

**LEADING EDGE  
MATERIALS**

# Critical Raw Materials in Europe

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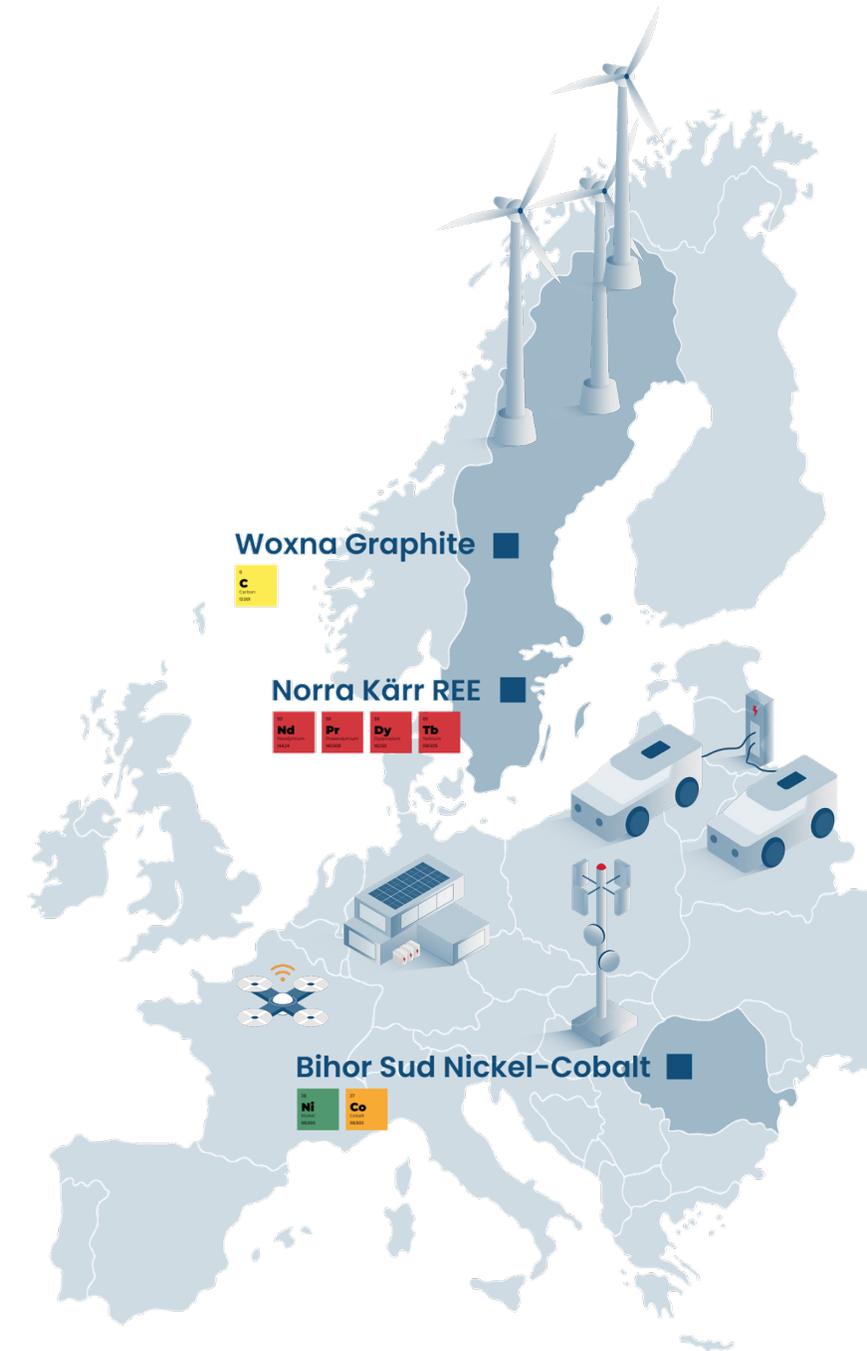
May 2022

**TSX.V: LEM**

**Nasdaq First North: LEMSE**

**OTCQB: LEMIF**

**FRA: 7FL**



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The Woxna project has never defined a mineral reserve. On June 9, 2021, Leading Edge announced the results of an independent preliminary economic assessment for the development of Woxna (the "2021 Woxna PEA"), the full details of which are included in a technical report entitled "NI 43-101 Technical Report – Woxna Graphite" prepared for Woxna Graphite AB with effective date June 9, 2021 and issue date July 23, 2021, available on Leading Edge's website [www.leadingedgematerials.com](http://www.leadingedgematerials.com) and under its SEDAR profile [www.sedar.ca](http://www.sedar.ca). The 2021 Woxna PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realized. Mineral resources that are not mineral reserves do not have demonstrated economic viability.

On July 22, 2021, Leading Edge announced the results of an independent preliminary economic assessment for the development of Norra Kärr (the "2021 Norra Kärr PEA"), the full details of which are included in a technical report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021, available on Leading Edge's website [www.leadingedgematerials.com](http://www.leadingedgematerials.com) and under its SEDAR profile [www.sedar.ca](http://www.sedar.ca). The 2021 Norra Kärr PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realized. Mineral resources that are not mineral reserves do not have demonstrated economic viability.

This presentation has been prepared by Leading Edge Materials Corp. The scientific, technical and economic information related to the Norra Kärr project has been reviewed and approved by Dr. Rob Bowell of SRK Consulting (UK) Ltd, a chartered chemist of the Royal Society of Chemistry, a chartered geologist of the Geological Society of London, and a Fellow of the Institute of Mining, Metallurgy and Materials, who is an independent Qualified Person under the terms of NI 43-101 for REE deposits. The scientific, technical and economic information related to the Woxna Graphite project has been reviewed and verified by Christopher Stinton of Zenito Limited, BSc (Hons), CEng MIMMM, an independent Qualified Person as defined by NI 43-101.

# Strategy and Project Portfolio



**Developing a portfolio of critical raw material projects located in the European Union. Critical raw materials are determined as such by the European Union based on their economic importance and supply risk. They are directly linked to high growth technologies such as batteries for electromobility and energy storage, and permanent magnets for electric motors and wind power that underpin the clean energy transition towards climate neutrality.**

## Woxna Graphite (100%)

- One of few fully-built graphite mines in the western world, ideally located to supply European industry
- Four deposits under mining leases, fully-built processing plant and infrastructure
- Targeting a vertically integrated natural graphite mine to lithium-ion battery anode material production
- 2021 PEA with post-tax Net Present Value(8%) of US\$248m, IRR of 37.4% and EBITDA of US\$49m\*
- Proposed 50/50 JV with Sicona Battery Technologies Pty Ltd for silicon-graphite composite anode materials
- Investigating planned restart of flake graphite production due to significant price increases

## Norra Kärr REE (100%)

- Significant heavy rare earth deposit with an unusually high enrichment of dysprosium and terbium
- Ideally located to offer a secure and sustainable supply of rare earth oxides to European industry
- Proposed production of nepheline syenite at site and off-site production of rare earth oxides
- 2021 PEA presents post-tax Net Present Value(10%) of US\$762m, IRR of 26.3% and EBITDA of US\$206m\*\*
- Incorporating newly proposed project design towards mining lease application

## Bihor Sud Ni-Co (51%)

- Exploration alliance with local JV partner with the potential to move to 90% ownership
- Project located in part of the Tethyan Belt in an area with historic mining activities
- Initial prospecting and sampling indicates potential for high-grade nickel-cobalt mineralizations
- **Exclusive exploration license granted**
- Moving to planned exploration program

\* See National Instrument 43-101 report entitled "NI 43-101 Technical Report – Woxna Graphite" prepared for Woxna Graphite AB with effective date June 9, 2021 and issue date July 23, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

\*\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.



# Board and Management



Canadian public company with experienced EU leadership

 **Chairman**

**Lars-Eric Johansson**

**Past**  
President & CEO Ivanhoe Mines  
CFO Kinross Gold Corporation  
CFO Noranda Inc  
CFO Falconbridge  
Vice President & CFO Boliden Mineral

 **Director**

**Daniel Major**

CEO GoviEx Uranium Inc. (TSXV)

**Past**  
Chief Executive and later Non-Executive Chairman of Basic Element Mining and Resource Division in Russia  
Mining analyst HSBC Plc and JPM  
Rio Tinto Rossing Uranium Mine

 **Director**

**Eric Krafft**

Private investor and largest shareholder. Serves on the boards of numerous private financial holding and ship-owning companies.  
Director GoviEx Uranium Inc. (TSXV)

**Past**  
Trafalgar Shipping/Dragon Maritime  
Corporate Finance DVB Bank AG

 **CEO**

**Filip Kozlowski**

**Past**  
Director Leading Edge Materials  
Portfolio Manager Macro HF  
Investment Manager Family Office  
Portfolio Trader Deutsche Bank Ldn

 **CFO**

**Sanjay Swarup**

CEO and founder SKS Business Services Ltd.

**Past**  
CFO Mandalay Resources (TSX)

 **Ops**

**Peter Young**

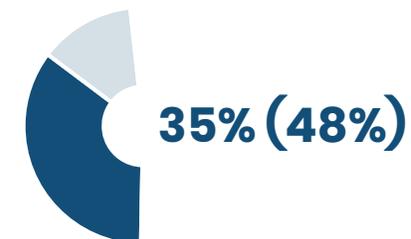
**Past**  
ORSU Resources  
Oriol Resources  
MINOPEX  
Johannesburg Consolidated Industries

 **Geo**

**Magnus Leijd**

**Past**  
Tasman Metals Ltd.  
Lundin Mining  
North Atlantic Natural Resources

## Board & Management Ownership

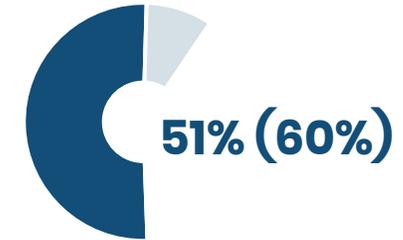


# Share

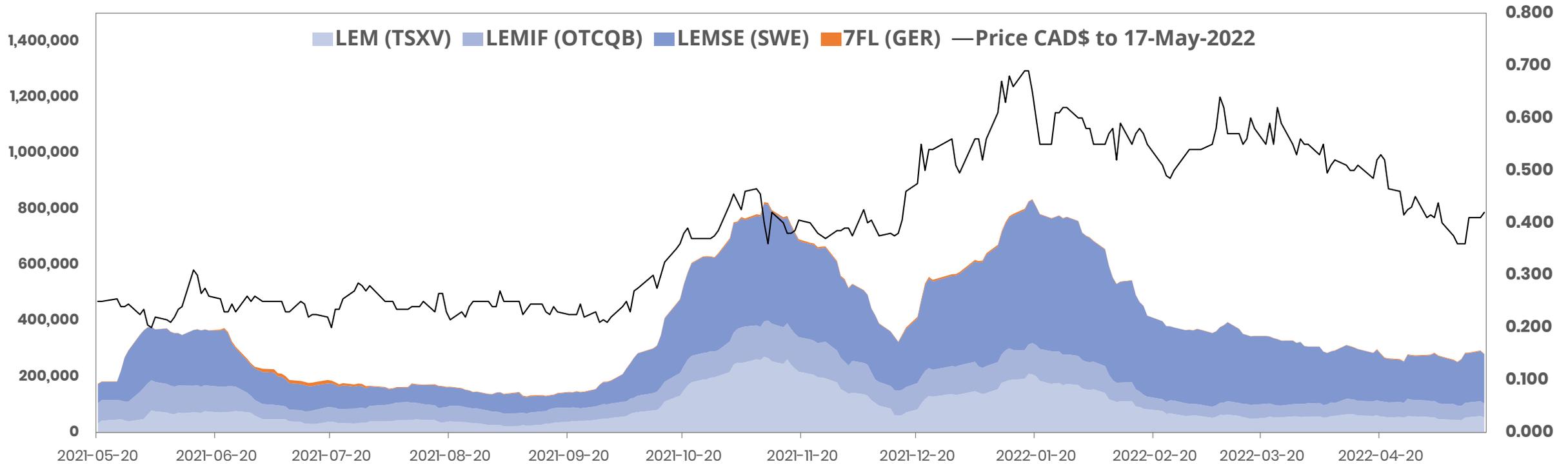


- **Tickers:** LEM.V (TSXV), LEMIF (OTCQB), LEMSE (NFN), 7FL (Fra)
- **Quote:** CAD \$0.42 / SEK 3.36 (per 17.5.2022)
- **Mkt Cap:** CAD \$64m / SEK 492M (non-diluted)

## Swedish Ownership



## Share price and rolling 20-day volume across listings



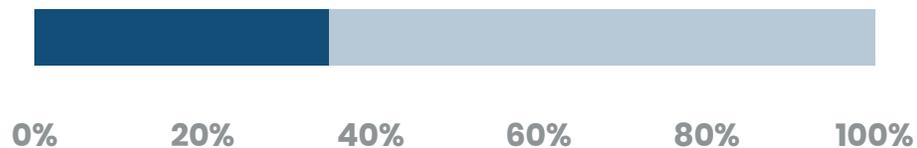
# Shares, Warrants and Options



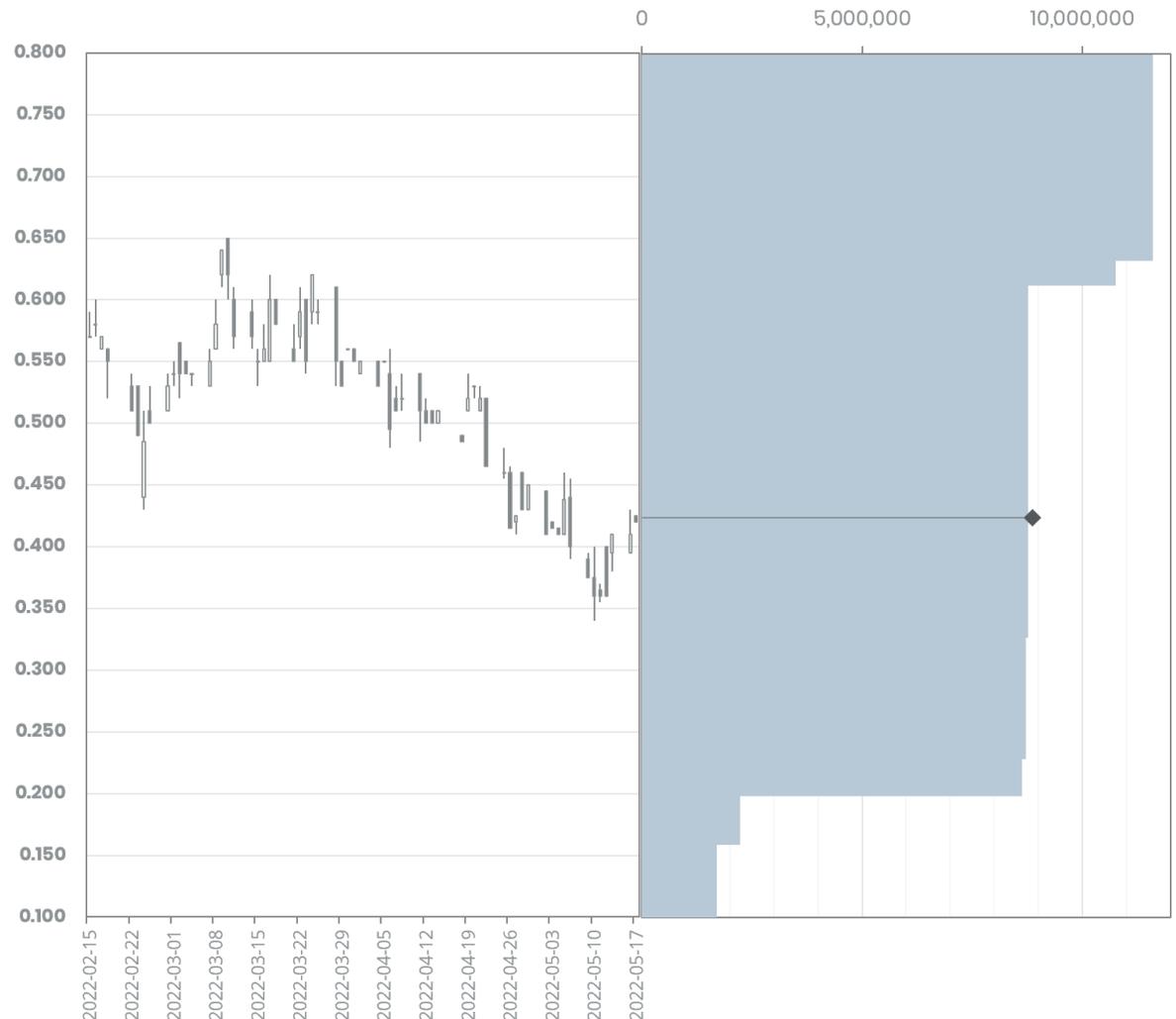
## Share Structure

<b>Issued and Outstanding as of Jan 26, 2022:</b>			<b>151,645,499</b>
Stock Options			8,470,000
Expiring May 30/22	@ 0.225	400,000	
Expiring Nov 02/22	@ 0.64	1,320,000	
Expiring Aug 11/23	@ 0.155	3,400,000	
Expiring Aug 14/23	@ 0.33	150,000	
Expiring Jan 27/25	@ 0.62	3,200,000	
Warrants			49,079,286
Expiring Dec 30/2023	@ 0.10	17,079,286	
Expiring Aug 7/2024	@ 0.20	32,000,000	
<b>Fully Diluted:</b>			<b>209,194,785</b>

## Insider Ownership



## Potential proceeds from exercise (CAD)



# Critical Raw Materials

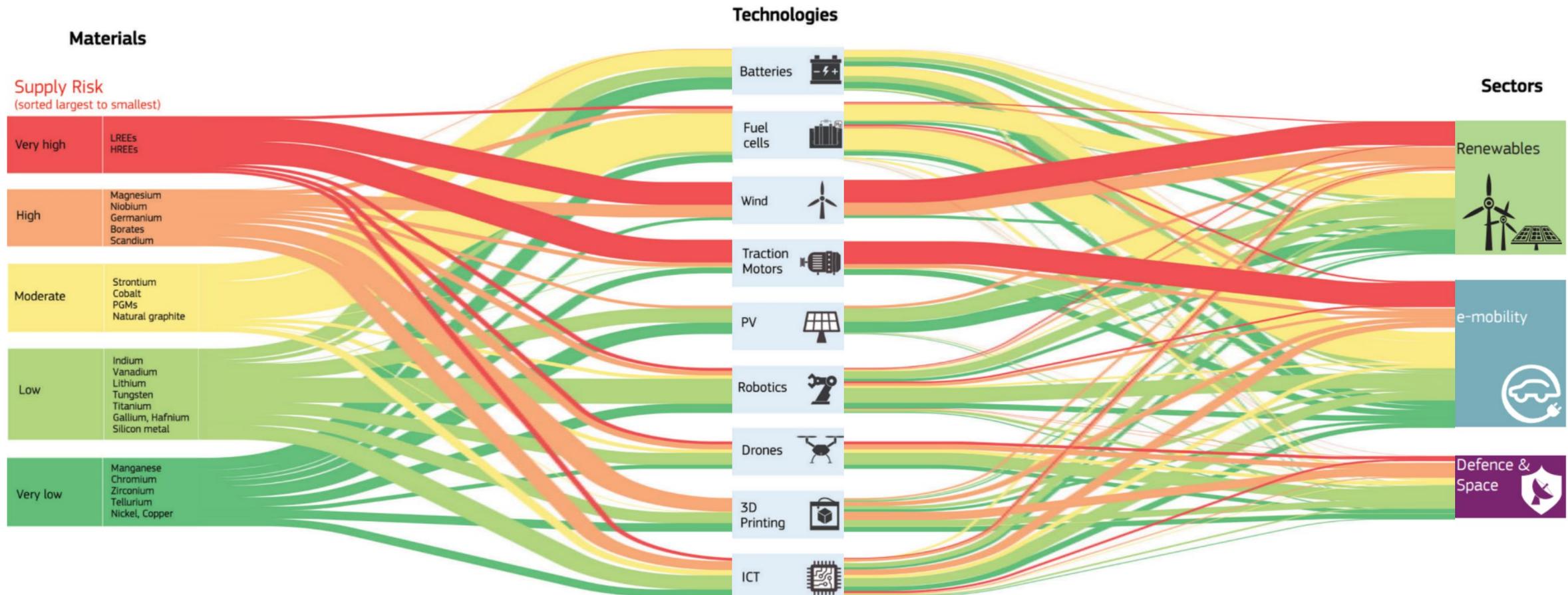


## Supply Risk

- EU is dependent on imports of CRMs
- A few single countries dominate the export of CRMs which leave the EU vulnerable for supply disruptions

## Economic Importance

- CRMs are directly linked to technologies such as batteries and permanent magnets that are critical for growth industries like renewables, energy storage and electromobility
- CRMs enable the transition to a green, digital and autonomous EU



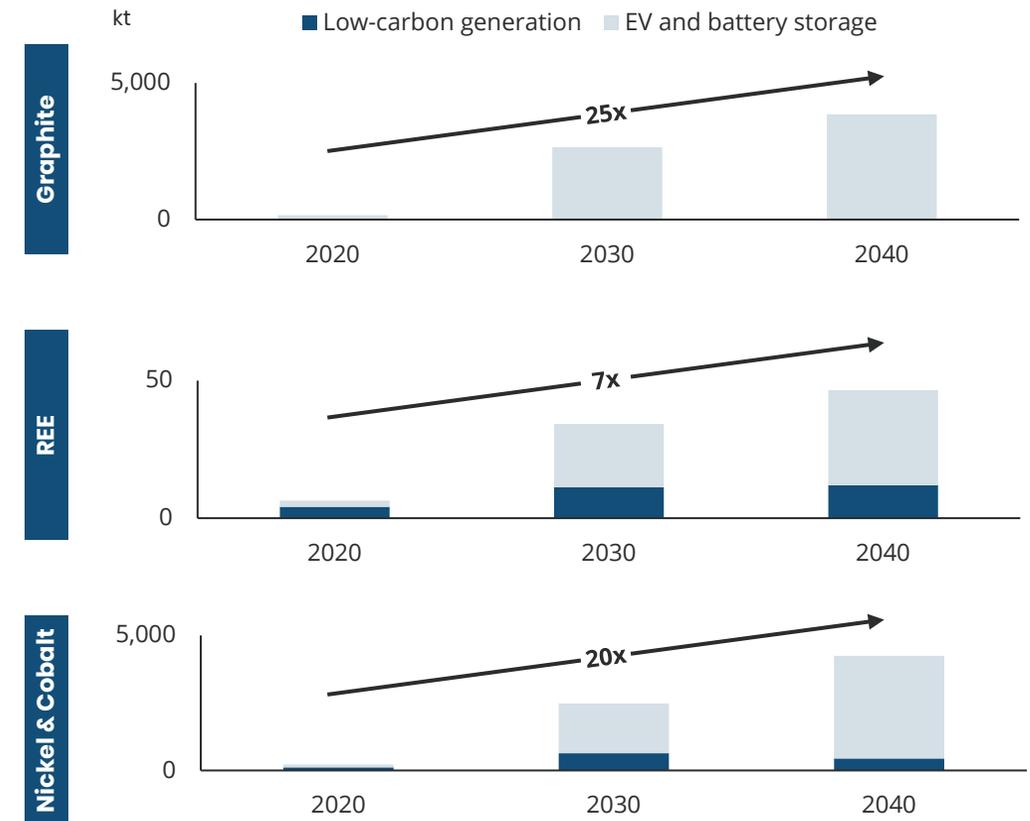
# CRMs are key enablers of a green, digital and autonomous EU...



**E-mobility and renewables are mineral intensive and built out rapidly...**

	 <b>Mineral intensity</b>	 <b>Growth outlook</b>
 <b>Electric cars</b>	<b>6x more</b> mineral inputs than a conventional car <sup>1)</sup>	<b>24x increase</b> in annual sales to 2040 in the SDS <sup>2)</sup>
 <b>On- &amp; offshore wind power</b>	<b>9x &amp; 13x more</b> mineral inputs than natural gas <sup>1)</sup>	<b>3x &amp; 9x increase</b> in electricity generation to 2030 in the SDS <sup>3,4)</sup>
 <b>Energy storage</b>	Intensive end-use of graphite, nickel, and cobalt	<b>26x increase</b> in annual storage capacity additions to 2040 in SDS <sup>5)</sup>

**...and demand for graphite, REE, cobalt and nickel-cobalt grow in tandem<sup>6)</sup>**



1) IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*, IEA, Paris <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>  
 2) IEA, Annual electric car sales in the Sustainable Development Scenario, 2020-2040, IEA, Paris <https://www.iea.org/data-and-statistics/charts/annual-electric-car-sales-in-the-sustainable-development-scenario-2020-2040>; "SDS" is the Sustainable Development Scenario  
 3) IEA, Offshore wind power generation in the Sustainable Development Scenario, 2000-2030, IEA, Paris <https://www.iea.org/data-and-statistics/charts/offshore-wind-power-generation-in-the-sustainable-development-scenario-2000-2030>  
 4) IEA, Onshore wind power generation in the Sustainable Development Scenario, 2000-2030, IEA, Paris <https://www.iea.org/data-and-statistics/charts/onshore-wind-power-generation-in-the-sustainable-development-scenario-2000-2030>  
 5) IEA, Annual battery storage capacity additions in the Sustainable Development Scenario, 2020-2040, IEA, Paris <https://www.iea.org/data-and-statistics/charts/annual-battery-storage-capacity-additions-in-the-sustainable-development-scenario-2020-2040>  
 6) IEA, *Total mineral demand from new EV sales by scenario, 2020-2040*, IEA, Paris <https://www.iea.org/data-and-statistics/charts/total-mineral-demand-from-new-ev-sales-by-scenario-2020-2040>

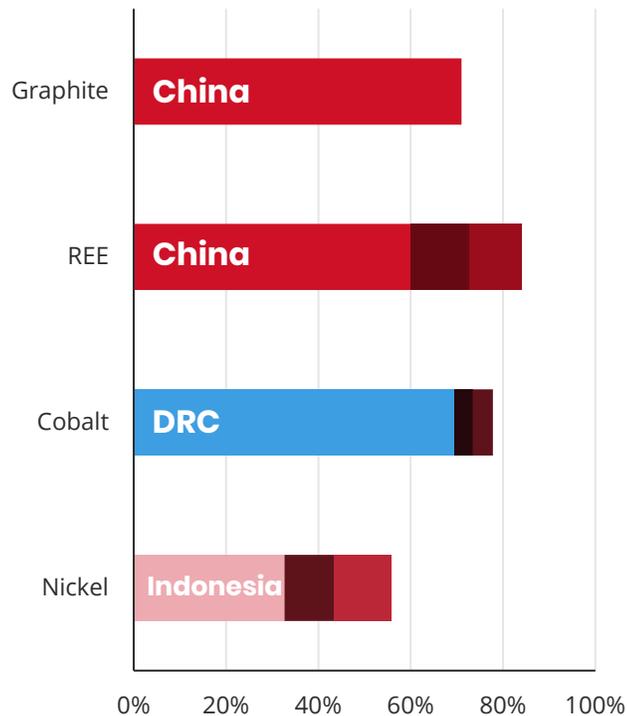
# ...and the EU is exposed to significant value chain risk



Global extraction of Critical Raw Materials is concentrated to a few countries, and processing even more so – exposing the EU to significant value chain risk, and in term, risk of not making the transition to a green, digital, and autonomous economy

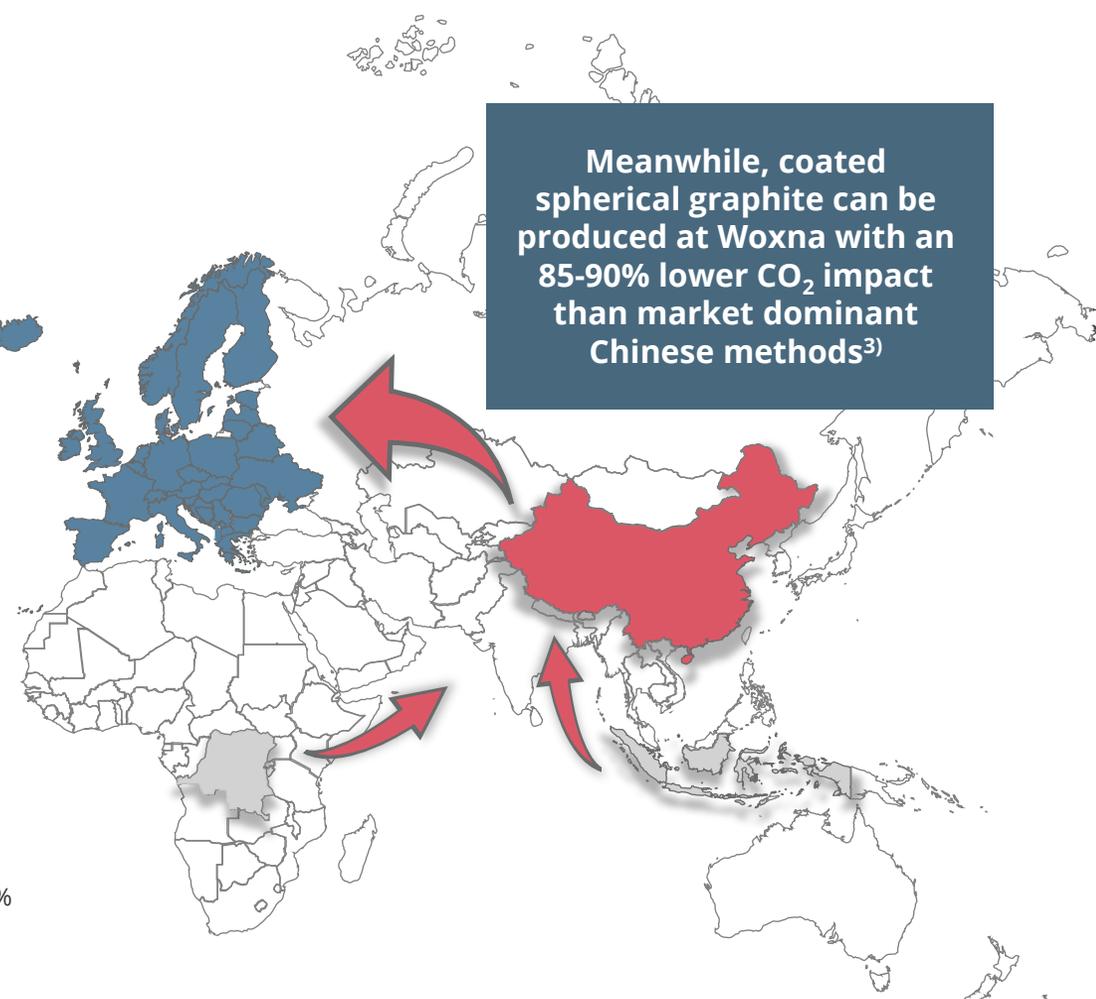
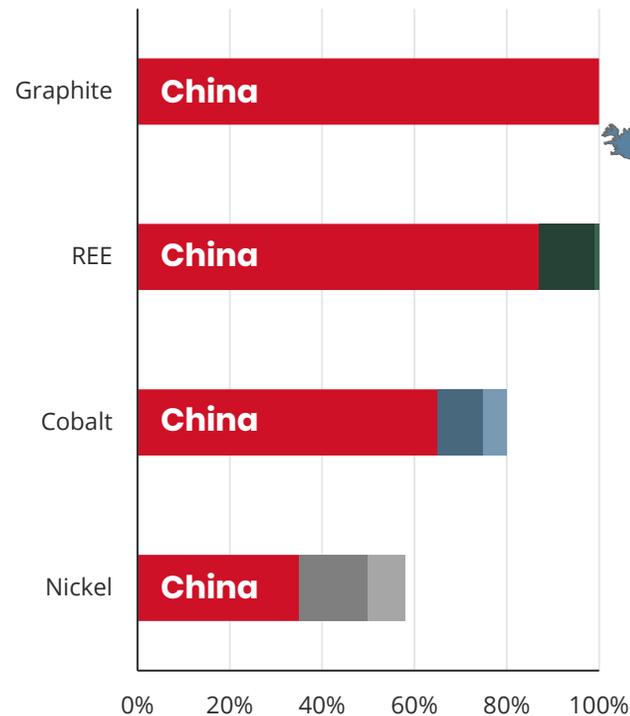
## Extraction

Share of global<sup>1)</sup>



## Processing

Share of global<sup>2)</sup>



1) IEA, Share of top three producing countries in extraction of selected minerals and fossil fuels, 2019, IEA, Paris <https://www.iea.org/data-and-statistics/charts/share-of-top-three-producing-countries-in-extraction-of-selected-minerals-and-fossil-fuels-2019>

2) IEA, Share of top three producing countries in total processing of selected minerals and fossil fuels, 2019, IEA, Paris <https://www.iea.org/data-and-statistics/charts/share-of-top-three-producing-countries-in-total-processing-of-selected-minerals-and-fossil-fuels-2019>

3) Woxna Graphite LCA, see news release dated June 21, 2021: <https://leadingedgematerials.com/leading-edge-materials-announces-preliminary-life-cycle-assessment-results-on-woxna-graphite-project/>

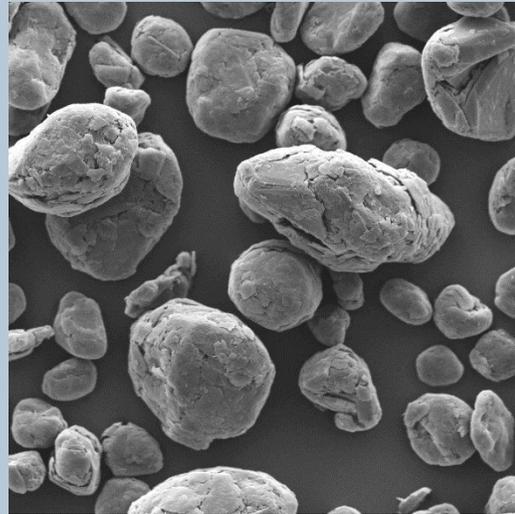
# The Challenge for Europe



“Green and digital technologies currently depend on a number of scarce raw materials. We import lithium for electric cars, platinum to produce clean hydrogen, silicon metal for solar panels. 98% of the rare earth elements we need come from a single supplier: China. This is not sustainable. So we must diversify our supply chains.”

**- Opening speech by European Commission President von der Leyen at the EU Industry Days 2021**





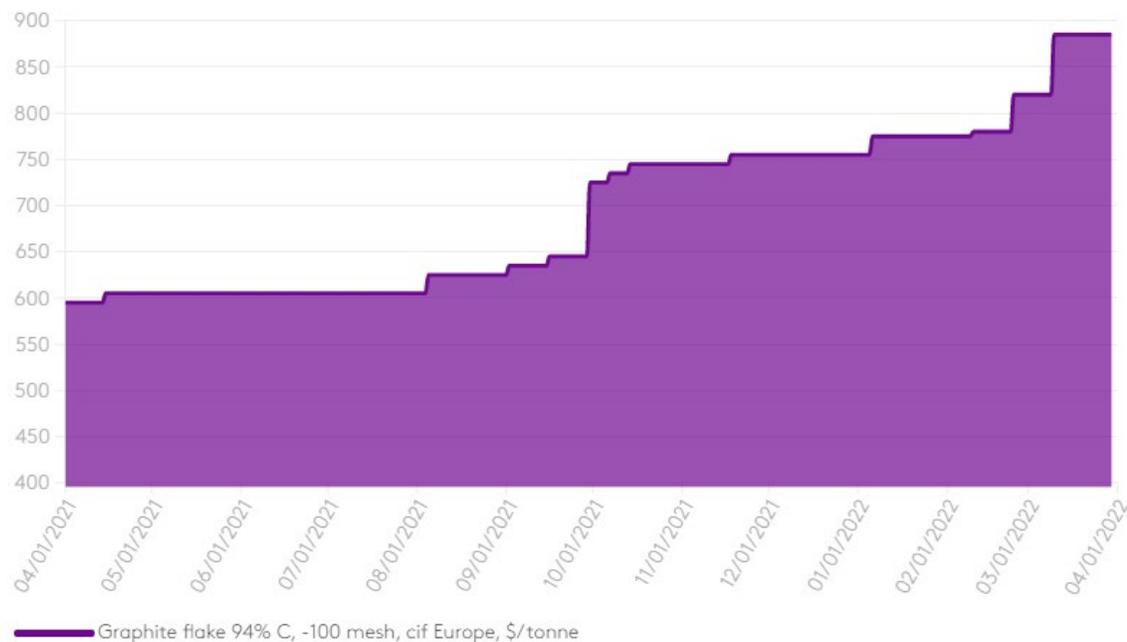
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# Woxna Graphite Anode project

# Flake Graphite Market on the Rise



**Graphite flake 94% C, -100 mesh, cif Europe, \$/tonne**  
March 2021 - 2022



Source: [Fastmarkets](#)

## GLOBAL GRAPHITE PRICES

	New price	Previous price	% Change
Graphite flake 94% C, +100 mesh, fob China, \$/tonne	1,010	1,010	0
Graphite flake 94% C, -100 mesh, fob China, \$/tonne	830	830	0
Graphite flake 94% C, +80 mesh, fob China, \$/tonne	1,250	1,250	0
Graphite flake 94% C, +100 mesh, cif Europe, \$/tonne	1,400	1,350	▲ 3.70
Graphite flake 94% C, -100 mesh, cif Europe, \$/tonne	920	885	▲ 3.95
Graphite flake 94% C, +80 mesh, cif Europe, \$/tonne	1,535	1,490	▲ 3.02
Graphite spherical 99.95% C, 15 microns, fob China, \$/tonne	3,500-3,800	3,500-3,800	0
Graphite amorphous 80% C, -200 mesh, fob China, \$/tonne	480-560	480-550	▲ 0.97
Graphite amorphous 80% C, -200 mesh, FCL, cif Europe, \$/tonne	720-835	650-800	▲ 7.24

Adjustment	This quarter's VIU	Previous quarter's VIU	Quarterly Change
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Carbon VIU in %	2.80	3.90	▼ 1.10
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94% C	95% C	96% C	97% C
0.0%	+2.80%	+5.60%	+8.40%

Source: [Fastmarkets](#)

# Focus on Graphite Increasing

11 April 2022  
Equity Research  
Global | Asia Pacific | Australia

CREDIT SUISSE

## Climate Transition Super Materials Graphite – Electrifying Net Zero

ESG Report

Thematic Research | Environmental, Social and Governance (ESG) Research



We return to the Climate Transition Super Materials series after our initiation [report](#) on Boron, in which we assess transition materials critical for all the technologies needed for reaching Net Zero. In this report we review Graphite, a material which combines strong heat resistance, electrical conductivity and chemical inertness, giving it unique exposure to electrification.

■ **Graphite – a critical enabler of electrification:** Close to half of graphite demand is from steel-making, with graphite for electrodes and refractories representing 32% and 17% of demand, respectively. But, graphite's unique suitability to forms of electrification sees end demand from decarbonisation technologies rise to 85% of total demand by 2050 due to exposure to Li-ion batteries, electric arc furnaces (EAF), vanadium redox flow batteries (VRFBs), and potentially, in hydrogen fuel cells, and nuclear power. The importance of graphite is underlined by its recent classification as a critical mineral by the US and EU, and with 73% of natural graphite extraction in China, there are moves to diversify supply.

■ **Graphite is a high impact transition material with a growing supply deficit:** We estimate potential demand for graphite could be 5.3x greater than current levels by 2050. While changes in technology may have big implications for overall demand (EVs grow to 74% of total demand), our assessment of alternative materials and technologies leads us to conclude that graphite will remain the dominant anode material for the foreseeable future. A combination of mining lead times, lengthy material qualification processes, China energy policy impacts to synthetic production, and the unfunded status of several new mines, may cause a sustained supply deficit and put significant upward pressure on pricing, in our view. We forecast a 10% deficit in CY2022 in the battery anode market, but this widens substantially to 32% by 2025. For comparison, CS forecasts lithium to have a 17% supply deficit for CY22 but return to a more manageable 1% surplus by 2025.

■ **Natural graphite grows in importance:** Currently 58% of battery anode material is made from synthetic graphite and 39% from natural graphite. In 2030, it is projected that 41% will be synthetic and 49% natural. Spherical graphite made from natural graphite has a higher power capacity and is less expensive than synthetic. Moreover, production of synthetic has an emissions-intensity >3x greater than natural graphite, and this is playing a larger role in auto OEMs supply considerations, especially as carbon pricing mechanisms extend. We also note that developments in purification and spherulisation technologies may be lowering costs and could see natural graphite disrupt other end-market applications. Natural graphite pricing is already responding, with the average flake price increasing by 19% through 2021 but spiking 38% since November 2021.

■ **Value chain and stock ideas:** Currently, 61% of synthetic graphite production and 83% of anode production occurs in China. However, the value chain is evolving rapidly, marked by increased vertical integration. Throughout the report we identify 50 stocks across the value chain comprised of coke producers, natural graphite producers, battery anode suppliers, and EAF graphite electrode manufacturers. From these we have applied financial screens to identify our top 35 exposures to the graphite thematic (See Figure 7).

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November 16, 2021 | 13:39 ET | 16:03 ET-

## Battery Materials

### Anode Material Deep Dive: Cut Through the Noise; Graphite to Remain Dominant

#### Bottom Line:

In this EV transition decade, the unwavering need for conventional graphite-based anodes is underappreciated. The perception that replacement technologies are around the corner, and wholly and immediately disruptive is a disconnect from reality. Major EV OEMs are looking to secure supply of proven materials and reduce reliance on Chinese-dominant supply, while also lowering battery production costs. Within a resulting strong demand backdrop for graphite anode material this decade, we see a unique opportunity for lower-cost, natural-based graphite anode material (CSPG), vs. synthetic graphite alternatives. New graphite-anode projects are going to be needed beyond the large Asian incumbent capacity growth plans (mostly synthetic-based), and new entrants able to break into Western auto OEM supply chains will be favorably positioned. However, anode material production is complex, particularly considering the importance of battery safety and performance. In this environment, we see a supportive backdrop for CSPG pricing this decade.

#### Key Points

**We expect graphite-based anode material to remain dominant in EVs this decade** underpinning robust demand growth (2.4Mt by 2030E; 23% CAGR off 2020-levels). We assume graphite holds underlying composition mix within total lithium-ion battery anode material of 96%/90% in 2025/30E (vs. ~98% now).

**Next-gen battery commercialization at scale (with lithium metal or silicon anodes) not expected until back half of the decade at the earliest, and that is only if remaining R&D hurdles can be overcome.** Next-gen EV battery prototypes potentially ready in the coming years at the earliest, followed by multi-year auto qualification and testing periods including assessing commercial viability (i.e., will production be cost competitive with conventional li-ion batteries by then at massive scale?).

**See an opportunity for lower-cost natural graphite-based anode material (CSPG) to gain incremental mix share within blends with synthetic graphite alternatives** as downstream OEMs look to lower battery production costs (e.g., Tesla is increasing natural mix). We model 50/50 natural and synthetic blends within anode material across the decade (vs. ~40/60 natural/synthetic blends in 2020).

**We expect a supportive backdrop for CSPG pricing upside.** While anode material price discovery is very opaque, we feel comfortable modeling CSPG ASPs of US\$7-8k/t across the decade, above current average industry opex costs of US\$3.5-6k/t. Current synthetic-anode material ASPs are over US\$10k/t.

**Opportunity for new entrant anode material suppliers to penetrate highly concentrated and Chinese-dominant supply chains** given downstream desire to localize supply to lower carbon footprints and reduce geopolitical risk.

**Anode material production is complex adding to overall greenfield development risk.** Multi-year anode material qualification processes with the downstream are also a key hurdle for new entrants.

Concurrent with this report we launch coverage of [NEXT at Outperform](#) and [NMG at Market Perform](#).

This report was prepared by an analyst(s) employed by BMO Nesbitt Burns Inc., and who is (are) not registered as a research analyst(s) under FINRA rules. For disclosure statements, including the Analyst Certification, please refer to page(s) 26 to 29.

BMO Capital Markets

### Battery Materials

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Legal Entity: BMO Nesbitt Burns Inc.

Analyst  
(647) 242-3191

#### What's Inside

• Deep dive on the graphite-based anode material market coinciding with launch of [NextSource \(NEXT\) at Outperform](#) and [Nouveau Monde \(NMG\) at Market Perform](#)

• Insights from conversations with various natural and synthetic graphite companies, graphite-anode consultants, downstream battery/auto OEMs, and from visiting a natural graphite deposit and anode material plant

• Comprehensive graphite-based anode material supply and demand model out to 2030

• Detailed overview of graphite-anode material pricing, opex costs, project capital intensities, and overall competitive landscape

• N.American/European LIB Plant and Anode Material Supply Maps

• In-depth analysis on downstream qualification/testing timelines of conventional battery raw materials and next-gen battery products

• Assessment of next-gen battery development path including technological hurdles, start-ups and incumbent strategies, commercial potential, etc.



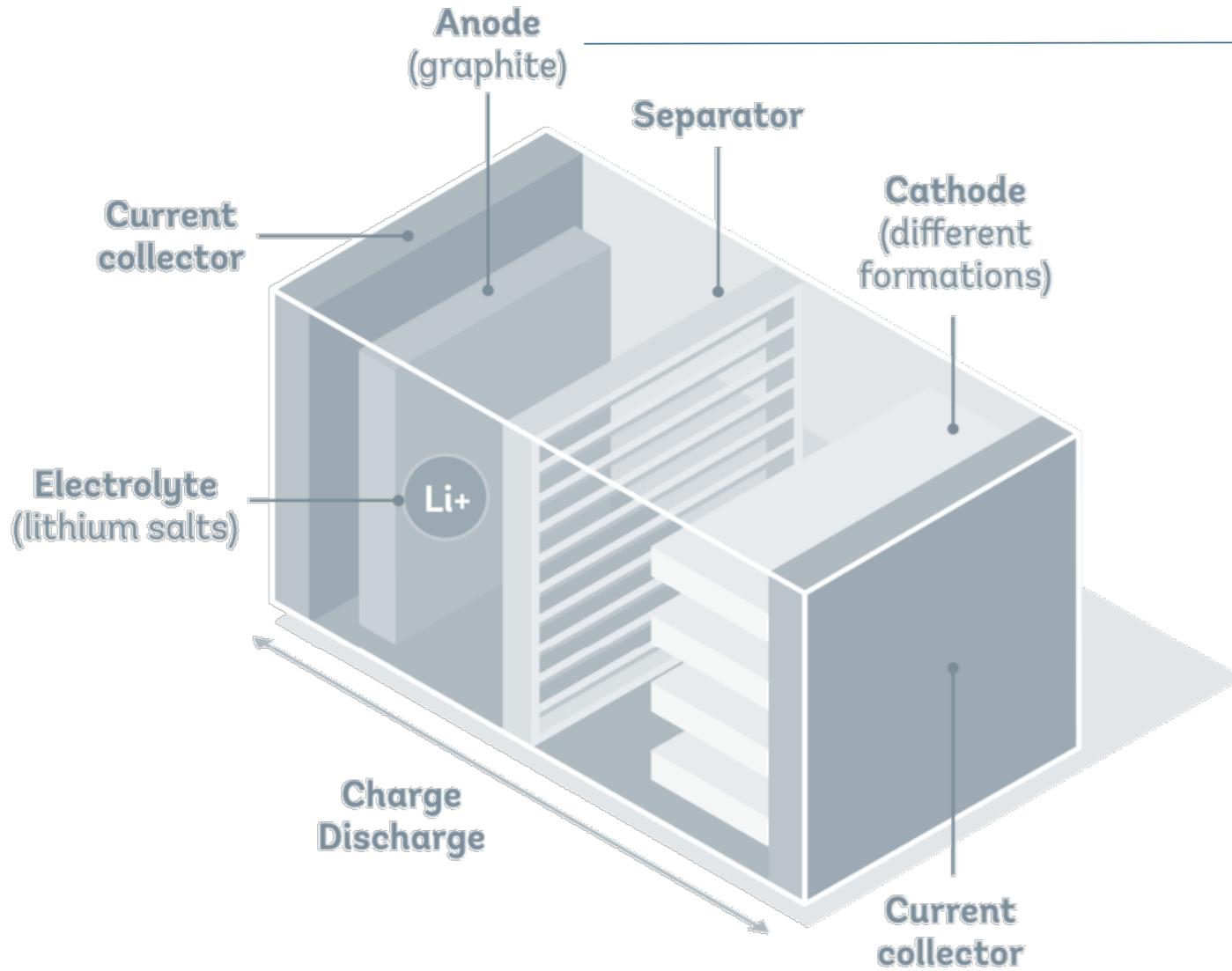
Industry  
Research



Glossary

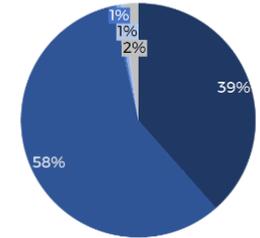
IN Depth

# Graphite in LiB

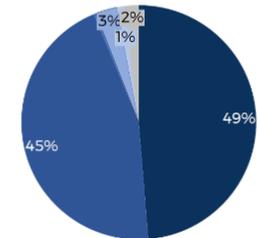


## Anode Material Share

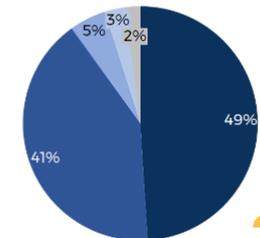
2020



2025



2030

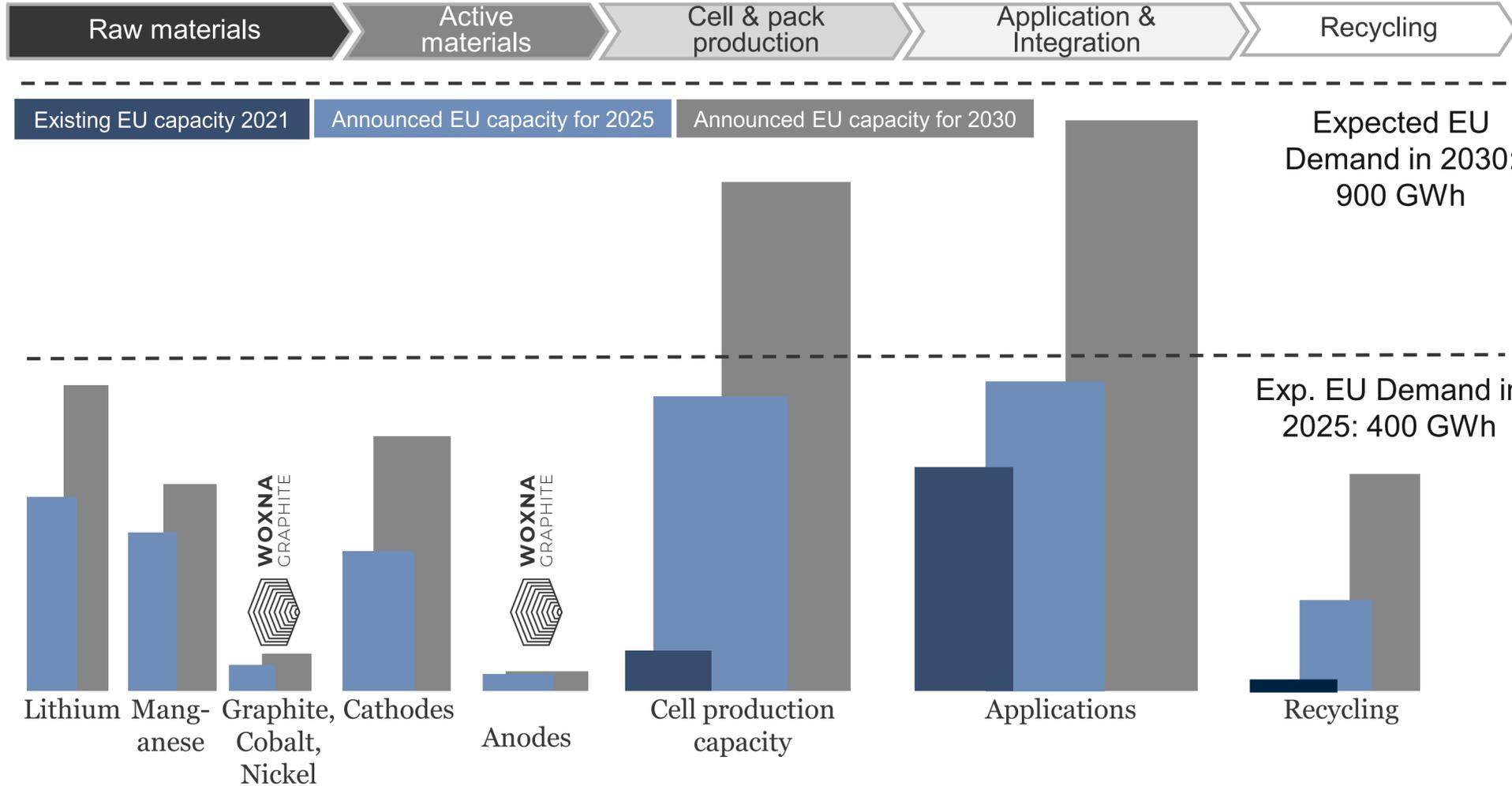


■ Natural  
■ Synthetic  
■ M/CMB  
■ Silicon  
■ LTO  
■ Other

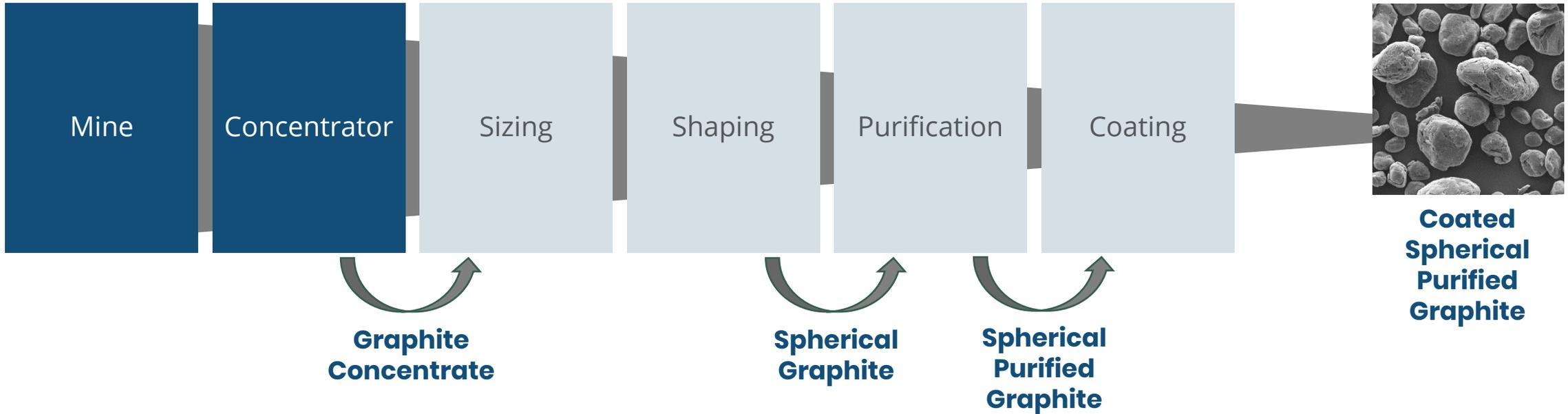
# Battery Value Chain Gap



## Predicted share of EU supply vs. expected EU demand until 2030 per value chain step



# Woxna Graphite Overview



Existing

Planned



# European Battery Industry

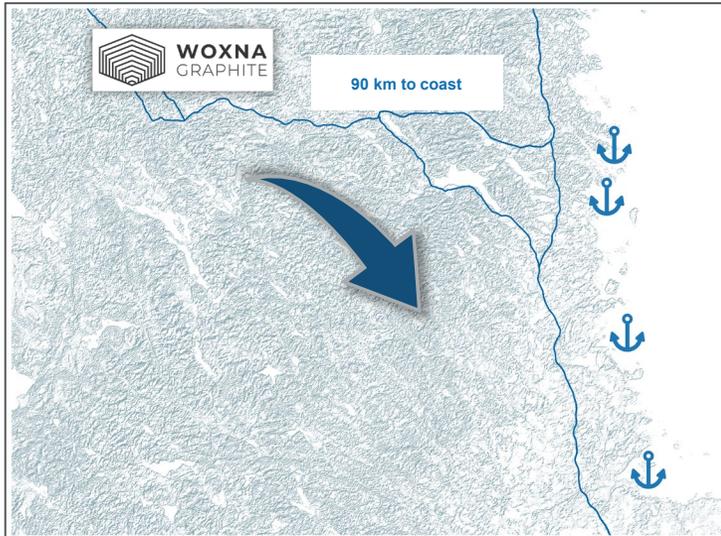


Woxna Graphite is ideally positioned to become a Swedish supplier to the European battery industry

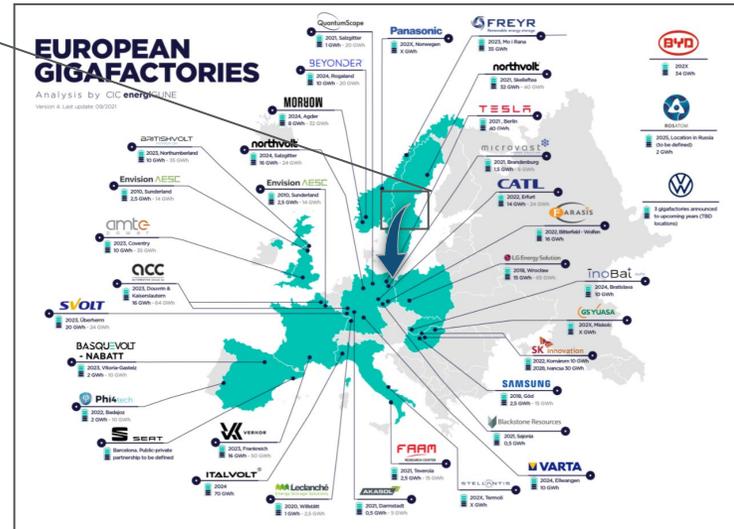
**1,000,000 tpa**  
of anode demand by 2030 based on 1,000 GWh battery production planned in Europe

**25x**  
Expected increase in demand for graphite by 2040 (IEA, SDS)

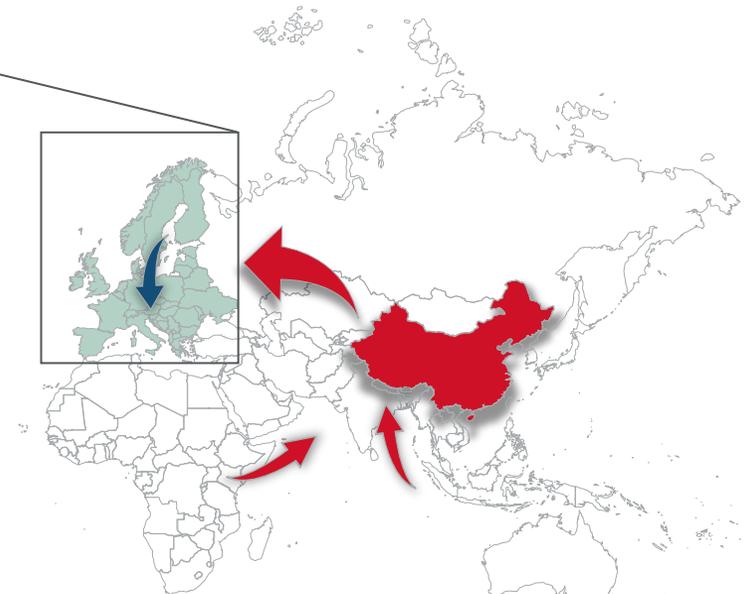
**71% – 100%**  
China's global supply dominance of graphite raw material and spherical graphite (Benchmark Mineral Intelligence)



Transport routes on sealed roads from mine site to various port options



Announced gigafactory plans in Europe



Global raw material imports to China and processed materials exports out of China

# Woxna Graphite Anode PEA\*



## Financial Highlights

- Post-tax Net Present Value (NPV 8%) of \$248m
- Post-tax IRR of 37.4%
- Accumulated project revenues of \$1,425m
- Average annual EBITDA of \$49m
- Initial Capital Expenditures (CAPEX) of \$121m

## Operational Highlights

- Life of Mine (LOM) is 15 years
- LOM average annual plant feed of 159,967 tonnes
- LOM average annual CSPG product 7,435 tonnes

## Mineral Resource Estimate – Measured and Indicated

Property	Classification of Mineral Resource	Tonnes (Mt)	Grade C (%)
Kringel	Measured	0.96	9.21
	Indicated	1.65	9.09
	<b>Sub-total Measured + Indicated</b>	<b>2.61</b>	<b>9.13</b>
Gropabo	Indicated	2.33	7.72
Mattsmyra		5.83	7.14
<b>Total</b>	<b>Measured + Indicated</b>	<b>10.77</b>	<b>7.75</b>

## Mineral Resource Estimate – Inferred

Property	Classification of Mineral Resource	Tonnes (Mt)	Grade C (%)
Kringel	Inferred	0.39	8.72
Gropabo		0.61	8.07
Mattsmyra		1.51	8.06
<b>Total</b>	<b>Inferred</b>	<b>2.51</b>	<b>8.16</b>

### Source: ReedLeyton 2021

**Notes:** Inconsistencies in totals are due to rounding; 4% Cg mill cut-off grade applied for reporting purposes constrained within the MPlan 2021 pitshell; Reported according to CIM Definition Standards 2011; Reported according to CIM Mineral Exploration Best Practice Guidelines (Nov 2018); No geological losses applied; Default Density of 2.7 t/m<sup>3</sup> applied to in situ, then Density of 2.82 t/m<sup>3</sup> applied to Type A Graphite and Density of 2.86 t/m<sup>3</sup> applied to Type B Graphite for Gropabo and Mattsmyra; and Default Density for Kringel remained at 2.7 t/m<sup>3</sup>; The previous Mineral Resource Estimates for the Project were developed without the constraint of an applied mine plan and open-pit shell. In the light of more rigorous compliance requirements, the Mineral Resources were reported by ReedLeyton within the constraints of the PEA mine plan as a means of demonstrating “reasonable prospects for economic extraction” as required by numerous international reporting codes. No new exploration data was included in the reporting process; Effective date of Mineral Resource Estimate is June 9, 2021; and Mineral resources are not mineral reserves and do not have demonstrated economic viability;

\* See National Instrument 43-101 report entitled "NI 43-101 Technical Report – Woxna Graphite" prepared for Woxna Graphite AB with effective date June 9, 2021 and issue date July 23, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

# Woxna Graphite Anode PEA\*



**The PEA indicates the potential viability of a Swedish operation producing battery grade graphite anode material utilizing an existing graphite mine and concentrator with the addition of a value-add processing facility offsite**

- Thermal purification process which, combined with access to low cost hydropower offers a low carbon footprint for the Project demonstrated through a recently announced life cycle assessment (LCA) report
- Improved waste management process for tailings further improving the sustainability ambitions of the Project
- The PEA utilizes one out of four deposits currently owned by Woxna under granted exploitation concessions, where two of the other deposits also have indicated and inferred mineral resource estimates offering potential upside for further expansion in future development or studies

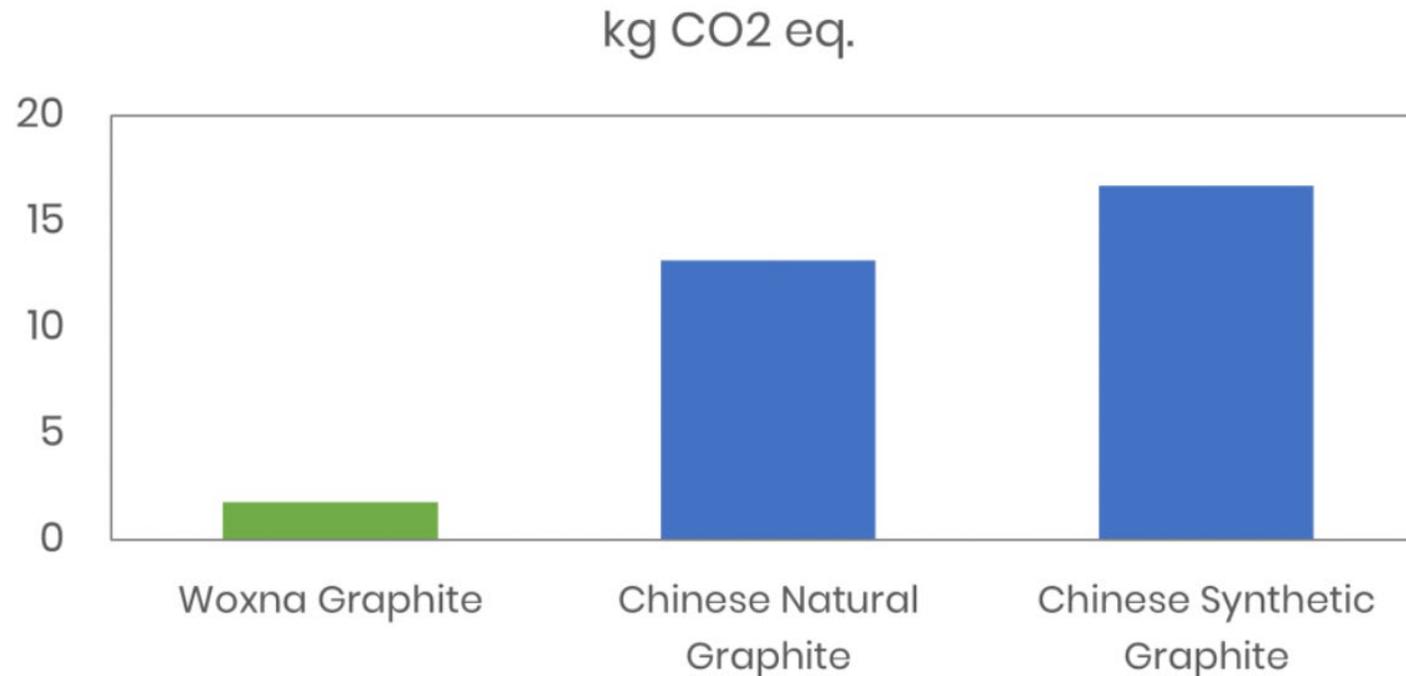


\* See National Instrument 43-101 report entitled "NI 43-101 Technical Report – Woxna Graphite" prepared for Woxna Graphite AB with effective date June 9, 2021 and issue date July 23, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

# Woxna Graphite LCA Results\*



- 1 tonne of natural graphite anode material (coated spherical purified graphite (“CSPG”)) from natural graphite extracted at the Woxna Graphite mine is forecast to have an impact of 1.8 tonnes CO2 eq
- 85% to 90% lower impact than the current market dominant Chinese alternatives
- Significant factor influencing the dramatically reduced carbon footprint for Woxna Graphite is the access to hydropower as the main electricity source
- 62.5% of the 1.8 tonnes CO2 eq. for Woxna contributed by argon and nitrogen. Local suppliers can offer climate neutral alternatives which would lead to further improvements in Woxna’s footprint
- The LCA study was conducted according to the requirements of the ISO-104040:2006 and ISO-14044:2006 standards and used a cradle-to-gate approach



\* See news release dated June 21, 2021: <https://leadingedgematerials.com/leading-edge-materials-announces-preliminary-life-cycle-assessment-results-on-woxna-graphite-project/>

# Proposed 50/50 JV with Sicona\*



## Targeting the production of advanced natural graphite and silicon-graphite-carbon composite active anode materials

- Sicona is commercialising innovative silicon-graphite-carbon composite anode and binder technology and materials that have been developed over the last ten years at the Australian Institute for Innovative Materials at the University of Wollongong and now owned by Sicona
- Due to its improved storage capacity, silicon graphite composite anode materials attract higher selling prices. However, due to the higher capacity the cost per capacity unit becomes lower for battery cell manufacturers, driving an increased interest to transition into these materials over the future
- Proposed Sweden-based advanced anode materials production facility targeting an annual production of up to 20,000 tonnes per year of multiple active anode materials products using Woxna graphite and other complementary suitable feedstocks such as externally sourced silicon and other carbon or graphite materials utilizing Sicona's significant proprietary IP and know-how

SICONA  
Battery Technologies

“Sicona has pioneered a simple & robust production process for high-performance silicon-graphite composite anode and polymer binder materials”

-Christiaan Jordaan CEO

\* For further details, see [news release dated October 6, 2021](#)

# Woxna Graphite Mine



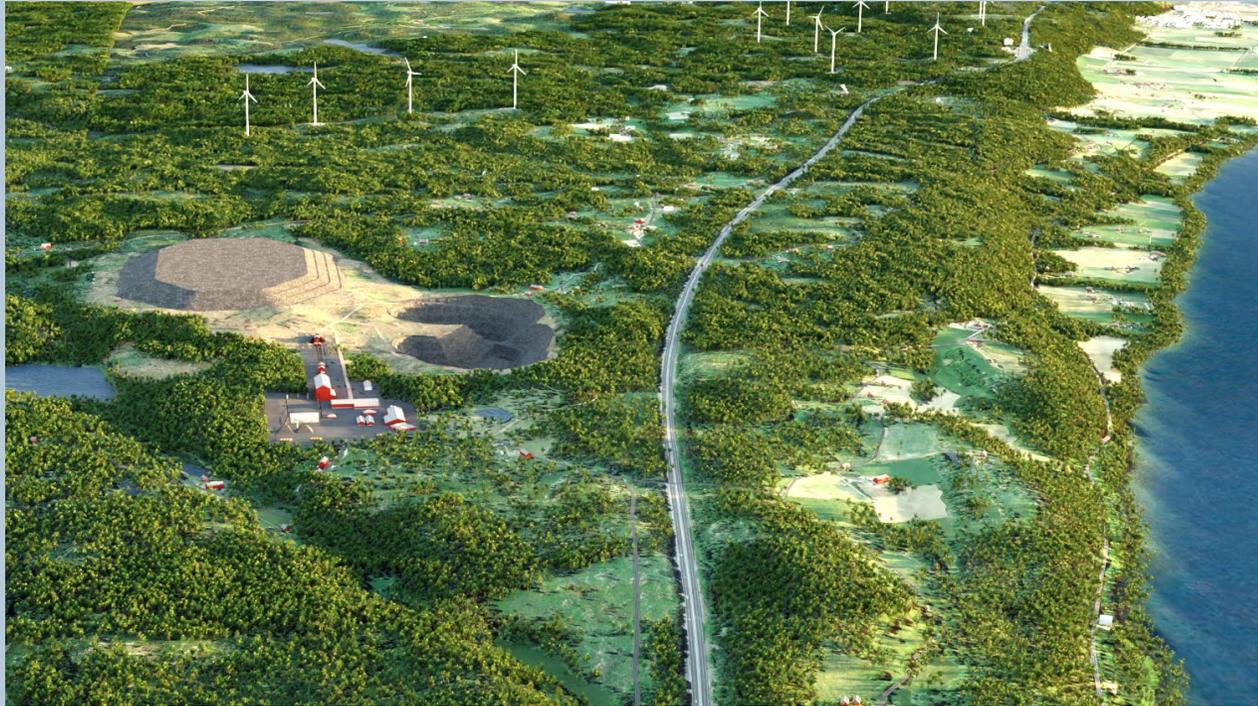
Annual potential anode output from Woxna Graphite\* could support the production of lithium-ion batteries needed for a significant amount of electric cars



100 000



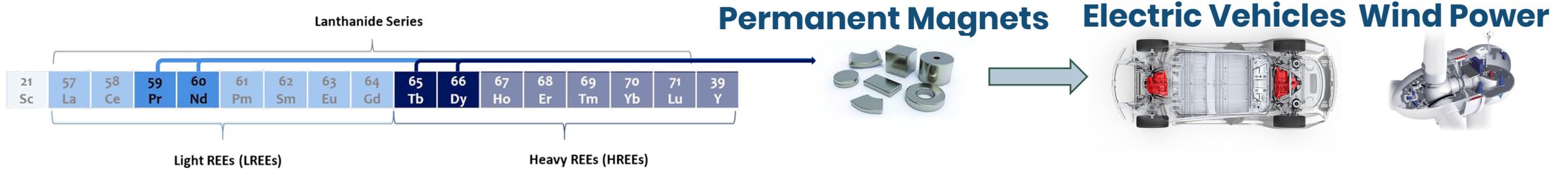
\* Management estimate calculations based on publicly available data and product output numbers from National Instrument 43-101 report entitled "NI 43-101 Technical Report – Woxna Graphite" prepared for Woxna Graphite AB with effective date June 9, 2021 and issue date July 23, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized. Image source: Polestar



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# Norra Kärr HREE Project

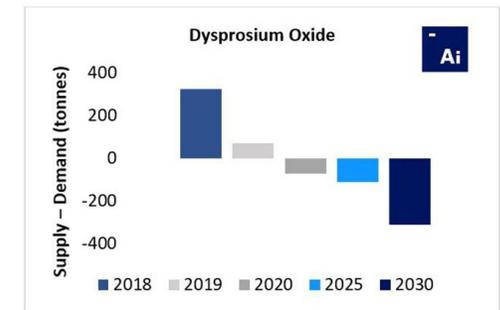
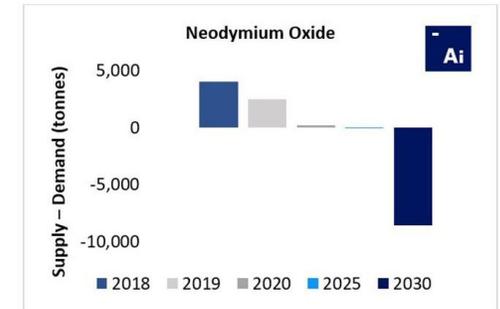
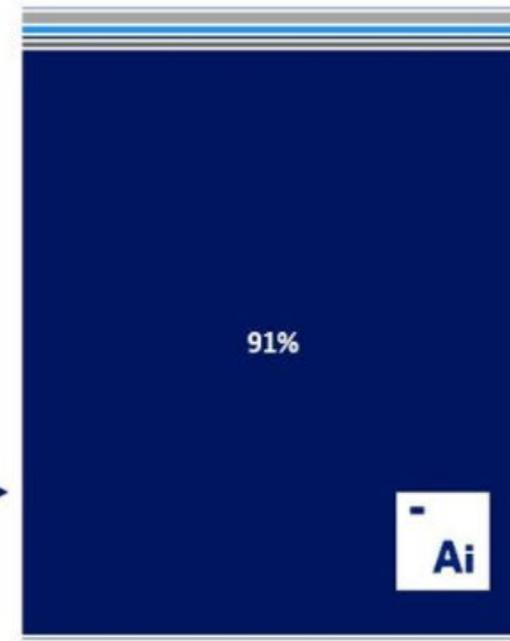
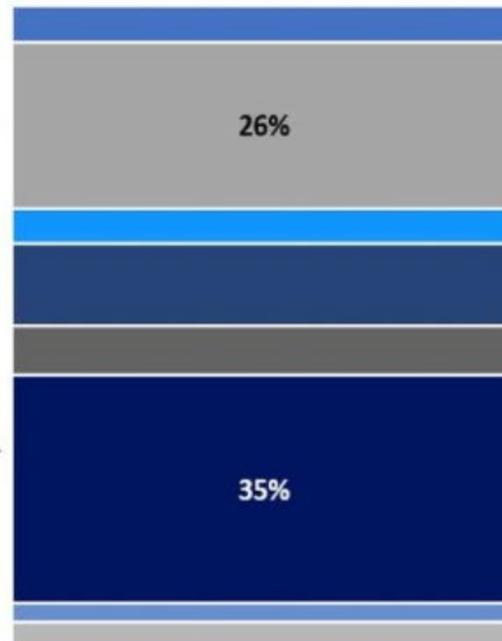
# Rare Earth Elements and permanent magnets



Categories

By Volume

By Value

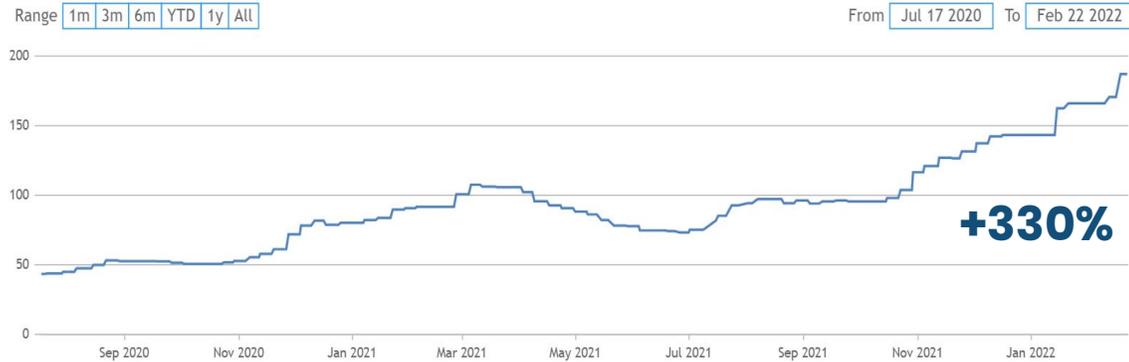


Source: Adamas Intelligence

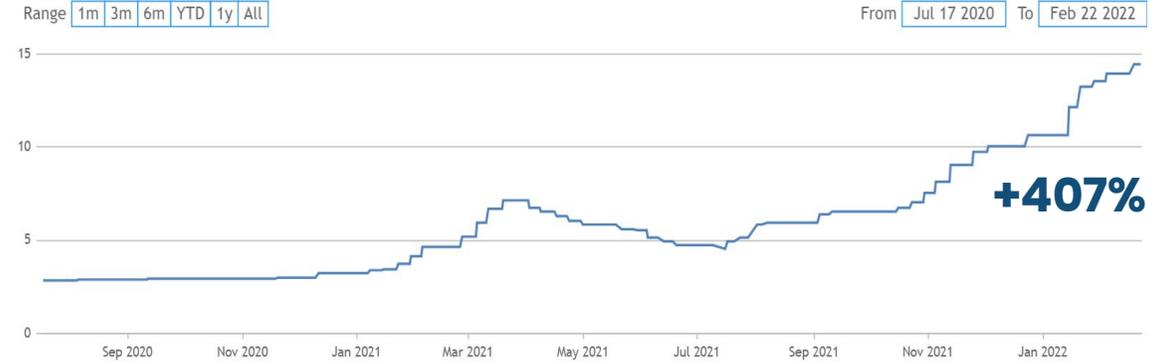
# REE Prices Rising



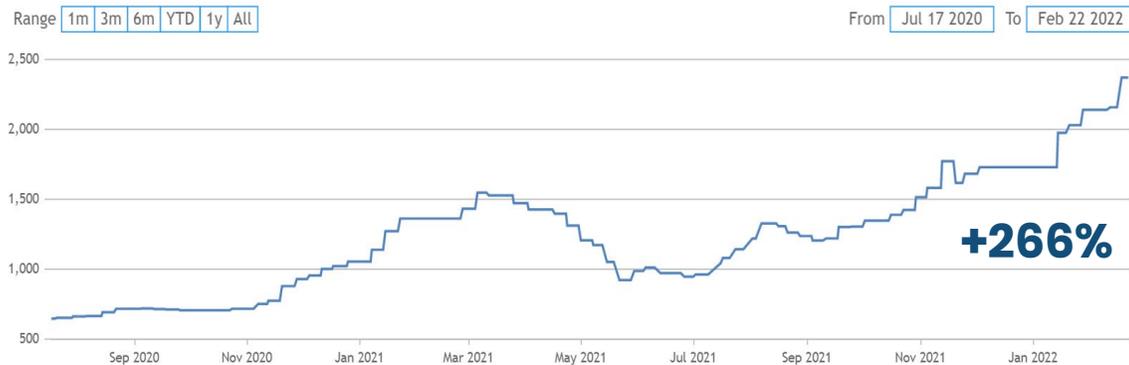
## Price history for Neodymium oxide (99.5% FOBChina) (\$/kg)



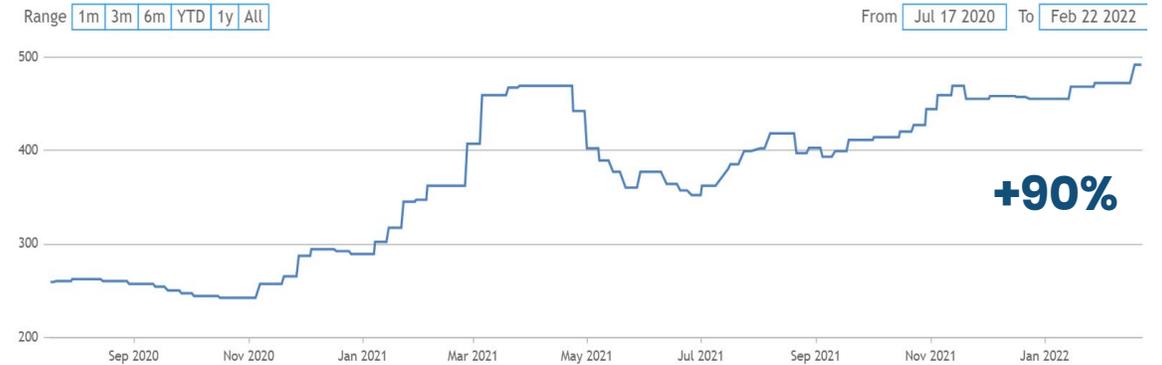
## Price history for Yttrium oxide (99.999% FOBChina) (\$/kg)



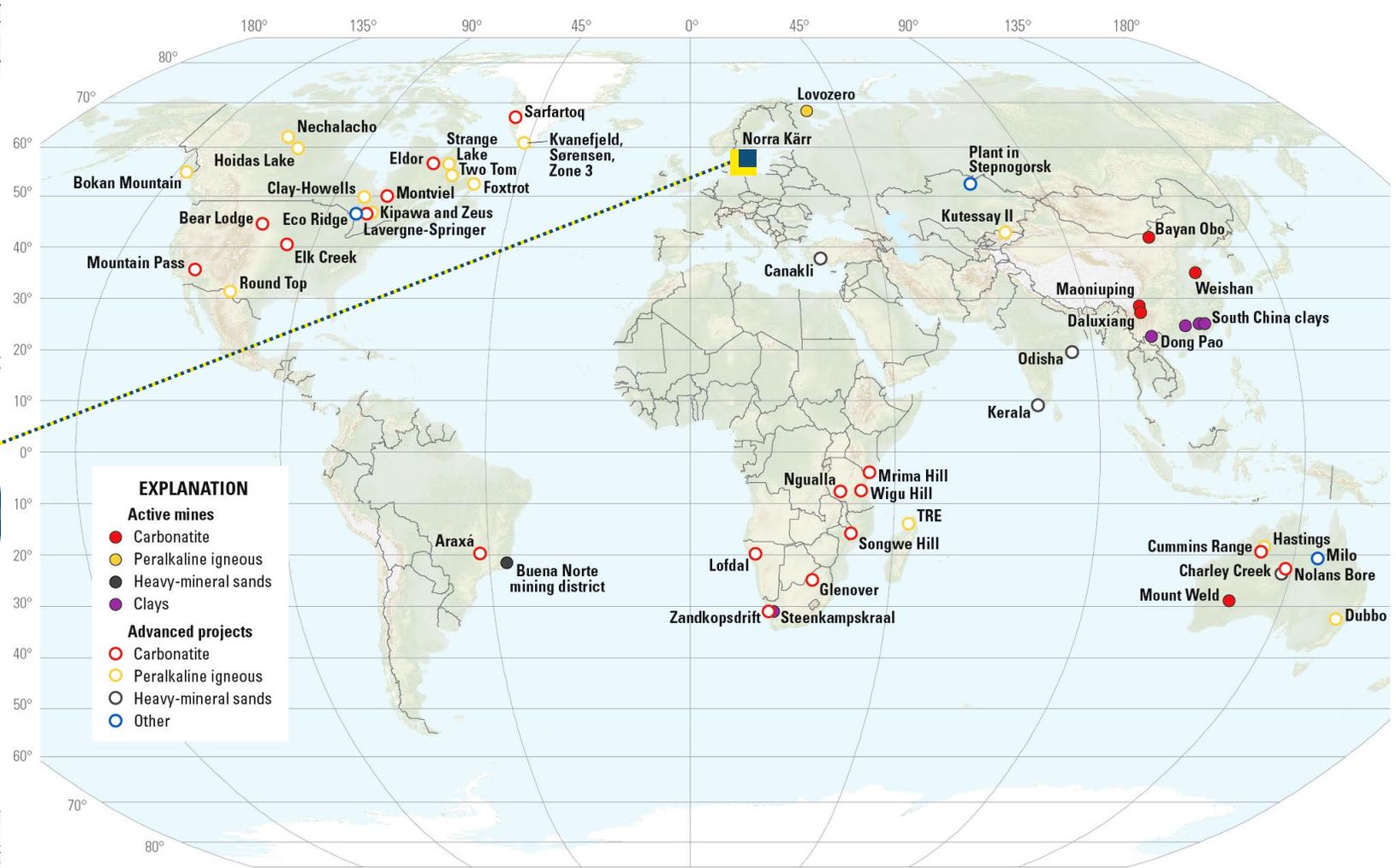
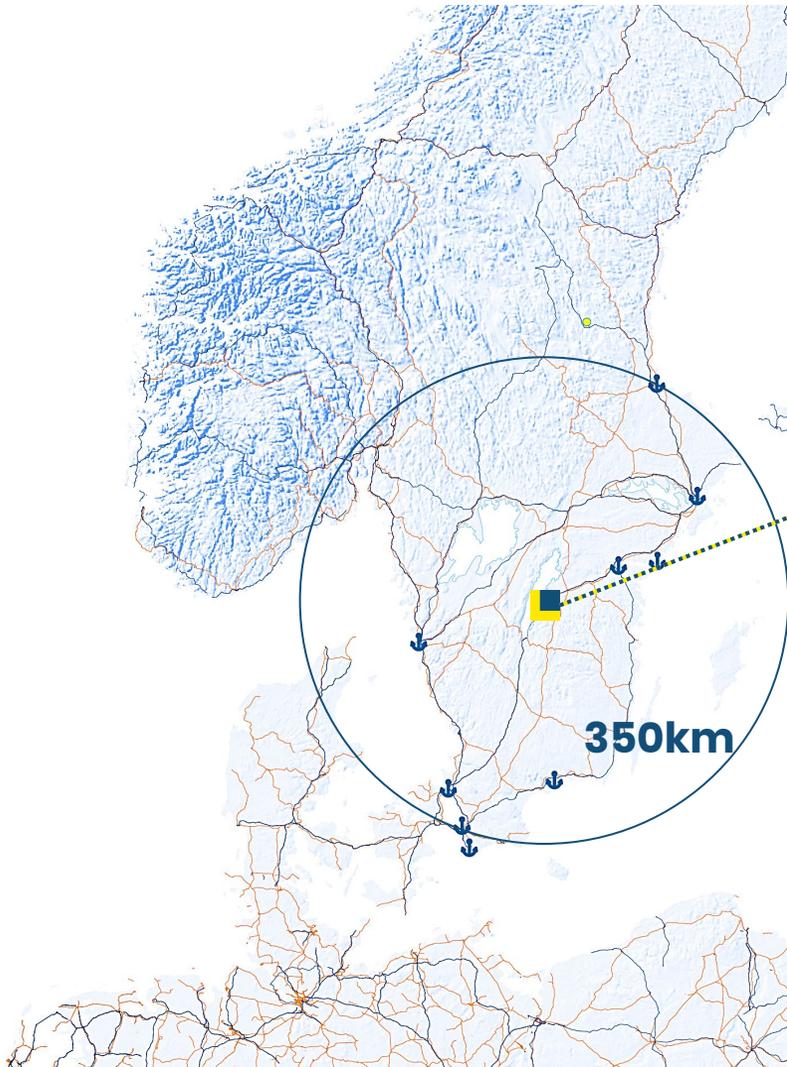
## Price history for Terbium oxide (99.99% FOBChina) (\$/kg)



## Price history for Dysprosium oxide (99.5%FOB China) (\$/kg)

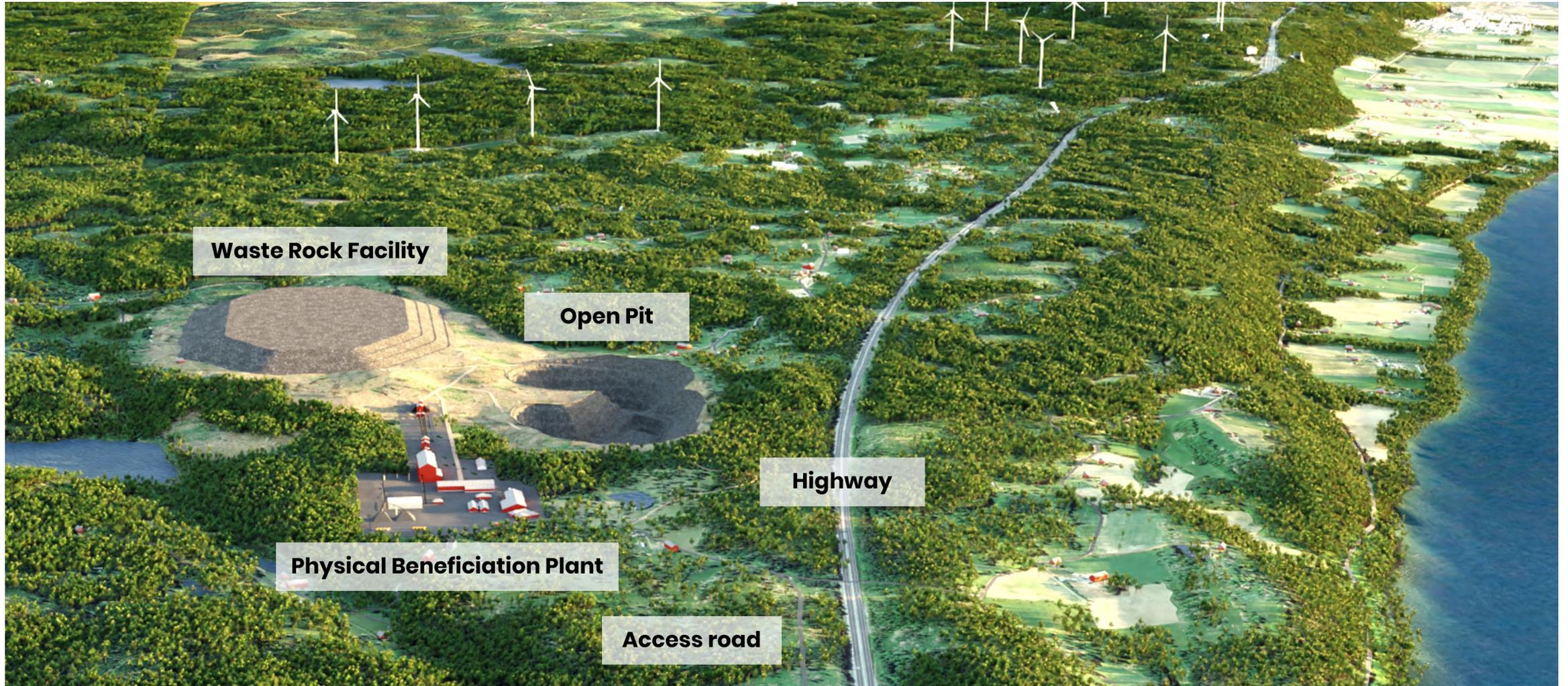


# Location of Norra Kärr



Base from U.S. Geological Survey Global 30 arc-second elevation data (1996) and from Natural Earth (2014); Robinson projection; World Geodetic System 1984 datum

# Norra Kärr Site Overview



# Norra Kärr Mineral Resource Statement



## Norra Karr Mineral Resource Statement (SRK, 18 August 2021)\*

Mineral Resource Classification	Tonnes (Mt)	TREO (%)	ZrO <sub>2</sub> (%)	Nb <sub>2</sub> O <sub>5</sub> (%)	Nepheline Syenite (%)
Inferred	110	0.5	1.7	0.05	65

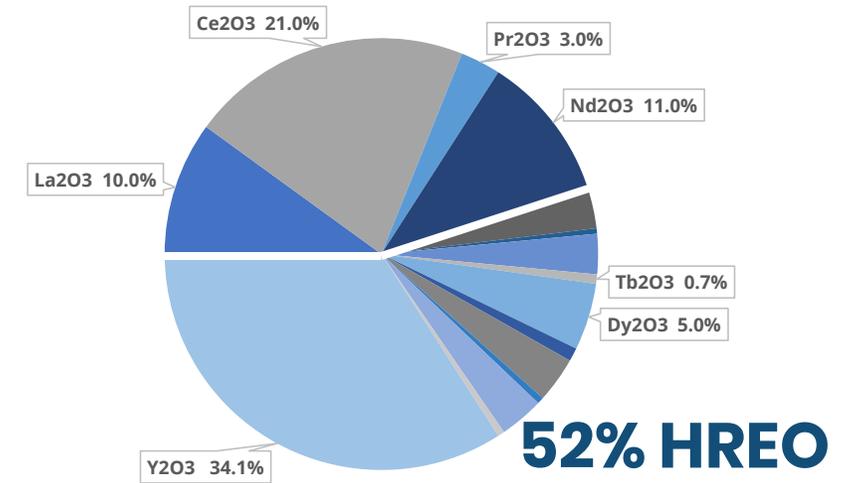
*\*Notes:*

1. Effective date 18 August 2021.
2. Qualified Person Mr Martin Pittuck MSc C.Eng
3. Mineral Resources are not Mineral Reserves until they have Indicated, or Measured confidence and they have modifying factors applied and they have demonstrated economic viability based on a Feasibility Study or Prefeasibility Study.
4. There is no guarantee that Inferred Mineral Resources will convert to a higher confidence category after future work is conducted.
5. The Mineral Resources reported have been constrained using an open pit shell assuming the deposit will be mined using open pit bulk mining methods and above a cut-off grade of USD150/t, including a 30% premium on projected commodity prices and unconstrained by commodity production rates and the 260m highway buffer zone.
6. The Mineral Resources reported represent estimated contained metal in the ground and has not been adjusted for metallurgical recovery.
7. Total Rare Earth Oxides (TREO) includes: La<sub>2</sub>O<sub>3</sub>, Ce<sub>2</sub>O<sub>3</sub>, Pr<sub>2</sub>O<sub>3</sub>, Nd<sub>2</sub>O<sub>3</sub>, Sm<sub>2</sub>O<sub>3</sub>, Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>2</sub>O<sub>3</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub>, Lu<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>.
8. Heavy Rare Earth Oxides (HREO) include: Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>2</sub>O<sub>3</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub>, Lu<sub>2</sub>O<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>
9. HREO is 52% of TREO

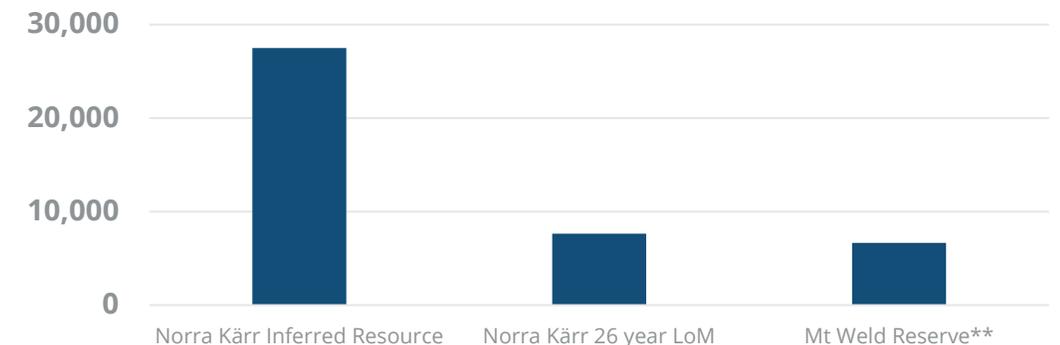
## Norra Karr Rare Earth Element Distribution

Light REO proportion of Total REO					Heavy REO proportion of Total REO									
La <sub>2</sub> O <sub>3</sub>	Ce <sub>2</sub> O <sub>3</sub>	Pr <sub>2</sub> O <sub>3</sub>	Nd <sub>2</sub> O <sub>3</sub>	Sm <sub>2</sub> O <sub>3</sub>	Eu <sub>2</sub> O <sub>3</sub>	Gd <sub>2</sub> O <sub>3</sub>	Tb <sub>2</sub> O <sub>3</sub>	Dy <sub>2</sub> O <sub>3</sub>	Ho <sub>2</sub> O <sub>3</sub>	Er <sub>2</sub> O <sub>3</sub>	Tm <sub>2</sub> O <sub>3</sub>	Yb <sub>2</sub> O <sub>3</sub>	Lu <sub>2</sub> O <sub>3</sub>	Y <sub>2</sub> O <sub>3</sub>
0.100	0.210	0.030	0.110	0.030	0.004	0.030	0.007	0.050	0.010	0.034	0.005	0.033	0.005	0.340
0.48					0.52									

## Resource REO Distribution



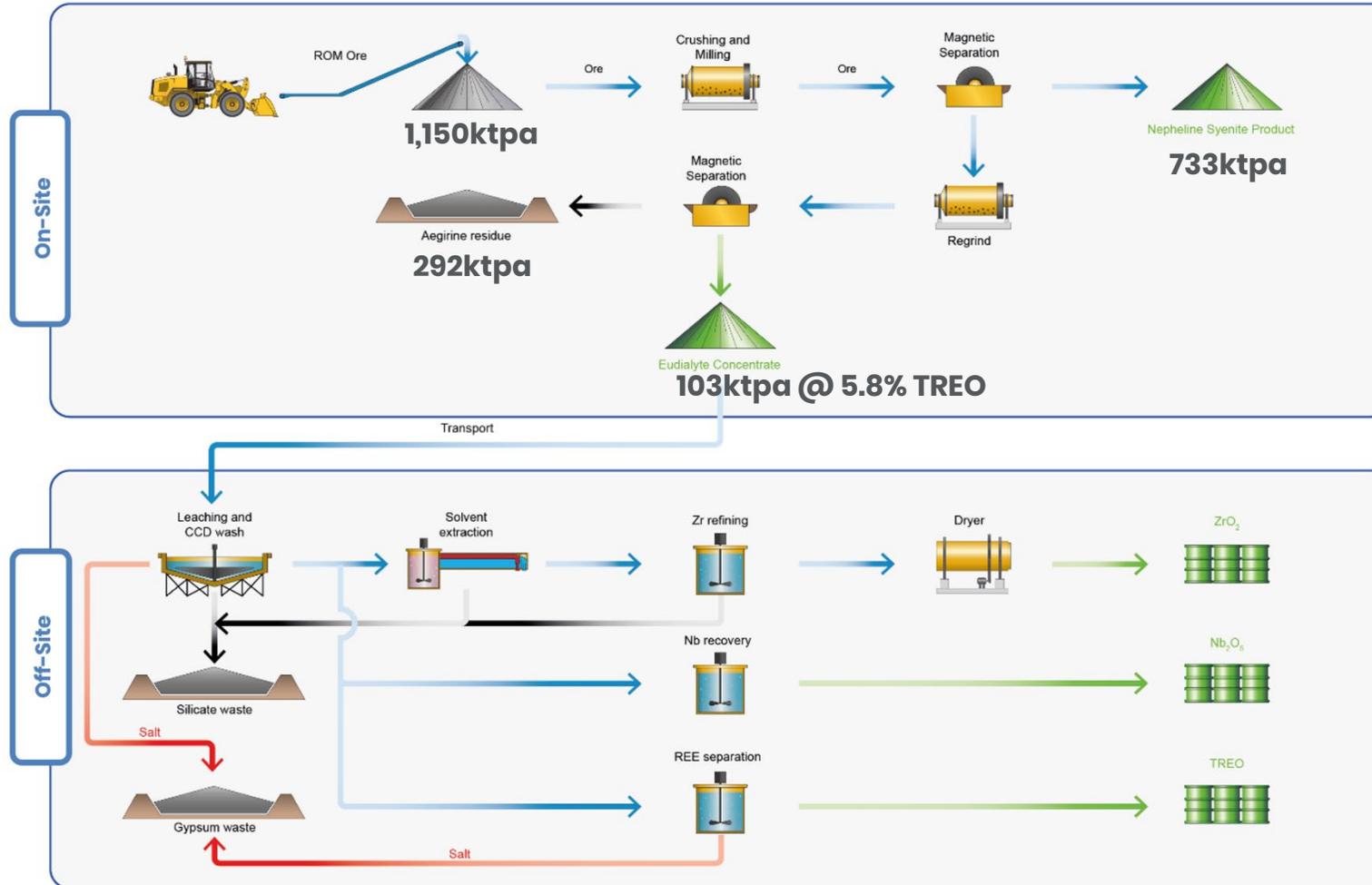
## Contained dysprosium



\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

\*\* August, 6, 2018 – Lynas Corporation Ltd, Reserve update

# Norra Kärr 2021 PEA\*



## Operational Highlights

- Life of Mine (LOM) is 26 years
- LOM average annual
  - Mining rate of 1,150,000 tonnes
  - strip ratio of 0.32
  - TREO 5,341 tonnes
  - Magnet REOs (Nd, Pr, Dy, Tb) 1,005 tonnes
    - Dy<sub>2</sub>O<sub>3</sub>: 248 tonnes
    - Tb<sub>2</sub>O<sub>3</sub>: 36 tonnes
    - Nd<sub>2</sub>O<sub>3</sub>: 578 tonnes
    - Pr<sub>2</sub>O<sub>3</sub>: 143 tonnes
- Nepheline Syenite co-product 732,885 tonnes
- Zirconium dioxide co-product 10,200 tonnes
- Niobium oxide product 525 tonnes

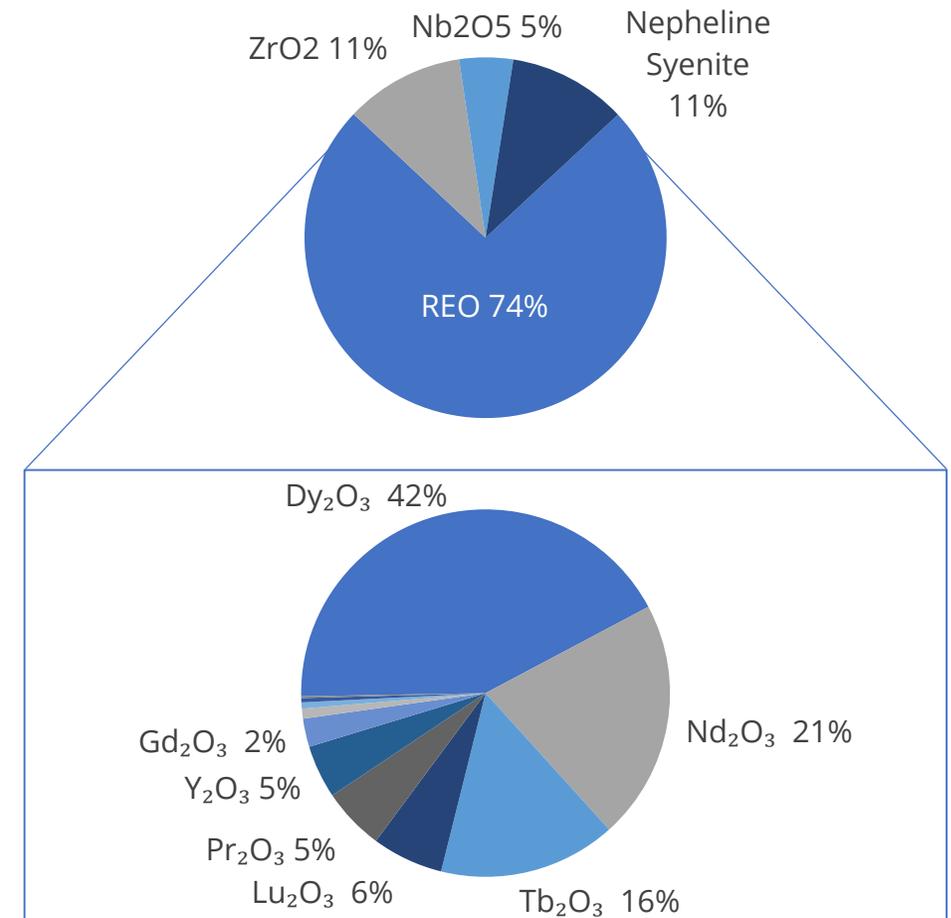
\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.



## Financial Highlights

- Post-tax Net Present Value (NPV 10%) of \$762M
- Post-tax Internal Rate of Return (IRR) of 26.3%
- Accumulated LoM project revenues of \$9,962M
- Average annual EBITDA of \$206M
- Initial Capital Expenditures (CAPEX) of \$487M
  - Split across \$165m on-site and \$323m off-site
- Pre-tax Payback Period from first production of 5.1 years
- Life of mine average gross basket price per kg of separated mixed REO product at \$53

## Revenue Distribution

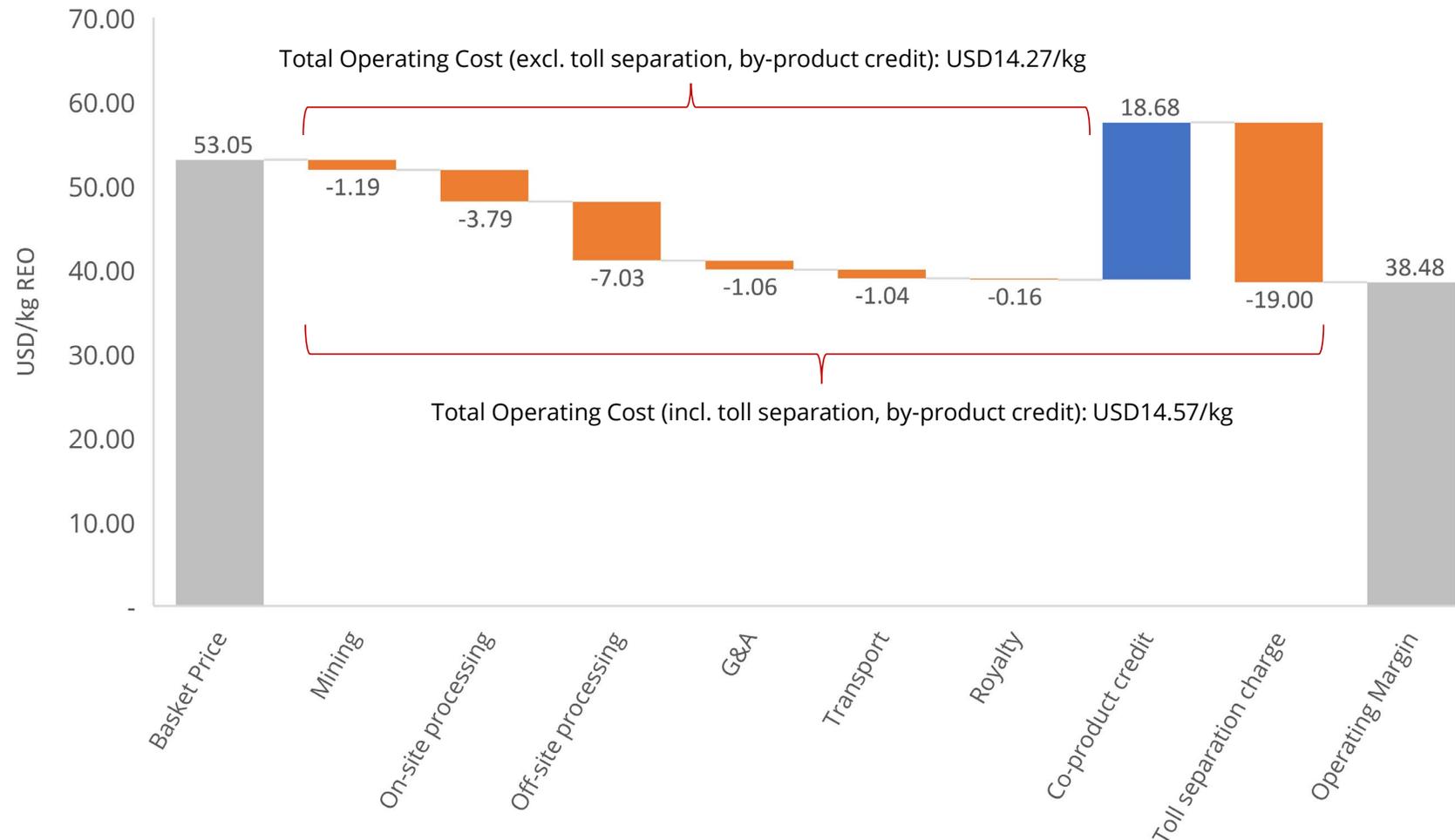


\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

# Norra Kärr 2021 PEA\*



## LoM Unit Operating Cost Economics (USD/kg REO)



\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

# Norra Kärr 2021 PEA\* vs 2015 PFS



- More than 50% of total mined material is planned to be sold as products compared with less than 1% in the previously project submitted for permitting
  - Opportunity for further improvement with waste rock for construction material and aegirine for paint pigment or block colouring
- Only mining, crushing, milling and magnetic separation at site.
- Chemical processing moves to a more suitable off-site location
- Waste at site is aegirine, dry stacked in a lined impoundment together with waste rock
- No wet tailings at site
- 80% reduction in land area usage
- 50% reduction in water requirements, and no processing water discharge planned

\* See National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized.

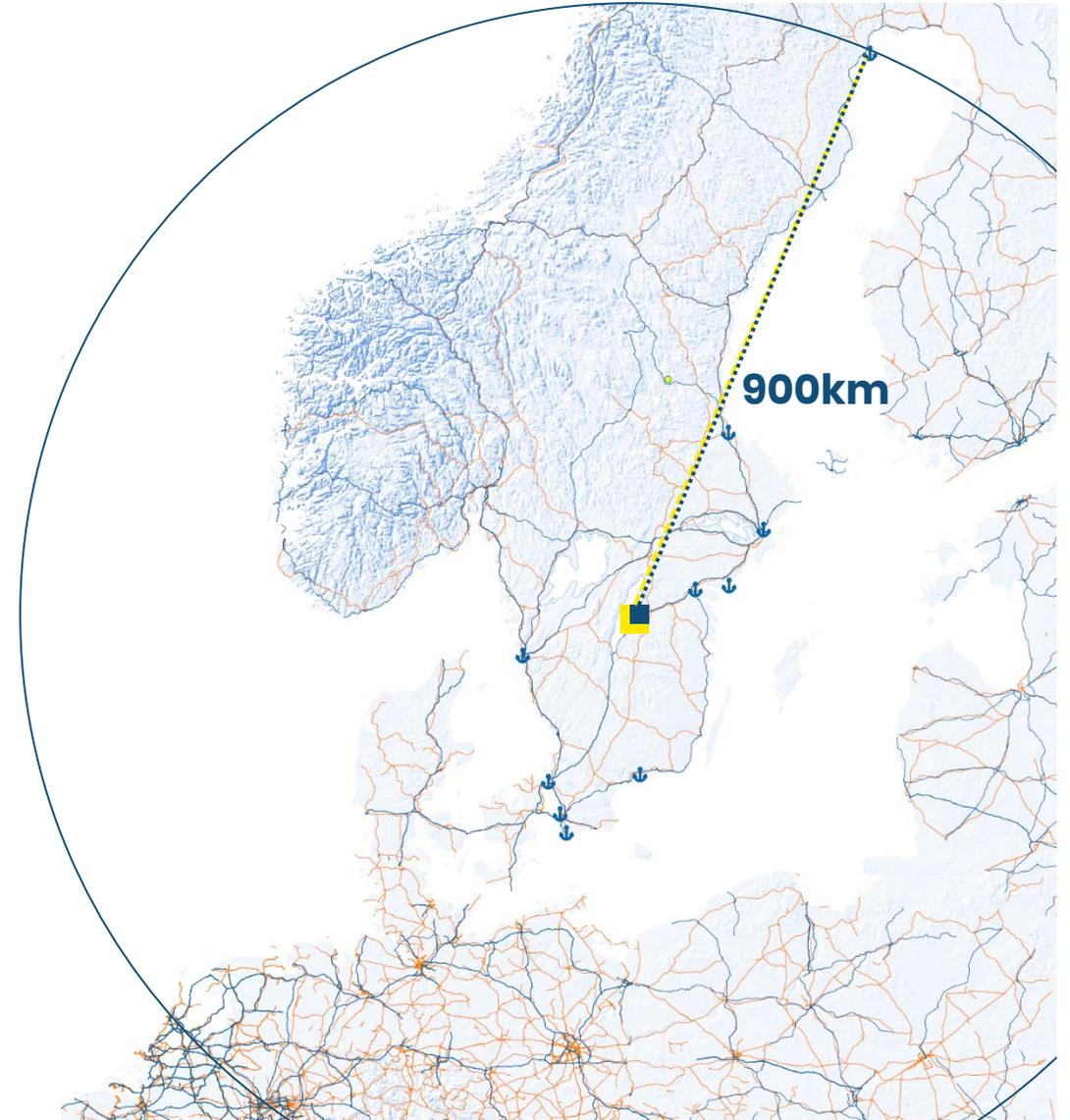
# Norra Kärr 2021 PEA Environmental Context



# Off-site Chemical Plant Localization



- Luleå chosen conceptually due to vicinity of sulphuric acid production, brownfield industrial areas and logistics
- Access to low cost low carbon footprint hydropower
- 900 kilometers by train
- Other locations in Sweden, or neighbouring countries will be evaluated



# Sustainability Opportunity of Norra Kärr



## Comparison of dysprosium production from different resources by life cycle assessment

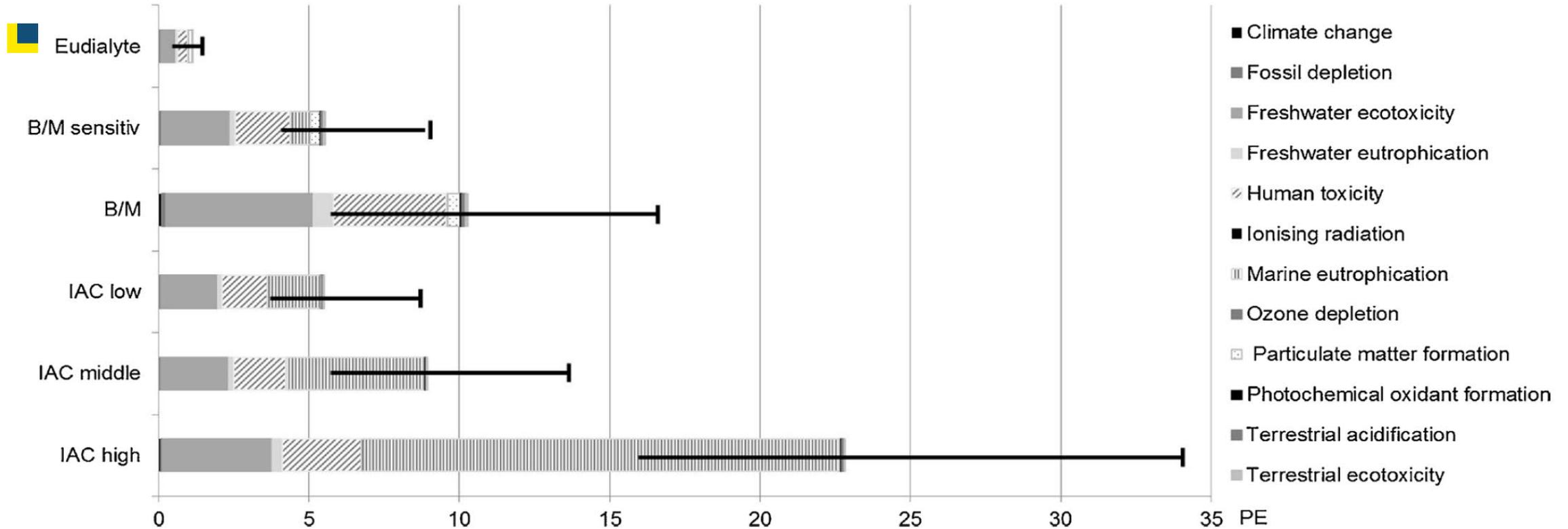
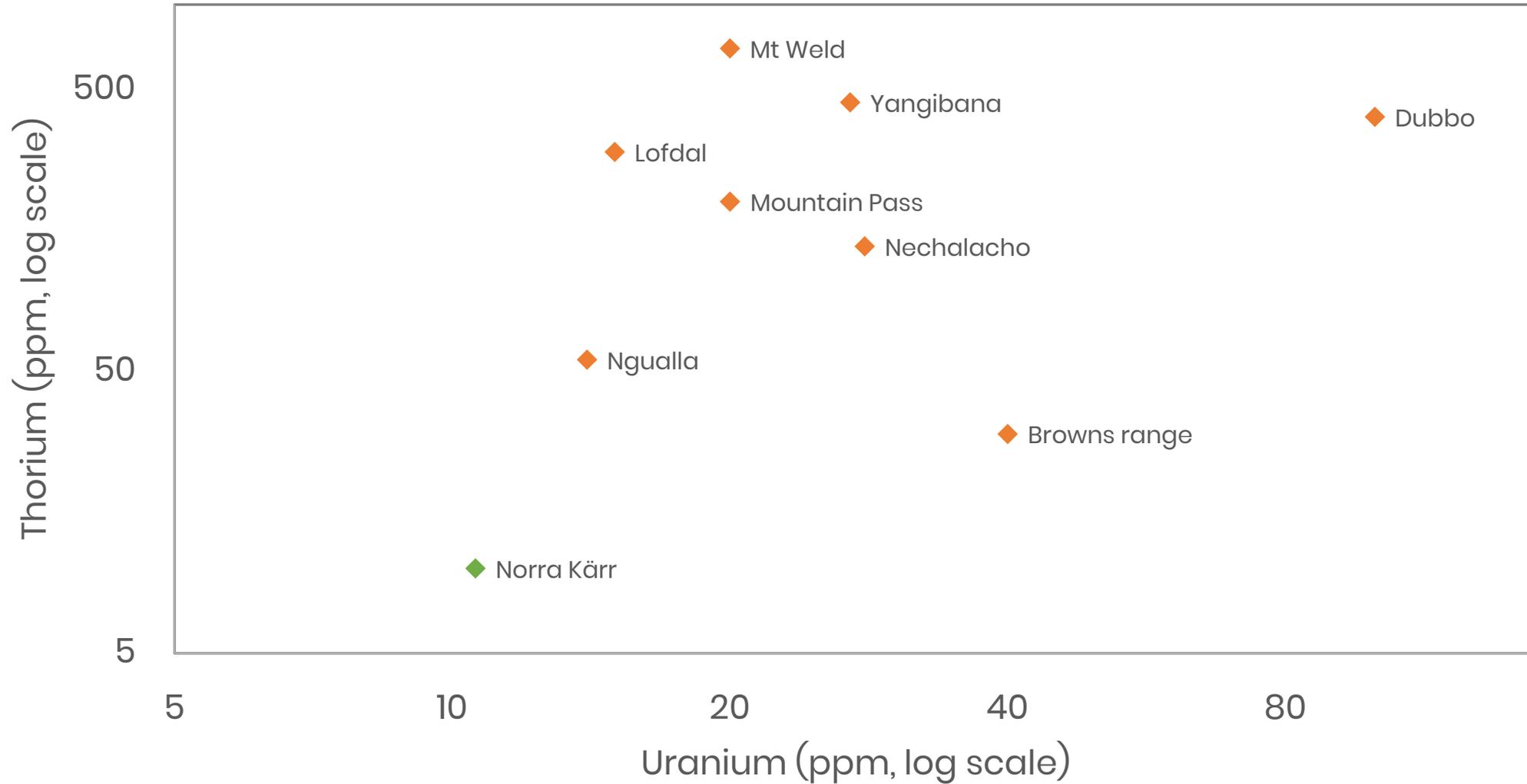


Fig. 3. Normalised impacts of process chains in person equivalents per kg Dy with deviation.

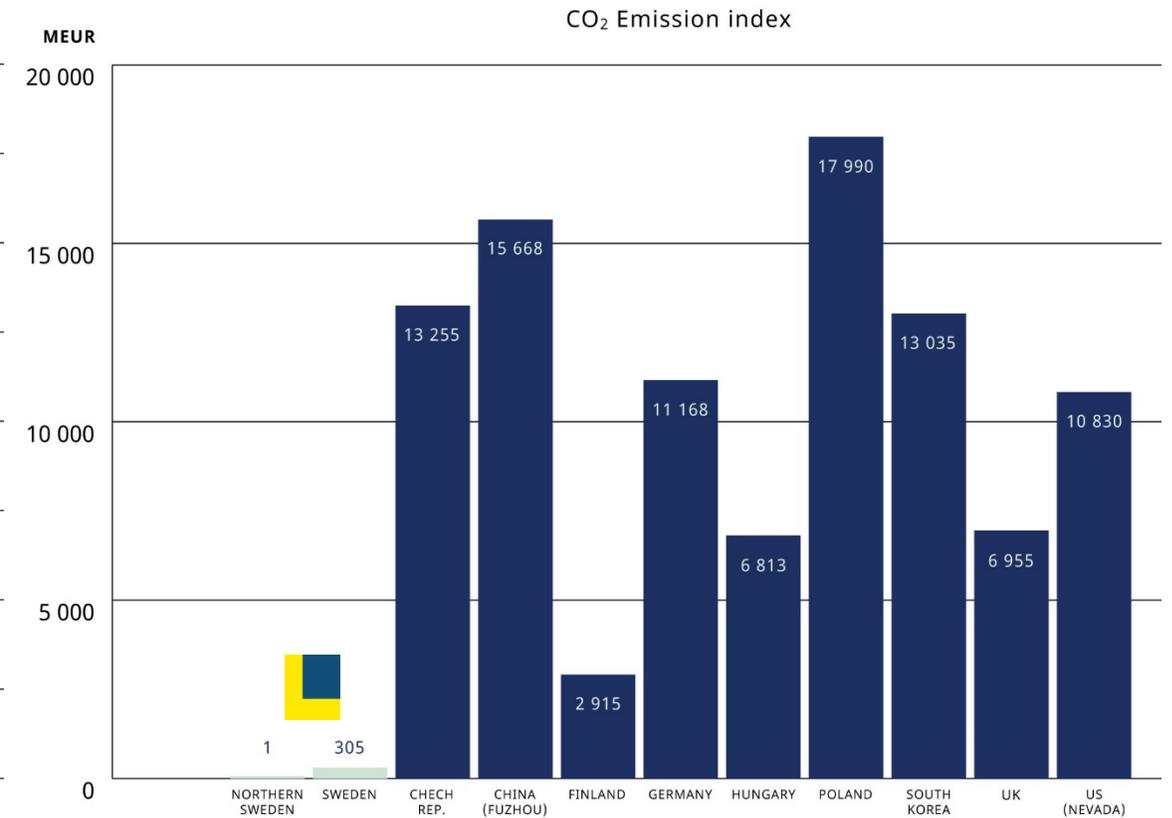
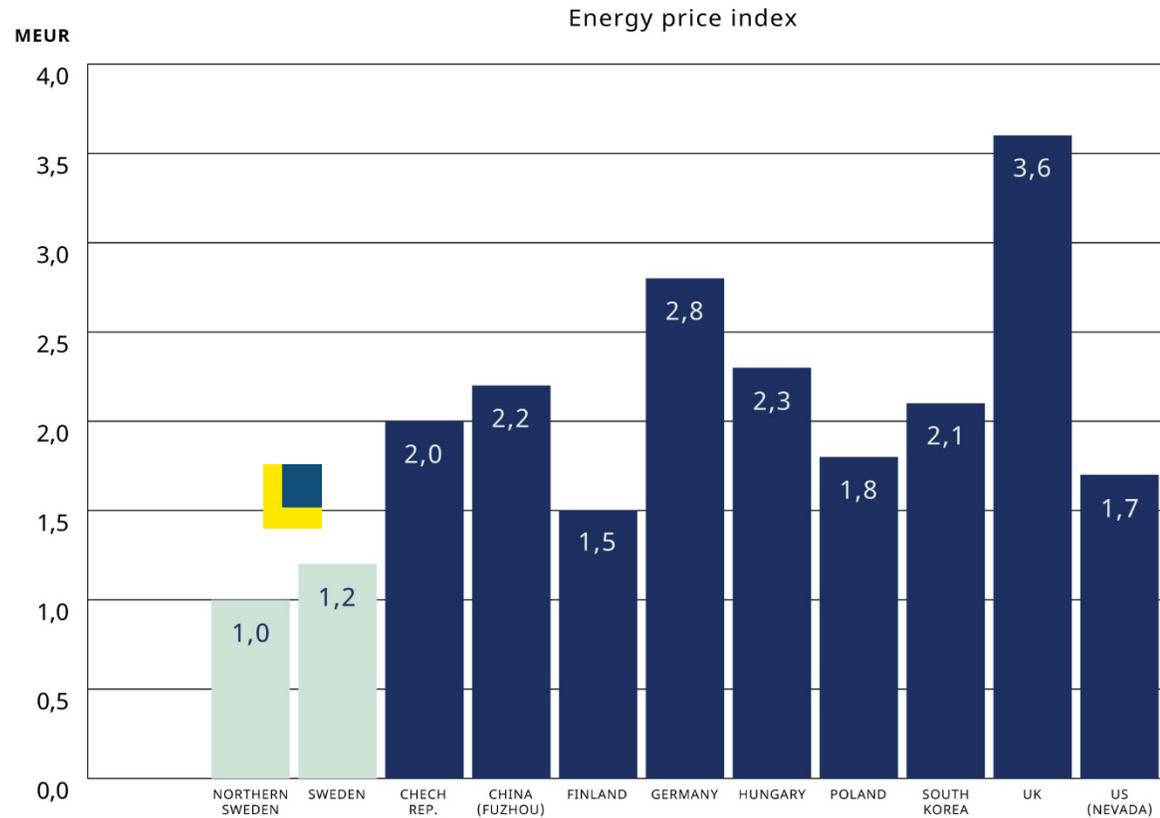
Source: Zapp, 2018

# Radionuclide Content



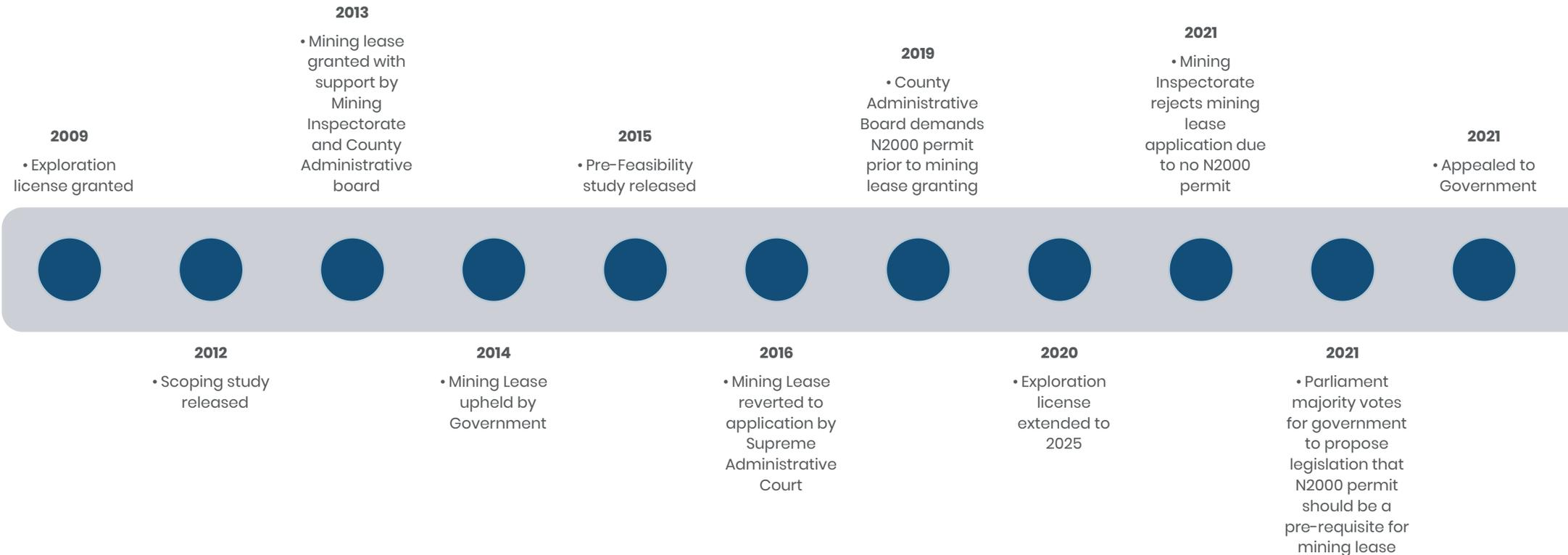
Data for peer projects is managements estimates based on publicly available data. Leading Edge Materials Corp. does not guarantee the exact accuracy of these estimates.

# Sweden's Power Advantage



Source: NodePole

# Social License of Norra Kärr



**2021**  
New Scoping Study released focussed on maximizing resource efficiency and minimizing local footprint of project which will drive permitting forward.

# Annual potential output from Norra Kärr\* could support the production of NdFeB permanent magnets needed for a significant amount of electric cars

60 <b>Nd</b> Neodymium 144.24	59 <b>Pr</b> Praseodymium 140.908
--	--

1 200 000

66 <b>Dy</b> Dysprosium 162.50	65 <b>Tb</b> Terbium 158.925
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1 900 000



\* Management estimate calculations based on publicly available data and product output numbers from National Instrument 43-101 report titled "PRELIMINARY ECONOMIC ASSESSMENT OF NORRA KÄRR RARE EARTH DEPOSIT AND POTENTIAL BY-PRODUCTS, SWEDEN" prepared for Leading Edge Materials Corp. with effective date August 18, 2021 and issue date August 19, 2021. See Leading Edge Materials Corp.'s SEDAR profile on [www.sedar.ca](http://www.sedar.ca) or [www.leadingedgematerials.com](http://www.leadingedgematerials.com) for report and more information. The PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the PEA will be realized. Image source: Polestar



# Romania Exploration Project

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# Romania Nickel-Cobalt Project

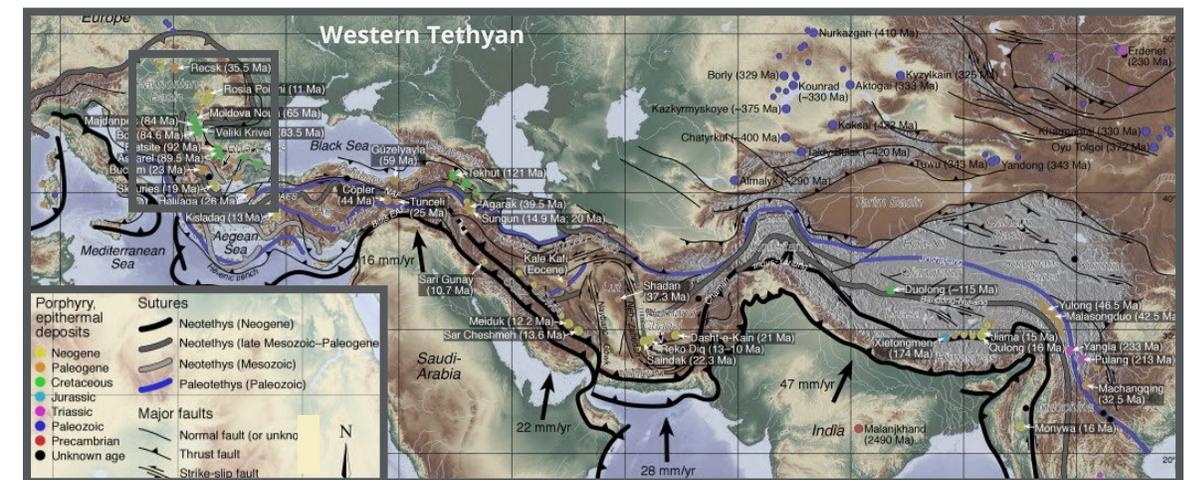
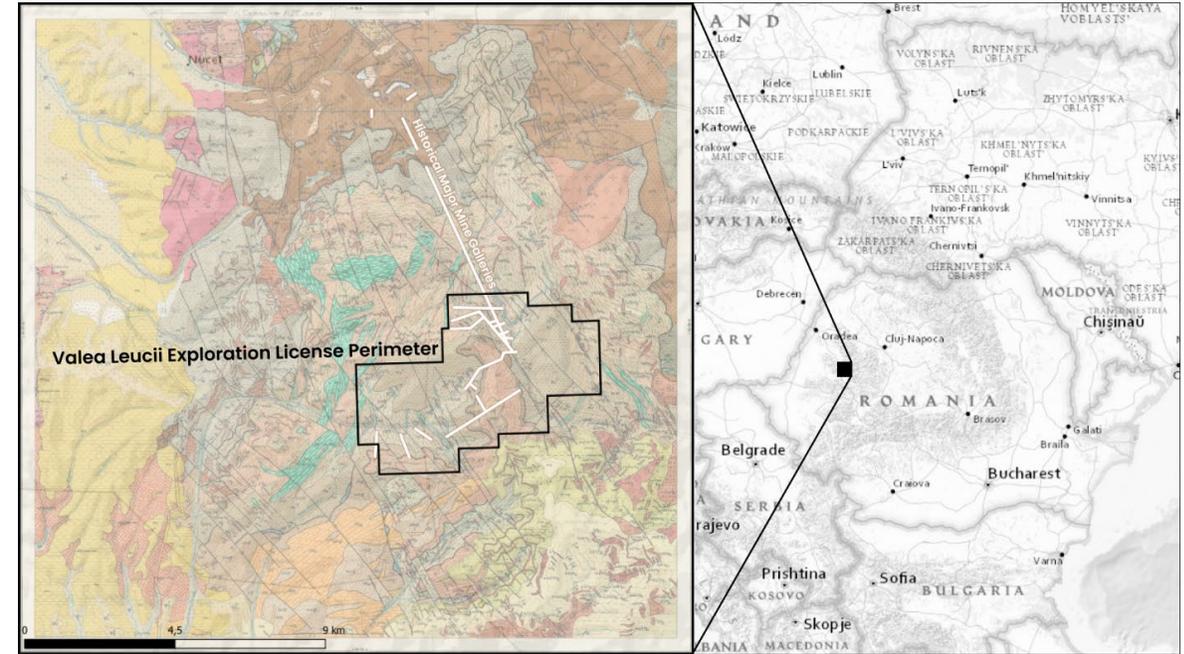


## Overview

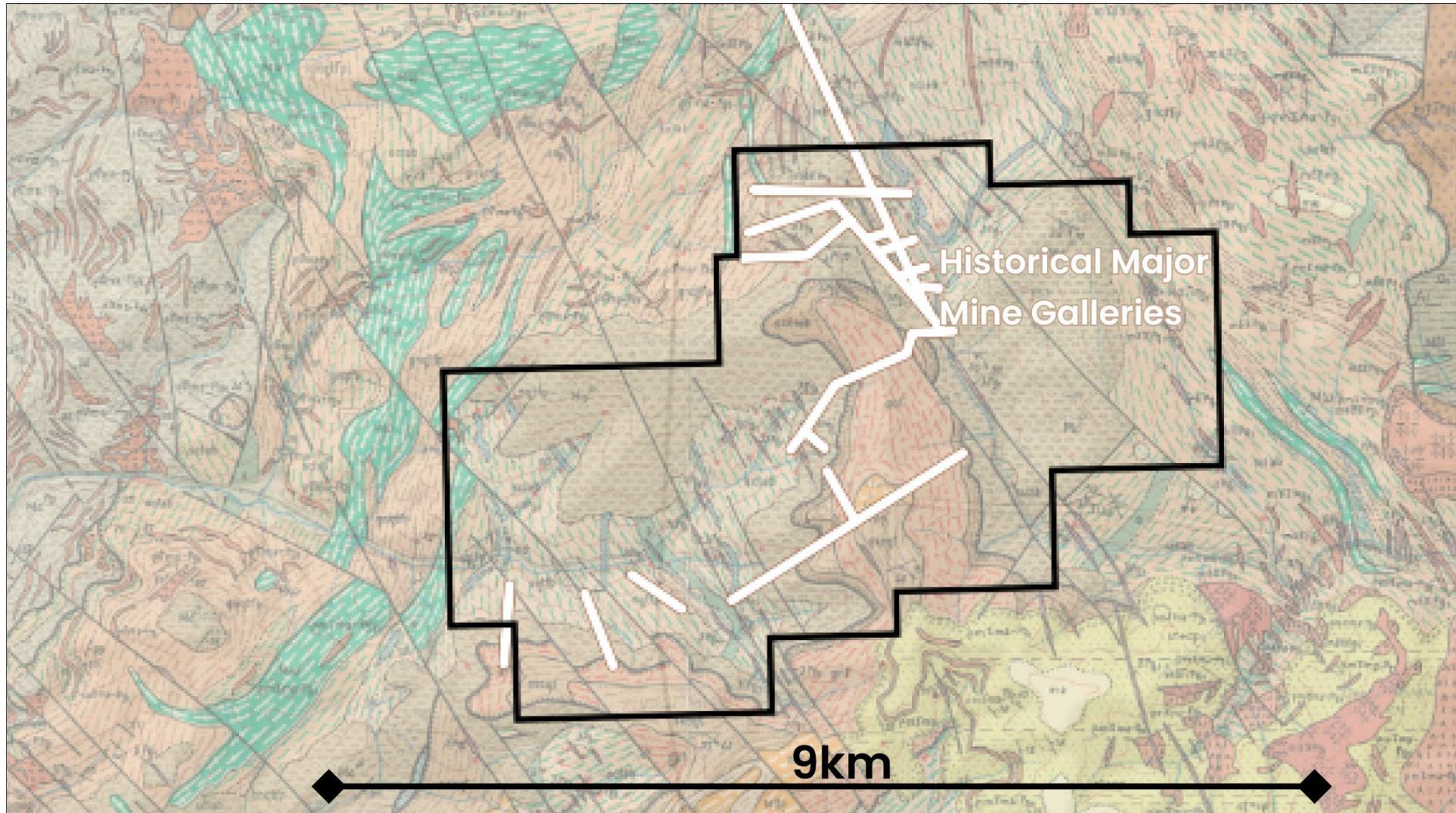
- JV from 2018 with 51% ownership with potential to move to 90%. Local JV partner operates a Dolomite mine in the area offering shared resources and local knowledge
- Located in the upper Cretaceous megacollisional belt, part of the Tethyan Belt in a historic mining area with a number of historic mines, one being a significant uranium mine
- Initial prospecting campaign and sampling from past mine workings indicates potential for high grade nickel-cobalt mineralizations

## Opportunity

- Bihor Sud is relatively isolated site whilst the road and power network is well developed due to prior mining and forestry. No permanent residences lie within 5km of the Exploration License boundary.
- Exclusive five year exploration license was granted on May 16<sup>th</sup> moving the project towards pre-submitted exploration program
- Romania is a historic mining country but nowadays one of Europe's poorest countries which should attract interest from strategic investors



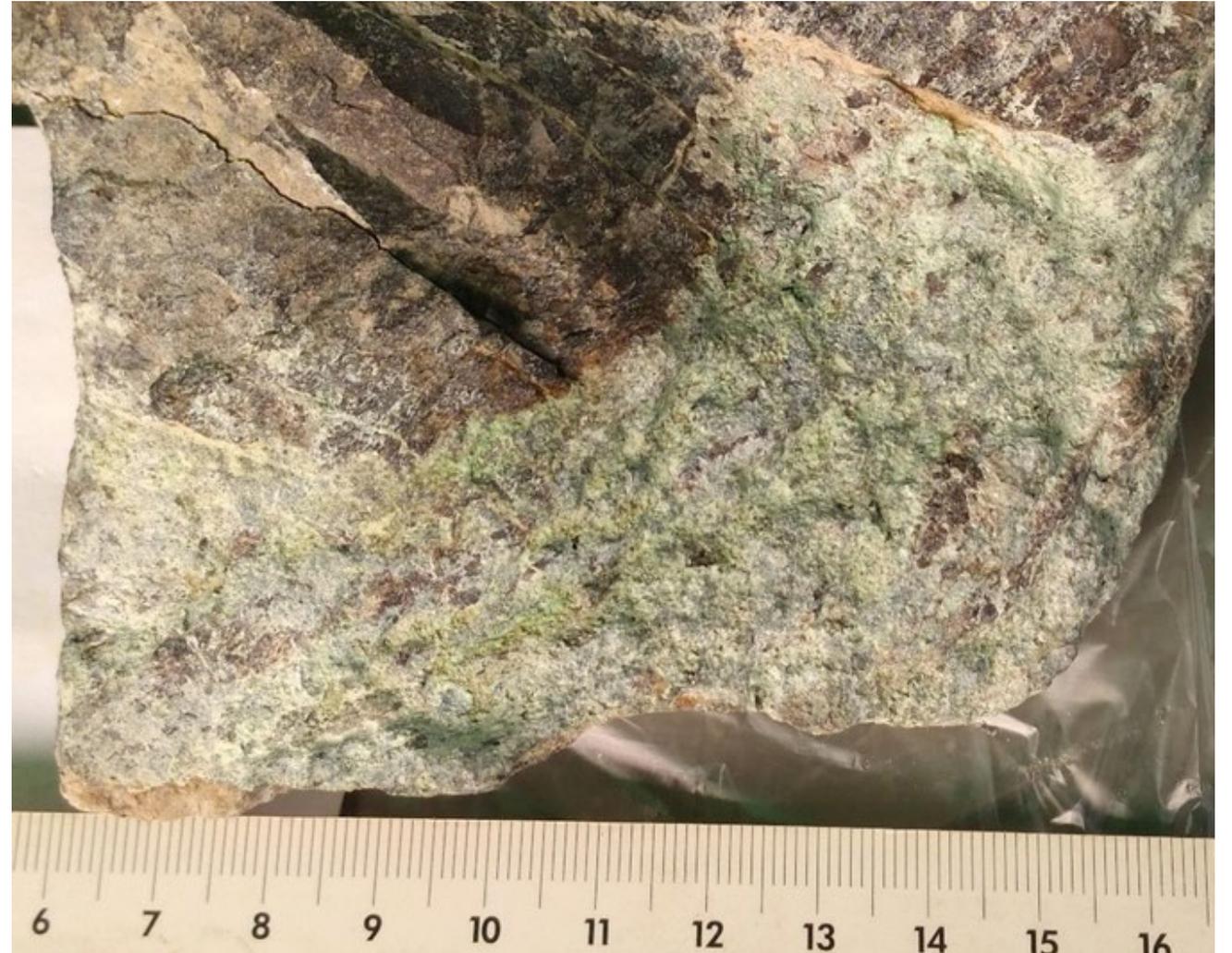
# Valea Leucii Exploration License



# Valea Leucii Samples



**Stringers of Co-Ni mineralization in low grade metamorphic sediments**



**Oxidized Co-Ni mineralization yielding greenish colours in low-grade metamorphic dark sediments**



# Current and Future Focus

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# Current and Future Focus



## Woxna Anode project

- Working with equipment suppliers for bulk samples of anode precursor material
- Natural graphite and graphite-composite anode material qualifications together with Sicona for binding JV discussions
- Localization studies for anode material plant in Sweden
- Investigating restart of flake graphite production

## Norra Kärr HREE project

- Incorporating new plan for the project into mining lease application
- Magnetic separation beneficiation testwork to produce representative material bulk samples
- Product development for nepheline syenite, aegirine and waste rock

## Romania project

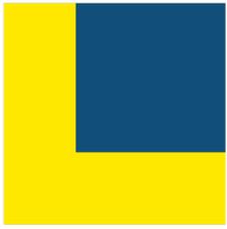
- Granted exclusive exploration license

## Corporate and Financial

- Internally funded through options and warrants that are in the money for planned development initiatives over next 12-18 months
- Increasing investor awareness, with added focus on Germany due to importance of projects for German industry
- Engaging with EU industrial alliances to support the establishment of secure and sustainable EU value chains, and enabling access to future public funding instruments

## Future

- Woxna Anode project
  - Incorporated JV with Sicona
  - 500 tpa anode material demonstration plant and customer qualification trials
- Norra Kärr HREE project
  - Commercialization of industrial mineral products
  - Hydrometallurgical pilot plant
  - Separation capability development
- Romania project
  - Exploration programme



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