



FERRO-ALLOY  
RESOURCES GROUP

CORPORATE PRESENTATION  
Q4 2021

# Overview

Vanadium producer in Kazakhstan with the world's most prospective deposit

## Corporate

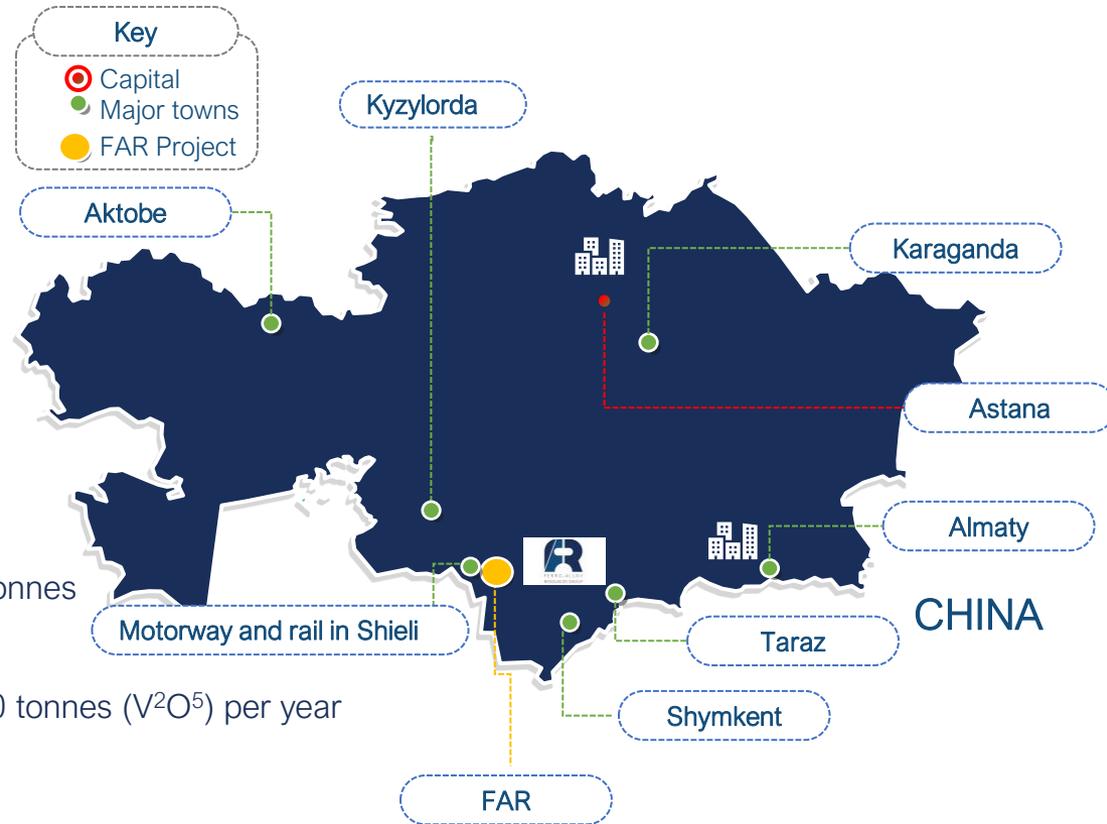
- Listed on London Stock Exchange and Astana International Exchange
- Operations: Kazakhstan
- Strategic Investor: Vision Blue Resources
- Market capitalisation \$150m (incl.CLN)

## Activities

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

## Vanadium – a green metal

- Micro-alloying reduces world steel requirements
- A huge new market as a battery metal



# Why is vanadium a green metal?

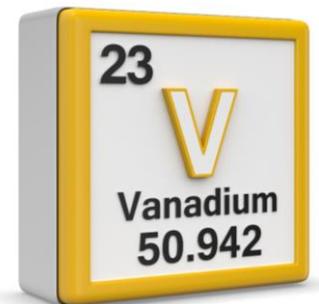
A: Reduces the world's need for steel

B: Needed for renewable energy storage



# Vanadium cuts down steel consumption

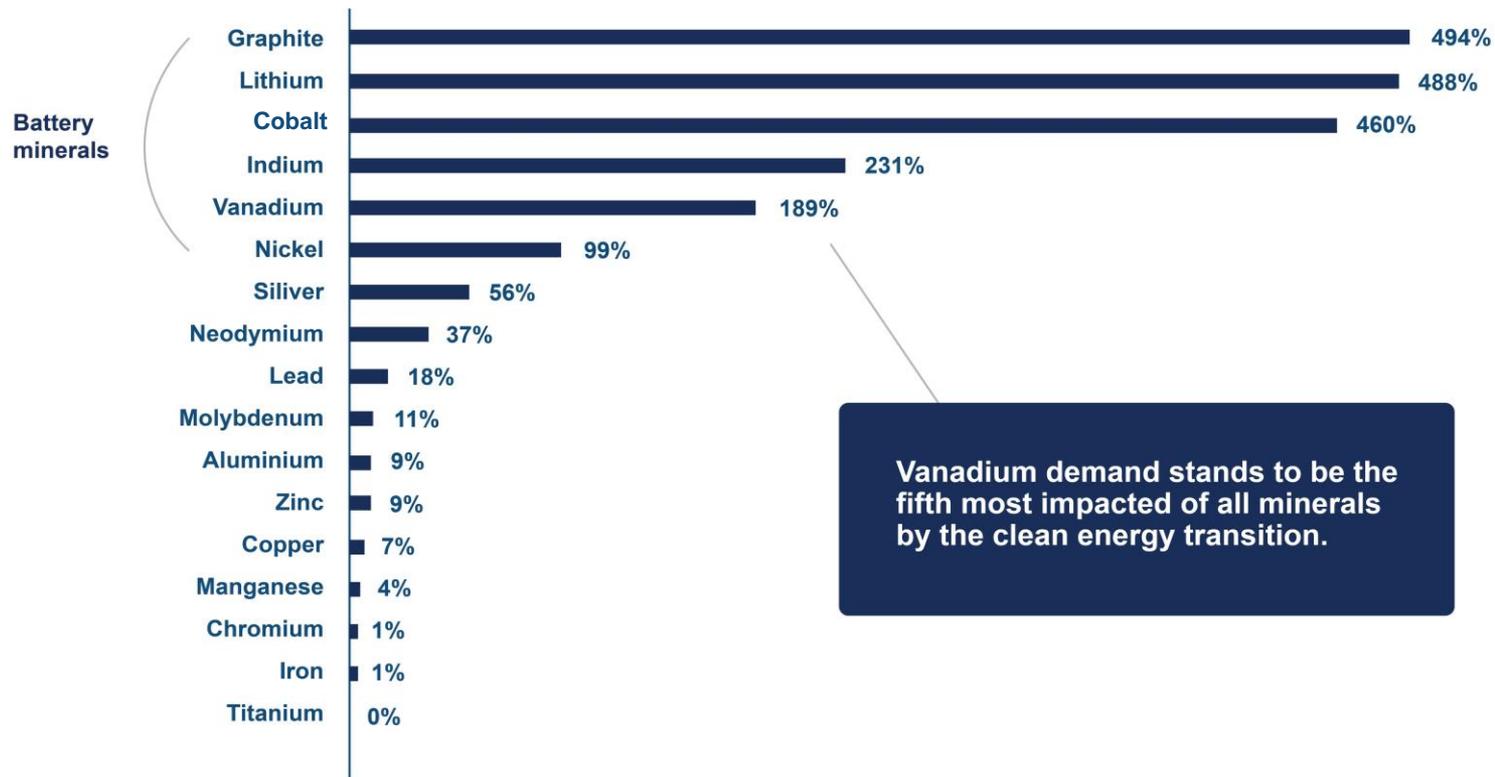
- 7% of the world's CO<sup>2</sup> comes from steel production (2020)
- Steel production is expected to grow by 1/3 by 2050
- Adding 1kg of vanadium to one tonne of steel increases the strength by up to 100%
- This cuts the quantity of steel required for the same strength
- Also increases fire and corrosion resistance
- Adding more vanadium to steel is one of the largest single-step means of reducing world CO<sup>2</sup> output
- This is why the percentage of vanadium in steel is growing year on year



# 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



Source: presentation to Vanitec 2020

# Batteries

As more of the world's energy comes from solar and wind, the need for energy storage increases.

**Vanadium redox flow batteries** work in a different way from the usual lithium-ion batteries in computers and cars as they are ideally suited to long-duration charge and discharge for bulk energy storage of renewable power. They contain liquid electrolyte that is pumped through the cells.

Advantages:

- No degradation over time
- Scalable by adding greater tanks
- Don't catch fire
- Can be fully charged and discharged unlimited times
- Components fully and cheaply recyclable
- Lower levelized costs over lifetime use

Vanadium can also be used in the cathode of **lithium-ion** batteries – a much larger market

# Ferro-Alloy Resources – why the world needs us

## Vanadium is abundant in the earth's crust, but it is expensive and energy-intensive to produce

- 15<sup>th</sup> most abundant element
- Occurs commonly as a small component of magnetite iron ore
- Production of vanadium from magnetite involves pre-concentration and high-temperature roasting
- Most projected production is too expensive for use in batteries

## Why Ferro-Alloy Resources is different

- Our deposit is not magnetite. It is completely different from nearly all other vanadium deposits
- Doesn't need preconcentration or roasting
- Isn't energy-intensive to produce
- Cost of production is a fraction of other primary producers and projects
- The deposit is huge, enabling FAR to become the world's largest and lowest costs producer

## Conclusions

- FAR can supply the increases in vanadium that the world needs
- The cost of production is at a level that is economic for battery needs
- FAR can produce sustainably, with relatively low energy input and minimal permanent waste products or tailings

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