AUSTRALIAN
RESEARCH
INDEPENDENT INVESTMENT RESEARCH

TNG Limited (ASX:TNG)

April 2018

INDEPENDENT
INVESTMENT RESEARCH

WHO IS IIR?

Independent Investment Research, "IIR", is an independent investment research house based in Australia and the United States. IIR specialises in the analysis of high quality commissioned research for Brokers, Family Offices and Fund Managers. IIR distributes its research in Asia, United States and the Americas. IIR does not participate in any corporate or capital raising activity and therefore it does not have any inherent bias that may result from research that is linked to any corporate/ capital raising activity.

IIR was established in 2004 under Aegis Equities Research Group of companies to provide investment research to a select group of retail and wholesale clients. Since March 2010, IIR (the Aegis Equities business was sold to Morningstar) has operated independently from Aegis by former Aegis senior executives/shareholders to provide clients with unparalleled research that covers listed and unlisted managed investments, listed companies, structured products, and IPOs.

IIR takes great pride in the quality and independence of our analysis, underpinned by high caliber staff and a transparent, proven and rigorous research methodology.

INDEPENDENCE OF RESEARCH ANALYSTS

Research analysts are not directly supervised by personnel from other areas of the Firm whose interests or functions may conflict with those of the research analysts. The evaluation and appraisal of research analysts for purposes of career advancement, remuneration and promotion is structured so that non-research personnel do not exert inappropriate influence over analysts.

Supervision and reporting lines: Analysts who publish research reports are supervised by, and report to, Research Management. Research analysts do not report to, and are not supervised by, any sales personnel nor do they have dealings with Sales personnel

Evaluation and remuneration: The remuneration of research analysts is determined on the basis of a number of factors, including quality, accuracy and value of research, productivity, experience, individual reputation, and evaluations by investor clients.

INDEPENDENCE – ACTIVITIES OF ANALYSTS

IIR restricts research analysts from performing roles that could prejudice, or appear to prejudice, the independence of their research.

Pitches: Research analysts are not permitted to participate in sales pitches for corporate mandates on behalf of a Broker and are not permitted to prepare or review materials for those pitches. Pitch materials by investor clients may not contain the promise of research coverage by IIR.

No promotion of issuers' transactions: Research analysts may not be involved in promotional or marketing activities of an issuer of a relevant investment that would reasonably be construed as representing the issuer. For this reason, analysts are not permitted to attend "road show" presentations by issuers that are corporate clients of the Firm relating to offerings of securities or any other investment banking transaction from that our clients may undertake from time to time. Analysts may, however, observe road shows remotely, without asking questions, by video link or telephone in order to help ensure that they have access to the same information as their investor clients.

Widely-attended conferences: Analysts are permitted to attend and speak at widely-attended conferences at which our firm has been invited to present our views. These widely-attended conferences may include investor presentations by corporate clients of the Firm.

Other permitted activities: Analysts may be consulted by Firm sales personnel on matters such as market and industry trends, conditions and developments and the structuring, pricing and expected market reception of securities offerings or other market operations. Analysts may also carry out preliminary due diligence and vetting of issuers that may be prospective research clients of ours.

INDUCEMENTS AND INAPPROPRIATE INFLUENCES

IIR prohibits research analysts from soliciting or receiving any inducement in respect of their publication of research and restricts certain communications between research analysts and personnel from other business areas within the Firm including management, which might be perceived to result in inappropriate influence on analysts' views.

Remuneration and other benefits: IIR procedures prohibit analysts from accepting any remuneration or other benefit from an issuer or any other party in respect of the publication of research and from offering or accepting any inducement (including the selective disclosure by an issuer of material information not generally available) for the publication of favourable research. These restrictions do not preclude the acceptance of reasonable hospitality in accordance with the Firm's general policies on entertainment, gifts and corporate hospitality.

DISCLAIMER

This publication has been prepared by Independent Investment Research (Aust) Pty Limited trading as Independent Investment Research ("IIR") (ABN 11 152 172 079), an corporate authorised representative of Australian Financial Services Licensee (AFSL no. 410381. IIR has been commissioned to prepare this independent research report (the "Report") and will receive fees for its preparation. Each company specified in the Report (the "Participants") has provided IIR with information about its current activities. While the information contained in this publication has been prepared with all reasonable care from sources that IIR believes are reliable, no responsibility or liability is accepted by IIR for any errors, omissions or misstatements however caused. In the event that updated or additional information is issued by the "Participants", subsequent to this publication, IIR is under no obligation to provide further research unless commissioned to do so. Any opinions, forecasts or recommendations reflects the judgment and assumptions of IIR as at the date of publication and may change without notice. IIR and each Participant in the Report, their officers, agents and employees exclude all liability whatsoever, in negligence or otherwise, for any loss or damage relating to this document to the full extent permitted by law. This publication is not and should not be construed as, an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. Any opinion contained in the Report is unsolicited general information only. Neither IIR nor the Participants are aware that any recipient intends to rely on this Report or of the manner in which a recipient intends to use it. In preparing our information, it is not possible to take into consideration the investment objectives, financial situation or particular needs of any individual recipient. Investors should obtain individual financial advice from their investment advisor to determine whether opinions or recommendations (if any) contained in this publication are appropriate to their investment objectives, financial situation or particular needs before acting on such opinions or recommendations. This report is intended for the residents of Australia. It is not intended for any person(s) who is resident of any other country. This document does not constitute an offer of services in jurisdictions where IIR or its affiliates do not have the necessary licenses. IIR and/or the Participant, their officers, employees or its related bodies corporate may, from time to time hold positions in any securities included in this Report and may buy or sell such securities or engage in other transactions involving such securities. IIR and the Participant, their directors and associates declare that from time to time they may hold interests in and/or earn brokerage, fees or other benefits from the securities mentioned in this publication.

IIR, its officers, employees and its related bodies corporate have not and will not receive, whether directly or indirectly, any commission, fee, benefit or advantage, whether pecuniary or otherwise in connection with making any statements and/or recommendation (if any), contained in this Report. IIR discloses that from time to time it or its officers, employees and related bodies corporate may have an interest in the securities, directly or indirectly, which are the subject of these statements and/or recommendations (if any) and may buy or sell securities in the companies mentioned in this publication; may affect transactions which may not be consistent with the statements and/or recommendations (if any) in this publication; may have directorships in the companies mentioned in this publication; and/or may perform paid services for the companies that are the subject of such statements and/or recommendations (if any).

However, under no circumstances has IIR been influenced, either directly or indirectly, in making any statements and/or recommendations (if any) contained in this Report. The information contained in this publication must be read in conjunction with the Legal Notice that can be located at http://www.independentresearch.com.au/Public/Disclaimer.aspx.

THIS IS A COMMISSIONED RESEARCH REPORT.

The research process includes the following protocols to ensure independence is maintained at all times:

1) The research process has complete editorial independence from the company and this included in the contract with the company;
2) Our analyst has independence from the firm's management, as in, management/ sales team cannot influence the research in any way;
3) Our research does not provide a recommendation, in that, we do not provide a "Buy, Sell or Hold" on any stocks. This is left to the Adviser who knows their client and the individual portfolio of the client.
4) Our research process for valuation is usually more conservative than what is adopted in Broking firms in general sense. Our firm has a conservative bias on assumptions provided by management as compared to Broking firms.
5) All research mandates are settled upfront so as to remove any influence on ultimate report conclusion;
6) All staff are not allowed to trade in any stock or accept stock options before, during and after (for a period of 6 weeks) the research process.

For more information regarding our services please refer to our website www.independentresearch.com.au.

Contents

INDEPENDENT INVESTMENT RESEARCH

TNG Limited (ASX: TNG)

Update - April 2018

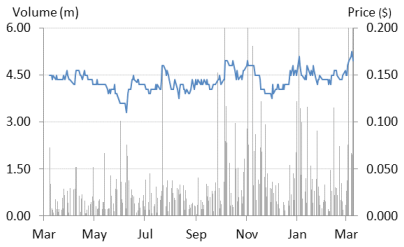
Note: This report is based on information provided by the company as at March 27, 2018

Investment Profile	
Share Price - 26 March 2018	A$0.18
Price Target per share	A$0.51
Issued Capital:	
Ordinary Shares	804m
Listed Options	25.9m
Unlisted Options	12.5m
Fully Diluted	843m
Market Capitalisation	A$144.8m
12 month L/H	A$0.11/$0.185
Cash (December 31, 2017)	A$4.83m
Listed Investments (17 March, 2018)	A$0.81m

Board and Management
Mr Paul Burton: Managing Director
Mr Rex Turkington: Non-Executive Director
Mr Stuart Crow: Non-Executive Director
Mr John Davidson: Non-Executive Director
Mr Simon Robertson: Company Secretary
Mr Paul Vollant: GM, Business Development
Mr Phillipe Guillemaille: Titanium Business Manager
Mr Kim Grey: Exploration Manager

Major Shareholders	
WWB Investments	9.94%
Adsu Investments	6.99%
Top 20	33.22%
Board and Management	3.61%

Price Chart



Senior Analyst – Mark Gordon

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

ADVANCING TO DEVELOPMENT

Subsequent to our November 2017 initiation, TNG Limited ("TNG" or "the Company") has made significant progress towards a planned mid-2018 Final Investment Decision ("FID")for its 100% owned Mount Peake Vanadium-Titanium-Iron Project ("Mount Peake" or "the Project"), located in the Northern Territory ("NT") of Australia.

In our view a key advance has been in the development of a simplified TiO_2 pigment concentrate production circuit, to allow concentrate to be produced directly from the residue of the TIVAN™ process, rather than going through an intermediate stage. This process, which has been developed in association with lead consultants, should lead to capital and operating cost reductions, and help advance negotiations for titanium offtake (our modelling indicates that titanium products provide some 60% of the revenue of Mount Peake); securing titanium product offtake will be critical in obtaining finance for the development of Mount Peake.

Both mine and plant site permitting have also advanced, with the Company expecting grant of the Mount Peake Mining Lease ("ML") in mid-2018; this is subject to pre-existing requirements including finalisation of a Mining Agreement with the Central Lands Council, for which negotiations are near completion. The Environmental Impact Assessment ("EIA") for the mine site has been approved by the NT Government, and Environmental Impact Study ("EIS") work for the Darwin plant site is also expected to be completed in the next few months.

Progress has also been made on project implementation, with key consultants being appointed over recent weeks.

KEY POINTS

Titanium pigment process developed: The Company, in associated with technical consults METS, SMS, and the CSIRO, has developed a high purity TiO_2 pigment process directly utilising the residue of the proprietary TIVAN™ process, which itself extracts the vanadium and iron from the concentrate feedstock.

Cost and Revenue benefits: Although no figures have been provided as yet by TNG, this simplified processing, largely using widely used off the shelf technology, is expected to result in lower capital and operating costs, improving the economics of an already robust project.

Offtake and financing benefits: Securing offtake for TiO_2 products will result in offtake agreements being in place for all three product lines; this is vital in obtaining financing for the Project, with financing negotiations currently progressing with a number of options being explored.

Environmental permitting advancing: The NT Government has approved the EIA for the Mount Peake mine site, with this now in the hands of the Federal Government for a final determination which is expected following standard processing times; in addition the Darwin plant site EIS is underway with the contract being awarded to experienced environmental consultants.

Mining Lease grant expected soon: The expected mid-2018 granting of the Mining Lease ("ML") is predicated on, in part, the signing of a Mining Agreement with the Traditional Owners - this agreement is progressing well, with the Company expecting finalisation in the next month or two.

Key implementation consultants appointed: The appointment of Como Engineers, McMahon Services and Clough Projects (all well regarded and experienced groups) will allow the Company to now commence project implementation activities in anticipation of a positive FID.

Strong vanadium and titanium markets, investor interest returns: Both titanium and vanadium markets have improved significantly over recent months; in particular vanadium has improved markedly, with V_2O_5 prices recently reaching over US$30/kg, up from lows of US$10/kg in early 2016. The main driver to date has been a deficit in vanadium markets; this has also led to strong renewed investor interest in vanadium with this interest also driven by forecast demand increases for use in vanadium redox flow batteries ("VRFB").

News flow from significant events: All going well, we would expect news flow regarding significant advances, largely related to permitting, offtake and financing over the coming months leading to the FID.

VALUATION SUMMARY

We have increased our base case, risked target price per share from A$0.41 to A$0.51. This is due to our increase of the risk factor from 60 to 65% given recent activities, and an increase in our forecast vanadium prices.

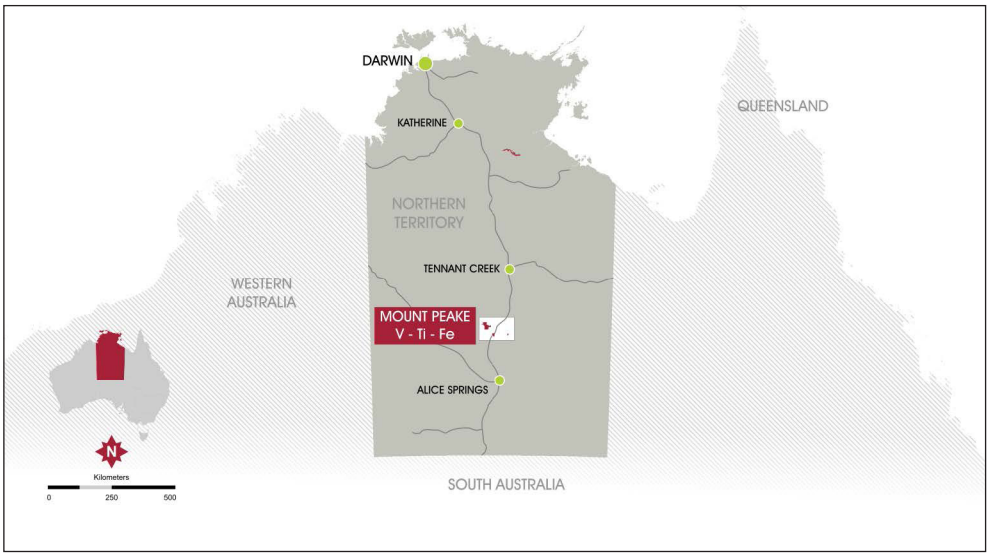
TNG indicative base case valuation

Asset	Value (A$m)	Risk Factor	Risked	Risked/Share	Notes
Mount Peake	$1,877	65%	$1,220	$0.507	Post-tax NPV_8
Cash	$4.83	100%	$4.83	$0.002	As at December 31, 2017
Todd River Holding	$0.77	100%	$0.77	$0.000	Current
Total	**$1,883**	**N/A**	**$1,226**	**$0.510**	

ACTIVITIES UPDATE

- The report presents an update to our initiation report published in November 2017, and available from IIR's and the Company's websites.
- TNG's strategy is the development of Mount Peake, which includes the mine and concentration plant near Alice Springs, and the planned TIVAN™ processing plant in Darwin (a key part of the strategy) - concentrate will be trucked 80km from the mine site and then railed 1,180km to Darwin for downstream processing (Figure 1).
- The 100% TNG-owned TIVAN™ is a proprietary hydrometallurgical process, initially developed by TNG, Perth based Metallurgical Engineering Technical Services ("METS") and the Commonwealth Scientific and Industrial Research Organisation ("CSIRO"), designed to extract high purity vanadium, titanium and iron oxide products from titaniferous magnetite concentrates; subsequent work has been carried out in conjunction with the SMS Group ("SMS") a major European based global metallurgical engineering group.
- The updated DFS, released in November 2017 and presented in our initiation report envisages a 17 year production term, producing a total of 243kt of V_2O_5, 10.6Mt of Fe_2O_5 and 3.5Mt of TiO_2 pigment for an estimated up front capital cost of A$853 million - the study resulted in a pre-tax, unfunded NPV_8 of A$4.7 billion.
- On the technical side, activities subsequent to our initiation report have been focussed largely on metallurgy, and on the non-technical side offtake, permitting, financing and project implementation - significant and important advances have been made on all of these fronts, further de-risking and adding impetus to the Project.
- In addition, we would expect major progress over the next few months, with the FID expected by mid-year.

Figure 1: Project location map



Source: TNG

TITANIUM PIGMENT PRODUCTION PROCESS

- On February 26, 2018, the Company announced that it had developed a process for streamlining production of high grade TiO_2 concentrate suitable for use in pigments.
- The updated Feasibility Study, completed in November 2017, envisaged a two-stage process:
  - Treatment of the TIVAN™ residue to an intermediate 65% TiO_2 product; and,
  - Additional chloride processing to refine the 65% TiO_2 product to a +92.5% pigment grade concentrate.
- The new process, developed by TNG and consultants METS, SMS and the CSIRO has, on a bench scale, produced high grade TiO_2 suitable for use as a pigment concentrate directly from residue from the proprietary hydrometallurgical TIVAN™ process using a modified sulphate processing route.

- The residue is the material left over after the vanadium and iron has been removed by the TIVAN™ process, and provides a low impurity and low iron feedstock for the modified sulphate pigment process developed by the Company.
- One of the benefits of this process when compared to the standard sulphate process is, due to the low iron content, the potential to minimise the environmental impact due to the low amount of iron sulphate waste - the standard process, which treats ilmenite ($FeTiO_3$) or similar minerals using sulphuric acid, has appreciable amounts of the acidic iron sulphate as a waste product that needs to be disposed of, and provides a potential environmental hazard.
- The standard sulphate process is "off the shelf" technology, having been originally developed in 1931, and being widely used since then.
- This development has potential key advantages:
  - Reduction in operating costs, capital costs and plant complexity when compared against the original planned process, and critically,
  - Allowing TNG to further advance TiO_2 offtake discussions by confirming the potential pigment type.

OFFTAKE AND FINANCING

- As mentioned above, the recently developed pigment process has given more certainty to ongoing negotiations for TiO_2 concentrate offtake, with offtake agreements required for project financing - our modelling suggests that TiO_2 products will potentially provide ~60% of the revenue stream for Mount Peake.
- The Company currently has an MoU in place with global TiO_2 trader Wogen for Life-of-Mine ("LOM") marketing and sales of TiO_2 products, and TNG's continuing discussions on offtake with Wogen and other producers and end users of pigment products.
- Offtake agreements currently in place include:
  - A Binding LOM Offtake Agreement for 60% of vanadium products with WOOJIN Metals of South Korea (this incorporates a "Technology Transfer Agreement whereby TNG has access to WOOJIN's V_2O_5 to ferrovanadium production technology, with a view to installing this on site); and,
  - A Binding Term Sheet with global trader Gunvor for the LOM offtake of a minimum of 60% of the iron products; the Company is continuing discussions with other parties for the remaining 40% of forecast production.
- With regards to financing, given the partnership with the German SMS Group, TNG has the potential for funding through German export credit banks.
- As part of this, the Company has had preliminary discussions with the Government owned IPEX-Bank GmbH, with the bank providing an expression of interest to conduct further due diligence which may lead to a mandate for financing.
- Other debt finance providers approached include the North Australian Infrastructure Fund ("NAIF") and EFIC, Australia's Export Credit Finance Agency - discussions with these groups are early stage and any potential involvement in funding the Project is currently unknown.

PERMITTING

- One of the key aspects of project development is permitting, with the Company making significant progress on this aspect.
- Critically, the Northern Territory Environmental Protection Agency ("NTEPA") has provided an approved Assessment Report for the Mount Peake mine site, with this completing the EIA process for this part of the planned operations.
- This Assessment Report has now been lodged with the Commonwealth Department of Environment and Energy ("DoEE") for their assessment - this is currently ongoing.
- Finalisation will allow the Company to move into obtaining the Mining Approval, which includes finalisation and lodgement of the Mine Management Plan ("MMP") - this will incorporate recommendations made by the NTEPA in relation to the Assessment Report.
- Other ongoing permitting activities include the Mount Peake Mining Agreement with the Central Land Council (CLC), the representatives of the Traditional Owners.
- This has been in progress for ~12 months, and the Company has stated, in an announcement made on March 6, 2018, that this is expected to be finalised in April 2018.

- The completion of the EIA, MMP and the Mining Agreement will pave the way for granting of the Mining Lease, which the Company expects by mid-2018.
- The EIS for the proposed Darwin plant site has recently commenced with Perth based specialist environmental group Animal Plant Mineral ("APM") being appointed to oversee this process following their completion of the mine site EIS.
- It is expected that this work will be completed in coming months.

PROJECT IMPLEMENTATION

- Three significant project implementation steps have been made since our initiation report - these include the commissioning of an alternative energy study for the Mount Peake mine and Darwin processing sites, the signing of a strategic agreement for the provision of engineering, procurement and construction ("EPC") services for Mount Peake and the appointment of the lead consultant for Project Management of construction of various facilities at the mine site.
- The alternative energy study has been made with Energy Made Clean ("EMC"), a wholly owned subsidiary of ASX-listed Carnegie Clean Energy (ASX: CCE); this follows on from a previous MoU.
- The study will assess the viability of using alternative energy sources at Mount Peake, including VRFBs and other alternative technologies; this will also investigate the possibility of obtaining funding through the Australian Renewable Energy Agency ("ARENA").
- As part of the alternative energy strategy, the Company is working with a leading global VRFB manufacturer for the supply of suitable batteries.
- Successful implementation of alternative energy sources has the potential to significantly decrease energy operating costs.
- On the EPC side, the Company has signed a strategic co-operation agreement with McMahon Services ("McMahon") and Clough Projects ("Clough") to provide services at Mount Peake.
- This will see these leading Australian based EPCM managers form a joint venture (the McMahon Services Clough JV) which will initially carry out a full review of the November 2017 updated FS to evaluate the preliminary construction management and procurement contracting services required for the Project - this will be undertaken together with SMS.
- Como Engineers Pty Ltd ("Como") has been appointed as the lead consultant for project management of the construction of the Mount Peake concentrator and key infrastructure; this will involve the creation of a steering committed to allow TNG to retain overall control of the Project whilst securing project management and technical support from Como.

VRFB POTENTIAL

- One of the forecast demand drivers for vanadium is in the VRFB sector (refer to section on vanadium below), with TNG ideally placed to take advantage of this expected growth.
- The Company has already demonstrated that the V_2O_5 flake product from the TIVAN™ process is suitable for VRFB electrolyte, and as such the Company is looking to create relationships and alliances with VRFB manufacturers and "green" energy faculties.
- As discussed above the Company is also investigating using VRFBs to provide on-site power.

SUMMARY OF PLANNED ACTIVITIES

- Upcoming activities will be concentrated on permitting, offtake and financing.
- On the permitting fronts, the following timelines, as stated earlier, are expected:
  - DoEE approval of the Approved Study - expected following standard processing times,
  - Mining Agreement - CLC - April, 2018,
  - Mining Lease approval - Mid-2018, and,
  - Darwin plant site EIS - coming months.
- Offtake and financing activities and discussions are progressing, including on the key titanium dioxide offtake.

- On the metallurgical front both the mine site concentration and Darwin-based TIVAN™ processing are now optimised to produce the three key product streams; ongoing work now will include Final Engineering and Design ("FEED") work based on the final optimised TIVAN™ flowsheet and concentrate specifications.

VALUATION

- We have updated our valuation for TNG, including a risked DCF valuation for Mount Peake, and current valuations for cash and holdings in Todd River Resources - our base case valuation is shown in Table 1 - this is post tax, uses a conceptual funding scenario (70% debt, 30% equity) and uses conservative metals prices.
- As for our November 2017 valuation, inputs are largely those as provided by TNG; the only changes from our 2017 valuation and the one presented here are an increase in vanadium pentoxide price from US$14,000/tonne to US$16,500/tonne, an increase in the risk multiplier for Mount Peake from 60% to 65% to reflect progress, and actual changes in the values of cash and the Todd River holding.

Table 1: TNG indicative base case valuation

TNG indicative base case valuation					
Asset	Value (A$m)	Risk Factor	Risked	Risked/Share	Notes
Mount Peake	$1,877	65%	$1,220	$0.507	Post-tax NPV_8
Cash	$4.83	100%	$4.83	$0.002	December 31, 2017
Todd River Holding	$0.77	100%	$0.77	$0.000	Current
Total	**$1,883**	**N/A**	**$1,226**	**$0.510**	
Diluted Shares	2,405 m	Tax Status	Post Tax		30% equity funding
Mount Peake Prices	V_2O_5	Pig Iron	TiO_2	AUD:USD	
	$15,000/t	$350/t	$3,000/t	0.75	IIR scenario

Source: IIR analysis

- Table 2 highlights the similarities in our pre-tax value using TNG's forecast metal prices to the results as presented in the updated DFS, and also shows the effect of the different pricing scenarios, with the NPVs using the TNG scenario being around double those using the conservative IIR scenario - this multiplier can be applied to all subsequent figures, including sensitivity tables - prices used by the Company in the updated FS were US$22,400/tonne for V_2O_5, US$3,500/tonne for titanium pigment and US$410/tonne for pig iron, and are based on independent forecasting.
- We note that the figures in Table 2 are using funded scenarios, however our unfunded pre-tax value using TNG's metals prices is ~A$4.5 billion, within 4% of the A$4.7 billion figure released by TNG.
- We have based our metal prices on the following (we do not have access to the confidential forecasts as used by the Company, and on which their prices are based):
  - V_2O_5 - average real prices over the past 14 years (this is updated from US$14,000/tonne in our November 2017 report to US$16,500/tonne now),
  - Pig iron - average prices since 2011 (unchanged at US$350/tonne), and,
  - TiO_2 - recent prices (unchanged at US$3,000/tonne), which are representative of real prices over the last 15 years, discounting the sharp spike in 2011/2012.
- Although there has been a significant recent appreciation in the price of vanadium to over US$30,000/tonne, our view is that the price we have used could be more indicative of longer term pricing; the metal has a history of volatile pricing (refer Figures 3 and 6); we have taken a similar approach to titanium pigment prices.

Table 2: TNG comparative valuations

TNG comparative valuations				
	Project NPV_8		Risked NPV_8/Share	
Asset	Pre Tax	Post Tax	Pre Tax	Post Tax
Pricing - IIR	$2,654 m	$1,877 m	$0.72	$0.51
Pricing - TNG	$4,723 m	$3,371 m	$1.28	$0.91

Source: IIR analysis

- Tables 3 and 4 present sensitivity analyses for our valuation of the Mount Peake Project on a funded, after tax basis.

Table 3: Un-risked Mount Peake sensitivity analysis

Un-risked Mount Peake sensitivity analysis						
Change	V_2O_5 Price	TiO_2 Price	Pig Iron Price	Exchange Rate	Opex	Capex
-15%	$1,634	$1,288	$1,651	$3,123	$2,519	$2,013
-10%	$1,715	$1,485	$1,727	$2,662	$2,305	$1,968
-5%	$1,796	$1,681	$1,802	$2,249	$2,091	$1,923
0%	$1,877	$1,877	$1,877	$1,877	$1,877	$1,877
5%	$1,959	$2,074	$1,953	$1,541	$1,663	$1,832
10%	$2,040	$2,270	$2,028	$1,235	$1,449	$1,787
15%	$2,121	$2,466	$2,103	$956	$1,235	$1,742

Source: IIR analysis

Table 4: Risked Mount Peake per share sensitivity analysis

Risked Mount Peake per share sensitivity analysis						
Change	V_2O_5 Price	TiO_2 Price	Pig Iron Price	Exchange Rate	Opex	Capex
-15%	$0.442	$0.348	$0.446	$0.844	$0.681	$0.604
-10%	$0.464	$0.401	$0.467	$0.720	$0.623	$0.569
-5%	$0.486	$0.454	$0.487	$0.608	$0.565	$0.537
0%	$0.507	$0.507	$0.507	$0.507	$0.507	$0.507
5%	$0.529	$0.561	$0.528	$0.417	$0.450	$0.479
10%	$0.551	$0.614	$0.548	$0.334	$0.392	$0.453
15%	$0.573	$0.667	$0.569	$0.259	$0.334	$0.428

Source: IIR analysis

- The first four columns are considered revenue factors, with these also being proxies for other revenue factors, including grade and metallurgical recovery; for example a 15% change in vanadium grade or recovery will have a similar effect on project economics as a 15% change in price as shown above; in the case of exchange rates, this can be considered as a proxy for changes in revenue factors for the combined metals.
- As can be seen the project is most sensitive to exchange rates (and hence to combined falls in metals prices), with changes in operating costs coming second; the project is least sensitive to changes in capital costs.
- Changes in the capital cost will also lead to changes in the diluted share structure.

BACKGROUND – COMMODITIES AND MARKETS

VANADIUM AND VRFBs

Introduction

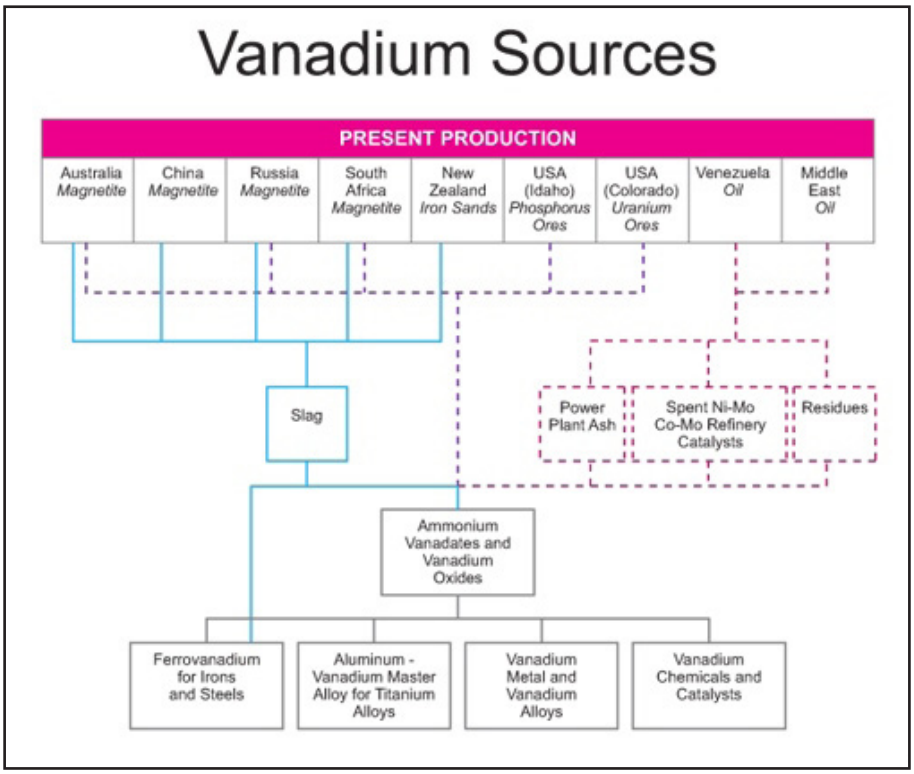
- Recent times have seen a marked increase in vanadium prices, with V_2O_5 recently trading at over US$30,000/tonne, up from US$10,000/tonne in 2016 (Figure 3) - as such we have included this background on the commodity given the resurgence in interest in vanadium.

Background

- The main use of vanadium is as a steel additive in high-strength steel, which accounts for about 92% of the current global demand of ~100,000t of vanadium metal (equivalent to ~180,000t V_2O_5, with the oxide containing 56% V).
- Other uses include chemicals, catalysts and in batteries - vanadium is produced as two main products – FeV for steel-making and V_2O_5 for chemical and battery applications.
- Global production was reportedly ~73,000t in 2016, with the largest source being as a by-product from slag produced from the smelting of titaniferous magnetite ores for steelmaking (Figure 10) – it is estimated that this accounts for ~73% of total supply, with 17% being derived from mining as a primary product and the remainder from secondary sources, including oil residues and fly ash.

- Supply is concentrated, with over 90% of vanadium products produced in South Africa, China, Russia and Brazil.
- New developments include Largo Resources Maracas Project in Brazil, which is now in full production, and exceeding the planned output of 9,200t of V_2O_5 per year, with a planned FeV plant to be added at a later date.

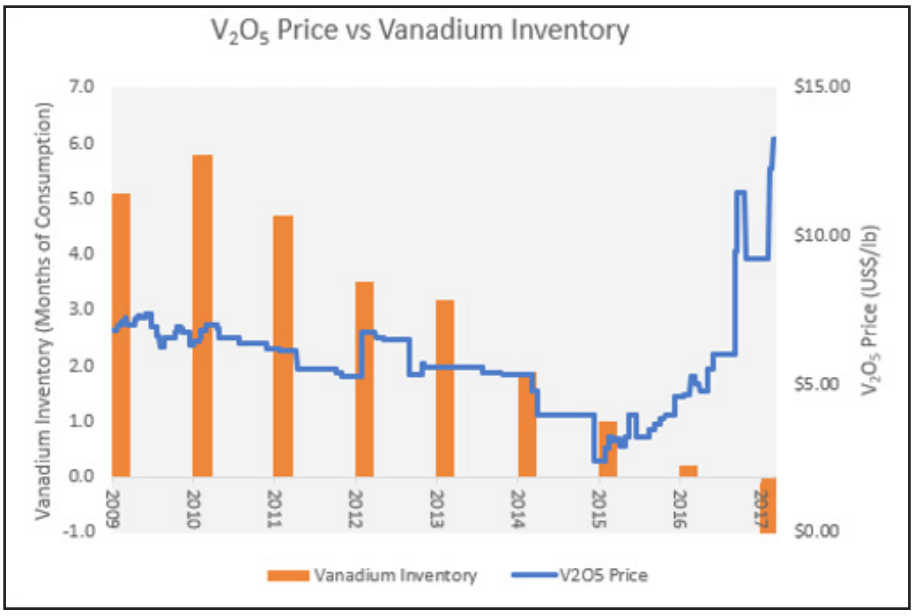
Figure 2: Vanadium sources



Source: Vanitec

- Demand has outstripped supply since 2010, with successive drawdowns on inventory; part of this has been due to industry rationalisation and environmental constraints in China, with this now resulting in the inventories being depleted and hence a recent increase in prices after falling for over 10 years (Figures 3 and 6)

Figure 3: Vanadium Inventory change



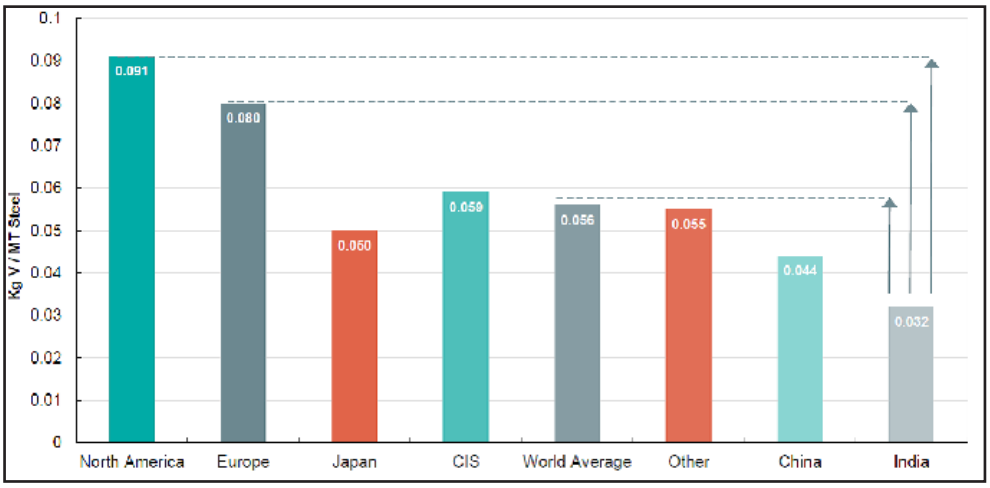
Source: Technology Metals

Demand Drivers

Steelmaking

- The current key demand driver is as an additive in steel – demand for vanadium closely follows the production of steel. This includes two factors – firstly the natural organic growth in steel production and secondly increasing vanadium intensity in steel with the move to lighter weight and higher strength steels – the addition of just 0.2% vanadium to steel increases steel strength by up to 100% and reduces the weight of steel required in relevant applications by up to 30%.
- This second factor is particularly relevant in China, where there is increasing vanadium intensity in rebar due to changes in building standards (with new regulations set to become effective in November 2018), partly following on from the 2008 earthquake - there is still a fair way to go with this and thus significant potential growth in use in this application, however this has the potential to increase Chinese vanadium consumption by up to 50% (15,000tpa).
- Roskill estimate that, although steel production will only grow at 1% CAGR over coming years, the increasing intensity of vanadium in steel along with other end uses will result in a long term demand growth of 3.45% CAGR from ~100,000tpa V in 2015 to 131,000tpa contained V in 2025, with the forecast supply deficits now being seen.
- The graph below shows the relative vanadium intensities in rebar between various jurisdictions.

Figure 4: Vanadium steelmaking intensity

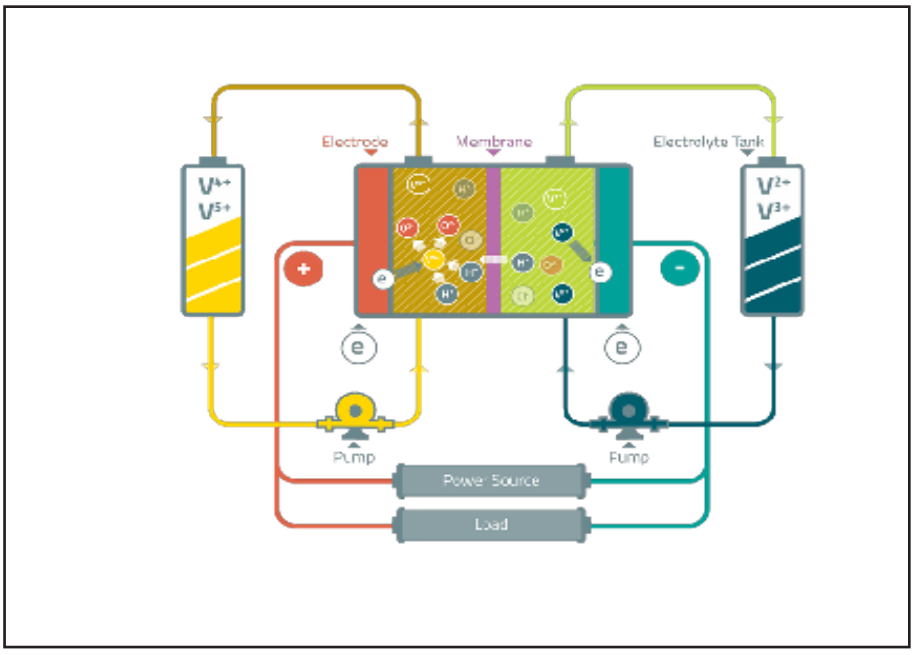


Source: Australian Vanadium

Energy Storage – VRFB's and Li-Ion Batteries

- The blue sky in demand, and the potentially disruptive technology is in grid scale battery usage - the key here will be the adoption of VRFB's that have the capacity for multi-megawatt scale storage - this makes them useful for grid scale applications, including grid balancing and storing energy from variable output sources, including wind turbines and solar cells.

Figure 5: VRFB schematic



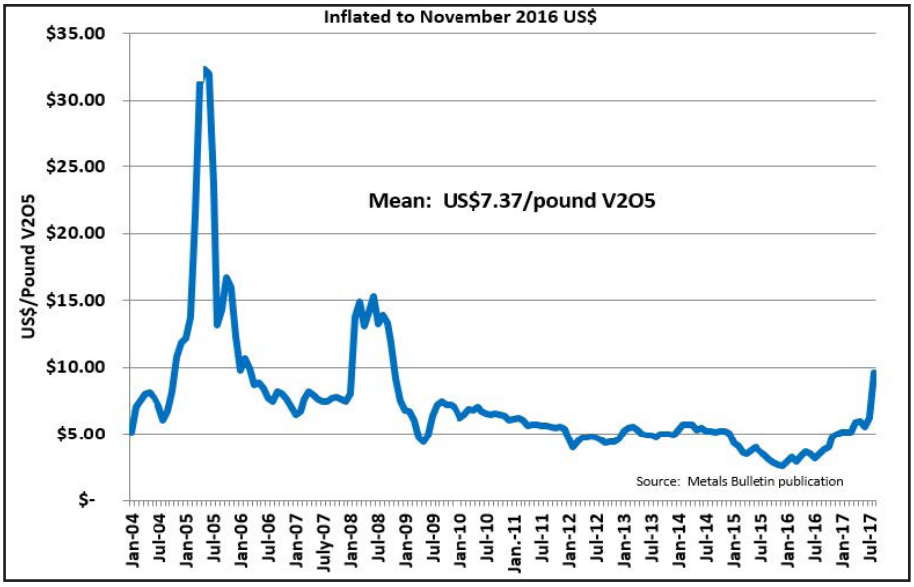
Source: Australian Vanadium

- The batteries are inherently simple, relying on the changing redox state of vanadium to store and then supply power.
- Other attributes of these batteries include:
  - Scalability
  - Long lifespan – up to 20 years
  - Up to a 1 year charge retention
  - 100% discharge without damage, and,
  - Only one element – V in various oxidation states – in electrolyte.
- There are widely differing forecasts on the growth in VRFB's, however some commentators see the potential for VRFBs to provide up to 30% of the growing energy storage market, with some forecasting an additional demand of 300,000t of vanadium over coming years to meet this need.
- There are a number of active VRFB developments globally at the moment, reportedly with the largest being the development of a 200MW/800MWh battery in Dalian, China, which reportedly uses 6,950 tonnes of V_2O_5, at an intensity of 8.7t/MWh; we have also seen documentation for other batteries with a usage intensity of 7.25t of V (12.94t of V_2O_5) per MWh of capacity.
- Other recent developments include a US$200 million, 15MW/60MWh facility by Sumitomo on the Japanese island of Hokkaido.
- Development of VRFBs has been partly hamstrung by the lack of a suitable battery grade V_2O_5 supply – batteries require a higher purity product than that used in steelmaking, and hence arises the opportunity for manufacturers of high purity material.
- Some forecasts see the Australian energy storage market reaching 3,000MWh by 2030 – should the VRFB penetration reach an estimated 30% of the market this will result in the requirement of 900MWh of VRFB capacity over the same period.
- Australia is an ideal market for fringe-of-grid and off-grid storage facilities given the extended power networks and large off-grid areas, thus potentially providing a domestic market for any V_2O_5 producers.
- Assuming a capital intensity of A$1,000,000/MWh, this equates to a A$900 million market, and using an average V_2O_5 intensity of ~10t/MWh (this intensity will vary depending upon the battery producer), this results in a potential domestic demand for an additional 9,000t of V_2O_5 by 2030.
- There is also significant forecast demand (~1/3 of that for VRFB's) for vanadium in Li-ion batteries.

Pricing

- Figure 3 above highlights the recent price recovery to over US$30/kg (US$14 - US$14.50/lb) largely due to de-stocking of inventories over recent years and supply constraints due to rationalisation of the iron ore industry in China (with vanadium being a major by-product) along with environmental constraints leading to a sharp decline in production
- Figure 6 presents a longer term chart of real V_2O_5 prices adjusted to November 2016, and shows the commencement of the recent recovery, which has followed a period of sustained falls in prices, largely post the GFC.
- The 30 year average price has been US$11/kg V_2O_5, with the inflation adjusted mean since 2004 being ~US$16/kg as shown in Figure 14 (note that Figure 14 is in US$/pound, with one kg = 2.205 pounds).
- It is expected that pricing may remain reasonably strong, although as shown in Figure 11 vanadium pricing has a history of volatility.
- The market is not particularly transparent, and also prices do not correlate with steel production even though this is the key demand driver.
- As mentioned earlier wide acceptance of VRFBs may go some way to breaking the price "spike-collapse" pattern over recent times, due to the requirement for a consistent supply of high purity V_2O_5 for the electrolyte.

Figure 6: FeV price chart



Source: Largo presentation

TITANIUM DIOXIDE

Uses and Production

- The majority (90%) of titanium dioxide is used in the pigment industry, being used in various products, including paints, coatings, paper and inks.
- It is a key white pigment in that it has a high refractive index (whiteness), provides UV protection and is non-toxic.
- Other uses include as a metal (military, aerospace and speciality applications) and for welding rod core wire.
- The bulk of feedstock currently comes from the mineral sands industry (67%), with the remainder being produced from blast furnace slag from titanium bearing ores - there is currently no hydrometallurgical production directly from titanomagnetite concentrate as is planned for Mount Peake.
- There are two main pigment production routes – chloride and sulphate, with chloride generally being cleaner and requiring higher grade feedstocks.
- The majority of Chinese capacity is for sulphate grade feedstock; western producers generally use the chloride process (as is proposed for Mount Peake).
- According to the USGS, installed pigment production in 2016 was 7,400,000t, with 2,940,000t (40%) being in China, and with the US coming second with 1,340,000t (18%) of installed production capacity; current Australian capacity is 280,000t (~4%).

- Planned average annual production from Mount Peake would account for some 3% of global capacity.
- Actual global production is closely aligned to world economic conditions, which can result in significant swings in demand and hence pricing; the cost and availability of feedstocks also affects pigment pricing.

Table 5: Titanium dioxide products sold, 2014

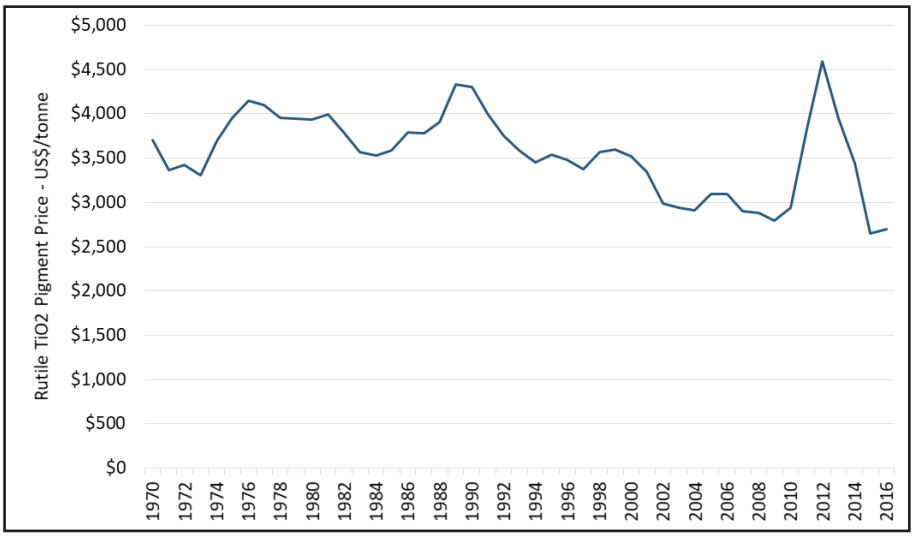
Titanium dioxide products sold, 2014			
Product, approximate market share	TiO2%	Notes	End Uses
Rutile – 10%	95-97	Mined product	Pigments, metal
Synthetic rutile – 3%	88-95	Upgraded from ilmenite in a furnace	Pigments
Ilmenite			
Sulphate – 42%	52-54	Processed to pigment - sulphate processing	Pigments
Chloride – 12%	8-62	Processed to pigment - chloride processing	
Slag			
Sulphate – 11%	80-85	Upgraded from sulphate ilmenite in a furnace	Pigments
Chloride – 19%	85-90	Upgraded from chloride ilmenite in a furnace	
Upgraded – 3%	95	Upgraded from ilmenite	

Source: Iluka.

Pricing

- The mineral sands and downstream pigment markets are relatively opaque – prices are generally fixed between the producer and buyer, and until 2009-2010 were largely on long term contracts, leading to relatively stable prices.
- More recently, changes in demand and supply have led to contracts more commonly being negotiated quarterly or half yearly.
- A recent feature of pricing was a sharp decrease in prices in 2013, which continued into 2016 – this followed slowing in demand during 2012, largely due to weakening global economic conditions.
- There were also significant price increases in feedstocks starting in 2010 - this was as a result of supply constraints enabling producers to renegotiate prices away from long term contracts, which were a disincentive on bringing on new production, with feedstock prices feeding into pigment prices.
- Until 2010 titanium dioxide product prices tended to follow annual GDP growth of around 3%.
- It is forecast by TZMI that there may be a deficit of up to one million TiO_2 units (around 2 Mt of feedstock) by 2020-2021, with prices now increasing due to tightening markets.
- Again feedstock prices are feeding into pigment markets - over recent quarters we have seen sustained rises in pigment prices following a sharp fall off after a peak from 2011 to 2013, with prices rising by over 20% since the beginning of 2016.
- This has resulted in recent prices of ~US$3,200/tonne, with this rising trend forecast to continue.
- Real prices (using 2016 dollars) from 1970 to 2016 are shown in Figure 7 - note that these are average annual prices - as mentioned earlier prices have generally been negotiated on a quarterly basis since 2011.

Figure 7: Real historic US$ TiO_2 pigment prices - 2016 dollars

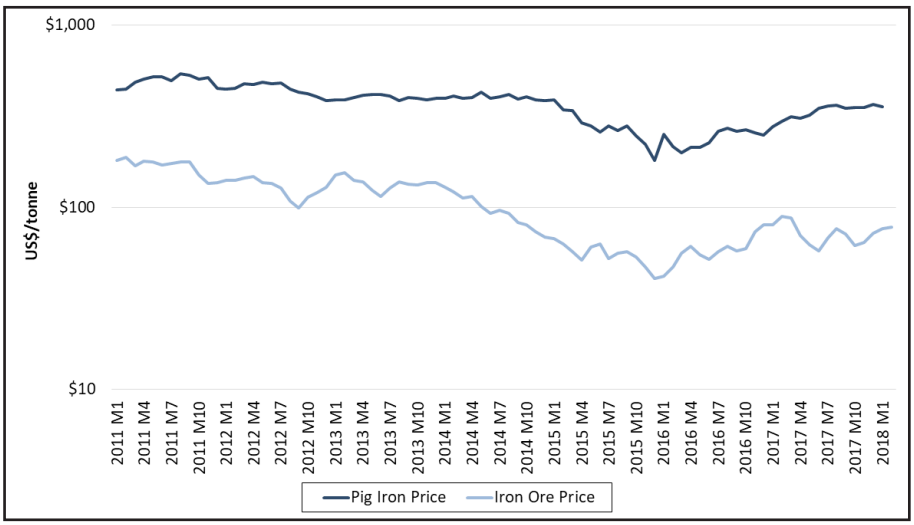


Source: TNG/Artikol

PIG IRON

- Pig iron is a semi-finished metallic form of iron, produced by reduction of iron ore in a furnace, which is then smelted to remove impurities and form steel.
- Pig iron generally contains significant impurities, including carbon (commonly between 3.5-4.5%), phosphorous and silica amongst others, and contains ~90-94% iron.
- 2016 production was estimated by the USGS at 1.15 billion tonnes, with China producing some 60% of this; Australia, given that it exports the majority of its iron ore, is not a significant producer of pig iron or steel.
- With an expected average annual output of ~600kt, TNG will only be a minor player in the market, and will have no trouble in selling its product - this is reinforced by the offtake agreement with Gunvor.
- Pig iron prices tend to largely follow those of iron ore, with a fixed margin due to the processing costs (Figure 8) - these have remained stable since our initiation report.

Figure 8: Nominal Brazil export pig iron and 62% Fe iron ore prices, 2011 to present



Source: Index Mundi, Steelonthenet

DISCLAIMER

(a) Disclaimer

The information, reports, financial models, forecasts, strategies, audio broadcasts and other media (referred to as "Content" throughout this Legal Notice), provided on this web site has been prepared and issued by Altavista Research Pty Ltd trading as Independent Investment Research "IIR", Independent Investment Research Holdings Pty Ltd (ACN 155 226 074), as authorised to publish research under an Australian Financial Securities Licence (AFSL No 420170) which allows Independent Investment Research to offer financial service advice to retail and wholesale clients. Users of this web site should not act on any Content without first seeking professional advice. Whilst the Content contained on this web site has been prepared with all reasonable care from sources which we believe are reliable, no responsibility or liability is accepted by Independent Investment Research, for any errors or omissions or misstatements however caused. Any opinions, forecasts or recommendations reflect our judgement and assumptions at the date of publication or broadcast and may change without notice. Content on this web site is not and should not be construed as an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. We are not aware that any user intends to rely on the Content provided or of the manner in which a user intends to use it. In preparing our Content it is not possible to take into consideration the investment objectives, financial situation or particular needs of any individual user.

Access by any user to this website does not create a client relationship between Independent Investment Research and the user. Users seeking to invest must obtain individual financial advice to determine whether recommendations are appropriate to their investment objectives, personal financial situation or particular needs, before acting on any recommendations. Any Content is not for public circulation or reproduction, whether in whole or in part and is not to be disclosed to any person other than the intended user, without the prior written consent of Independent Investment Research.

(b) Disclosure of Interest

General

Independent Investment Research, its officers, employees, consultants and its related bodies corporate have not and will not receive, whether directly or indirectly: any commission; fee; benefit; or advantage, whether pecuniary or otherwise, in connection with making any recommendation contained on this web site. Independent Investment Research, discloses that from time to time, it or its officers, employees and its related bodies corporate: may have an interest in the securities, directly or indirectly, which are the subject of these recommendations; may buy or sell securities in the companies mentioned in the Content; may effect transactions which may not be consistent with the recommendations in the Content; may have directorships in the companies mentioned in the Content; and/or perform paid services for the companies that are the subject of such recommendations.

However, under no circumstances, has Independent Investment Research been influenced, either directly or indirectly, in making any recommendations contained on this web site.

Corporate Research

Independent Investment Research has or may have, received a fee either directly by a company itself or by a third party, to provide coverage and/or corporate research (the "Fee"). Where a Fee has been received, Independent Investment Research does not publish:

Buy / Hold / Sell recommendations for the security or managed investment schemes.

(c) Copyright Protection

All Content at this web site is protected by copyright. Apart from any use permitted under the Copyright Act (Cth) 1968, you must not copy, frame, modify, transmit or distribute the material at this web site, without seeking the prior written consent of the copyright owner. Content on this web site is owned by the business Independent Investment Research. Users are prohibited from copying, distributing, transmitting, displaying, publishing, selling, licensing, creating derivative works or using any content on the web site for commercial or public purposes

(d) Trade Marks

The trade marks and logos displayed on this web site belong to Independent Investment Research or other parties. Such trade marks include registered trade marks and trade marks pending registration. Users are prohibited from using any of these trade marks, without seeking the prior written consent of IIR or such third party, which may own the trade mark content on this web site.

(e) Limitation of Liability

To the fullest extent permitted by the law, Independent Investment Research and any of its officers, employees, agents, consultants or related bodies corporate disclaim any liability, whether based in contract, tort, strict liability or otherwise, for any direct, indirect, incidental, consequential or special damages arising out of or in any way connected with the use of any Content made available on this web site by any person or entity.

(f) No Warranties

Independent Investment Research does not make any claims, promises, guarantees, representations or warranties regarding the accuracy, completeness or fitness for purpose of the Content made available on this web site. All information on this web site is provided to you on an as is basis, without warranty of any kind either express or implied. To the extent that research can be provided by third parties, Independent Investment Research makes no warranty or representation as to the accuracy or completeness of such information displayed on this site, and accepts no liability for errors or omissions arising from such third party information. To the fullest extent permitted by law, under no circumstances will Independent Investment Research be liable for any loss or damage caused by users reliance upon information obtained through this web site. It is the responsibility of the user to evaluate the accuracy, completeness or usefulness of any information, opinion, general advice or other content made available through this web site. Furthermore, Independent Investment Research does not warrant or represent that this web site is error free or free from viruses or defects. A user must do all that is necessary (including using virus checking software) to satisfy itself that accessing this website will not adversely affect its system.

For further information, please contact IIR at: client.services@independentresearch.com.au

INDEPENDENT
INVESTMENT RESEARCH

Independent Investment Research (Aust.) Pty Limited

SYDNEY OFFICE
Level 1, 350 George Street
Sydney NSW 2000
Phone: +61 2 8001 6693
Main Fax: +61 2 8072 2170
ABN 11 152 172 079

MELBOURNE OFFICE
Level 7, 20–22 Albert Road
South Melbourne VIC 3205
Phone: +61 3 8678 1766
Main Fax: +61 3 8678 1826

HONG KONG OFFICE
1303 COFCO Tower
262 Gloucester Road
Causeway Bay, Hong Kong

DENVER OFFICE
200 Quebec Street
300-111, Denver Colorado USA
Phone: +1 161 412 444 724

MAILING ADDRESS
PO Box H297 Australia Square
NSW 1215