



**BEOWULF MINING plc**

# European Critical Raw Materials for the Green Transition

July 2024



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# Developing a portfolio of critical minerals

Delivering European minerals for a sustainable future



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## Portfolio of European critical minerals

- Listed on AIM (UK) and Spotlight (Sweden)
- Focused on delivering shareholder returns



Jokkmokk Iron

26

Fe

Iron  
55.8

## Iron ore for Green Steel

- High-grade, low-impurity concentrate
- Growing demand in Europe (and globally)



GRAFINTEC

6

C

Carbon  
12.0

## Graphite anode material for Li-ion batteries

- Developing Graphite Anode Materials Plant
- One of Europe's largest flake graphite resources



VARDAR  
MINERALS

29

Cu

Copper  
63.5

30

Zn

Zinc  
65.4

3

Li

Lithium  
6.9

47

Ag

Silver  
107.9

27

Co

Cobalt  
58.9

28

Ni

Nickel  
58.7

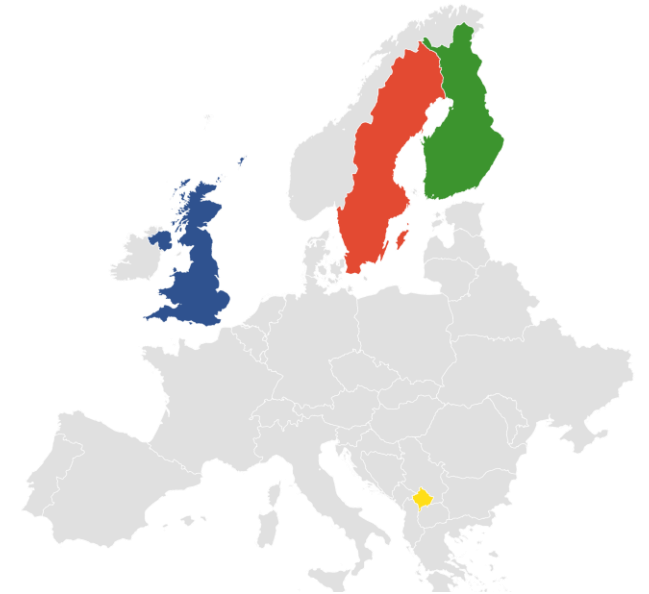
79

Au

Gold  
197.0

## Portfolio of European exploration assets

- Focus on base and precious metals
- Targeting discovery of critical minerals



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# Supply chain security

## Political initiatives

EU Critical Raw Materials Act to secure EU supply:

- >10% extracted from EU
- >40% processed within EU
- >25% from recycling
- <65% from a single country



US Inflation Reduction Act (IRA) to support clean-energy industries and supply chains:

~US\$370 billion in spending and tax credits



UK Critical Minerals Strategy



Canada's Critical Minerals Strategy



Australia–India Critical Minerals Cooperation Agreement



US–Japan Critical Minerals Agreement on battery minerals (lithium, nickel, cobalt, graphite and manganese):

- to help Japanese automakers and critical minerals processors access the benefits of the 2022 US Inflation Reduction Act.



The Indian Ministry of Mines JV company, Khanij Bidesh India Ltd. (KABIL) to ensure the supply of critical minerals:

- actively seeking offtake agreements and has already signed with Argentina and Australia




Minerals Security Partnership (MSP)

- led by the US Department of State, to stimulate government and private-sector investment
- Partner governments include Australia, Canada, Finland, France, Germany, Japan, South Korea, Sweden, the UK, the US and the EU.



# Supply chain security

## Driving investment in critical minerals

 <b>PORSCHE</b> Supply agreement from 2026 H2 <b>green steel</b> October 2023	<b>V O L V O</b> Supply agreement from 2026 H2 <b>green steel</b> September 2023	<b>STELLANTIS</b> €9.2m investment for 11.5% and 40% offtake for 5 years  April 2023	 Mercedes-Benz 10ktpa of lithium hydroxide for 5 years' worth ~€1.5b <b>RockTech</b> Lithium October 2022	<b>TESLA</b> 75kt nickel concentrate over 6 years  January 2022
 US\$2.9b battery JV  October 2023	 Mercedes-Benz JV on battery recycling plant  August 2023	 general motors US\$650m investment <b>LithiumAmericas</b> January 2023	<b>STELLANTIS</b> €50m investment for 8%  June 2022	<b>Renault Group</b> 6-17ktpa of lithium offtake  August 2021
<b>STELLANTIS</b> US\$155m investment for 14.2%  October 2023	 <b>SCANIA</b> Supply agreement from 2027 H2 <b>green steel</b> June 2023	<b>STELLANTIS</b> US\$30m and 45ktpa manganese sulphate offtake for 5 years <b>Element</b> 25 January 2023	<b>Renault Group</b> 5ktpa of cobalt sulphate for 7 years  June 2022	<b>Renault Group</b> Nickel sulphate supply for 200,000EVs or 15GWh pa <b>Terrafame</b> October 2021



# Scandinavia benefits from cheap, clean energy

## Driving both Green Steel and Gigafactory investment

### Steel industry

- 7% of global CO<sub>2</sub> emissions (5% in EU)
- €130b annual revenues in Europe
- Employs 306,000 people in Europe

Green Steel – reduces emissions by ~95%

**H<sub>2</sub>green steel**

€1.5b equity in Sept 2023

€3.5b of conditional debt commitments

Located in Boden, 170km from Kallak



Targeting €4b plant in Finland

Plan to build pellet plant in Norway



JV between LKAB, SSAB and Vattenfall

Targeting production by 2030

### Giga factories

- 40 plants for €30b planned in Europe
- 69GWh in 2022
  - 238-286GWh in 2025
  - 413-616GWh in 2027
  - 773-1,395GWh in 2030

**northvolt**

€17.3b capital raised

€27b in contracts secured (€14b Volkswagen)

**FREYR**

Initial plant at Mo i Rana, Norway

Further plant considered in US and Vaasa, Finland

**MORROW**

Initial plant at Arendal, Norway in 2024

Targeting 43GWh by 2028

**V O L V O**

Planned site with Northvolt in Gothenburg





# Building blocks for a sustainable future

ESG embedded throughout the company

Sustainability approach driven by:

- Transparency and Accountability
- Stakeholder Engagement
- Environmental Stewardship
- Corporate Governance
- Innovation and Technology

Beowulf plans to:

- Build a sustainable minerals business
- Adopt innovation and technology
- Target carbon neutrality
- Support the green transition
- Generate value for all stakeholders



Note: The Company is contributing towards the above UN Sustainable Development Goals. Further information on the UN SDGs can be found here: <https://sdgs.un.org/goals>

The Company has also adopted the following Disclosure Topics listed by the Sustainability Accounting Standards Board for the Metals and Mining sector (<https://www.sasb.org/standards/>) as material to the Company's stakeholders: Energy Management; Water Management; Biodiversity Impacts; Security, Human Rights & Rights of Indigenous Peoples; Community Relations; and Business Ethics & Transparency







**Jokkmokk Iron**



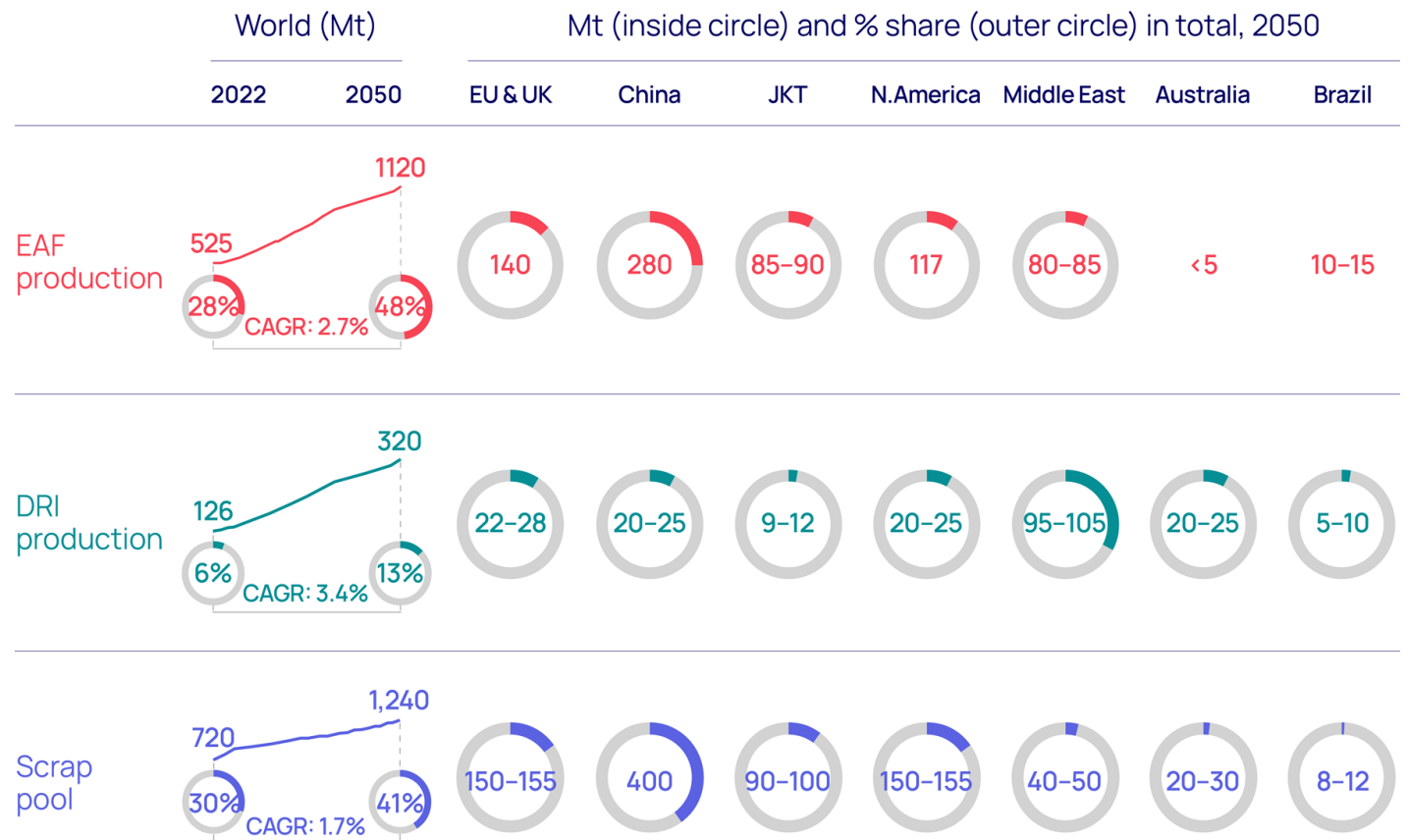
# High-grade iron ore: demand forecast to grow

Decarbonisation of steel to drive demand of low carbon feedstocks, primarily DRI

- Decarbonisation is transforming the supply and trade of iron and steel
- Electric Arc Furnaces (EAFs) are replacing highly polluting Blast Furnaces (BFs)
- Low-carbon feedstocks, primarily DRI, will be essential to support EAF capacity.
- DRI produced with green hydrogen offers a real route to delivering low-carbon steel
- New hubs will develop in countries with abundant low-cost renewables energy and competitive green hydrogen capacity

Source: Wood Mackenzie

Share of DRI and scrap in total metallics demand (2022 and 2050)



# Kallak: high-grade, low-impurity iron ore

Critical product to decarbonise the steel industry

- Potential to produce unique high-grade concentrate
- Strong demand from domestic and international markets
- Well located for infrastructure: rail ~40km; range of port options
- Access to low-cost, clean energy
- Exploitation concession received and scoping study completed
- Further exploration upside

## Kallak North Mineral Resource Estimate:

Classification Category	Tonnes (Mt)	Fe <sub>total</sub> %	FeO %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	P %	S%
Measured	16	33.6	10.5	43.4	2.9	0.04	0.002
Indicated	95	27	7.1	49.8	4.5	0.03	0.002
Meas+Ind	111	28.0	7.6	48.9	4.3	0.03	0.002
Inferred	25	28.3	7.8	48.1	4.2	0.04	0.002

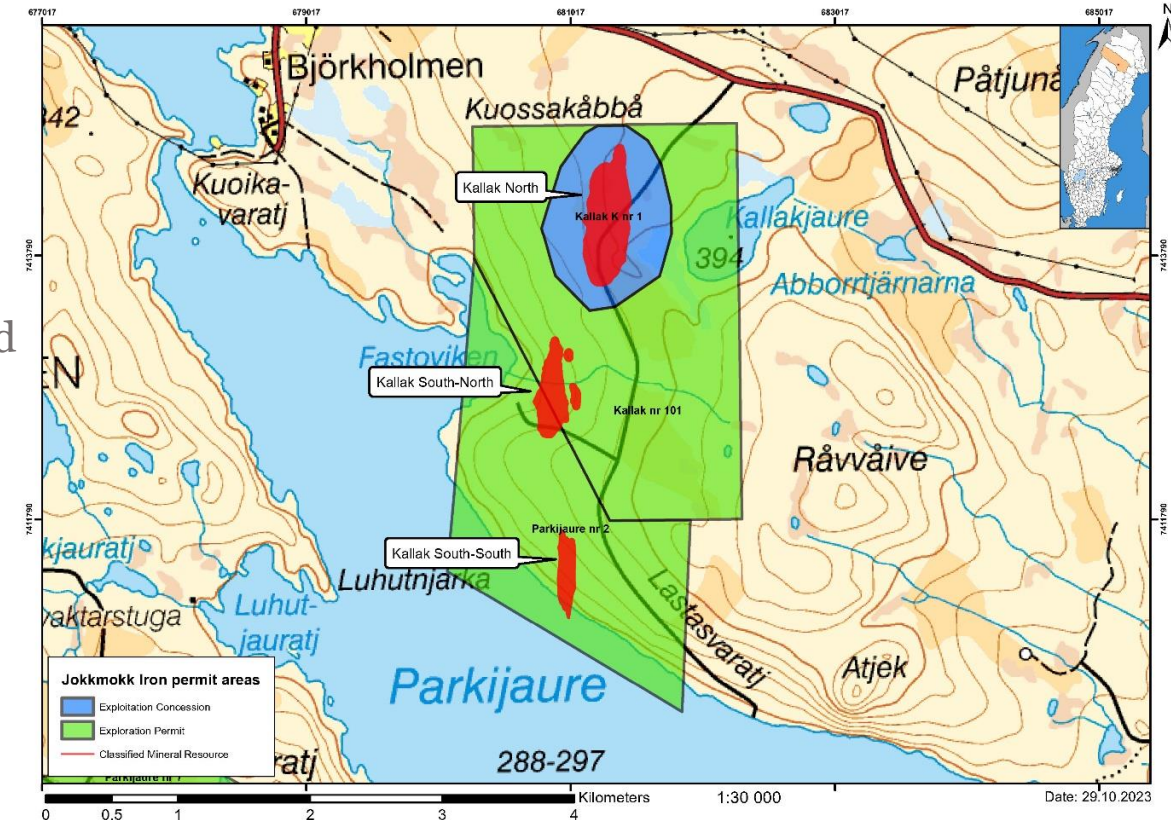
\*Accompanying notes:

(1) Mineral Resources which are not Mineral Reserves have no demonstrated economic viability

(2) The effective date of the Mineral Resource is 09 May 2021 (reported under PERC 2017).

(3) The Open Pit Mineral Resource statement was constrained within lithological and grade-based solids and within an optimised pit shell defined by the following assumptions; base case metal price of USD130 / tonne for a 65% Fe concentrate; Fe recovery of 71% at Kallak North; Fe concentrate grades of 68% at Kallak North; Processing costs of USD6.8 / t wet; Selling cost of USD21.0 / t wet concentrate; Mining cost of mineralised material of USD3.3 / t, mining cost of waste of USD3.0 / t and an incremental mining cost per 10 m bench of USD0.05 / t; Wall angles of 30° within the overburden and 47.5° in the fresh rock.

(4) Mineral Resources have been classified according to the PERC Standards 2017, by Howard Baker (FAusIMM(CP)), an independent Competent Person as defined in the PERC Standard 2017.



# Kallak North Iron Ore Project

## Project parameters

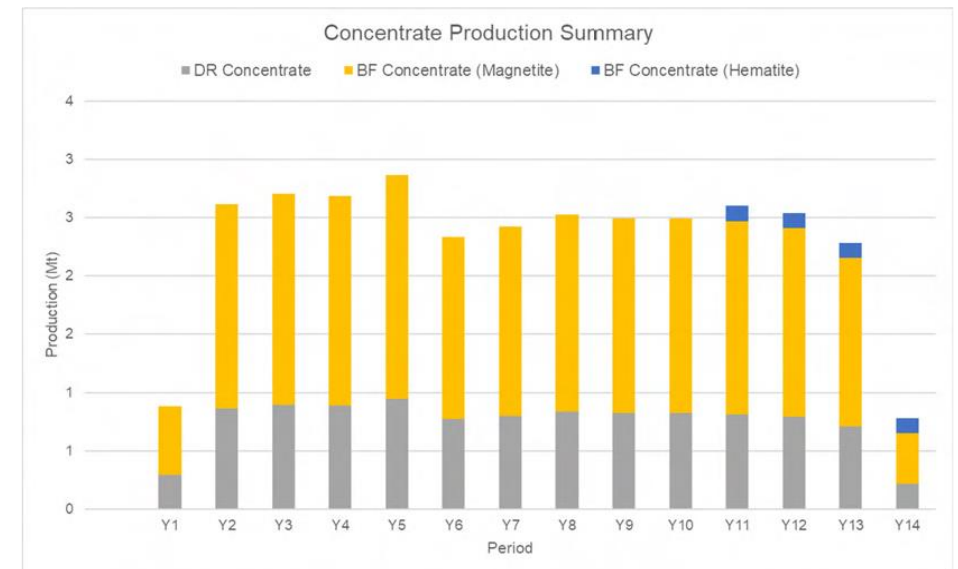
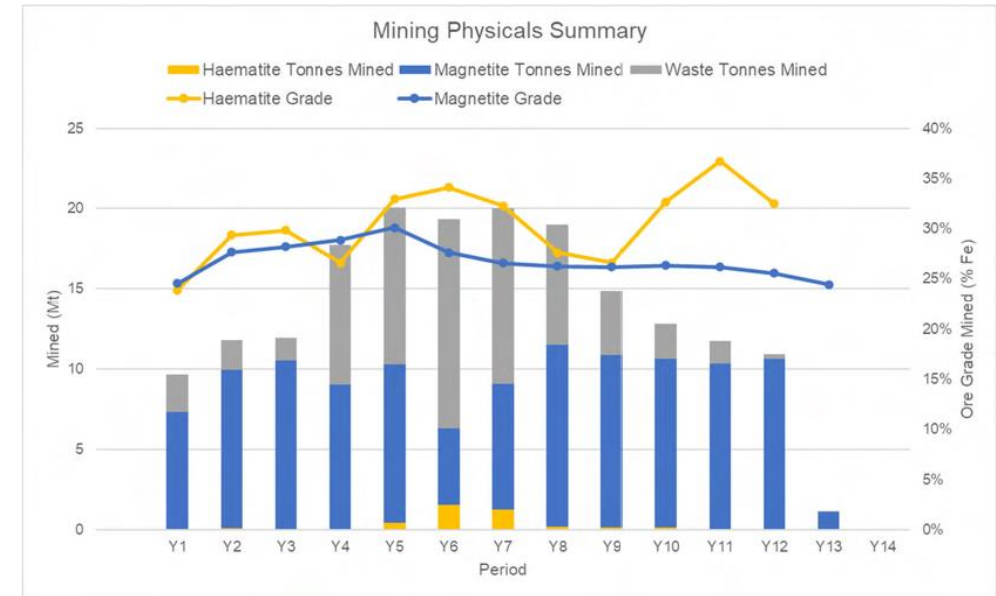
Scoping Study completed on Kallak North Deposit:

- Open pit mine
- Mining ~9Mtpa of ore
- Producing ~2.5Mtpa of high-grade, low-impurity concentrate
- Initial 14 year mine-life

Physical Parameters	
Mining rate (Mtpa)	14
Total Ore Mined (Mt)	114
Strip Ratio (waste/ore)	0.5
Processing throughput (Mtpa)	9
Total concentrate produced (Mt)	32
Concentrate production (Mtpa)	2.5
Average concentrate grade (Fe %)	69%

Economic parameters	
Initial Capital (US\$m)	386
Contingency - 20% (US\$m)	77
Sustaining Capital (US\$m)	138
Mining costs (US\$/t mined)	2.85
Processing costs (US\$/t processed)	6.30
Transport & Logistics (US\$/t processed)	7.07
Other (US\$/t processed)	1.03
Total Operating Costs (US\$/t processed)	18.79

Source: Kallak North Scoping Study, January 2023





# Infrastructure & Logistics

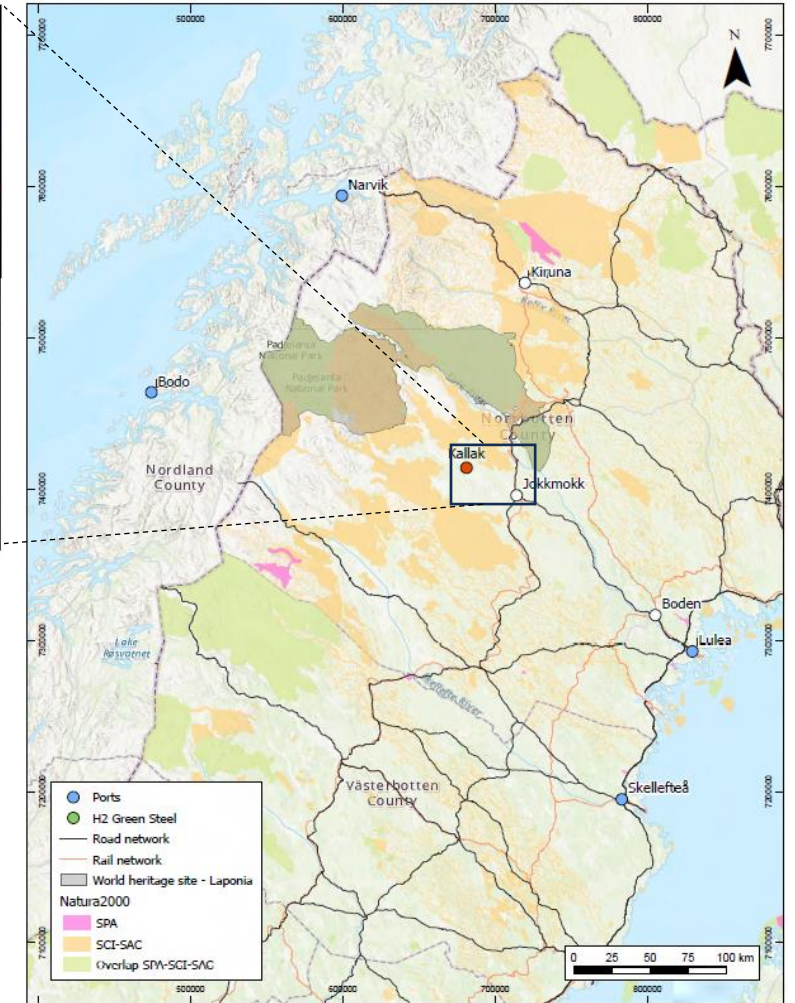
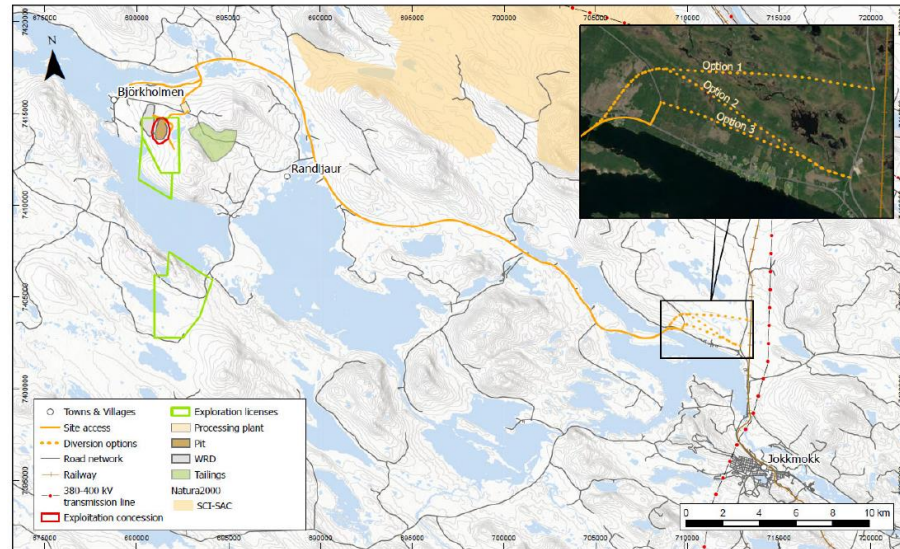
Well located for infrastructure

Well located to access:

- Low-cost, clean energy
- Road and rail
- Multiple port options
- Domestic consumers

Distances (km):

	Road	Road to Jokkmokk and then Rail
Inlandsbanan	46	
Lulea	205	349
Pitea	221	364
Skellefteå	298	458
Narvik	419	402
Boden	169	309





# Current workstreams

Focus on developing a world class mine

## Environmental:

- EIA consultation
- Nature values, biodiversity, water quality
- Hydrogeology
- Noise and vibration
- Air quality
- Cultural Heritage
- Reindeer Herding Analysis
- World Heritage Impact Assessment
- Social Impact Assessment
- Ecological compensation
- Ongoing stakeholder engagement

*Submission of the Environmental Permit application in Spring 2025*

## Technical:

- Infill drilling
- Mineral Resource Estimate
- Mine Planning
- Metallurgy & Mineral Processing
- Waste Management
- Infrastructure
- Logistics, transportation and Marketing
- Economic Analysis

*Completion of the Pre-Feasibility Study by Q2 2025*

# Kallak advantage

## Targeting a premium product

### Premium product:

- Critical for decarbonising steel industry
- Highly sought after for domestic and international markets
- Enhanced economics
- Focus on developing a sustainable world class mine
- Further upside potential from Kallak South deposits



<u>Scoping study base case parameters</u>			<u>Upside potential<sup>3</sup></u>
NPV at 8%:	US\$177m	➡	<b>US\$895m</b>
IRR:	14.5%	➡	<b>33.1%</b>
Payback period:	4.5 years	➡	<b>2.8 Years</b>
Concentrate split:	67% BF <sup>1</sup> , 33% DR <sup>1</sup>		67% BF, 33% DR
BF price:	US\$109/dmt <sup>2</sup>		US\$165/dmt
DR price:	US\$125/dmt <sup>2</sup>		US\$181/dmt

### Notes:

1. BF - Blast Furnace feed and DR - Direct Reduction feed
2. Scoping Study pricing assumptions assume premia archived over Platts 62% Fe benchmark price of US\$80/dry metric tonne ("dmt")
3. Management Case assumes the same premia achieved as with Scoping Study but uses the 3-year average price to January 2024 of the NYMEX Iron Ore 62% Fe benchmark of US\$135.59/t.



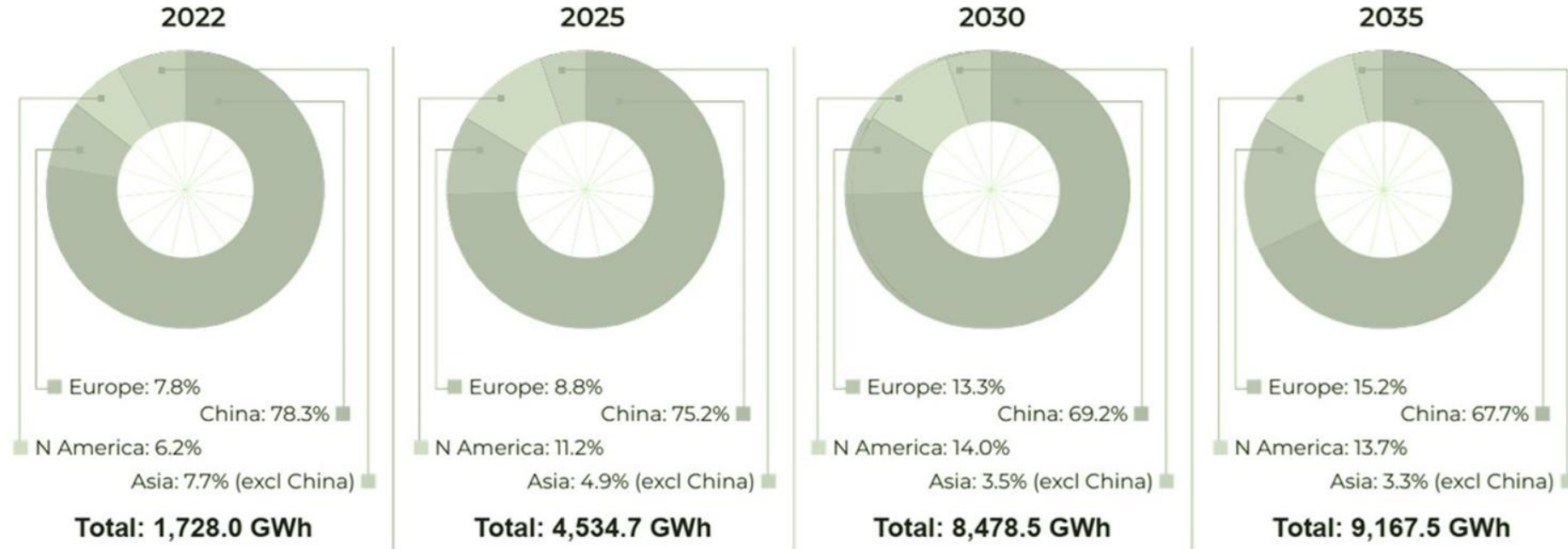
**GRAFINTEC**



# Strong growth in European batteries

## Driving demand for Graphite Anodes

*Lithium-ion Battery Cell Capacity by Region*



### For European Cell Manufacturing

7.8% of 1,728.0 GWh = **134.78 GWh**  
1,200 tonnes of graphite anode per GWh  
**Demand = 161,736 tonnes**

8.8% of 4,534.7 GWh = **399.05 GWh**  
1,200 tonnes of graphite anode per GWh  
**Demand = 478,860 tonnes**

13.3% of 8,478.5 GWh = **1,127.64 GWh**  
1,200 tonnes of graphite anode per GWh  
**Demand = 1,353,168 tonnes**

15.2% of 9,167.5 GWh = **1,393.46 GWh**  
1,200 tonnes of graphite anode per GWh  
**Demand = 1,672,152 tonnes**

Source: Benchmark Mineral Intelligence March 2023



# Grafintec

Aiming to be a European leader in the sustainable supply of anode material



## Anode Materials Production

- Development of anode materials production facility in Finland
- Established partnerships to provide an integrated solution
- Advanced discussions with several mines to secure supplies of imported raw material in the short term



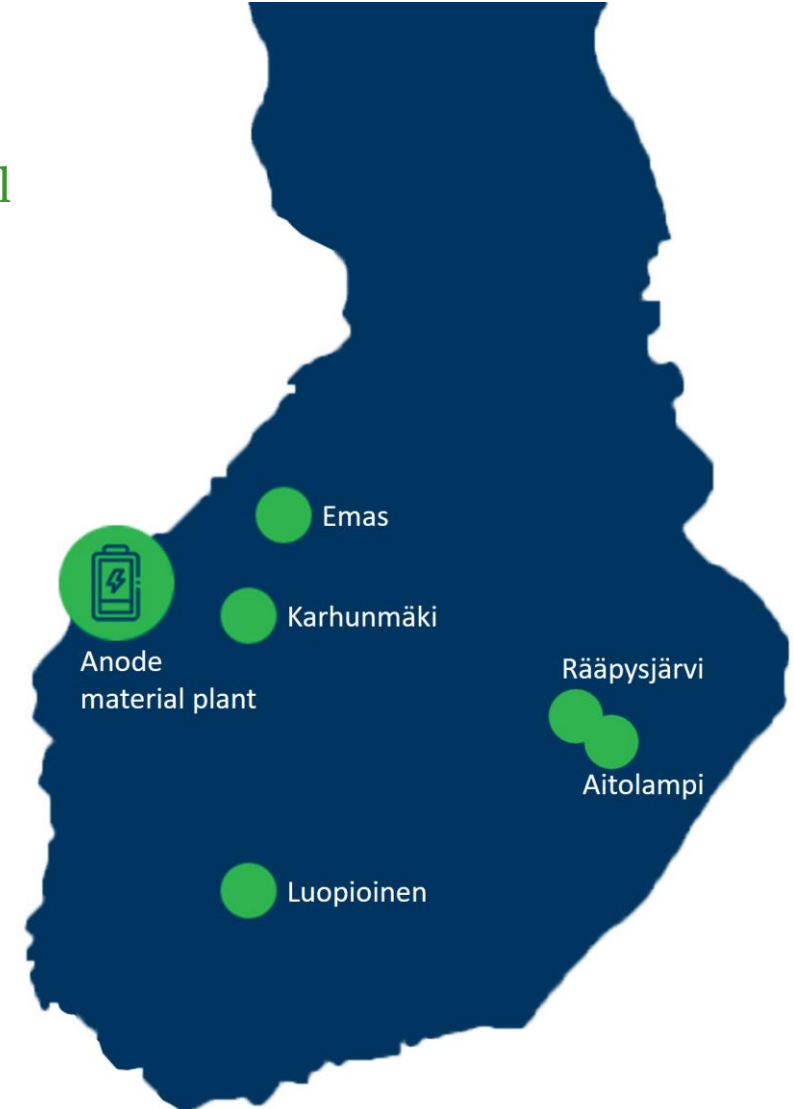
## Primary Raw Material

- Aitolampi graphite project provides long-term security of supply
- Total Indicated and Inferred Mineral Resource of 26.7Mt at 4.8% for 1,275,000 t of contained graphite
- Exploration upside with other graphite prospects



## Sustainability, Transparency and Security

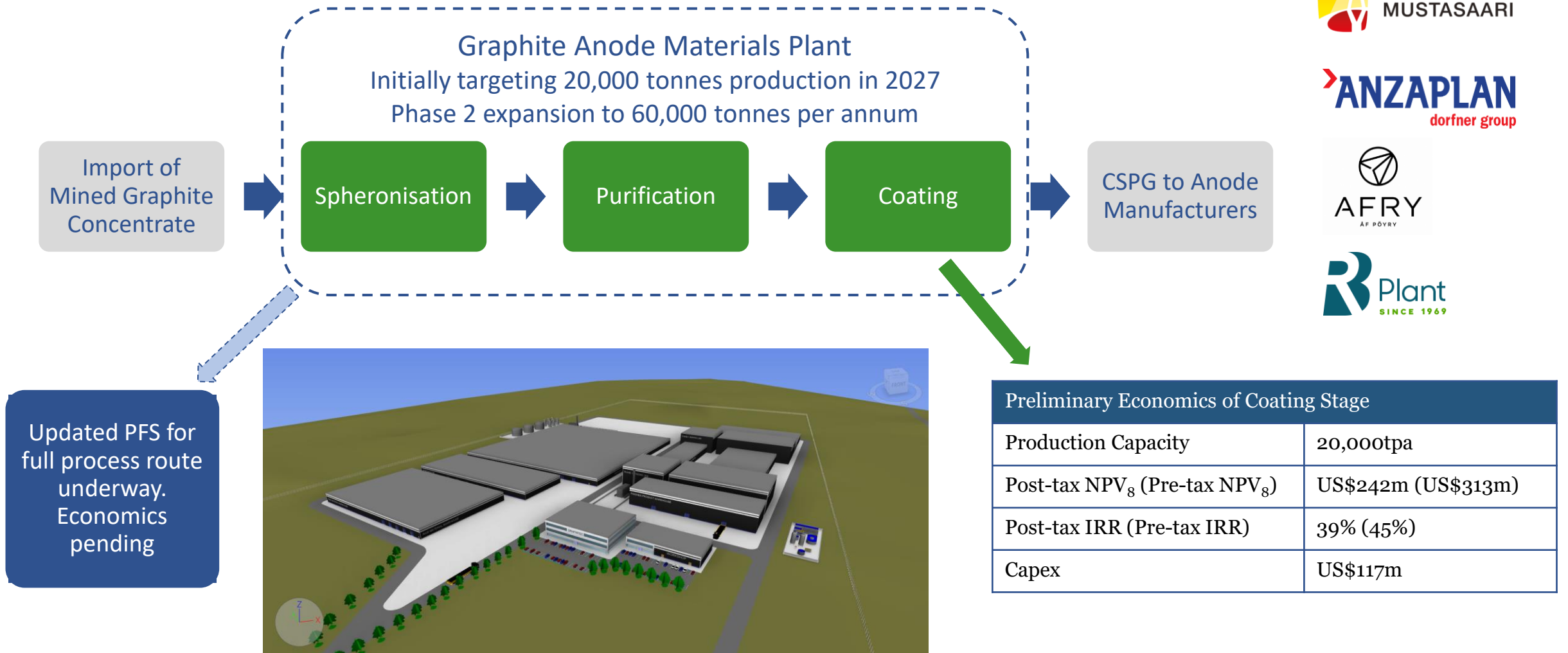
- Sustainability focus
- Local/optimised/seamless/ESG certified supply chain
- Powered by renewable electricity
- Key role in the Finnish battery cluster



Source: Grafintec

# Graphite Anode Materials Production in Finland

Site reserved at GigaVaasa Energy Industrial Hub

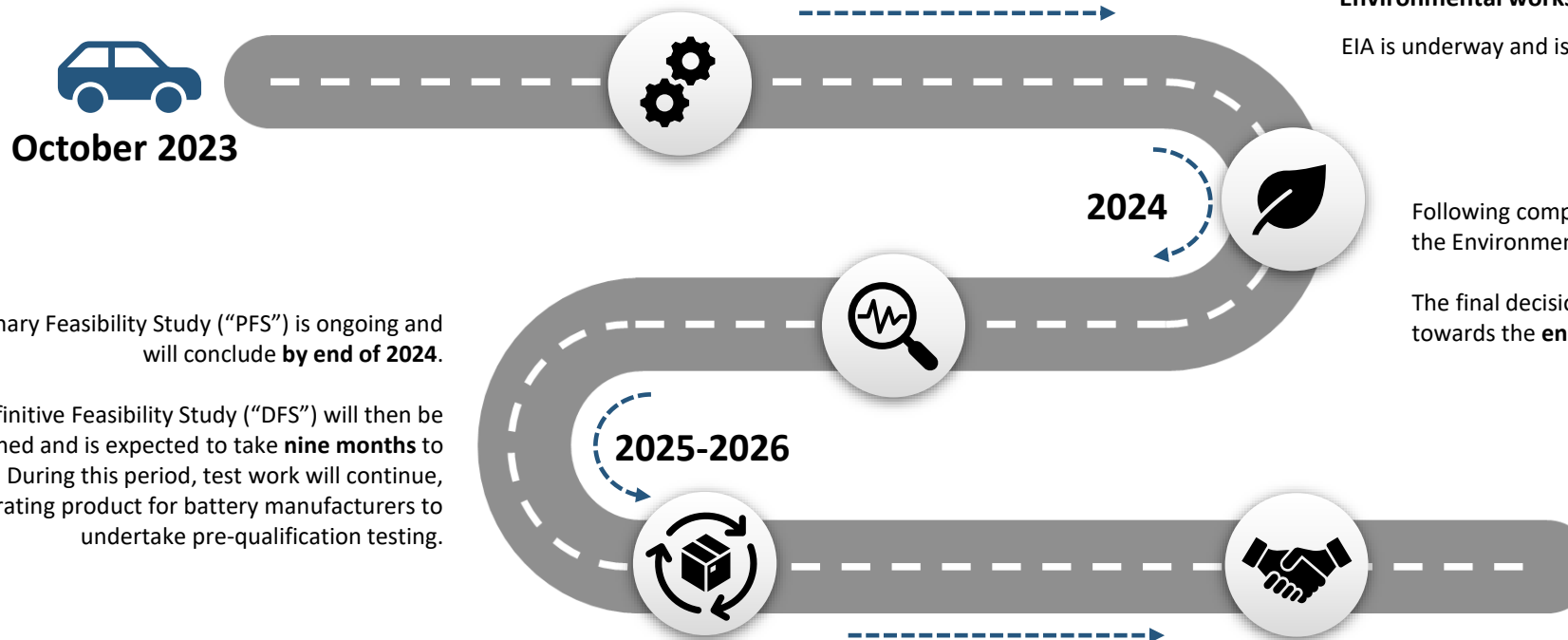


# Development Timeline

## Environmental and Technical Workstreams

### Technical workstream:

The project is advancing with bench-scale test work that commenced in October, which is to be followed by pilot-scale test work.



### Environmental workstream:

EIA is underway and is aimed to be completed in **Q3 2024**.

Following completion of the EIA, work will commence towards the Environmental Permit.

The final decision of the Environmental Permit is expected towards the **end of 2025**

With the successful conclusion of the Environmental and Technical workstreams listed above, the GAMP project will enter Front-End Engineering Design (FEED), financing and ultimately construction phases with first production targeted for 2027.

# Strategic resources

One of Europe's largest flake graphite deposits

## Aitolampi

### Mineral resource

### Metallurgical testwork

- Indicated and Inferred 26.7Mt at 4.8% graphite for 1,275,000 tonnes of contained graphite (Indicated and Inferred)
- Several untested EM conductive areas
- 96.8% to 97.5% graphite concentrates produced suitable as a pre-cursor for graphite anode materials production
- Purification tests achieved >99.95% graphite
- Spheronisation and battery application tests completed

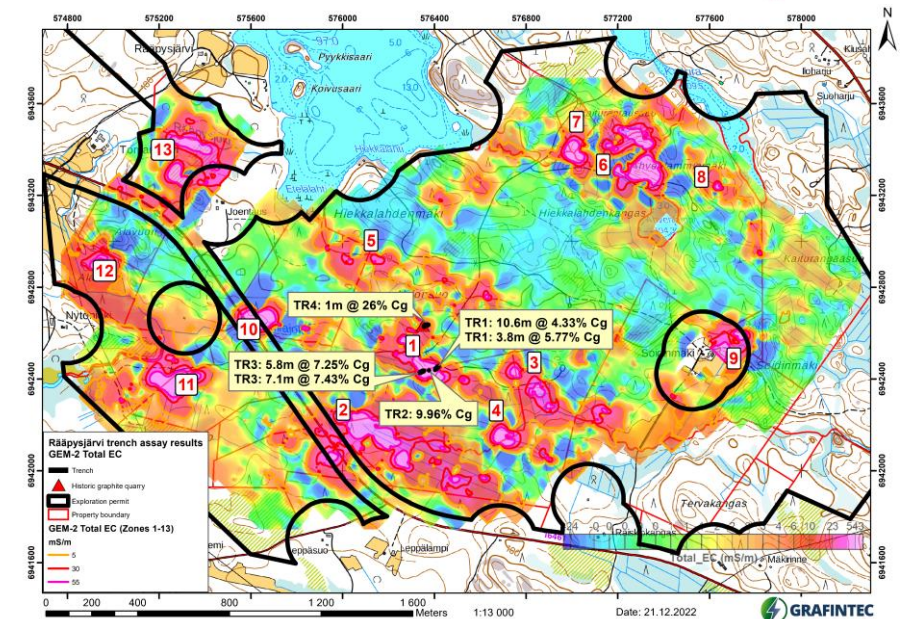
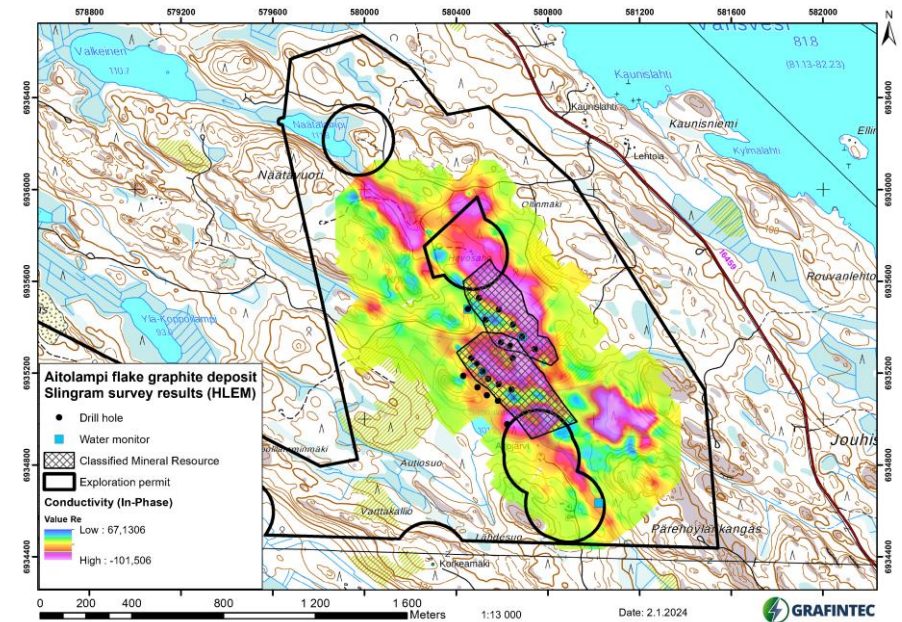
## Rääpysjärvi

### Exploration work

- Located 8km from Aitolampi
- EM conductive anomalies are more extensive - potential for a larger tonnage of graphite mineralisation in the area
- >50% graphite assayed (*limitation of the analysing methodology*) from grab sample at historic graphite quarry at Zone 1 - potential for localised very high-grade mineralisation
- Four trenches revealing significant flake graphite mineralization, including 1.0m at 26.00% graphite & 7.1 m at 7.43% graphite

### Metallurgical testwork

- Composite surface grab sample with a head grade of 19.8% graphite
- 97.4% graphite concentrate produced with 18.8% in the large/jumbo flake fraction







# Vardar – focused on discovery

## Tethyan Belt – a major metallogenic province

### Timok deposit (Zijin), Serbia:

- Zijin acquired Nevsun Resources Ltd. for US\$1.4b in 2018, after Nevsun acquired Reservoir Minerals Inc. for US\$365m in 2016
- Total resources of 1.8bt @ 0.9% Cu & 0.2g/t Au
- Forecast 2023 production of 3Mt for 181kt Cu & 156koz Au

### Skouries deposit (Eldorado Gold), Greece:

- Total resource of 308Mt @ 0.6g/t Au & 0.5% Cu

### Stan Terg mine (Trepca), Kosovo:

- Reported historic resource of 63Mt @ 3.5% Pb, 2.3% Zn & 80g/t Ag

### Sasa deposit (Central Asia Metals), North Macedonia:

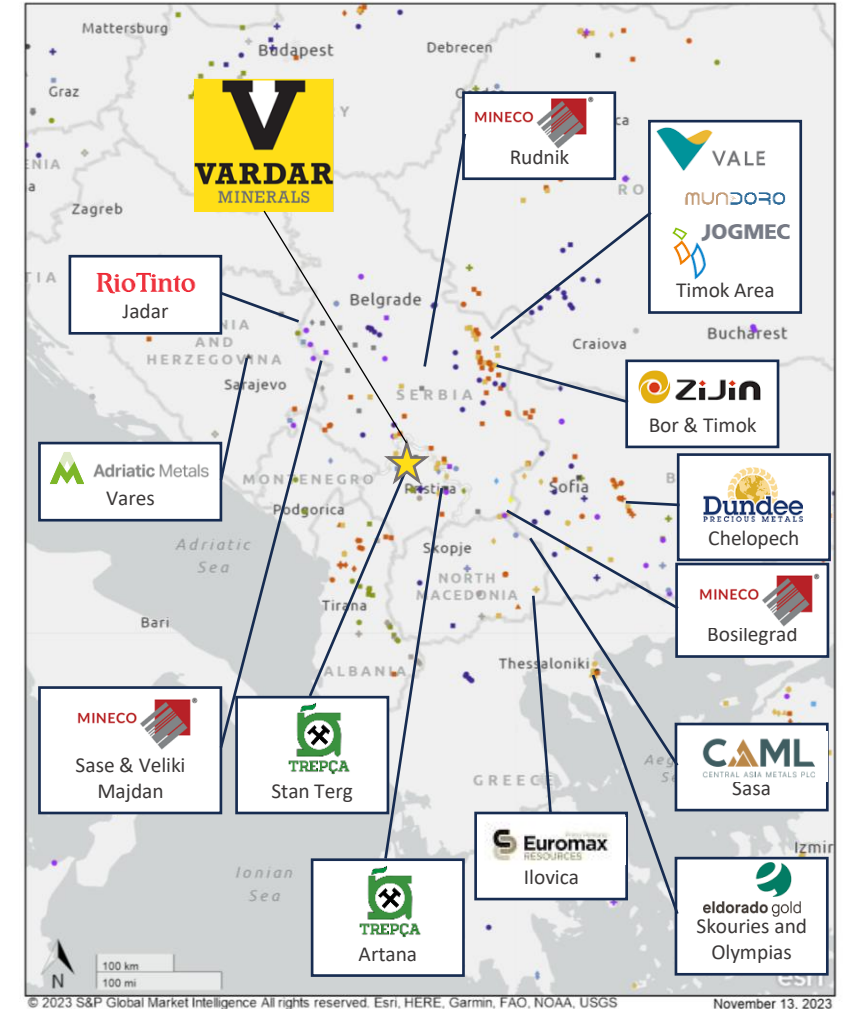
- Acquired for US\$402.5m in 2017
- Total resources of 22.3Mt @ 4.2%Pb, 2.5% Zn & 20.5g/t Ag
- 2022 production of 807kt @ 3.6% Pb & 3.2% Zn

### Vares deposit (Adriatic Metals), Bosnia & Herzegovina:

- Construction underway with US\$244.5m finance raised
- Total resource of 21.1Mt @ 156g/t Ag, 4.3% Zn, 2.8% Pb, 1.2g/t Au, 0.4% Cu, 0.2% Sb & 27%BaSO<sub>4</sub>
- Forecast production of 15Moz Ag equivalent pa for first 6 years

### Jadar deposit (Rio Tinto), Serbia:

- Total mineral resource of 144Mt at 1.8% Li & 14.3% B<sub>2</sub>O<sub>3</sub>



Source: Company websites and reports

# Vardar – systematic exploration

## First-mover in highly prospective Kosovo

### Kosovo:

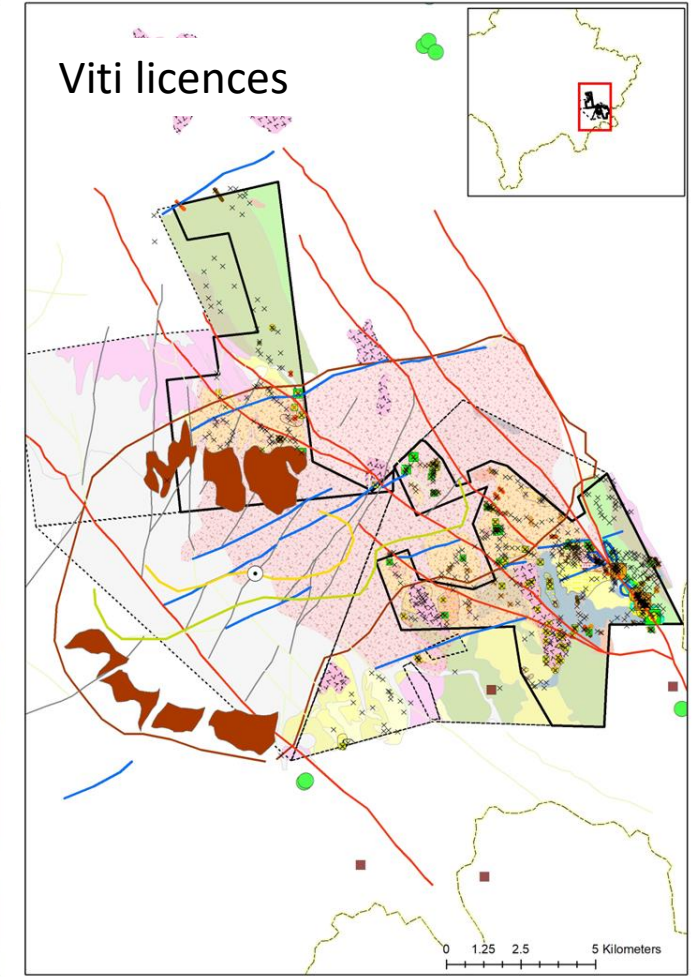
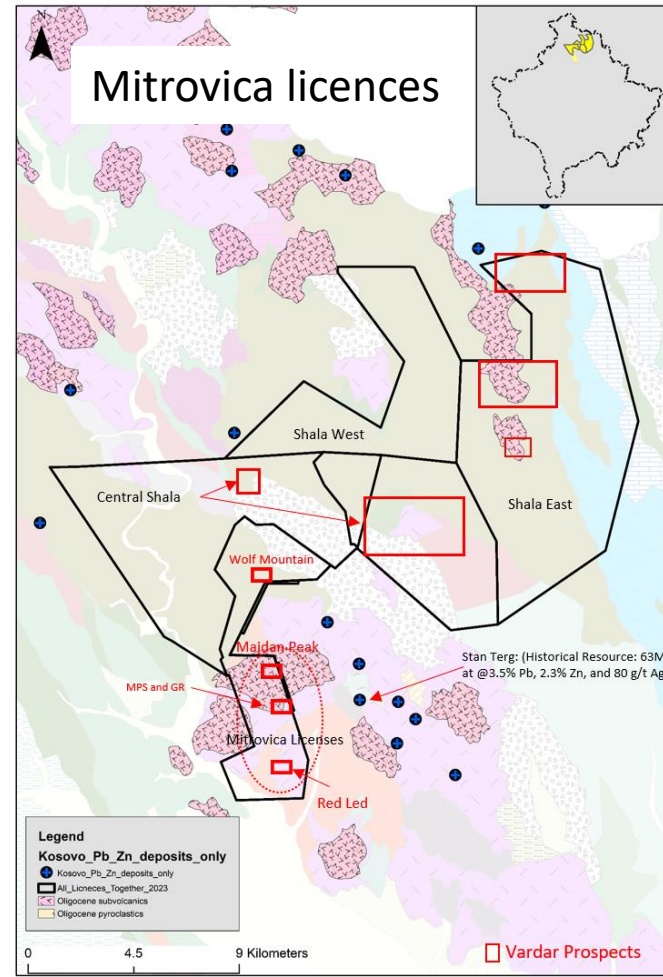
- highly prospective for base and precious metals
- limited to no exploration since the 1980s

### Mitrovica licence area:

- km-scale hydrothermal alteration systems identified - comparable in size to world-class base and precious metals deposits
- multiple high-quality targets defined by mapping, geochemistry, geophysics and drilling
- Red Lead priority Zn target yet to be drilled, similarities and proximal to Stan Terg
- significant drill results to date include:
  - MP6: 10.8m at 0.48 g/t Au, 0.1% Cu and 18 g/t Ag
  - MP6: 6.8m at 4.1% Pb, 0.6% Zn and 15 g/t Ag; and
  - MP15: 44.4m at 0.2 g/t Au

### Viti licence area:

- anomalous copper and gold from surface sampling and drilling
- potential for Jadard-like lithium mineralisation



Note: The Mitrovica, Viti North and Viti East licences are currently under application



# Other assets and opportunities

## Active management of portfolio

### Swedish assets:

- Kallak South-North deposit: 21Mt at 26.9% Fe Indicated & 6Mt at 23.4% Fe Inferred
- Kallak South-South deposit: 8Mt at 26.1% Fe Inferred
- Copper exploration target with up to 14.6% Cu in boulder sample

### Finnish assets:

- Rääpysjärvi graphite project: trench results include 1.0m at 26.00% TGC & 7.1 m at 7.43% TGC
- Cobalt/ nickel exploration project

### Review of other opportunities:

- European & Green Transition focus
- Green- and brownfield assets
- Multiple commodities including copper, iron ore, graphite





# Summary and Outlook

## Primed for a re-rate

### **Diverse portfolio of critical materials:**

- Jokkmokk Iron has the potential to produce a market-leading, high-grade, low impurity concentrate
- Grafintec holds one of Europe's largest flake graphite resources and aims to supply of graphite anode material
- Vardar is focused on the discovery of base and precious metals

### **Prime location to establish a secure European supply chain:**

- Beowulf's Nordic assets are located close to leading Green Steel and Gigafactory investments
- Access to low-cost, clean energy and established transport infrastructure for domestic and international markets
- Kosovo is located at the heart of the highly prospective Tethyan Belt

### **Market primed for re-rate:**

- Chinese nationalism driving political intervention (China's graphite export controls vs. EU's Critical Raw Materials Act)
- Significant investment in downstream (Green Steel and Gigafactories) and growing upstream investment by OEMs and vehicle manufactures
- Junior resource equities trading at multi-year lows - supply-chain security to drive re-rating



An aerial photograph of a wind farm during the 'golden hour' of sunset. Several white wind turbines are visible, with the one in the foreground being the most prominent. The landscape consists of green fields and a dark forest in the lower-left corner. The sun is low on the horizon, creating a warm, hazy atmosphere and long shadows. The word 'Appendices' is written in a blue, serif font across the middle of the image.

# Appendices

# Corporate summary

## Experienced Board & Management

### Market Data (as at 15 July 2024)

Listing	AIM/ Spotlight
Ticker	BEM/ BEO
Share price	33.5p/ SEK 4.04
Shares outstanding	38.8 million
Market Capitalisation	£13.0 million
Cash (31 March 2024)*	£3.9 million
Debt (31 March 2024)*	Nil
Shares held in Sweden	81%
Average daily volume (30-day)	126,000

\* Includes net funds raised of £3m announced on 3 April 2024 and post repayment of Bridge Loan



**Johan Röstin**

**Non-Executive Chairman**

Former CEO of shipping and port companies with significant experience in infrastructure, logistics, capital investments and permitting processes



**Ed Bowie**

**Chief Executive Officer**

Over 20 years' experience in corporate, advisory and fund management roles and across a broad range of commodities and jurisdictions



**Mikael Schauman**

**Non-Executive Director**

Former SVP Commercial for Lundin Mining responsible for worldwide sales, with more than 40 years' experience of base metals



**Chris Davies**

**Non-Executive Director**

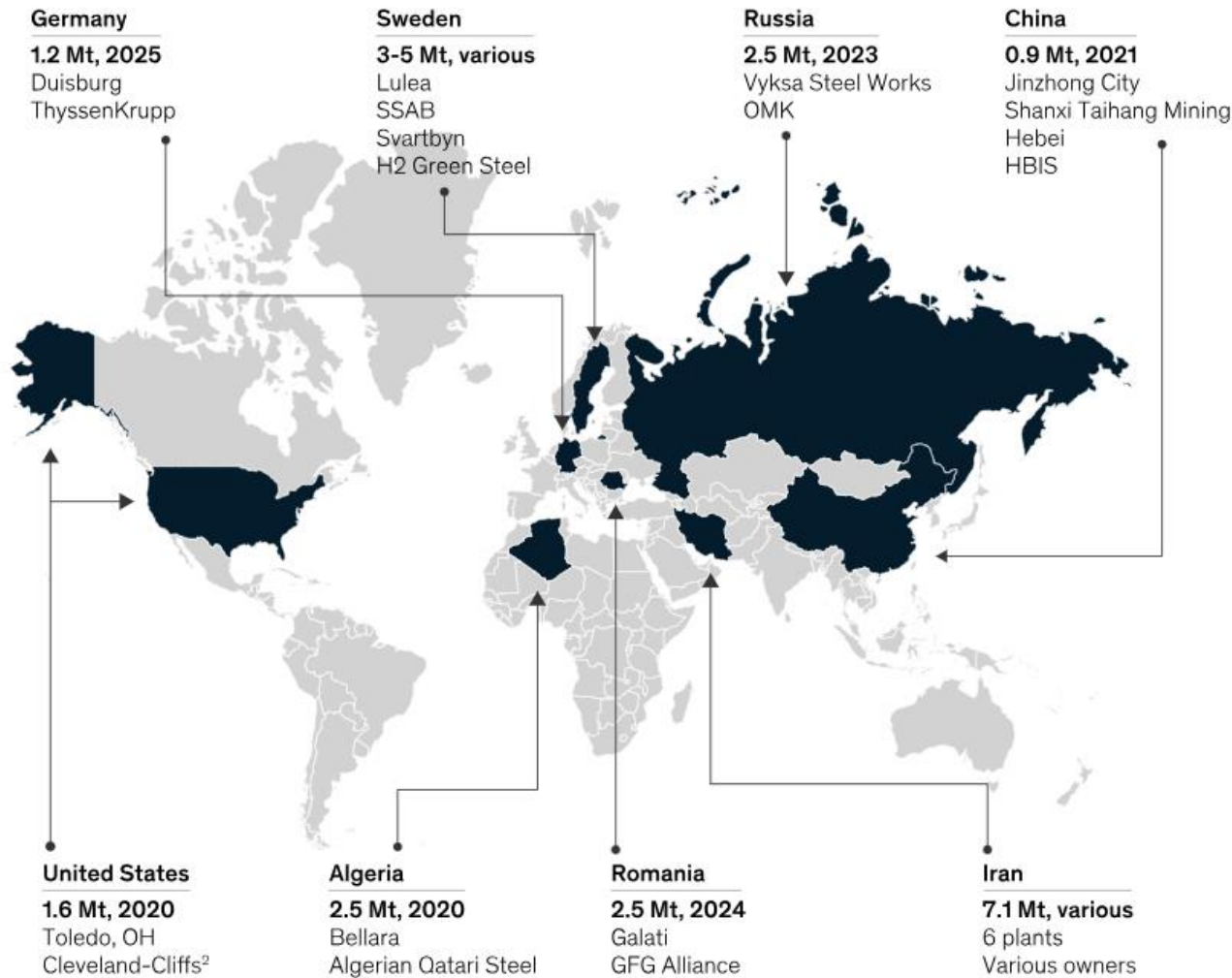
Exploration geologist with over 40 years' experience across multiple commodities and jurisdictions





# Forecast growth in steel from DRI

Planned and under-construction DRI plants and capacity<sup>1</sup>



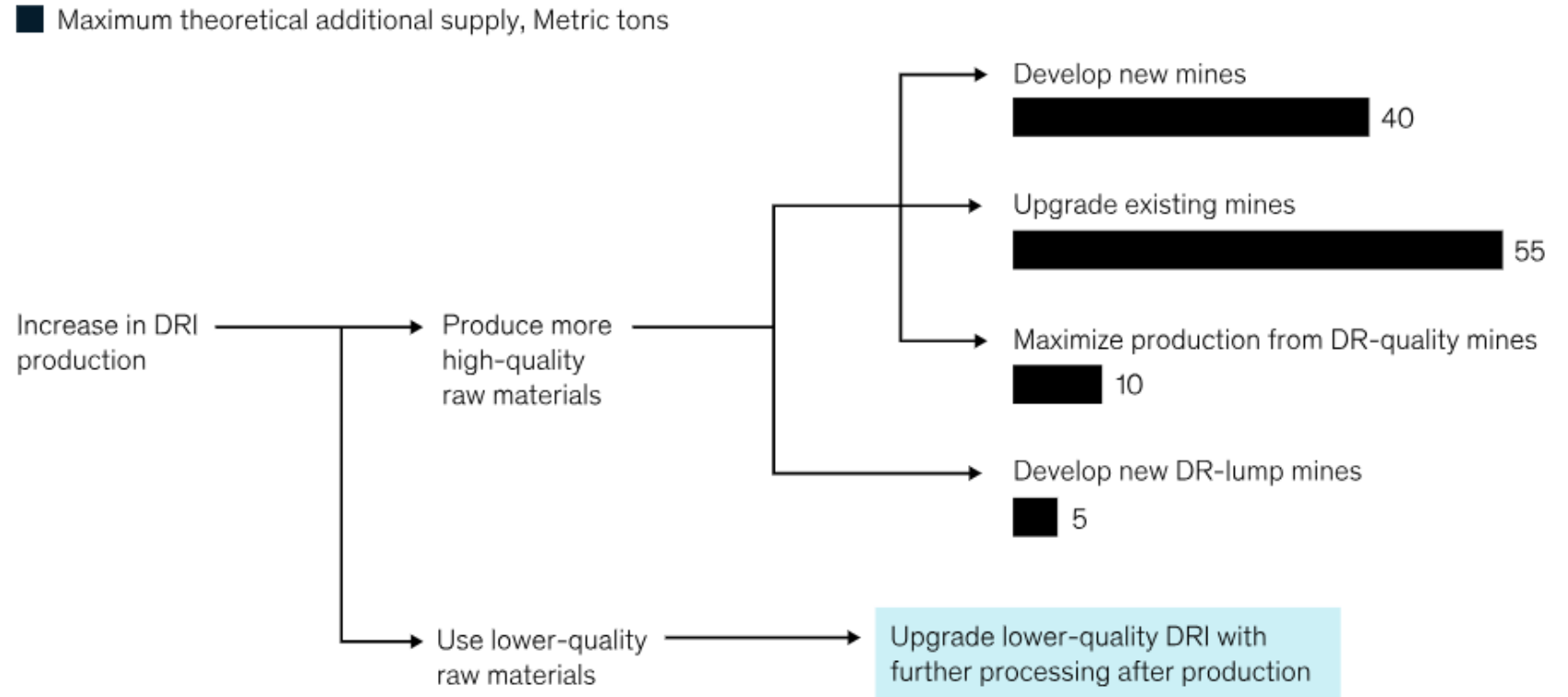
- 1 Estimated metric tonnes of steel based on DRI capacity, expected utilization, and raw material yields
- 2 Began operations in 2020

Source: McKinsey & Company

# Direct Reduction Iron supply-side constraints

Anticipated deficit of high-quality raw materials

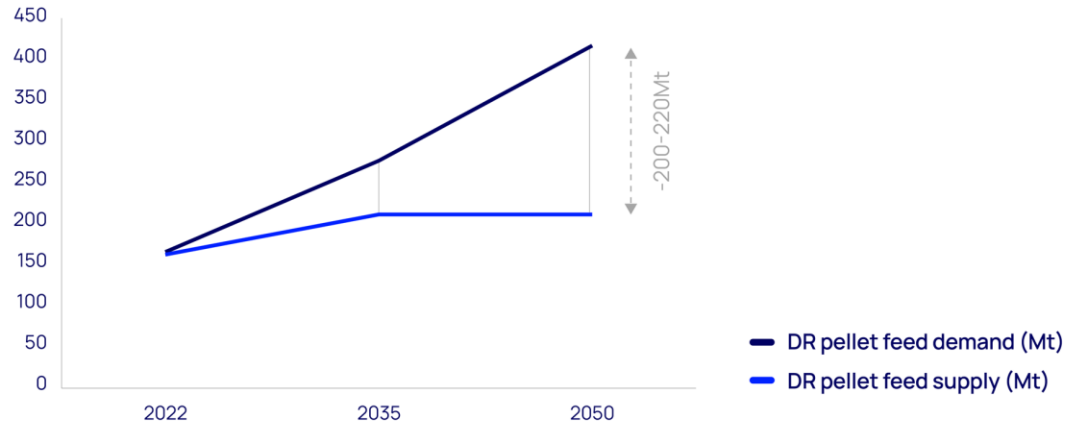
- DRI currently accounts for ~5% of supply to steel industry
- Production will need to more than triple in next 30 years if steel industry to become carbon neutral
- Mines capable of supplying sufficiently high quality material for DRI will not meet demand
- DRI will also likely need to be produced from lower quality iron ore



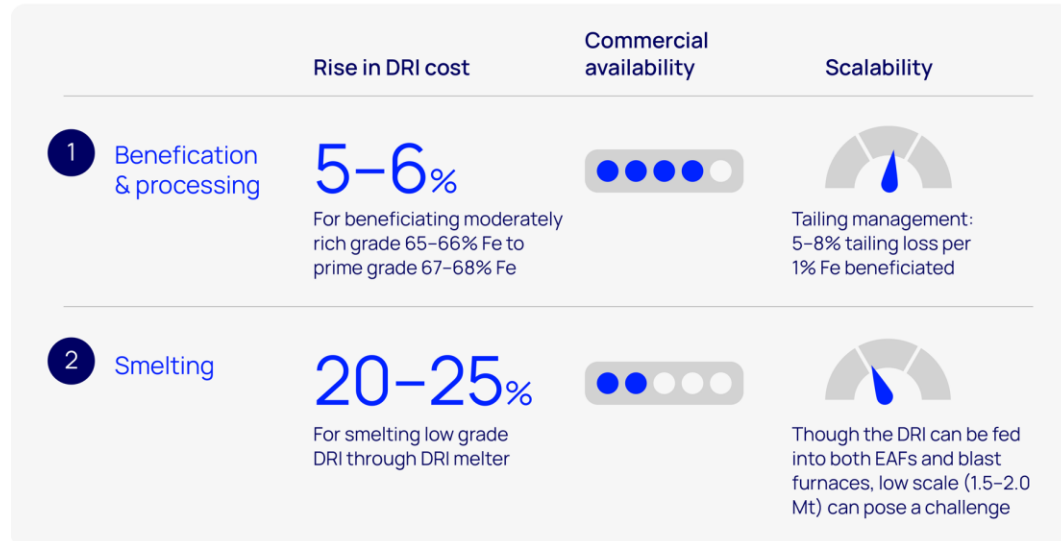
Source: McKinsey analysis

# Supply deficit forecast for DRI

Demand for high grade iron concentrate set to increase



- 200-220Mt shortfall in high-grade ore anticipated by 2050
- Iron ore accounts for ~50% of the total production cost of DRI - access to the necessary grade of feedstock is becoming more critical
- Deficit driving search for new solutions to upgrade lower grade material to DRI but with additional cost
  - Beneficiation and processing of medium grade material (e.g. from Brazil and Africa) will add ~6%
  - Smelting of low grade material (e.g. from Australia) will add 20-25%



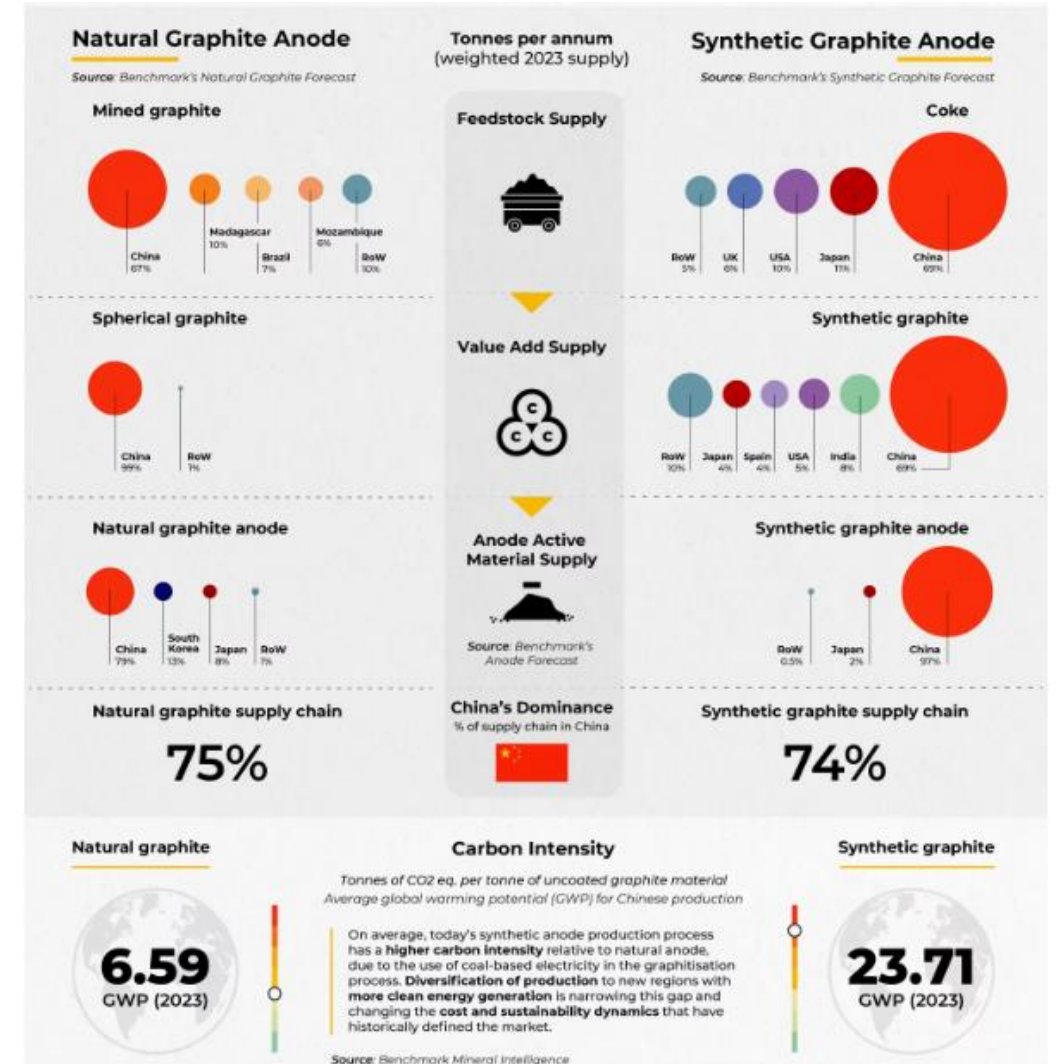
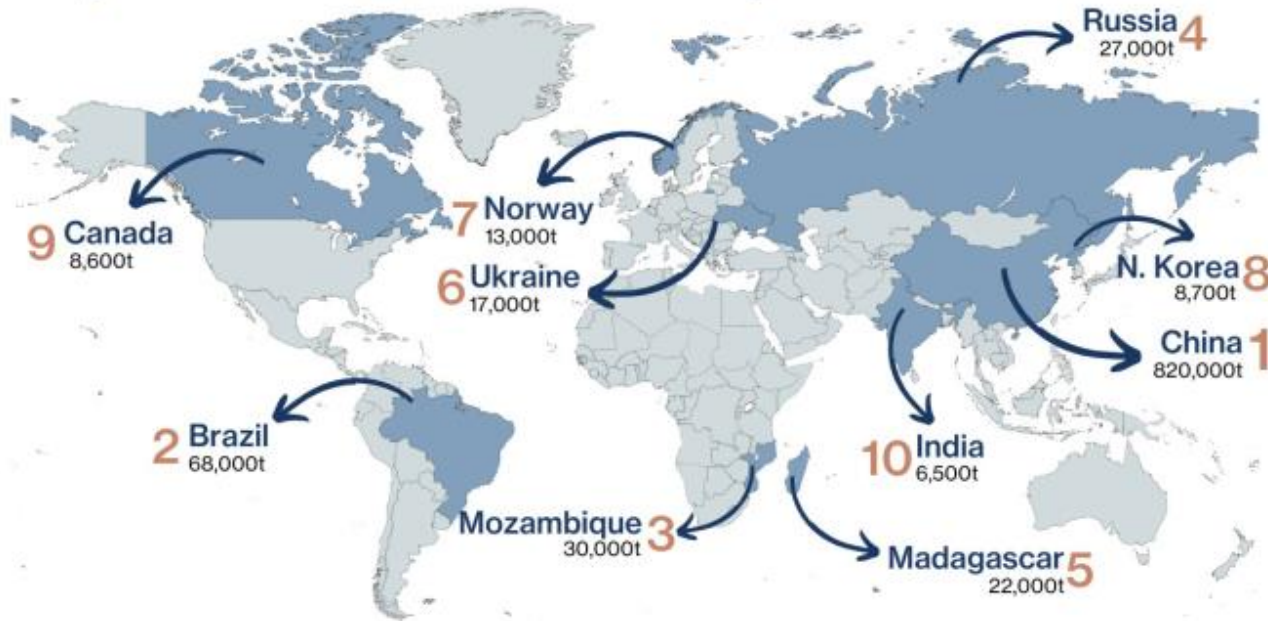
Source: Wood Mackenzie



# Global Graphite Supply

Dominated by China

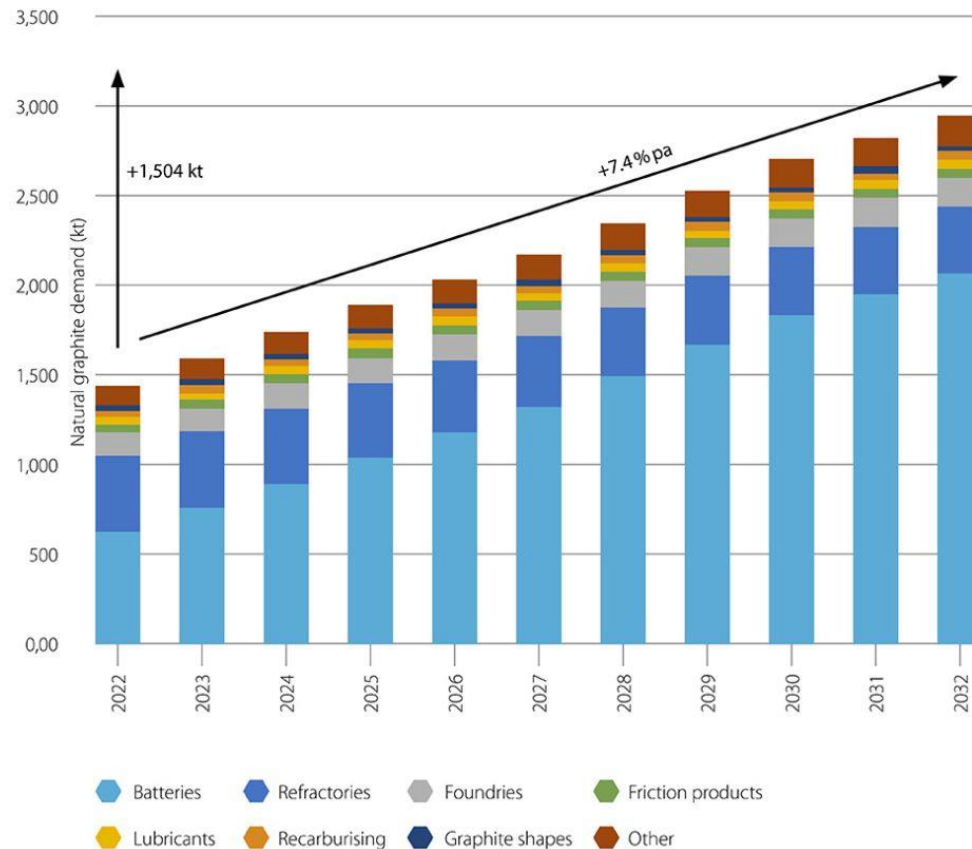
## Top 10 Producers of Natural Graphite



# Global Graphite Demand

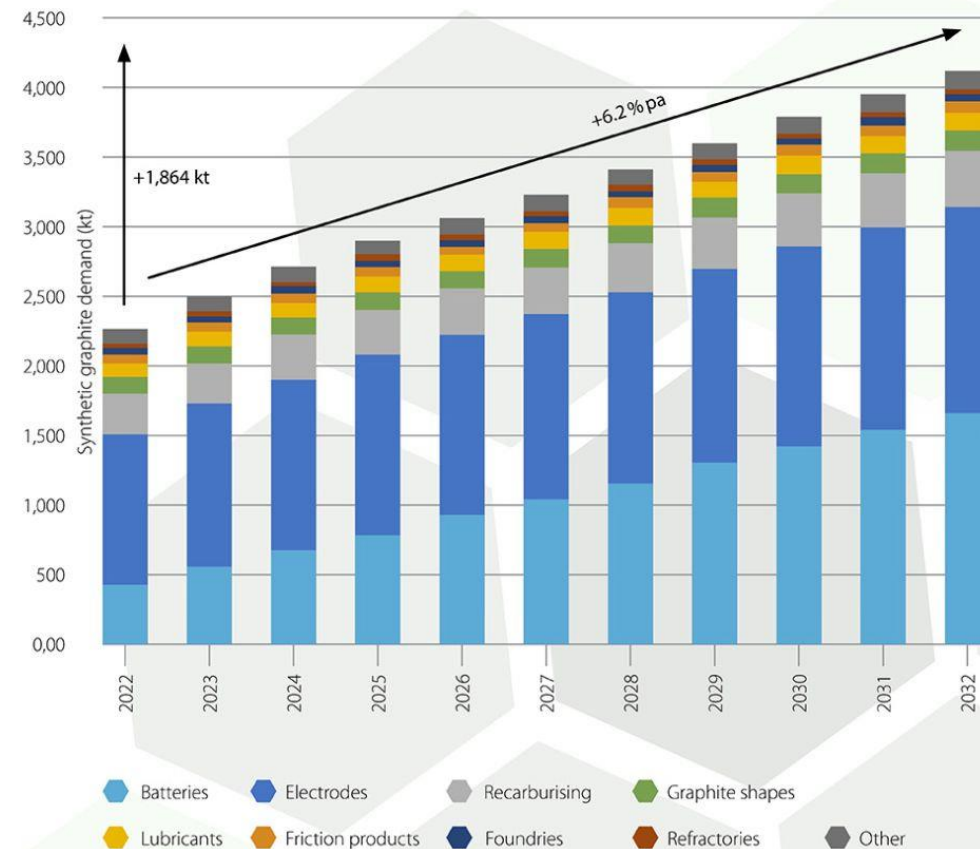
Dominated by China

Global demand of natural graphite



Source: Wood Mackenzie

Global demand of synthetic graphite



Source: Wood Mackenzie