

# TNG LIMITED

ASX:TNG

## Derisking The Mount Peake Project

121 Conference Hong Kong, October 2017

Paul Burton, Managing Director





## Forward Looking Statements

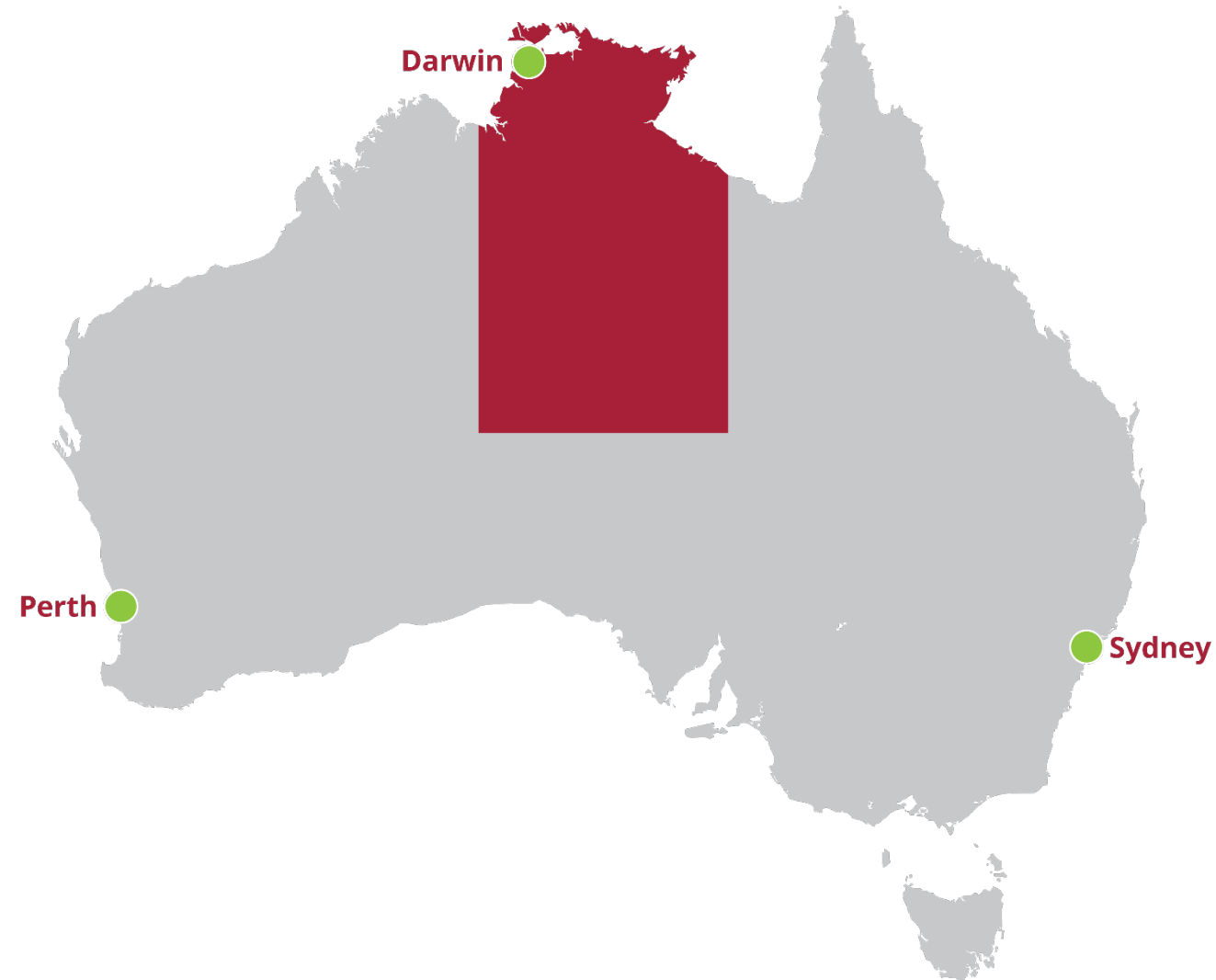
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## Competent Person's Statements

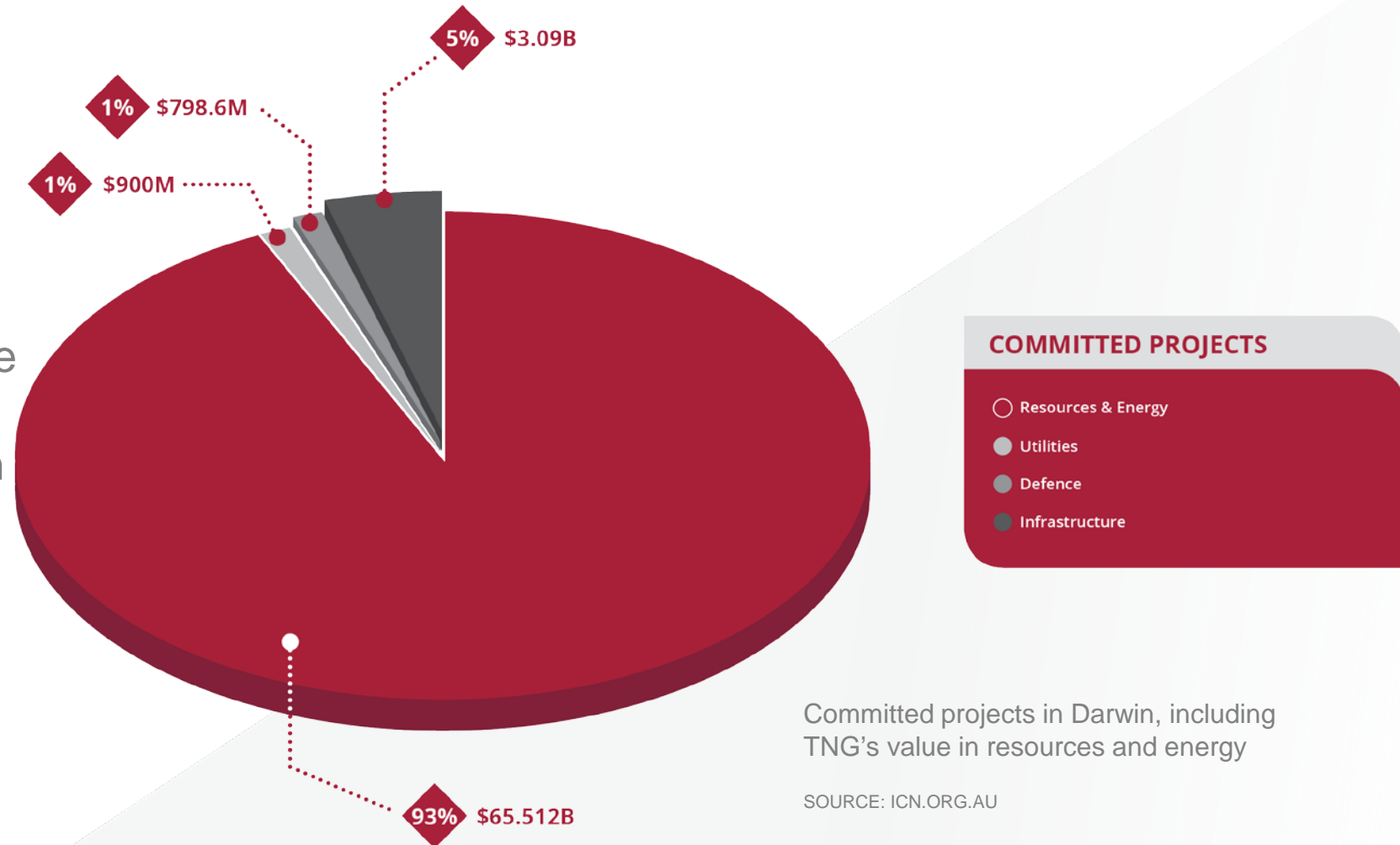
- ▶ The information in this report that relates to the Mount Peake Mineral Resource estimates is extracted from an ASX Announcement dated 26 March 2013, (see ASX Announcement –26 March 2013, “Additional Information on the Mount Peake Resource”, [www.tngltd.com.au](http://www.tngltd.com.au) and [www.asx.com.au](http://www.asx.com.au)), and was completed in accordance with the guidelines of the JORC Code (2012). Initial mining and financial assessment work, based on the Mineral Resource, followed (see ASX Announcement - 15 July 2013, “TNG Considers Two-Stage Development Option for Mount Peake Project, NT”, [www.tngltd.com.au](http://www.tngltd.com.au) and [www.asx.com.au](http://www.asx.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the Mineral Resource estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are represented have not been materially modified from the original market announcement.
- ▶ The information in this report that relates to the Mount Peake Ore Reserve estimates is extracted from an ASX Announcement dated 31 July 2015, (see ASX Announcement –31 July 2015, “Mount Peake Feasibility Study Confirms a World-Class Project”, [www.tngltd.com.au](http://www.tngltd.com.au) and [www.asx.com.au](http://www.asx.com.au)) and was completed in accordance with the guidelines of the JORC Code (2012). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the Ore Reserve estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are represented have not been materially modified from the original market announcement.
- ▶ The information in this report that relates to Exploration Results for Mount Peake and Mt Hardy projects are based on information compiled by Exploration Manager Mr Kim Grey B.Sc. and M. Econ. Geol. Mr Grey is also a member of the Australian Institute of Geoscientists and a full time employee of TNG Limited. Mr Grey has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the ‘Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves’. Mr Grey consents to the inclusion in the report of the matters based on his information in the form and context in which it appear.

## Production Targets and Financial Information

- ▶ Information in relation to the Mount Peake Definitive Feasibility, including production targets and financial information, included in this report is extracted from an ASX Announcement dated 31 July 2015, (see ASX Announcement –31 July 2015, “Mount Peake Feasibility Study Confirms a World-Class Project”, [www.tngltd.com.au](http://www.tngltd.com.au) and [www.asx.com.au](http://www.asx.com.au)). The Company confirms that all material assumptions underpinning the production target and financial information set out in the announcement released on 31 July 2015 continue to apply and have not materially changed.



- ▶ Australia's 2<sup>nd</sup> fastest growing capital city
- ▶ City of Darwin's Gross Regional Product is estimated at \$9.65 billion, (42.3% of the Territory's Gross State Product)
- ▶ The Mount Peake Project we expect will bring significant economic benefits to Darwin and the Northern Territory



- ▶ Northern Australia's only major multimodal port
- ▶ 750m of quay line designed to handle variety of imports and exports
- ▶ 24hr pilot service and port management
- ▶ Landbridge Group (Chinese-owned company operators) have committed >\$200m for infrastructure development over 25 years
- ▶ To support minerals export stakeholders the Port is considering the following over 10yrs:
  - ▷ A cross land conveyor system
  - ▷ Dedicated enclosed storage sheds
  - ▷ Additional bulk loading systems
  - ▷ Additional rail dump facilities

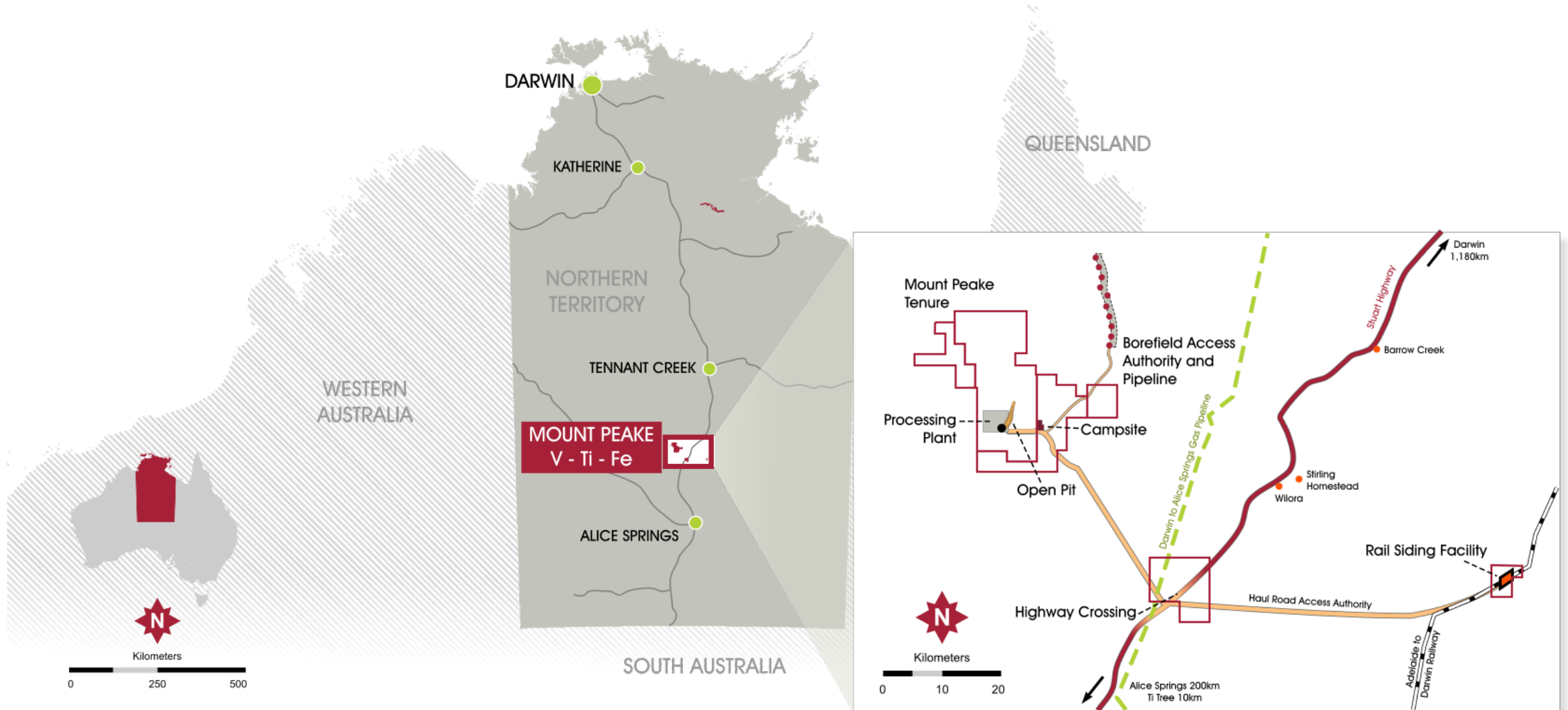




- ▶ NT Government is pro-resource development
- ▶ Major Project Status awarded to Mount Peake in 2012
- ▶ Project Facilitation Agreement in 2016
- ▶ Excellent support geological and infrastructure support



# Mount Peake: Project Layout



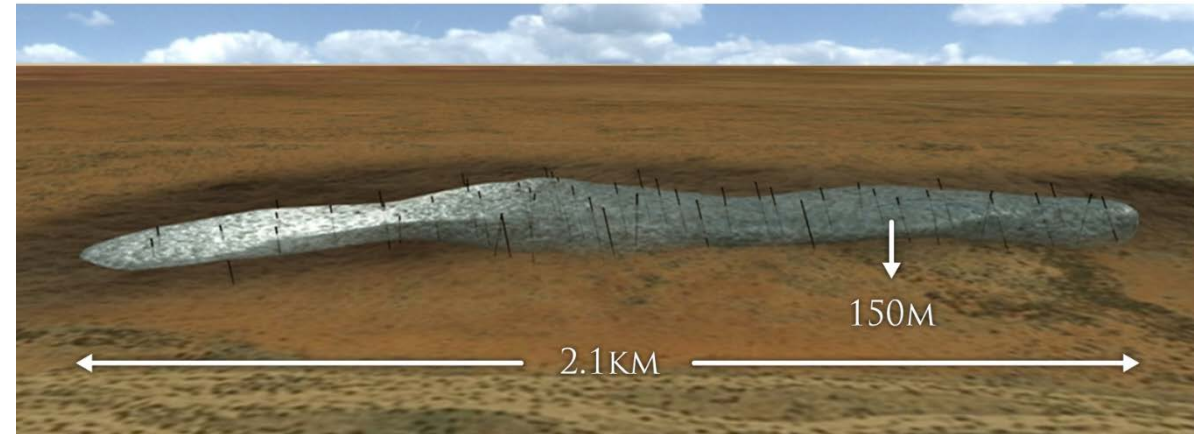
## Mineral Resources as at March 2013

Category	Tonnes (Mt)	V <sub>2</sub> O <sub>5</sub> %	TiO <sub>2</sub> %	Fe%	Al <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %
Measured	118	0.29	5.48	23.64	8.18	32.81
Indicated	19.5	0.28	5.33	22.05	9.09	33.98
Inferred	22	0.22	4.41	19.06	10.38	37.79
Total	160	0.28	5.31	22.81	8.60	33.64

## Maiden Ore Reserve as at July 2015

Category	Tonnes (Mt)	Cut-off	V <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	Fe
Probable	41.1		0.42%	7.99%	28.0%

Refer ASX announcements 31 July 2015.





## Titano-magnetite Ores: Key Strategic Advantages

- ▶ **Abundant:** many known, accessible and easy-to-mine deposits
- ▶ **Ilmenite Shortage:** high-grade ilmenites, suitable for synthetic rutile production are becoming scarce
- ▶ **Growing Vanadium Demand:** urbanisation in fast-growing emerging markets calls for the construction of high rises, requiring large quantities of vanadium-reinforced rebar
- ▶ **Potential For Additional Products:** the hydrometallurgical processing of titano-magnetite also allows for the extraction of other valuable fractions, such as scandium, high-purity silicon and MgO



# Titano-magnetite Ores: Key Strategic Advantages

- ▶ Typically processed by pyro-metallurgical method with high energy and single product output = Inefficiency
- ▶ TIVAN™ hydrometallurgical process allows maximum recovery of full value from magnetite ore
- ▶ Magnetic concentrate passes through a wet chemical refinery
- ▶ Bulk leaching separation for 3 products
- ▶ Leaching and SX process well understood, good recoveries, high-purity products:
  - ▷ V2O5 Vanadium Pentoxide
  - ▷ TiO2 Titanium Dioxide Concentrate
  - ▷ Fe2O3 Iron Oxide
- ▶ Process developed in Australia tested at CSIRO





# TIVAN'S Products: Polymetallic Mix from single resource

## Titanium dioxide pigment (TiO<sub>2</sub>)

- ▶ World demand: 6,600,000tpa
- ▶ TNG's Phase 1 production: 236,000tpa (3.5% of world demand)
- ▶ Main usage: Paint, plastics, paper and inks

## Vanadium Pentoxide (V<sub>2</sub>O<sub>5</sub>)

World demand: 140,000tpa

TNG's Phase 1 production: 17,560tpa (12.5% of world demand)

Main usage: Steel, non-ferrous alloys, chemicals, catalysts and energy storage (VRB)

## Pig Iron

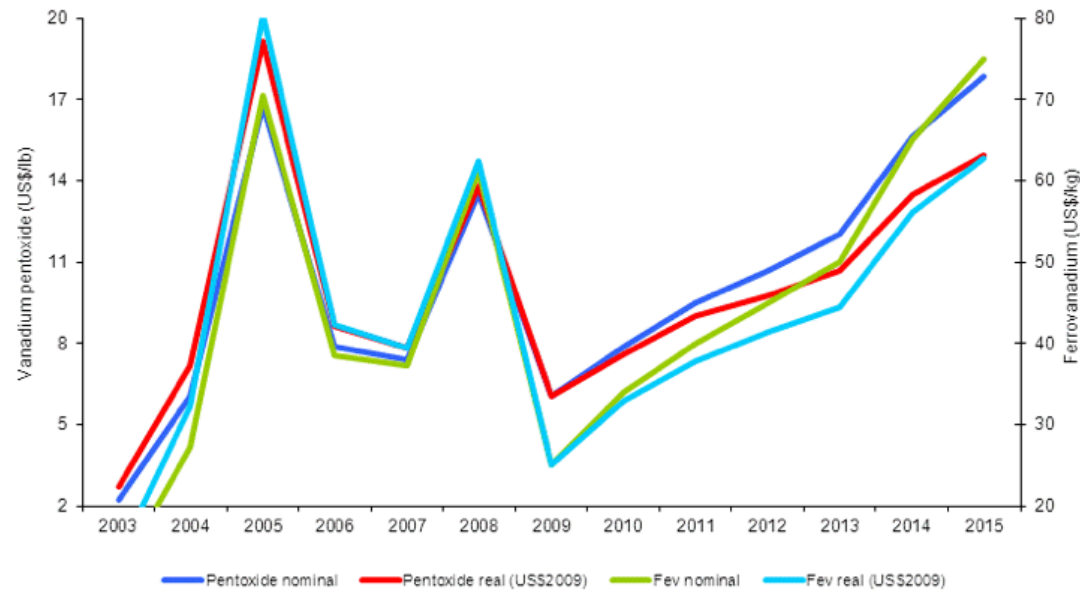
World demand: 1.2 billion tpa

TNG's Phase 1 production: 637,000tpa (0.05% of world demand)

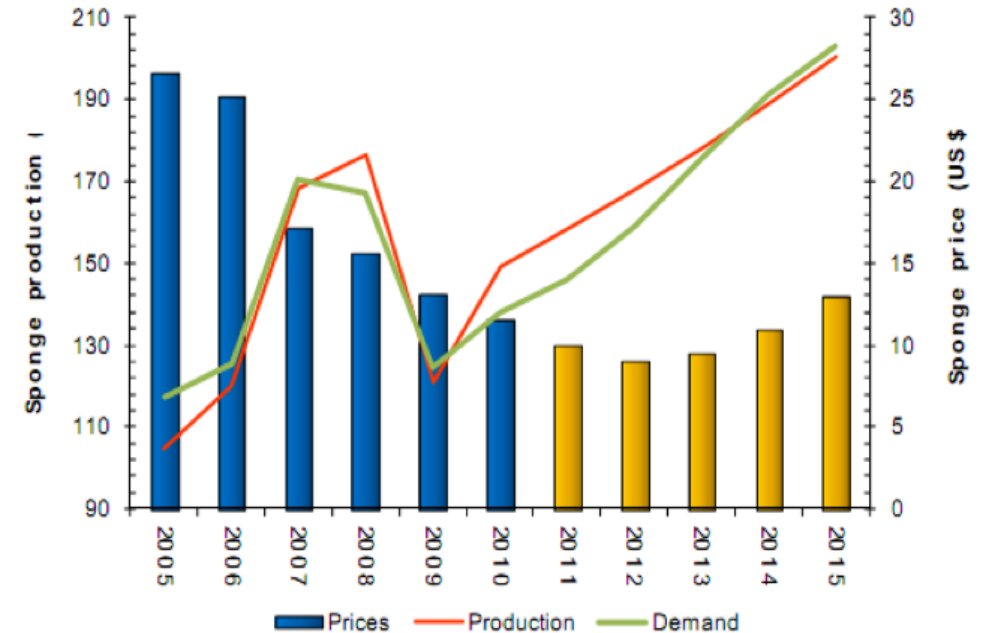
Main usage: Steel making

# The Market: Vanadium and Titanium Outlook

## Vanadium Prices Forecast to Increase Significantly



## Titanium Production and Prices Forecast to Increase Significantly



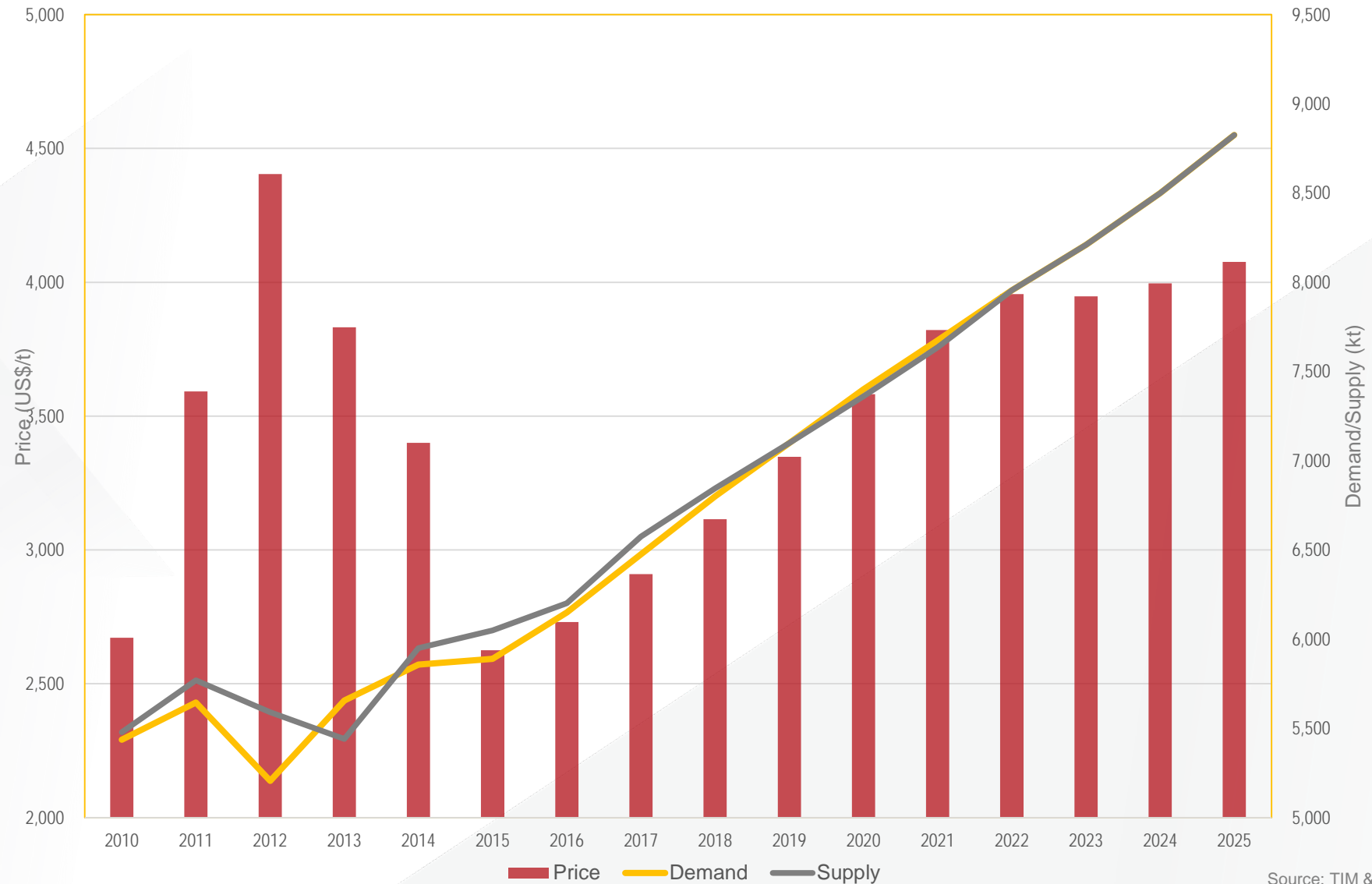
Source: Roskill



## Titanium Markets: Sponge vs Pigment

- ▶ TNG will be producing **high-quality TiO<sub>2</sub>**
- ▶ The majority of titanium feedstocks (annual market **US\$17 Billion** or 85% by value) are used to produce **titanium dioxide pigment**
- ▶ Titanium dioxide pigment is used as an additive in **paints, plastics, paper and ink**
- ▶ Only **15%** of titanium feedstocks are used to produce **titanium metal products** (sponge)
- ▶ Current **median price** for high quality **titanium dioxide pigment** is **US\$2,650** per/t on a CIF basis to USA (source: Industrial Minerals 26 January 2017).

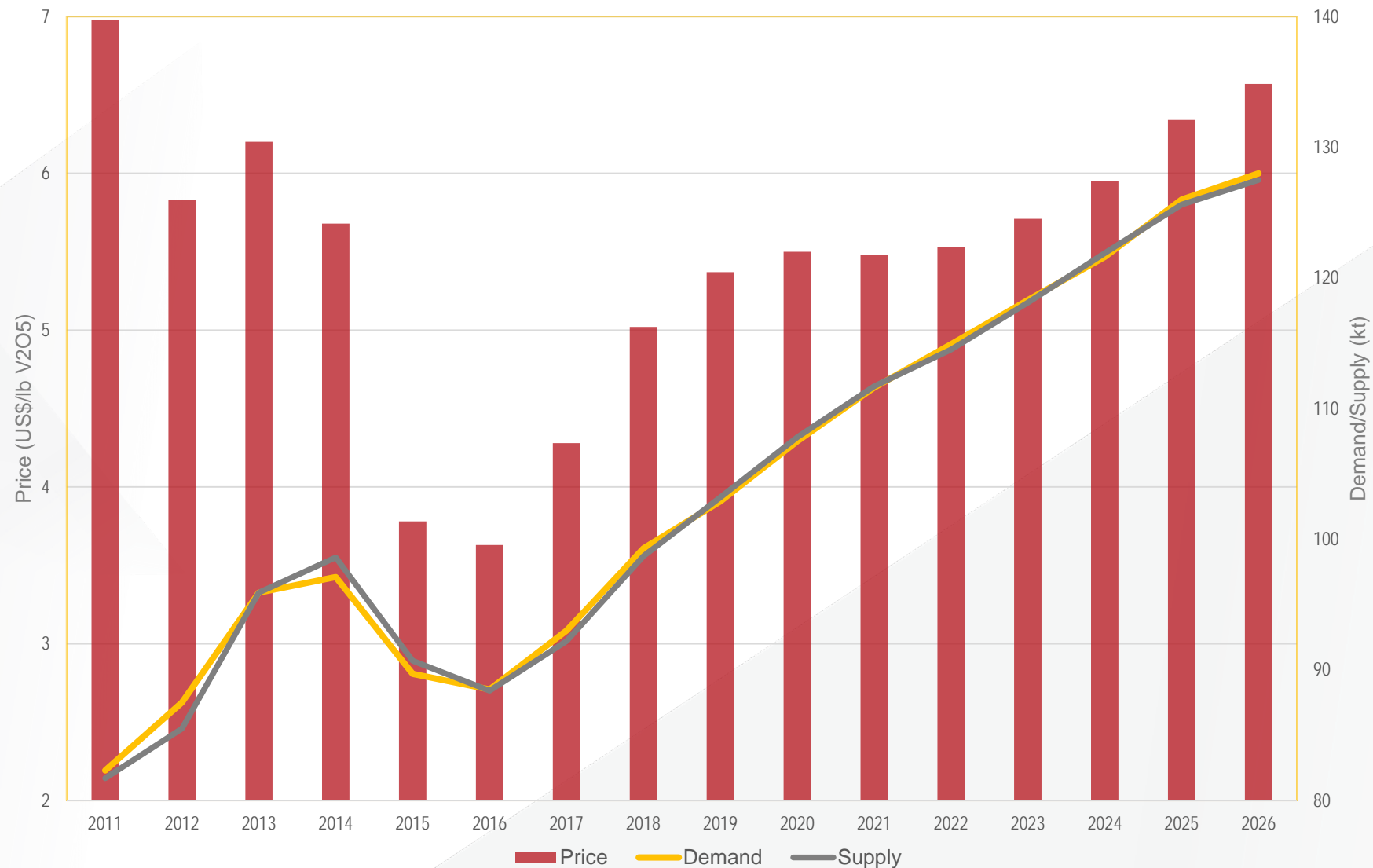
## TIVAN'S Products: Tio2 Pigment Forecast Demand vs Supply and Nominal Price



Source: TIM & Artikol



# TIVAN'S Products: Vanadium Forecast Demand vs Supply and Nominal Price

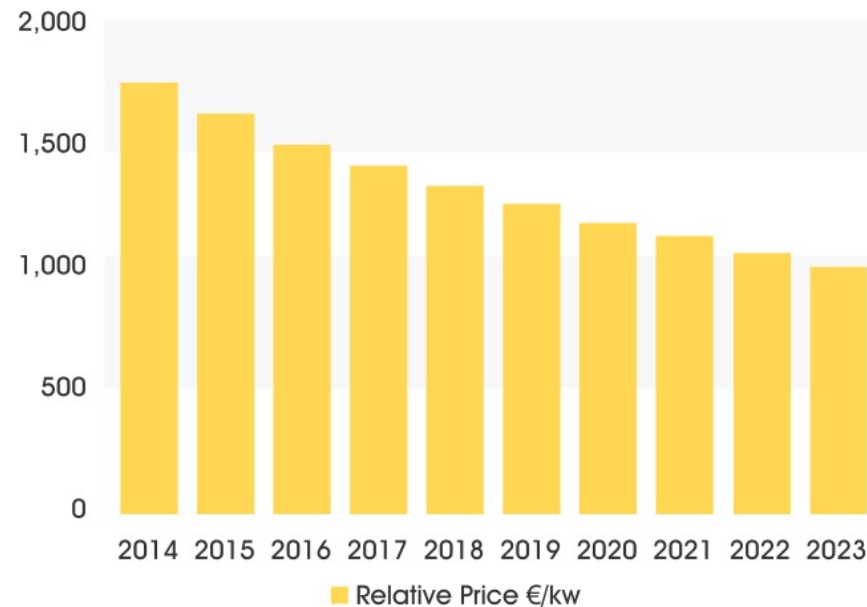
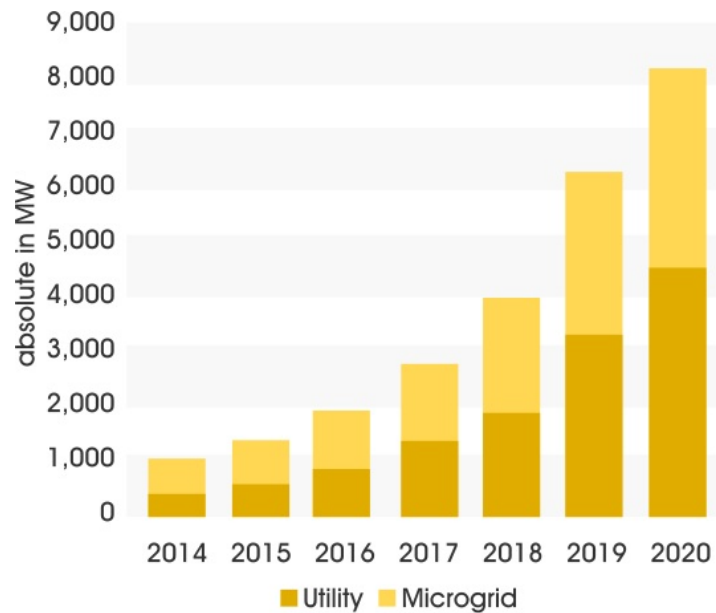


Source: Roskill

# Vanadium Redox Flow Batteries: The future concept for energy storage

## Market Forecast – Development of Power on the Energy Storage Market

- ▶ Industry CAGR 2015-2020: 30.8%
- ▶ Stronger growth in utility scale from 2018 onwards
- ▶ US\$6 billion market opportunity in 2020



Sources: Gildemeister, Pike Research, Navigant Research, Lux Research, Roland Berger, IHS, SNL Power





## ECE:

- ▶ Major Chinese mineral exploration, development and mining group
- ▶ Over 5,000 employees, has discovered +160 deposits in China worth more than \$10b



## ECE/WANLONG GROUP:

- ▶ \$13.4m investment in TNG
- ▶ Cooperation on future development of Mount Peake
- ▶ Potential access to Chinese finance, EPCM and final product end-users
- ▶ Strategic partnership on other mineral projects



## Proven mining strategies and innovative processing

ROM	3Mtpa, increasing to 6Mtpa by year 5 (stage 2)
Process route	TIVAN® hydrometallurgical process
Waste mined	72Mt
Ore production	76Mt
Average head grade	0.38% V <sub>2</sub> O <sub>5</sub> , 27.1% Fe, 7.04% TiO <sub>2</sub>
Average recoveries	>90% V <sub>2</sub> O <sub>5</sub> , 80% Fe, 67% TiO <sub>2</sub>
Annual metal production (Ave LOM)	17.5kt V <sub>2</sub> O <sub>5</sub> , 236kt pigment Ti, 637kt Pig Iron
Total mining inventory	78Mt @ 0.38% V <sub>2</sub> O <sub>5</sub> , 7.04% TiO <sub>2</sub> and 27.1% Fe
Project life	17 years
Strip ratio	0.9
Mine type	Open pit
Extraction techniques	Conventional drill, blast, load and haul
Transport	Ore and waste hauled by truck up a one-in-ten gradient haul road. Concentrate hauled 80km by truck to rail siding for rail freight to Darwin



Mine Plan View

Refer ASX announcements 31 July 2015.

# Mount Peake: Planned Mining

- ▶ Total mining inventory of 78Mt @ 0.38% V2O5, 7.04% TiO2 and 27.1% Fe
- ▶ Strip Ratio – 0.9
- ▶ Open pit with conventional drill and blast and load and haul with excavators and large mining equipment
- ▶ Ore and waste hauled by truck up a one-in-ten gradient haul road
- ▶ Concentrate hauled 80km by truck to rail siding for freight to Darwin

Refer ASX announcements 31 July 2015.





## Binding LOM Off-take Agreements

### ► Vanadium Products:

- Binding Life-of-Mine (LOM) Off-take Agreement and Technology Transfer Agreement with WOOJIN Metals
- WOOJIN's proprietary technology currently has the world's highest vanadium recovery rate and is expected to significantly enhance the Project's profitability

### ► Iron Products:

- Binding Term Sheet for LOM Off-take Agreement with major global commodity trader Gunvor (Singapore)

### ► Titanium Products:

- Off-take to be agreed; Discussions advanced

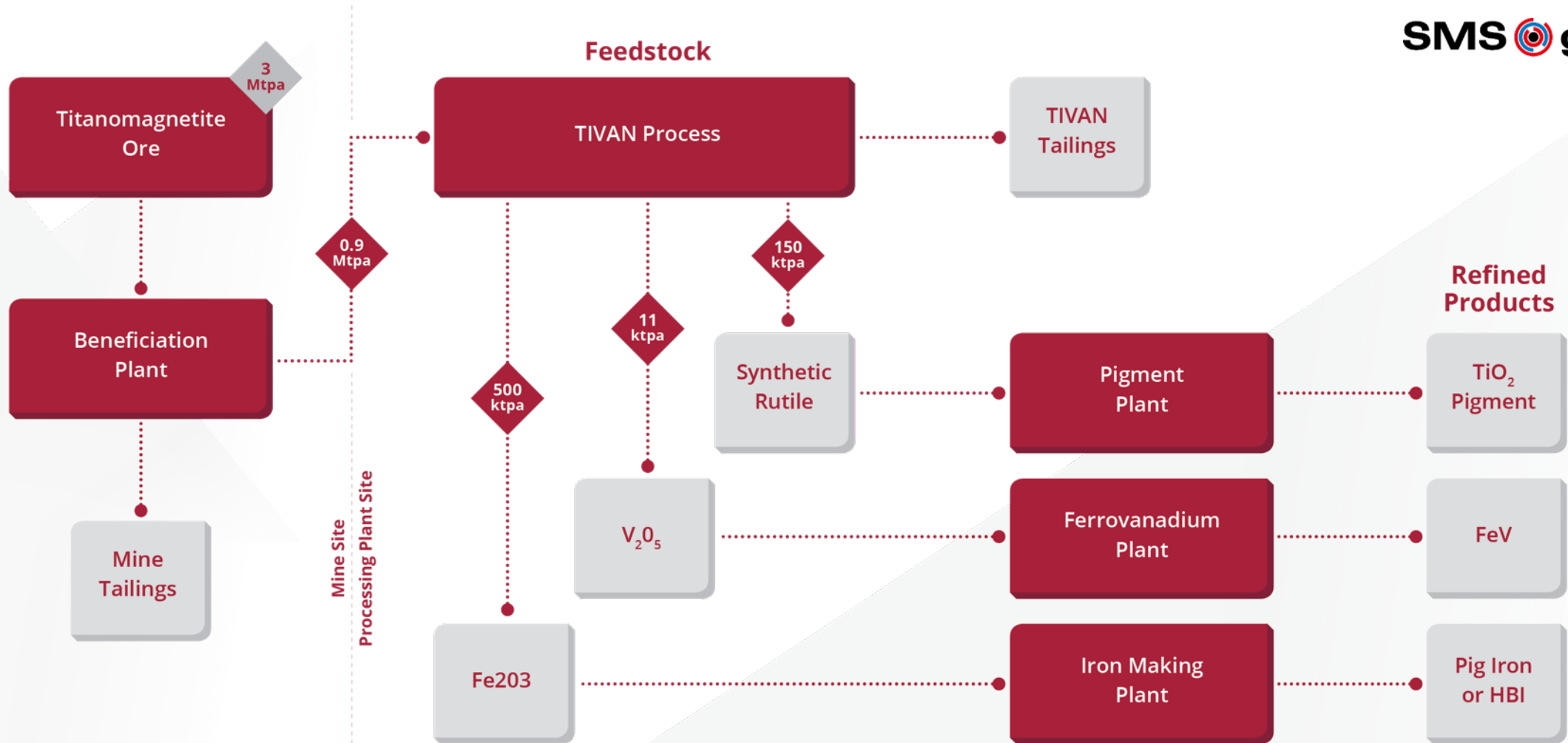


## Project Development Agreements

- ▶ **European-based global engineering group**
- ▶ Binding agreement for engineering, design and construction of the TIVAN™ refinery in Darwin
- ▶ MOU for joint commercial exploitation of TIVAN™ technology
- ▶ Assisting TNG to obtain funding for refinery construction through Export Credit Agencies or other structured finance
- ▶ **Global engineering and services provider**
- ▶ Pre-Mine development, operations and investment agreement for total project delivery
- ▶ Downer is a leading service provider in markets including mining, minerals and metals processing, transport services, technology and communication services, utilities services, engineering, construction and maintenance (EC&M) and rail, employing around 20,000 people worldwide

**SMS**  **group**

**Downer**   
Relationships creating success



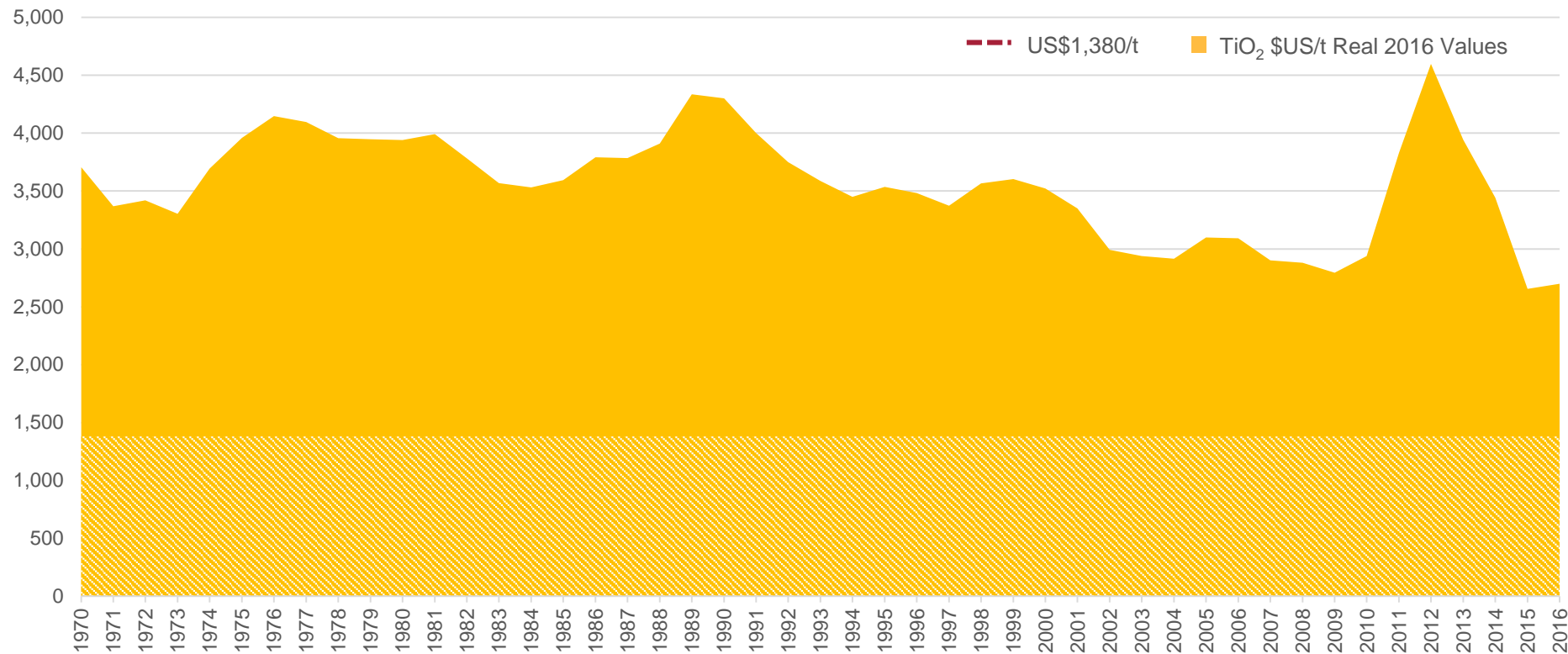




# TIVAN'S Products: Titanium Dioxide

## Titanium dioxide pigment (TiO<sub>2</sub>)

► TNG's cost of production: Approx US\$1,380/tonne (shaded line below)



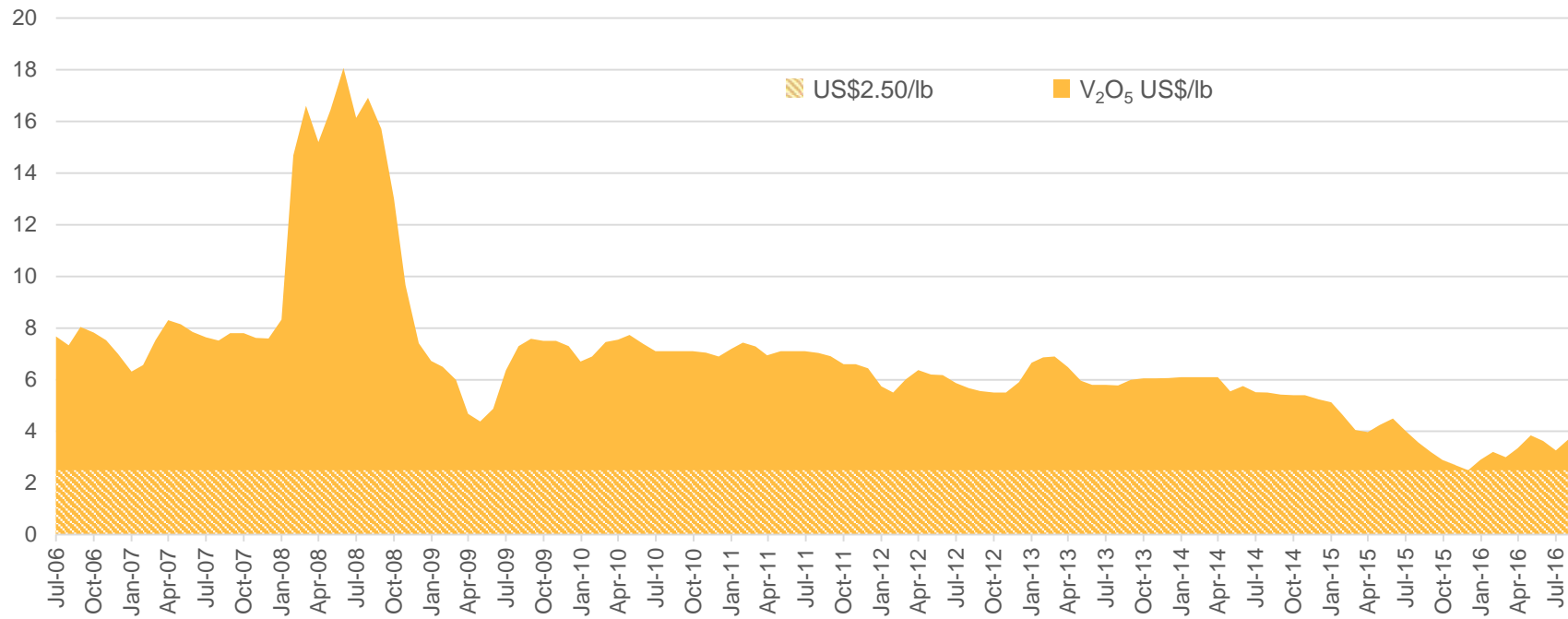
Source: Artikol



# TIVAN'S Products: Vanadium Pentoxide

## Vanadium Pentoxide ( $V_2O_5$ )

TNG's cost of production: Approx US\$2.50/lb (shaded line below)



Source: Metal Bulletin

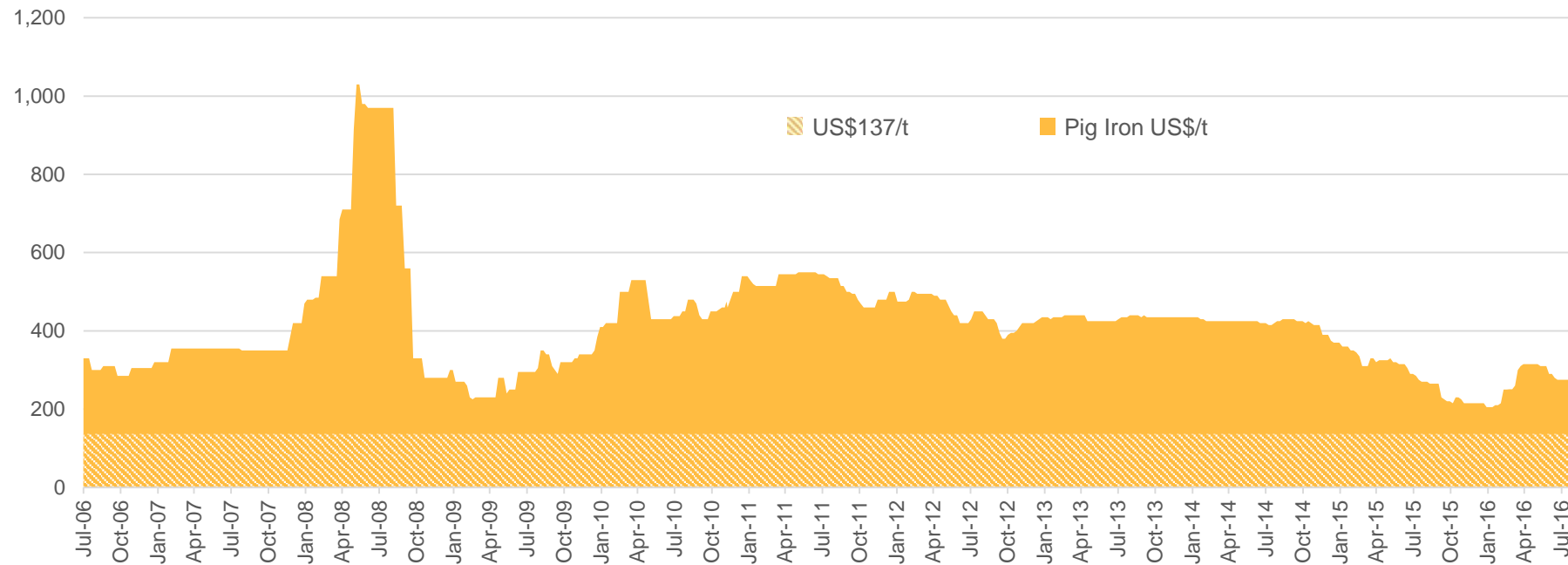




# TIVAN'S Products: Iron

## Pig Iron

TNG's cost of production: Approx US\$137/t (shaded line below)



Source: Metal Bulletin



- ▶ Vanadium Redox Storage Batteries now an accepted alternative
- ▶ Require a good source of high purity vanadium electrolyte
- ▶ can be produced by TNG (with SMS) cost effectively from its own source V205
- ▶ Vanadium flow batteries store energy in the electrolyte fluid
- ▶ Life of a commercial lithium-ion battery = 5 to 8yr  
Life of a vanadium flow battery is up to 20yrs
- ▶ Huge potential for remote Australasia, India and Africa



## Mount Peake: Why can this Project merit a higher technology risk?

- ▶ **TIVAN™ Process:** 3 product efficiency
  - ▶ The TIVAN™ Process achieves greater value from the resource through its state-of-the-art processing technology to cost effectively extract high-value vanadium, titanium and iron to produce high-purity metals for export . This is likely to become the method of choice to process these ores in future
- ▶ **While remains some process risk, it is not unmitigated risk:** SMS Group
  - ▶ Pilot plant at CSIRO Australia confirmed the viability of the process for the purpose of the feasibility study; ongoing optimization and test work in Australia and at SMS has further de-risked process.
- ▶ **Innovating new technologies:** successfully produced high-purity vanadium electrolyte
  - ▶ This demonstrates the viability of the processing chain from the mine to the final product
  - ▶ TNG's test and optimisation work indicates it will be able to produce V2O5 at minimum 99% purity, which is currently among the highest globally
- ▶ **Applying proven processes to new applications:** every part of the process exists
  - ▶ Each stage of the process is used currently on a commercial basis for a different application
  - ▶ What is new, is putting all of these processes together in a sequence for a new purpose



## Next Steps

- ▶ Mine site concentrate specs optimal
- ▶ SMS to finalise TIVAN process Flow Sheet
- ▶ SMS / Snowden Revised CAPEX
- ▶ SMS / Snowden Revised OPEX
- ▶ Gresham / Snowden Revised financial model August 2018
- ▶ TNG Board FID
- ▶ Confirm Appointment of EPC
- ▶ Confirm and place Project Management Team
- ▶ Completion of EIS for TIVAN





# TNG LIMITED

ASX:TNG

**Paul Burton – Managing Director**

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