



FERRO-ALLOY  
RESOURCES GROUP

CORPORATE PRESENTATION  
October 2020

# Overview – a vanadium producer in Kazakhstan

the world's most prospective deposit

## Corporate:

- Listed on London Stock Exchange and Astana International Exchange
- Headquarters: Guernsey
- Operations: Kazakhstan

## Activities

- Existing profitable production – expanding to 1,500 tonnes ( $V_2O_5$ ) per year
- Balasausqandiq vanadium project – 22,400 tonnes per year

## Vanadium

- Fast-growing traditional markets
- A huge new market as a battery metal



# The Vanadium Market

# Vanadium

Used in established industries and emerging green technology

## Uses:



90% consumed by global steel industry



Vanadium Flow Batteries



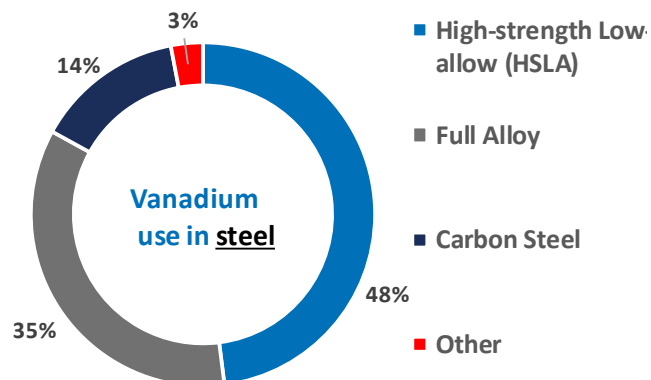
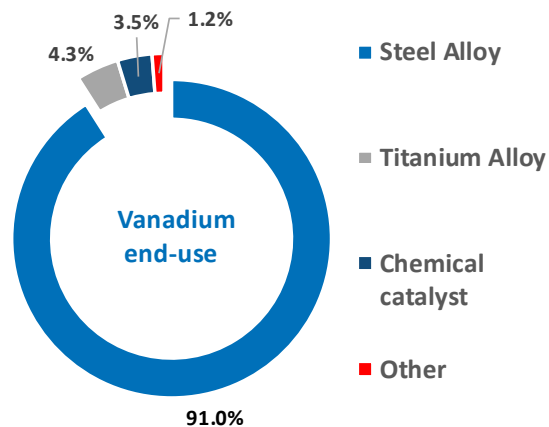
Titanium alloys - e.g. jet engine and aircraft



Ceramics and chemicals industry

## Main products:

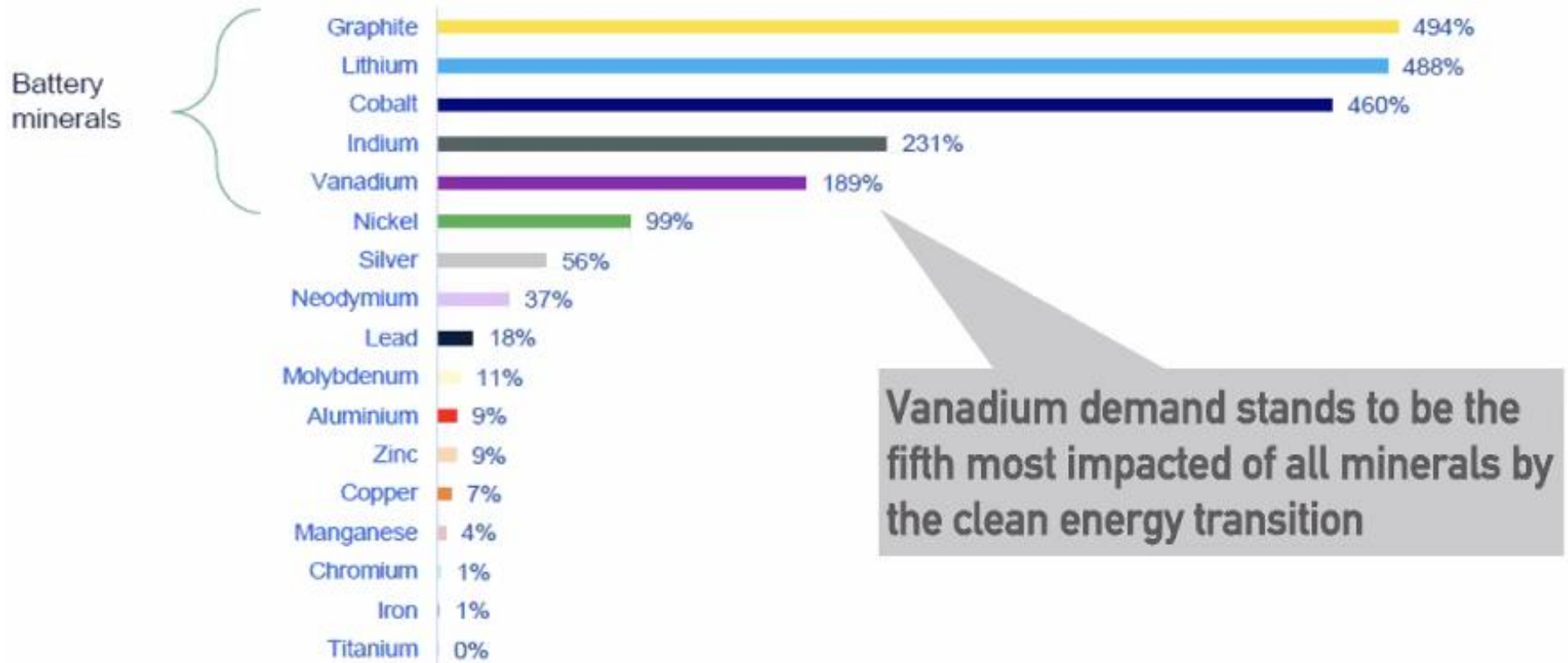
- Vanadium Pentoxide ( $V_2O_5$ )
- Ferro-vanadium (FeV)
- Battery electrolyte



# Vanadium is a battery metal

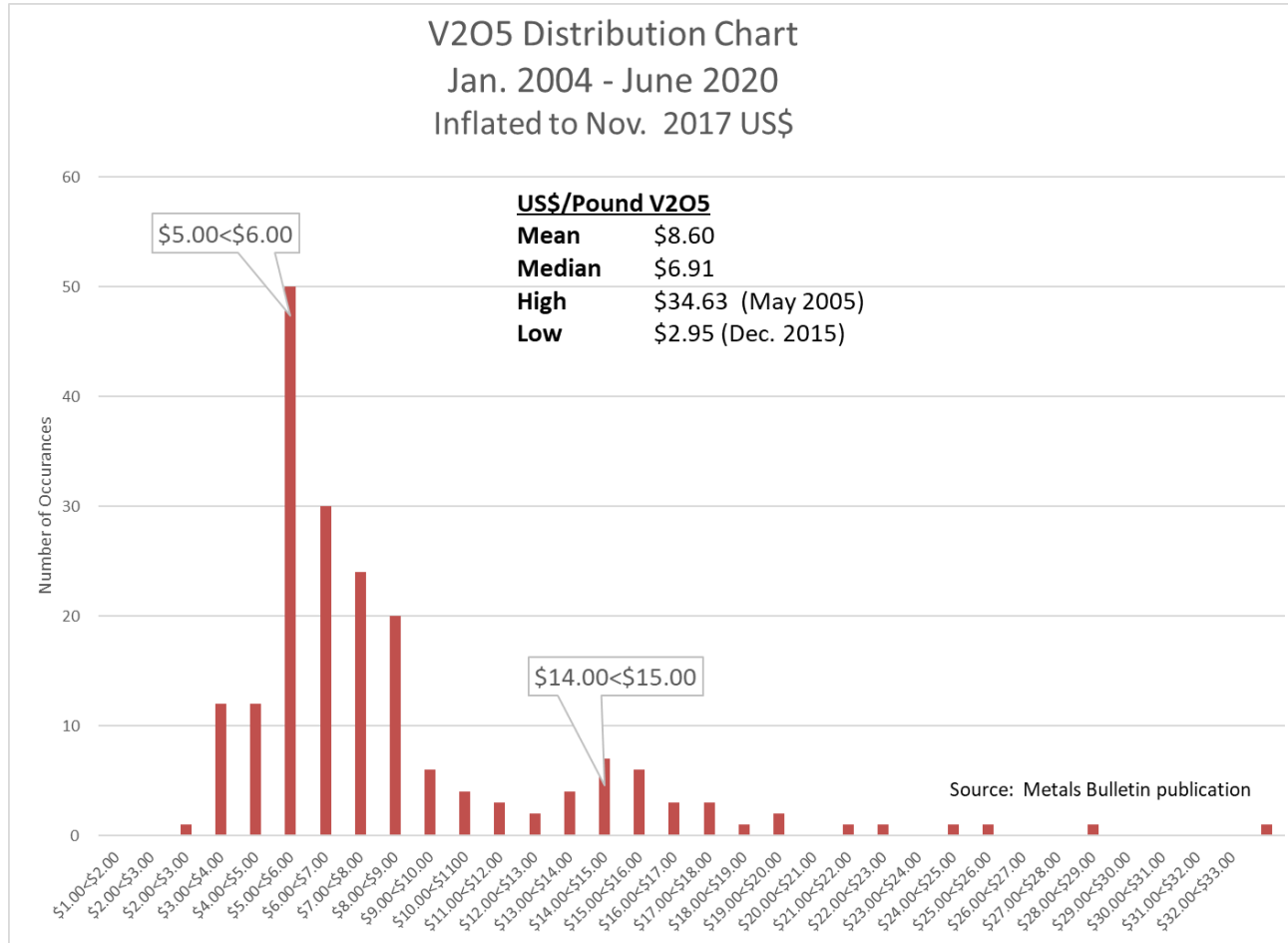
an entirely new major market for vanadium

Projected Annual Demand in 2050 for Energy Technologies as a Percentage of 2018 Production Levels under 2DS



# The vanadium price is volatile

The average price is much higher than the usual price



Source: Metal Bulletin, TTP Squared, Inc.

# World market for vanadium is growing strongly

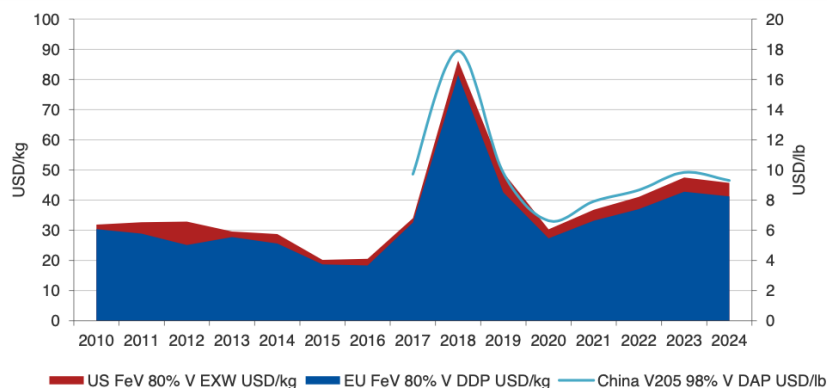
The world needs a new project like Balasausqandiq Phase 1 every year to meet demand

**Table 2 Vanadium demand by end-use 2018-2030, tonnes V**

	2018	2019	2020	2022	2024	2026	2028	2030	2019-2030 CAGR	Delta 2019- 2030
Steel	88,918	91,423	91,705	98,957	104,592	110,010	115,304	121,243	2.6%	29,820
Batteries	1,505	1,804	2,638	4,946	6,403	13,206	26,155	34,060	30.6%	32,256
Aerospace	4,171	4,044	4,420	4,821	5,263	5,764	6,175	6,614	4.6%	2,570
Chemicals	4,498	4,563	4,664	4,912	5,129	5,367	5,620	5,889	2.3%	1,326
<b>Total</b>	<b>99,092</b>	<b>101,834</b>	<b>103,426</b>	<b>113,636</b>	<b>121,387</b>	<b>134,347</b>	<b>153,254</b>	<b>167,806</b>	<b>4.6%</b>	<b>65,972</b>

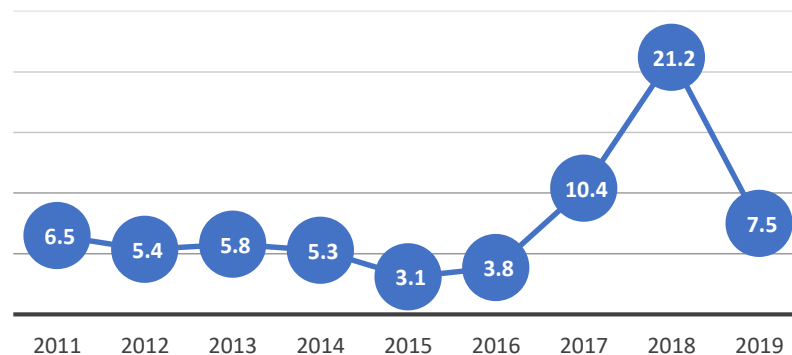
CRU

**Figure 4 Medium term vanadium pricing 2010-2024, nominal \$/kg & \$/lb**



CRU

**V2O5 price, USD/lb, average MB mid price Rotterdam**





# Two operations

A: Existing processing operation

B: Balasausqandiq project



# Two operations

Two projects operating on the same site:

## A. EXISTING OPERATION

- Treating purchased secondary material to recover vanadium pentoxide
- Existing capacity 700 tonnes per year
- Expansion to 1,500 tonnes per year of vanadium pentoxide underway
- 150 employees

## B. BALASQANDIQ PROJECT

- A huge deposit with economic potential in a class of its own
- Upgrade of existing study to western bankable standard ongoing
- \$2 billion NPV
- Expected to be world's lowest cost producer
- Potential to become the world's largest producer



# Existing operation

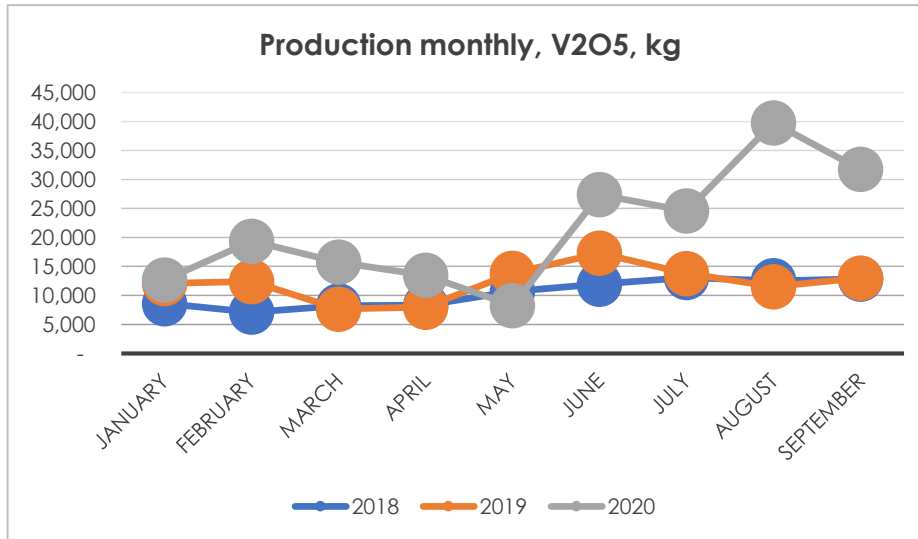
# Existing process plant - today



- Hydrometallurgical line and a pyrometallurgical line
- Can recover vanadium and molybdenum
- Combined production capacity today is around 60 tonnes of V<sub>2</sub>O<sub>5</sub> per month, planned to rise to 125 tonnes per month during 2021
- Good road access
- Motorway and rail in Shieli, 70 km from site
- Already grid connected, and connecting onto adjacent high voltage power-line

# Existing production

The existing process plant production of V2O5:



- Treating purchased concentrates and secondary materials to extract V2O5 in the form of AMV
- Capacity now reaching 60 tonnes per month and growing
- A converter is being installed to convert AMV to V2O5 – completion around December 2020
- Planned to increase capacity in 2021 to 125 tonnes per month with the installation of an electric arc furnace

# Existing process plant: hydrometallurgical line





# Existing process plant: pyrometallurgical line

## Roasting Ovens



# Laboratory

Ferro - Alloy has a well-equipped laboratory with highly qualified technical staff

Technical director Mr A A Fofanov – one of the world's foremost vanadium specialists





# Balasausqandiq deposit



# Balasausqandiq deposit: a unique type of ore – vanadium quartzite



# Balasausqandiq – why a huge cost advantage over other producers and projects?

Crucially not a titano-vanadiferous magnetite (“TVM”) deposit

## WHY THIS MATTERS:

- No need for high temperature roasting
- No need to pre-concentrate ore
- Higher recovery
- Valuable by-products



- Reduces capital and operating costs by ~60%
- Reduces operating costs by ~60%
- Destined to be the world's lowest cost producer



# Balasausqandiq – other advantages

## FAVOURABLE GEOLOGY

- Outcrops at surface, open pit,
- Very large deposit
- Total resource plus exploration potential 126m tonnes (middle of estimated range)
- Visible geological cut-off, low stripping ratio

## EXISTING INFRASTRUCTURE AND TRANSPORT LINKS

- Surfaced road already existing to site from town of Shieli (70 km)
- Shieli lies on the route of the motorway and rail links connecting Western Europe with East-Coast China
- High voltage (110kV) power line adjacent to site – connecting now
- Water and land readily available

## ENVIRONMENTAL AND SOCIAL

- All the constituents of the ore and recycling operations can be sold as products
- No permanent waste or tailings will be kept on site
- No arable land will be disturbed
- The site is 16 km from the nearest habitation - no people will be moved or disturbed

# Balasausqandiq - economics

These cost advantages translate into what is destined to become the world's lowest cost and most profitable vanadium producer

## WORLD'S LOWEST COST PRODUCER

- Balasausqandiq forecast cash cost of production:
  - \$1.54/lb expected (costs apportioned between products)
  - \$(1.20) (negative) if by-product revenues are deducted from costs

Compared with:

- Next lowest cost producer after Ferro-Alloy Resources \$3.48/lb

## EXCEPTIONAL FINANCIAL STATISTICS (Phases 1 and 2 combined)

- NPV of \$2 billion (10% discount rate, after tax cash flows)
- 79% operating margin (gives plenty of scope for royalty sales or streaming funding)
- 89% IRR
- Annual operating cash flow \$430m per year after tax (\$103m per year from Phase 1 only)



# Development plan

# Development Plan

Now	Expansion of existing operation to 1,500 tpa and feasibility study for Balasausqandiq	Ongoing
Phase 1	Mining and processing 1 Mtpa of ore Production 5,600 tpa (to be funded from existing operations, debt, and other non-equity sources)	Capex \$100m
Phase 2	Expansion to 4 Mtpa of ore Production increase to 22,400 tpa (to be funded from earnings)	Capex \$225m

Production figures in tonnes of vanadium pentoxide (V2O5)

- Funding for Phase 1 will be assisted by earnings of the existing operation plus debt, royalty sales and streaming – limited or no need for equity issues
- Funding of Phase 2 will be from operating earnings of Phase 1



# Appendix



# Kazakhstan

## An attractive operating environment

- An upper-middle income country (World Bank)
- Smooth transition to a new President in 2019 (World Bank)
- 25<sup>th</sup> (of 191) in ease of doing business (World Bank 2020)
- 10% income tax, 20% profits tax
- 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



# Appendix: Valuable by-products

Valuable by-products produced as part of the single processing route

## Carbon-silica flux

Concentrated to make carbon black, used in the manufacture of rubber – a \$12bn global market, Carbon-silica mix can be briquetted to make ideal feed for ferro-silicon smelting

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## Uranium / molybdenum

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

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## Potassium alum

Able to market in China 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

## BOARD

### **Nicholas Bridgen** Chief Executive

Chartered accountant, lives in Kazakhstan and speaks Russian. 14 years with Rio Tinto group in various roles and 26 years' board level experience with companies operating in the FSU including CEO of Hambleton 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 Fellow of the Securities Institute IAQ and a Fellow of the Institute of Directors. Director of Accounts For You Ltd.

## MANAGEMENT

### **Alexandar Fofanov** Technical Director

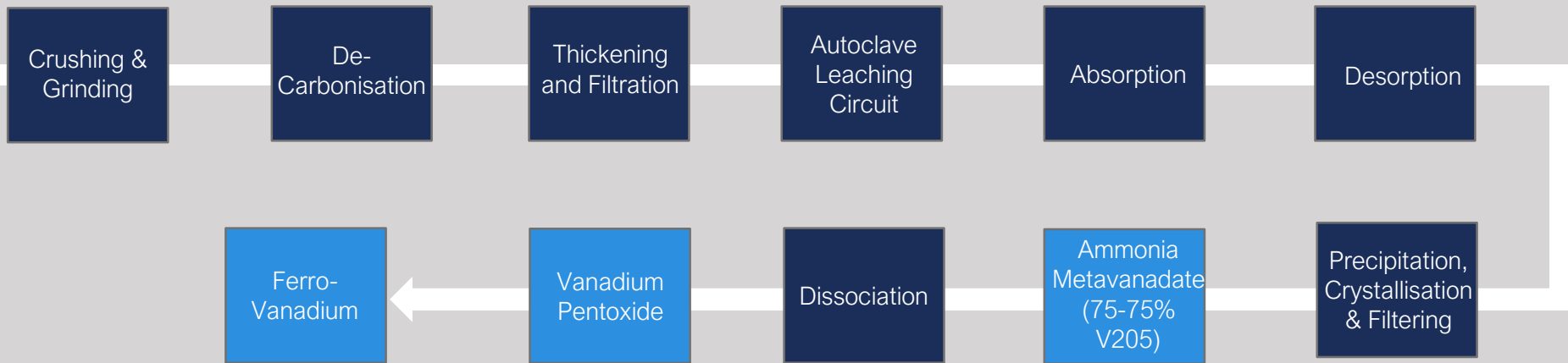
Chemical engineer with a PhD in vanadium extraction. Completed a tenure at the Central Research Metallurgical Institute, Moscow and has been MD at Tula Vanadium and Technical Director for Vanadium at the Evraz Group.

### **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.

# Appendix: Straightforward process

Process flowsheet tested in 15,000 tpa pilot plant



# Appendix: Balasausqandiq

## 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

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

4. A Reserve (JORC 2012) based on the indicated resource of OB 1 only amounts to 23m tonnes. In addition, the Inferred primary material in the table above lies within the contours of the planned open pit.

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