



FERRO-ALLOY  
RESOURCES GROUP

CORPORATE PRESENTATION  
OCTOBER 2019

# Overview

An emerging vanadium producer located in Kazakhstan



## Established Vanadium Producer

Current production 144 tpa  
 $V_2O_5$



## Excellent Project Potential

5 known ore bodies – 1st has an estimated JORC reserve of 23 million tonnes



## Outstanding Project Economics

NPV of \$2 billion;  
60% lower cost than standard;  
Negative cost/lb after by-product credits



## Favourable Location

Easy access to Chinese, Russian and European end markets



## Staged Expansion Plan

Increasing production to 23,500 tpa  $V_2O_5$  by 2023



## Experienced Management Team

Board and senior management with proven track record

# Operational Highlights

Two projects operating simultaneously on the same site:

## 1. EXISTING OPERATION

- Treating purchased secondary material
- Currently producing 144 tonnes  $V_2O_5$  per year
- Expansion to 1,500 tonnes per year underway
- First significant increase in production expected Q4 2019

## 2. BALASQANDIQ PROJECT

- A huge deposit with economic potential in a class of its own
- Development of project on-going in parallel with the Existing Operation

# The Balasausqandiq Project

Balasausquandiq has the potential to be one of the world's largest vanadium producers, at the lowest cost of production

- New standalone plant to be operated in parallel with the existing profitable processing operation
- Phased expansion in two stages:

1	Mining & Processing 1Mtpa of ore	Capex requirement: \$100m
2	Expansion to 4Mtpa of ore	Capex requirement: \$225m

- Each completed stage will contribute towards the capital requirement of the next phase of expansion – minimising shareholder dilution

# Balasausqandiq – A Unique Project

Crucially not a titano-vanadiferous magnetite deposit

The ore contains very low levels of acid consuming components such as iron oxide and carbonates.

## WHY THIS MATTERS:

1. Smaller quantity of acid required for leaching
2. No need for high temperature roasting
3. No need to pre-concentrate ore



1. Reduces capital and operating costs by ~60%
2. Potential to become the world's lowest cost producer
3. Economic potential in a different class to peers



# Balasausquandiq Vanadium Project

Potential to be an industry leading, low cost, giant source of supply

## FAVOURABLE GEOLOGY AND PROCESSING

- Outcrops at surface, open pit with no pre-strip required
- Very large, with huge exploration potential
- Constant grade with little tectonic alteration, visible geological cut-off makes for easy mining
- Straightforward process flowsheet, tested in a 15,000 tpa pilot-plant

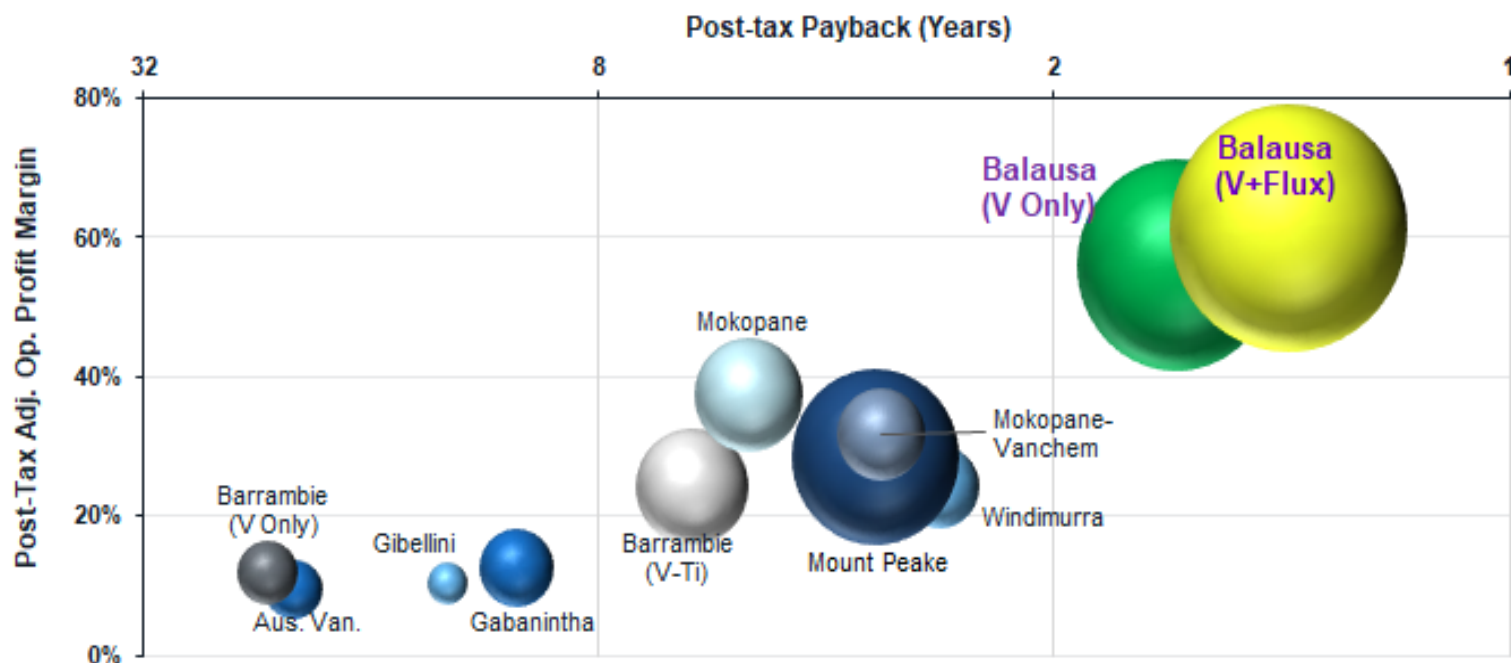
## JORC RESOURCE

- Total JORC Resource: 24.3Mt @ 0.68% V<sub>2</sub>O<sub>5</sub>; 165,670 tonnes of V<sub>2</sub>O<sub>5</sub>
- JORC Resource based only on one ore body out of a known five
- Middle of the range estimate of 126Mt at similar grade for the total known ore bodies (including JORC exploration potential and non-JORC)

## ROBUST ECONOMICS

- Base-case financial analysis shows that Balasausquandiq will be a highly profitable operation
- Operating margin of 79% - \$7.50/lb V<sub>2</sub>O<sub>5</sub>
- Revenue per tonne treated of \$135

# Best in class



Size of bubble represents post tax profit

Source: Shore Capital

# Geographical Advantage

Excellent regional infrastructure and access to end markets

**Brownfield:** existing operating vanadium plant and therefore significant site infrastructure is already in place

**Logistics:** excellent links to China, Russia and Europe

**Power:** connected to grid, now connecting to nearby HV line

**Water:** readily available sources

**Terrain:** unpopulated area, no agricultural use

**Roads:** 70km sealed road runs from near site to Shieli from where there are motorway standard roads and rail into Europe, Russia and China

**Silk Road Economic Belt:** corridor of roads, rail, energy and telecommunications infrastructure linking China to Europe, passing through southern Kazakhstan





# Kazakhstan

## An attractive operating environment

- Stable democratic, business-friendly government
- Already a major exporter of metals and minerals
- Attractive fiscal regime – low tax and royalties
- No requirement for government free-carry or local ownership
- Subsoil use law updated in 2018 based on international practices
  
- **STRONG GOVERNMENT SUPPORT**
- Investment Incentive Agreement signed with the Government
- Main incentives given in respect of processing operations:
  - 0% tax until 2026
  - Property tax exemption until 2024



Minister arriving on site

# Existing Processing Operation

Small scale processing plant in operation at project site

- Operates a vanadium processing plant which treats purchased vanadium-containing concentrates and raw materials
- \$10m expansion of the current operation is underway
  - Ten-fold expansion to 1,500 tpa of  $V_2O_5$  equivalent
  - Allow the plant to treat a wider range of higher grade vanadium-containing feedstocks and to produce higher-value products
  - Production will increase incrementally with only minor shutdowns
  - First significant production increase due in Q4 2019



Current production	144 tpa $V_2O_5$
Expanded production	1,500 tpa $V_2O_5$
$V_2O_5$ price assumption/lb	2019: \$13, 2020: \$10 then \$7.50
NPV (10%) of expansion project	\$73m, IRR 242%
Net annual cash flow (2021 – 2026)	\$9.7m p.a

# Vanadium

Used in established industries and emerging green technology

A soft grey ductile transition metal

**Main products:**

- Vanadium Pentoxide ( $V_2O_5$ )
- Ferro-vanadium

- One of the highest strength to weight ratios of all metals
- Adds corrosion and heat resistance
- Ability to exist in multiple oxidation states
- Resistant to attack from acids and salt water

VANADIUM

**Uses:**



90% consumed by global steel industry



Small additions can double the strength of steel alloy



Used in titanium alloys - e.g. jet engine and aircraft



Minor use in ceramics and chemicals industry



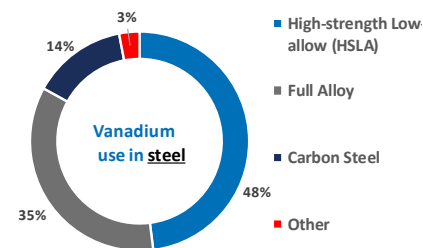
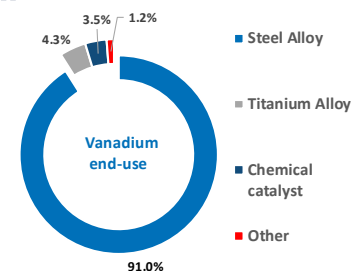
Rapidly growing use in Vanadium Flow Batteries

153kt  
 $V_2O_5$

**2017 demand**

238kt  
 $V_2O_5$

**2025 TTP Squared Forecast**



# Vanadium

## Demand drivers in traditional and emerging uses

### STEEL

#### Steel demand remains robust

- Demand for structural steel and speciality steels in the automotive & aerospace industries
- Specifically the high-strength low-alloy (HSLA) steels which utilise vanadium

#### Growth area - Reinforcing bars (rebar) used in the construction industry increasing

- High-strength rebar contains more vanadium
- Tightening legislation in China - requires Grade 3 rebar to be used in new building construction
- Shift from Grade 2 (no vanadium) to Grade 3 (c.0.35kg V/t) and Grade 4 (1kg V/t)
- Further revisions due – elimination of 335MPa rebar in favour of 600MPa – positive for vanadium

#### Intensity Of Use Increasing

- Steel demand 3-4% CAGR but intensity of vanadium use in steel 8% CAGR

### REDOX FLOW BATTERIES

Replacement of fossil fuels with solar and wind power requires energy storage to cope with intermittency.



Typically VFBs charge in the day and near full-discharge overnight.



Lithium-ion batteries are unsuitable for this purpose.

VFBs have indefinite life with no degradation over time or use giving a low localised cost.



Being rolled out world wide but particularly China.

FAR is the only potential primary vanadium supplier that can:

- meet this demand at relatively low capital cost
- at a price that allows the VFB industry to develop

# Vanadium

Supply issues increase demand for stable source of production

Supply is extremely concentrated: 72% of global production derived as a co-product from steel plants

FAR is one of the few global pure play vanadium developers

Not enough mine development: Few economic primary vanadium mines in the pipeline

FAR's has potential to be the lowest cost producer meaning it will be economically resilient to price fluctuations

High capital costs and long lead time: make it difficult for other primary producers to justify development

FAR to expand on existing operation and take advantage of its existing infrastructure and low capex requirements

Supply disruption possible: conversion of steel production from vanadiferous magnetite to more economic hematite

FAR to increase production to satisfy an emerging supply/demand gap

Declining mine production: Russia and South Africa have reduced output, partially offset by Brazil

FAR strategically located near key end markets including Europe and Asia

# Upcoming Work Programme

Established, staged development plan

	Current	Expansion of current operation	Balasausqandiq Stage 1 1Mtpa	Balasausqandiq Stage 2 4Mtpa
Additional production:		1,356 tpa V <sub>2</sub> O <sub>5</sub>	5,600 tpa V <sub>2</sub> O <sub>5</sub>	16,400 tpa V <sub>2</sub> O <sub>5</sub>
Total production:	144 tpa V <sub>2</sub> O <sub>5</sub>	1,500 tpa V <sub>2</sub> O <sub>5</sub>	7,100 tpa V <sub>2</sub> O <sub>5</sub>	23,500 tpa V <sub>2</sub> O <sub>5</sub>
Total Capex:		\$10m	\$100m	\$225m
Approx start date:	Operating	In stages to end of H1 2020	2021	2023

# Funding

Owing to the limited capital requirements and excellent financial returns available from the project, the Company will be able to seek extensive non-equity funding – minimising shareholder dilution

## STAGE 1

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The Company will seek non-equity funding towards the Stage 1 expansion from:

- Streaming finance
- Royalty sales
- Export credit backed finance
- Other asset secured finance
- Project finance
- Sovereign wealth funding

## STAGE 2

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The company intends to fund the Stage 2 expansion from the earnings of the Stage 1 operation which means that production of 23.5 tpa (\$2 billion NPV) is achievable from minimal further equity finance

# Investment Case

An excellent opportunity centred on a world class project



Established producer with low-cost expansion plan underway

23.5 tpa

Annual production by 2023



Large asset with significant exploration potential

23 Mt

JORC Reserve for one (of five) orebody



Potential to be one of the world's lowest cost vanadium producers

60%

Lower operating cost in comparison with peers



Low technical and jurisdictional risk

0%

Tax on processing operations until 2026



Peer leading low capital intensity due to simple mining and processing

79%

Operating margin



Economically robust – resilient to pricing fluctuations

\$2.0bn

Combined NPV



# Appendix: Valuable by-products

Opportunity to further boost revenue through sale of by-products

## Carbon-silica flux

Concentrated to make carbon black, used in the manufacture of rubber – a \$12bn global market, selling for several thousand dollars per tonne depending on grade. Carbon-silica mix can be briquetted to make ideal feed for ferro-silicon smelting

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## Uranium / molybdenum

A bulk concentrate. Kazatomprom has a statutory first right to purchase uranium products in Kazakhstan

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## Potassium alum

Able to market in China in the chemicals, medicinal, culinary industries and for water purification, or break-down into alumina and fertilisers

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## REE concentrate

Currently excluded from base case due to depressed market, but potential for the future

Product	Projected revenue per tonne of ore (\$/t)
Vanadium ( $V_2O_5$ ) @ \$7.50/lb	93
Carbon-silica flux	26
Uranium	3
Aluminium/potassium	10
Molybdenum	4

# Appendix: Board and Management

Experienced team with proven capability and understanding

## BOARD

### **Nicholas Bridgen**

Chief Executive

Chartered accountant, lives in Kazakhstan and speaks fluent Russian. 14 years with Rio Tinto group in various roles and 25 years' board level experience with companies operating in the FSU including CEO of Hambledon Mining.

### **Andrey Kuznetsov**

Director of Operations

Engineer with PhD in mathematical logic, native Russian, English speaker. Previously lead the Scientific Department in Central Committee of Youth, Kontakt Research and Development and TOO Firma Balausa. Author of more than 10 vanadium treatment technology patents.

### **Chris Thomas**

Non Executive Director

Chairman of I&S BBDO, Japan and previously CEO for BBDO in the Americas as well as for Asia, Middle East and Africa.

### **James Turian**

Non-Executive Director

Background in accounting and trust management and a Chartered Fello of the Securities Institute IAQ and a Fellow of the Institute of Directors. Director of Accounts For You Ltd.

## MANAGEMENT

### **Alexandar Fofanov**

Technical Director

Chemical engineer with a PhD in vanadium extraction. Completed a tenure at the Central Research Metallurgical Institute, Moscow and has been MD at Tula Vanadium and Technical Director for Vanadium at the Evraz Group.

### **Oleg Shulepov**

Production Director

Mechanical Engineer with the majority of career spent at Tula Vanadium and the Evraz group, most recently as Chief Manager of the Project Management Department.

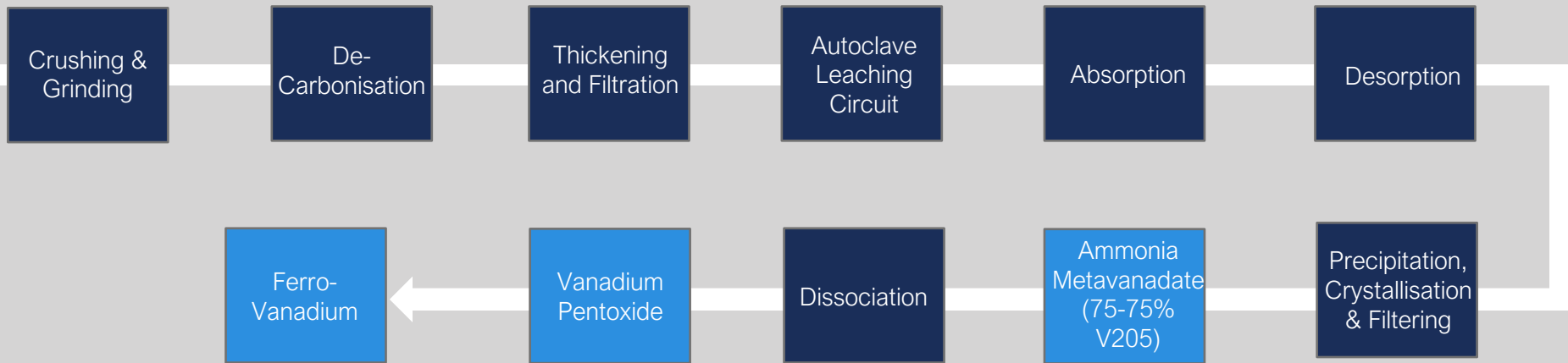
### **Tony Thornton**

Project Director

Mining engineer from the Camborne School of Mines. Previously Director of Illuka's Kazakhstan operations and MD of SRK's Kazakhstan office following a varied career in mining.

# Appendix: Straightforward Process

Process flowsheet tested in 15,000 tpa pilot plant



# Appendix: Balasausquandiq

## Resources and Potential

JORC resource based on only one orebody

Orebody	Category (JORC 2012)	Tonnes (Mt)	V2O5 (%)	V2O5 (tonnes)
OB1	Indicated Primary <sup>1</sup>	21.4	0.67	143,380
OB1	Inferred Oxide <sup>2</sup>	1.3	0.89	11,570
OB1	Inferred Primary <sup>1</sup>	1.6	0.67	10,720
Total		24.3	0.68	165,670
OB2-OB5	Exploration Target <sup>3</sup>	85.5	0.68	581,400
Total		109.8	0.68	747,070
Locally Approved (non-JORC)		15.9	1.02	162,144
<b>Overall Total</b>		<b>125.7</b>	<b>0.72</b>	<b>909,214</b>

1. Oxide ore based on bulk density of 1.7

2. Primary ore based on bulk density of 2.4

3. Mean of range estimated by FAR's independent geologist. GBM CPR, 12 November 2018

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