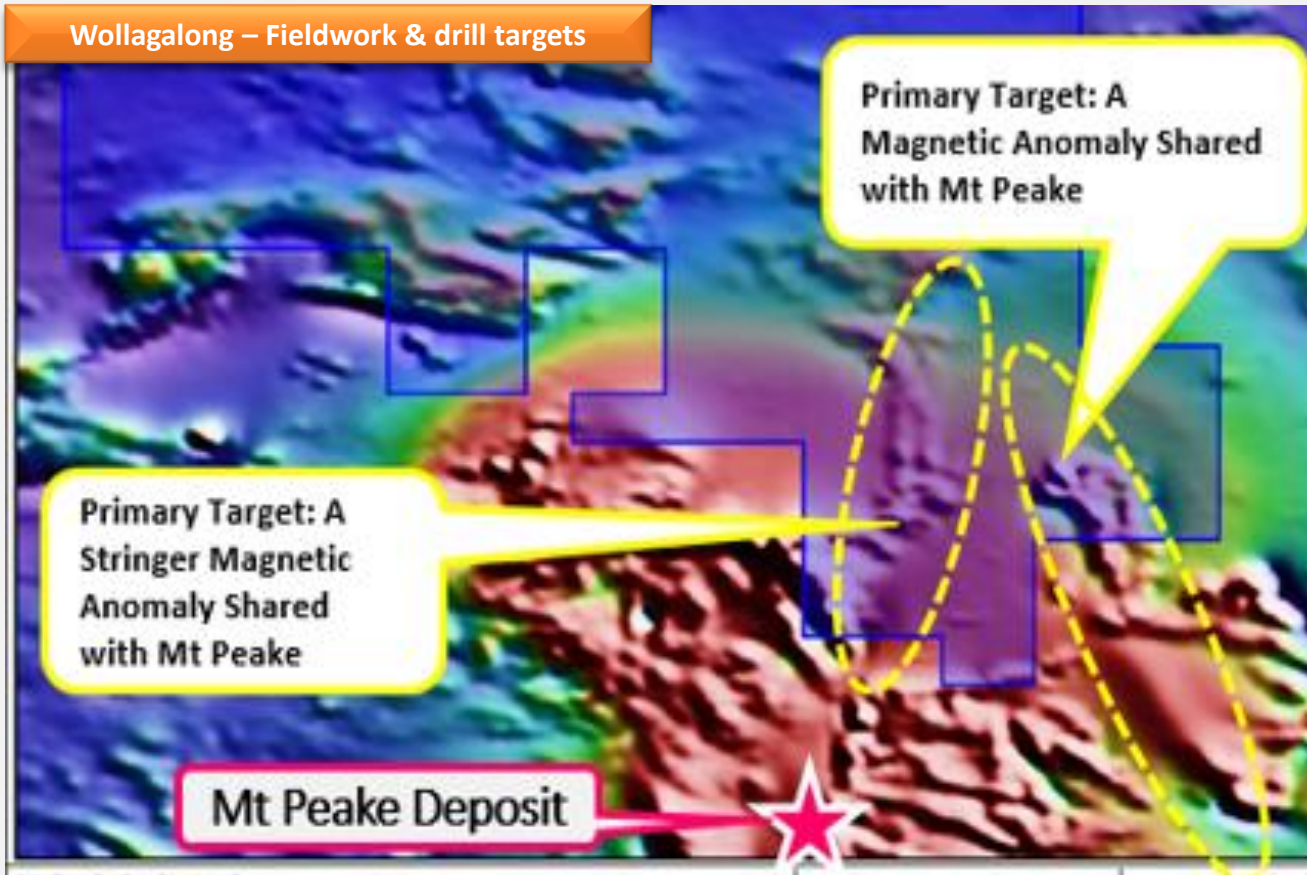
NT: magnetic image highlights mineralisation

- The magnetic response identified by aerial surveys indicates two phases of mineralisation, with E-W and N-S trending structures visible and intersecting within the project areas
- The projects have similar geological and magnetic features to Mt Peake's declared resource for vanadium, titanium and iron
- These features are believed to be gabbro hosted magnetite deposits, which are key targets for follow up field work ▯

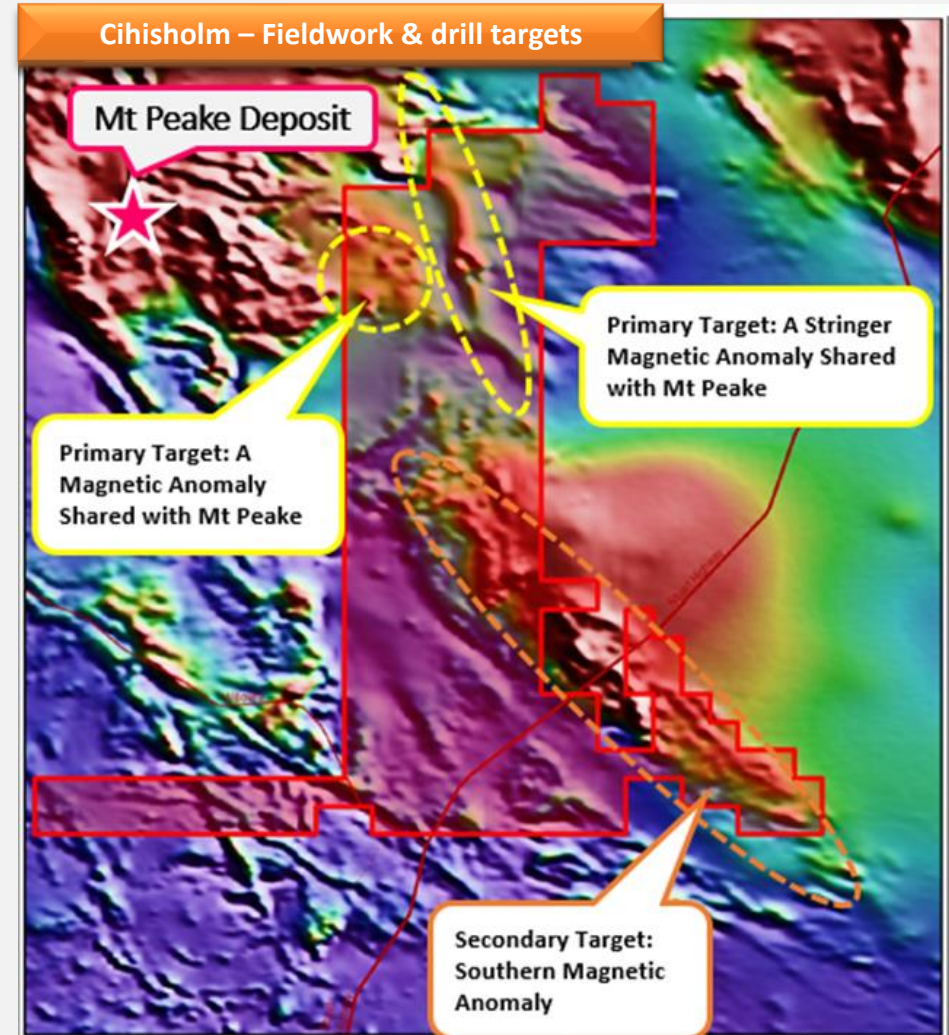


Wollagalong & Chisholm exploration targets

Wollagalong – Fieldwork & drill targets



Chisholm – Fieldwork & drill targets

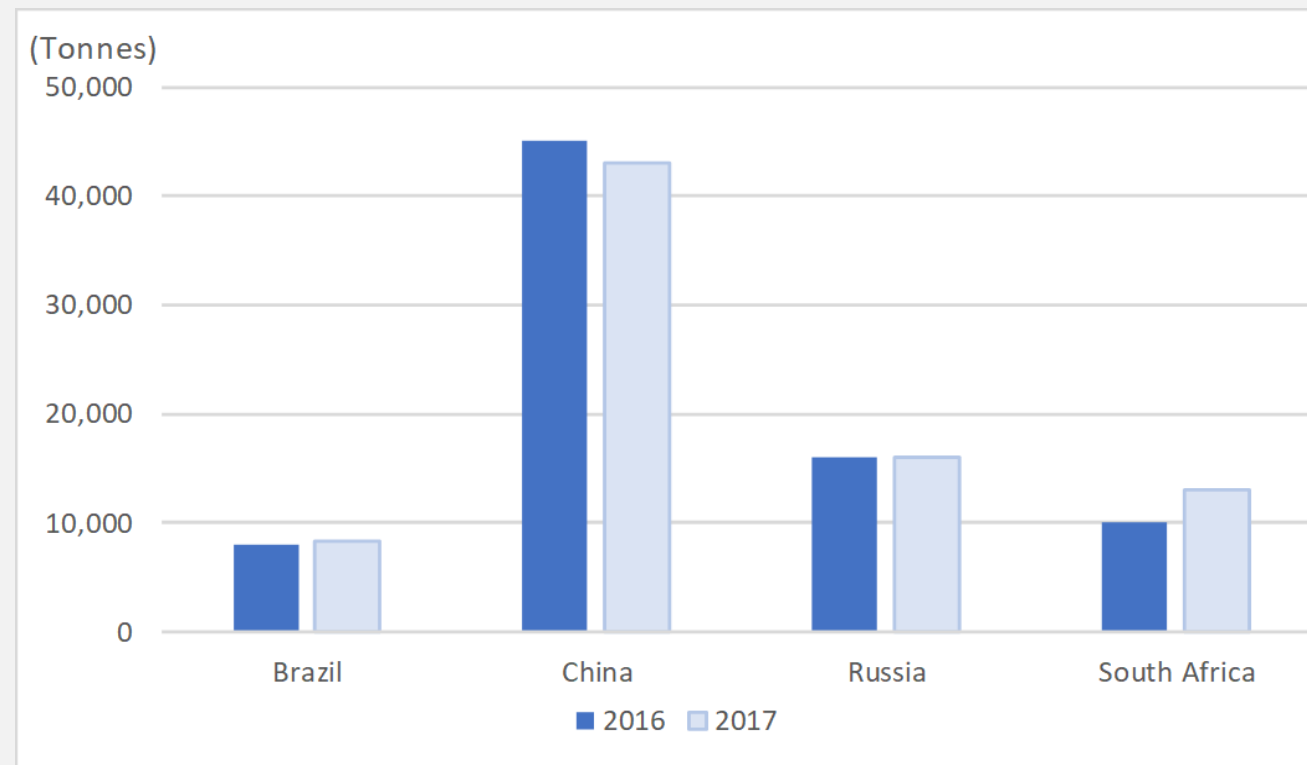


APPENDICES



A: Supply-side dynamics at work...

- On the supply side, China's clamp down on polluting vanadium mines reduced its output nearly 5% YoY in 2017 to 43,000t
- Higher output from South Africa resulted in only a 2% increase in global production to 80,400t

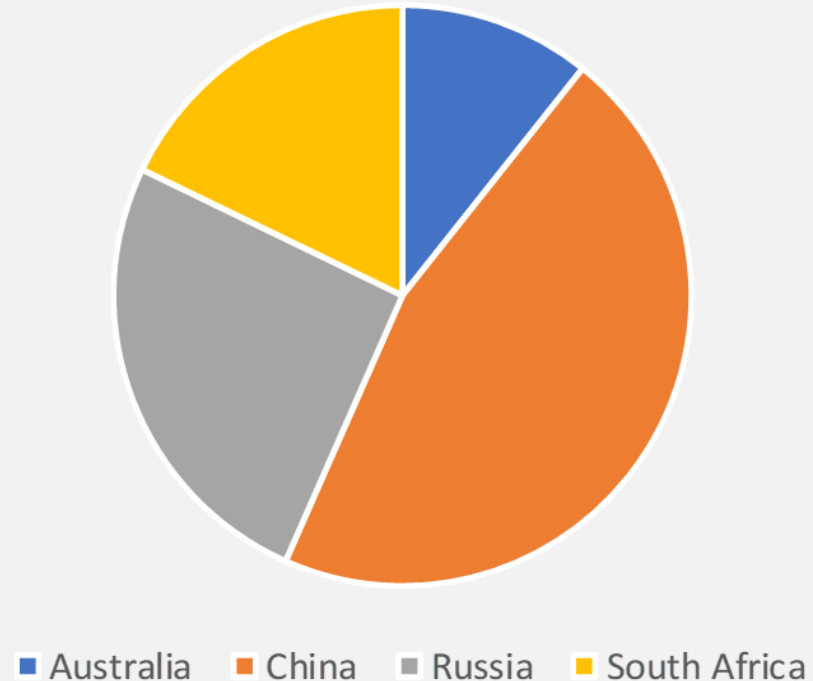


Source: USGS

A: ...limited new options available

- According to USGS, Australia has the fourth largest vanadium reserves globally, which are largely unexploited (Note: no data is available on South America)

Global Vanadium Reserves (19.6Mt)



Source: USGS

A: Demand-side applications accelerating

- Traditionally the steel industry has driven vanadium demand, but at the margin it is now the stored energy sector
- As such, with demand for scalable energy storage accelerating, reflecting wider renewable energy adaption, VRBs are an emerging solution end-users prefer[^]
- Key VRB positives comprise:
 - ❖ Scalability and suitable for grid connection;
 - ❖ 20-yr lifespan and instant energy release;
 - ❖ Excellent charge retention / discharge; and
 - ❖ Using only one element in electrolyte form: V_2O_5
- This transformation is propelling vanadium towards energy commodity status

B1: Vanadium explained

- Vanadium is a soft, ductile and very rare metal
- Periodic table symbol *V* and atomic number 23
- Vanadium can be found in numerous mineral forms and as a trace element in oil deposits
- Typical ores are vanadinite, carnotite and patronite
- Vanadium must be processed into vanadium pentoxide (V_2O_5) for market requirements

Vanadium



Vanadium Pentoxide



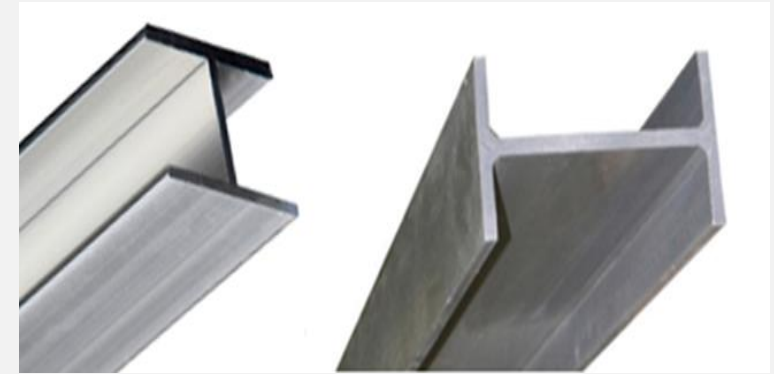
B2: Types of vanadium mineralisation

- Based on the location of VM's projects in QLD and NT, it is geologically exposed to two differing types of vanadium mineralisation:
 - ❖ **Oil shale vanadium mineralisation:** this grade of vanadium mineralisation ranges from 0.30-to-0.40% V within enormous deposits (from several hundred to > a billion tonnes) that are located near surface which facilitates easy and economic open-pit bulk mining methods
 - ❖ **Titano-magnetite vanadium mineralisation:** the vanadium mineralisation grade is circa 0.30% V, comprising a polymetallic ore located at shallow depths enabling exploitation via open cut mining
 - Deposits potentially have economic mineralisation including TiO_2 , Fe, Al_2O_3 , SiO_2 , and V_2O_5 which is the case with TNG's Mt Peake deposit in NT

C: Vanadium uses – traditional...

- Vanadium is used for alloys (85%), acid production, ceramics and batteries
- Vanadium is added in small amounts ($< 0.2\%$) to structural steels
- The alloy improves steel toughness, ductility, and strength owing to the grain refining effect of vanadium carbide precipitates
- These steels are used in automotive components, such as hoods and door panels, in oil and gas pipelines, and in structural steel
- Notable legacy – Vanadium was first used in the production of the *Ford Model T*

Structural steel products



Ford Model T



C: ...and hi-tech applications

- Vanadium Redox Battery (VRB) technology provides a commercial solution for the grid storage of green energy
- VRBs can connect to power plants, electrical grids or solar energy sources

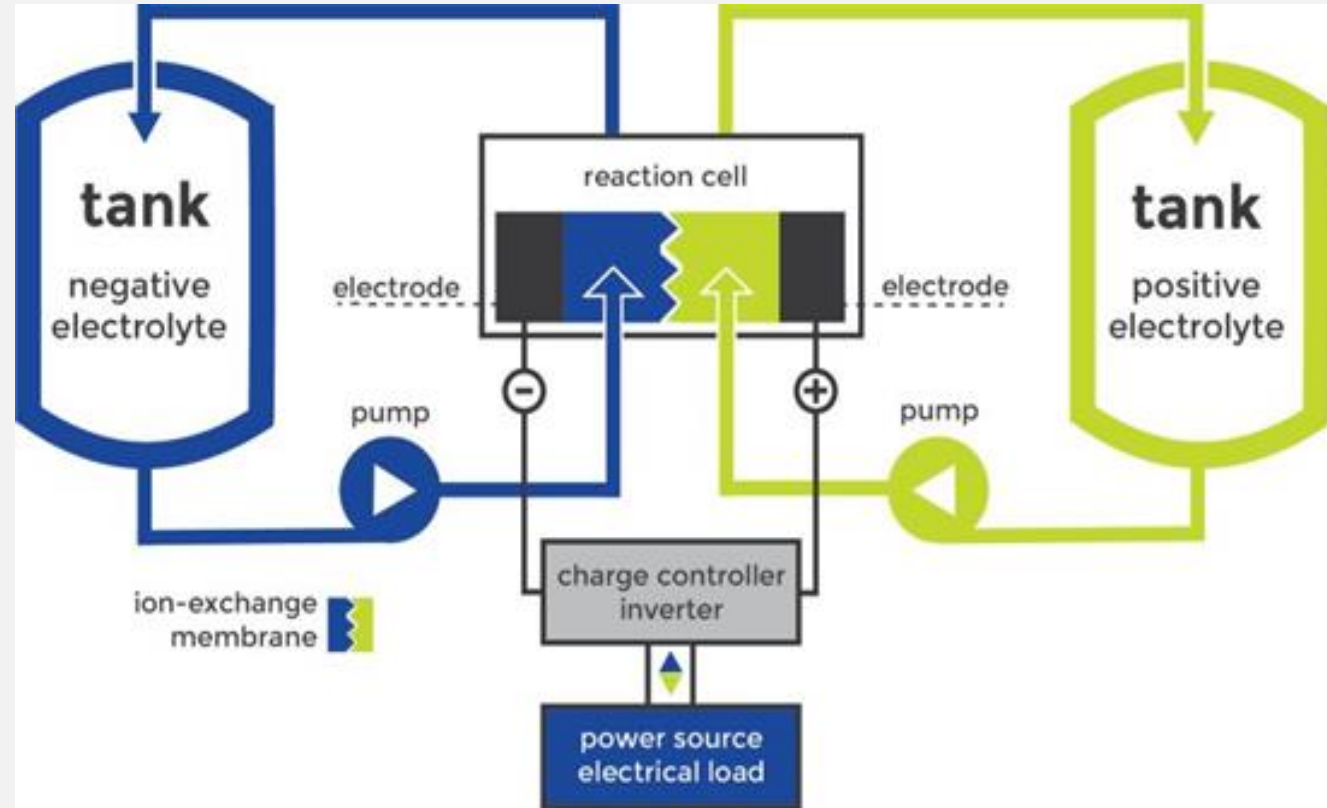


D: How VRBs work and key advantages

- Vanadium ions permit a rechargeable flow to store or dissipate energy

VRB Advantages:

- The fluid electrolyte storage tanks provide scalability in energy capacity
- The potential to be left completely discharged for long periods of time
- The electrolyte is aqueous and inherently safe and non-flammable



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