SCRREEN Symposium Ljubljana, Slovenia

30th March 2023

Vanadium for Emerging Technologies: A case study using DERA‘s Raw Materials Monitoring

Sophie Damm

German Mineral Resources Agency (DERA) at the
Federal Institute for Geosciences and Natural Resources (BGR)

Federal Ministry
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and Climate Action

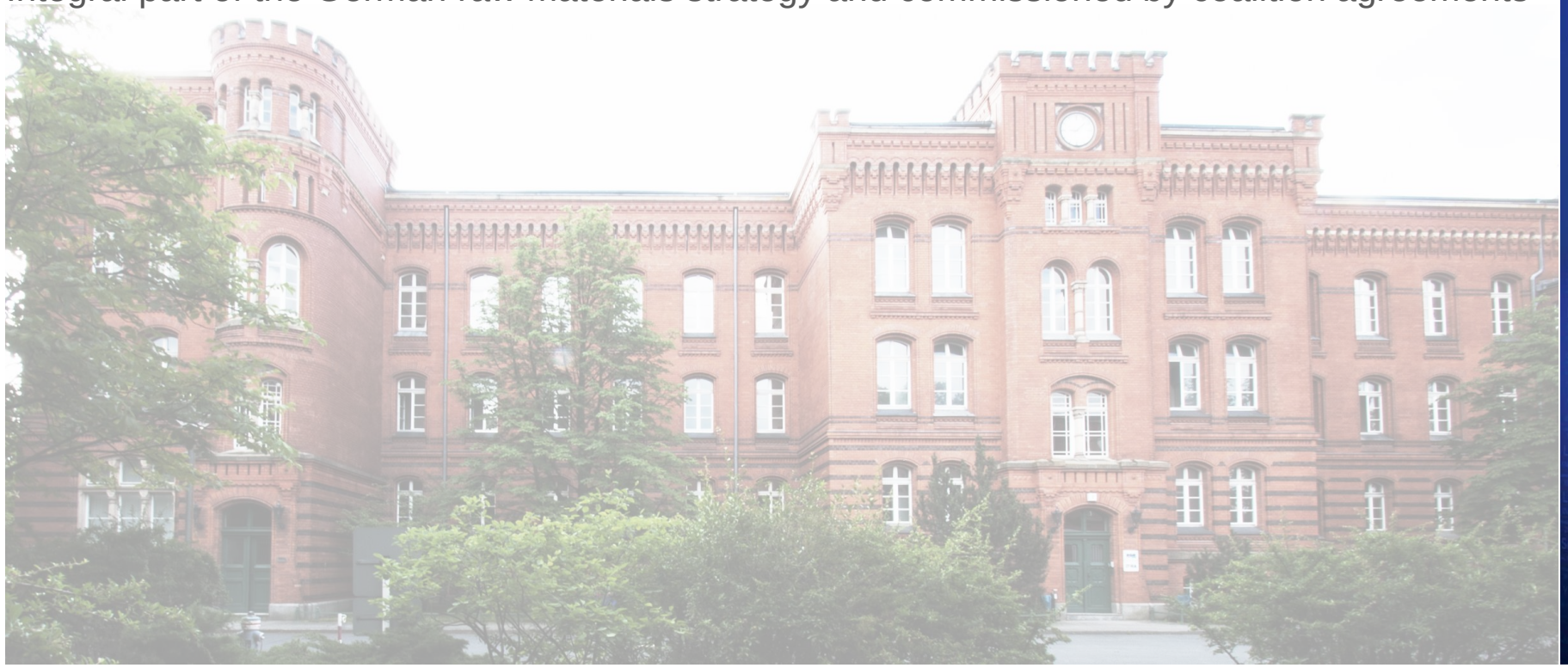
The Federal Institute for Geosciences and Natural Resources is the central geoscientific authority providing advice to the German Federal Government in all geo-relevant questions. It is subordinate to the Federal Ministry for Economic Affairs and Climate Action (BMWK).

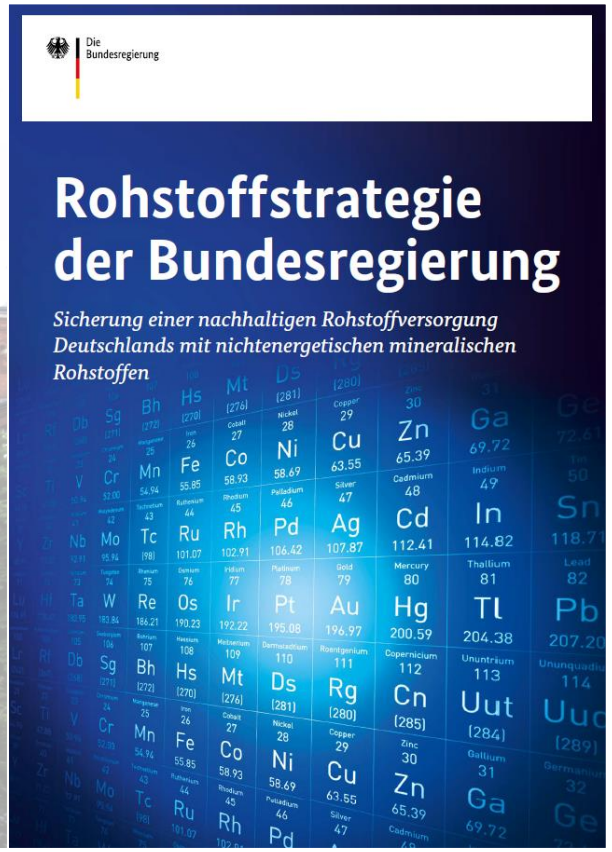
The German Mineral Resources Agency (DERA) at BGR

Part of the Federal Institute for Geosciences and Natural Resources (BGR)

Subordinate to the Federal Ministry for Economic Affairs and Climate Action (BMWK)

Integral part of the German raw materials strategy and commissioned by coalition agreements





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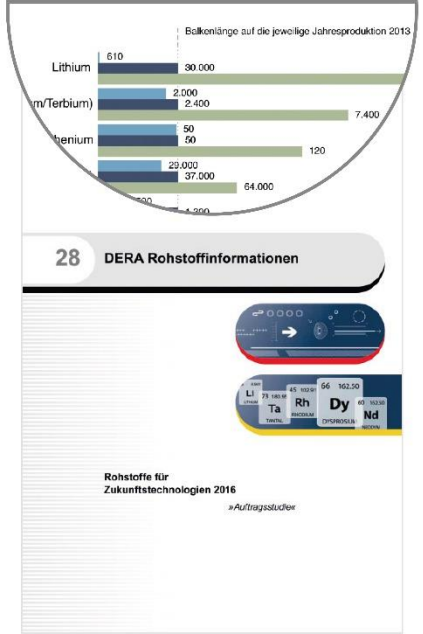
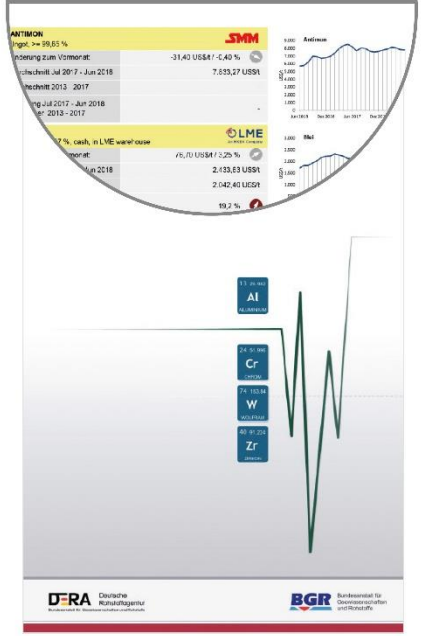
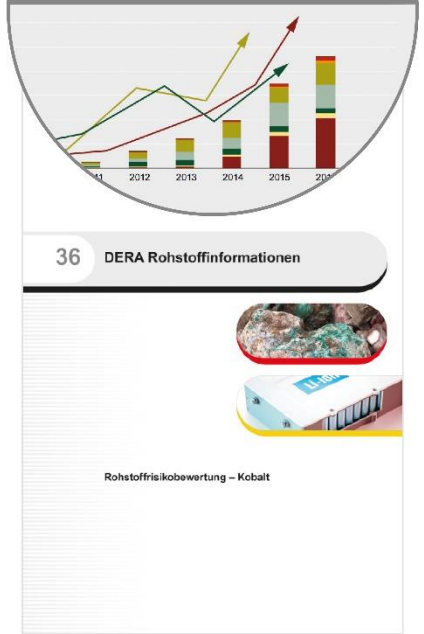
The German Mineral Resources Agency (DERA) at BGR

DERA – RAW MATERIALS MONITORING

Demand	Supply	Prices	Market Analyses
Study of raw materials for emerging technologies • 160 technologies •	DERA Criticality List • 160 raw materials • • 200 intermediate products •	Price Monitor • 80 price specifications •	Risk assessments Supply scenarios Demand scenarios







Vanadium 2023

Network

Conferences / DERA Raw material dialogues / DERA Industry Workshops

DEMAND – Why Vanadium

HSLA Steel | Full Alloy Steel | Carbon Steel | Others..

Construction | Pipelines | Automotive | Railways | Transportation | ..

Titanium Alloys | Superalloys | Magnetic Alloys | Other Non-Ferrous Alloys

Aerospace | Gas Turbines | Automotive | ..

Catalysts | Dyes | Ceramics | Pharmaceuticals

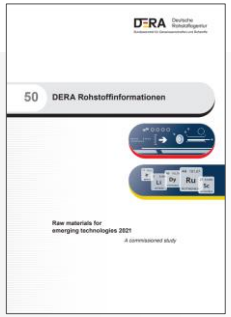
Sulphuric Acid Production | Synthetic Rubber Production|

..

Vanadium Redox-Flow Batteries – A New Driver of Demand

2022: 1.5GW

2040: 20GW



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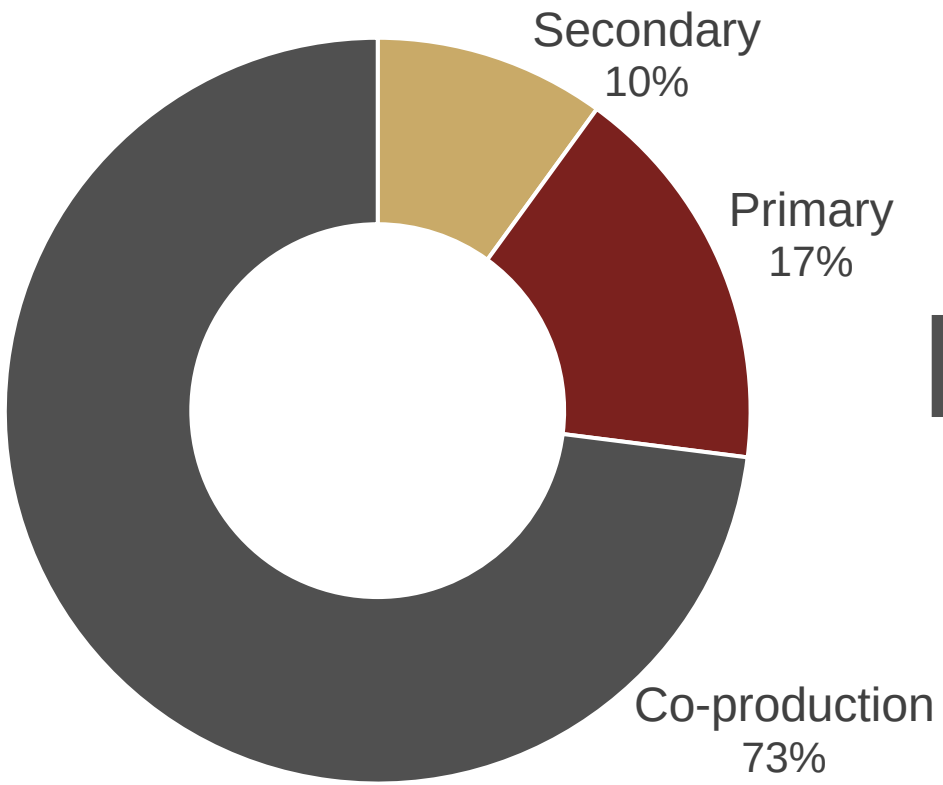
DEMAND – Vanadium Value Chain

Vanadium Raw Material Producers



Vanadium Producers

Vanadates

Fused Flake V_2O_5

V_2O_5 Powder

V_2O_3 Powder

Vanadium Converters

Ferrovanadium

Vanadium master alloys

Vanadium chemicals

Electrolyte

Vanadium Consumers

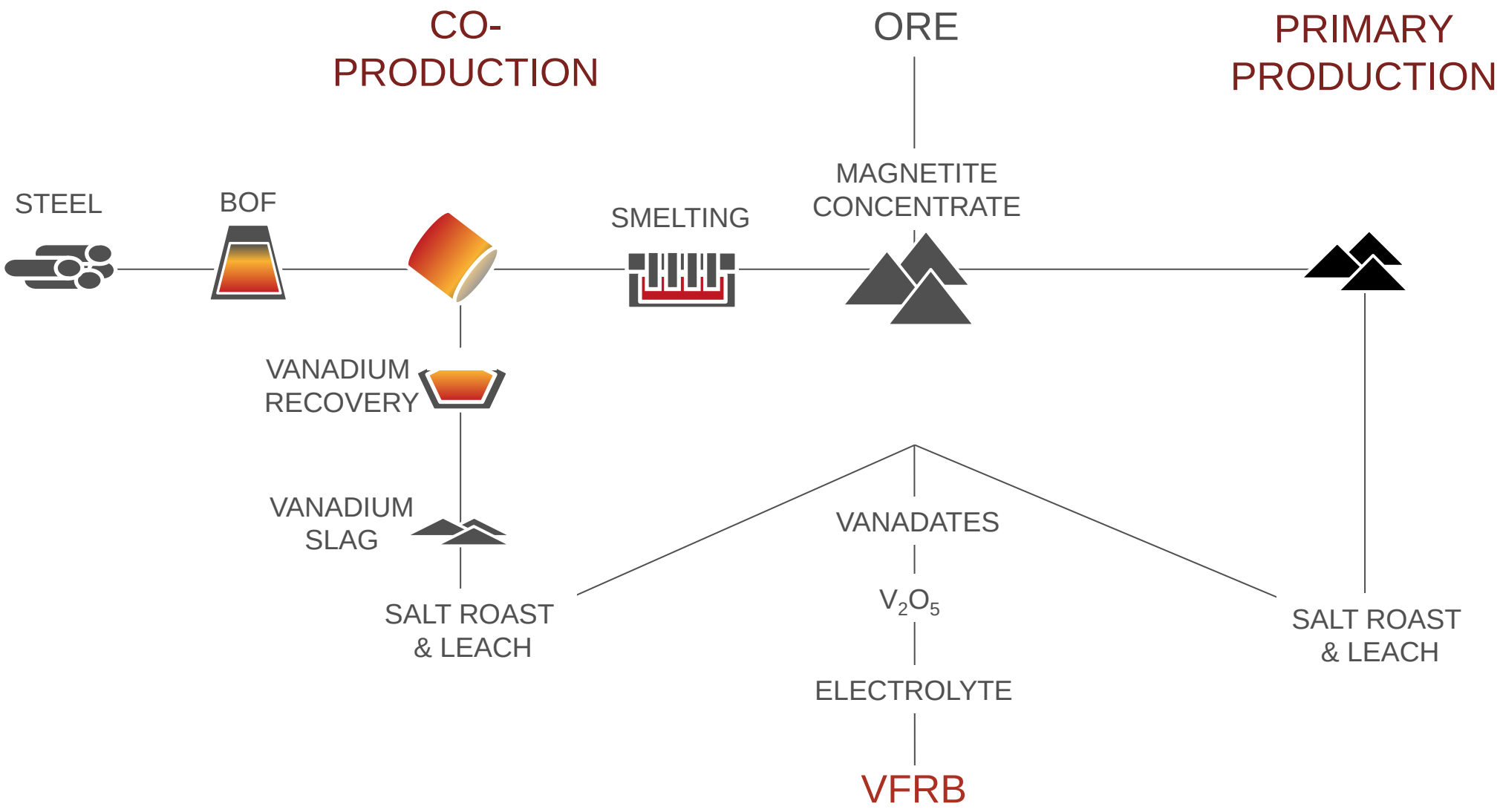
STEEL INDUSTRY

TITANIUM INDUSTRY

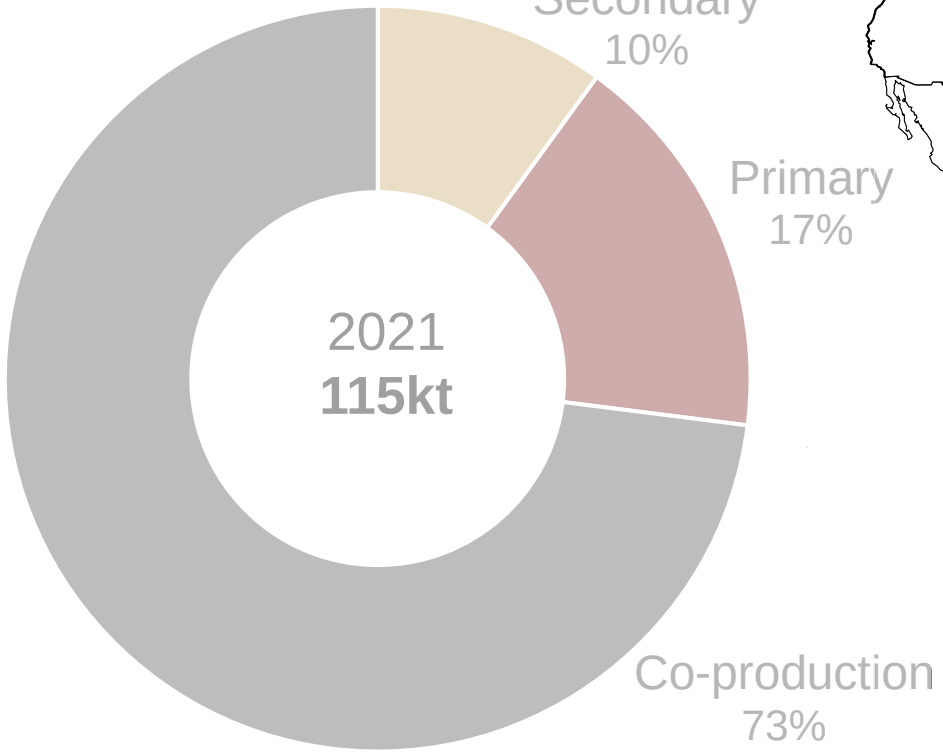
CHEMICAL INDUSTRY

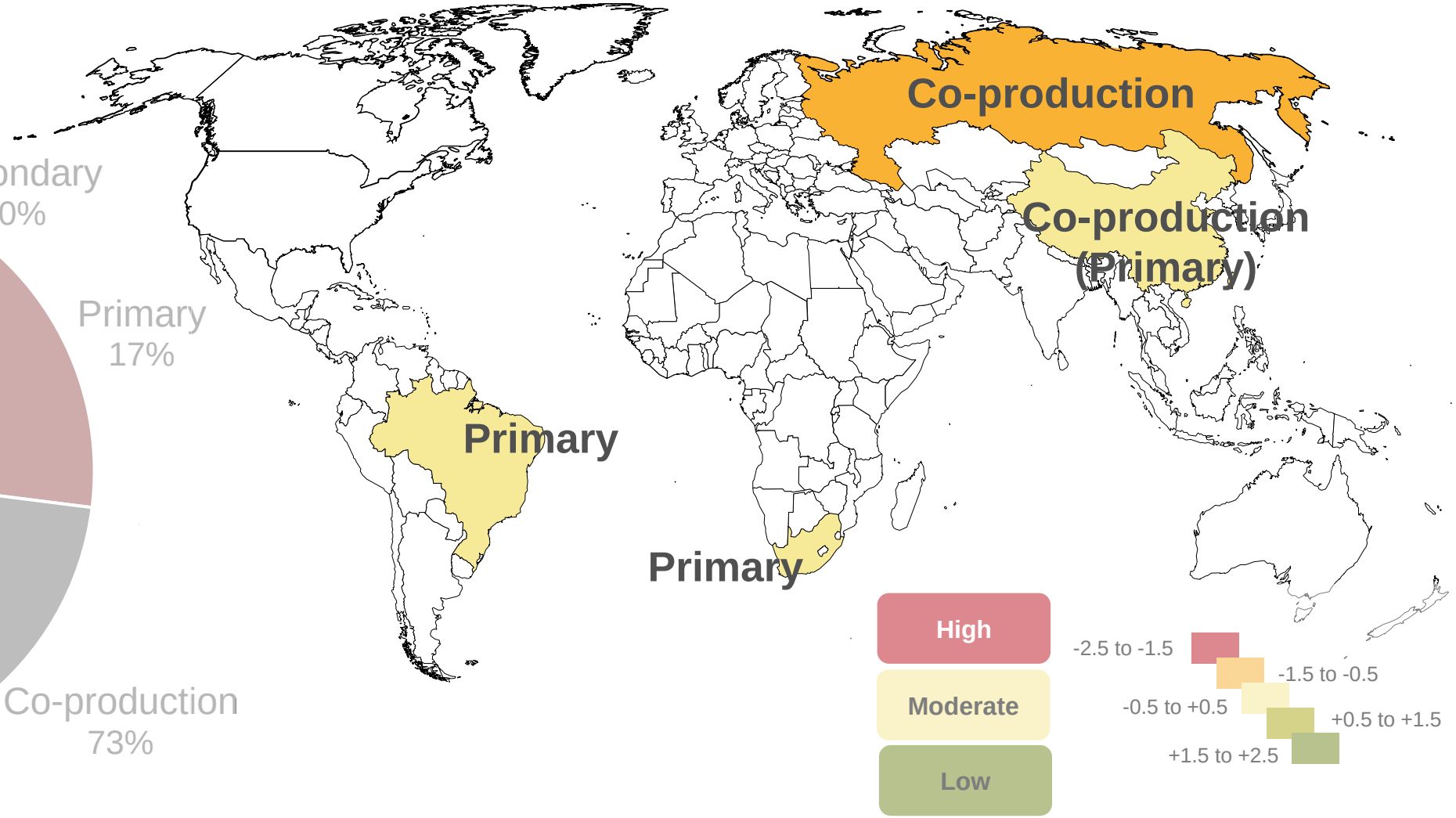
ENERGY STORAGE

SUPPLY – Vanadium Production



SUPPLY – Major Vanadium Producers





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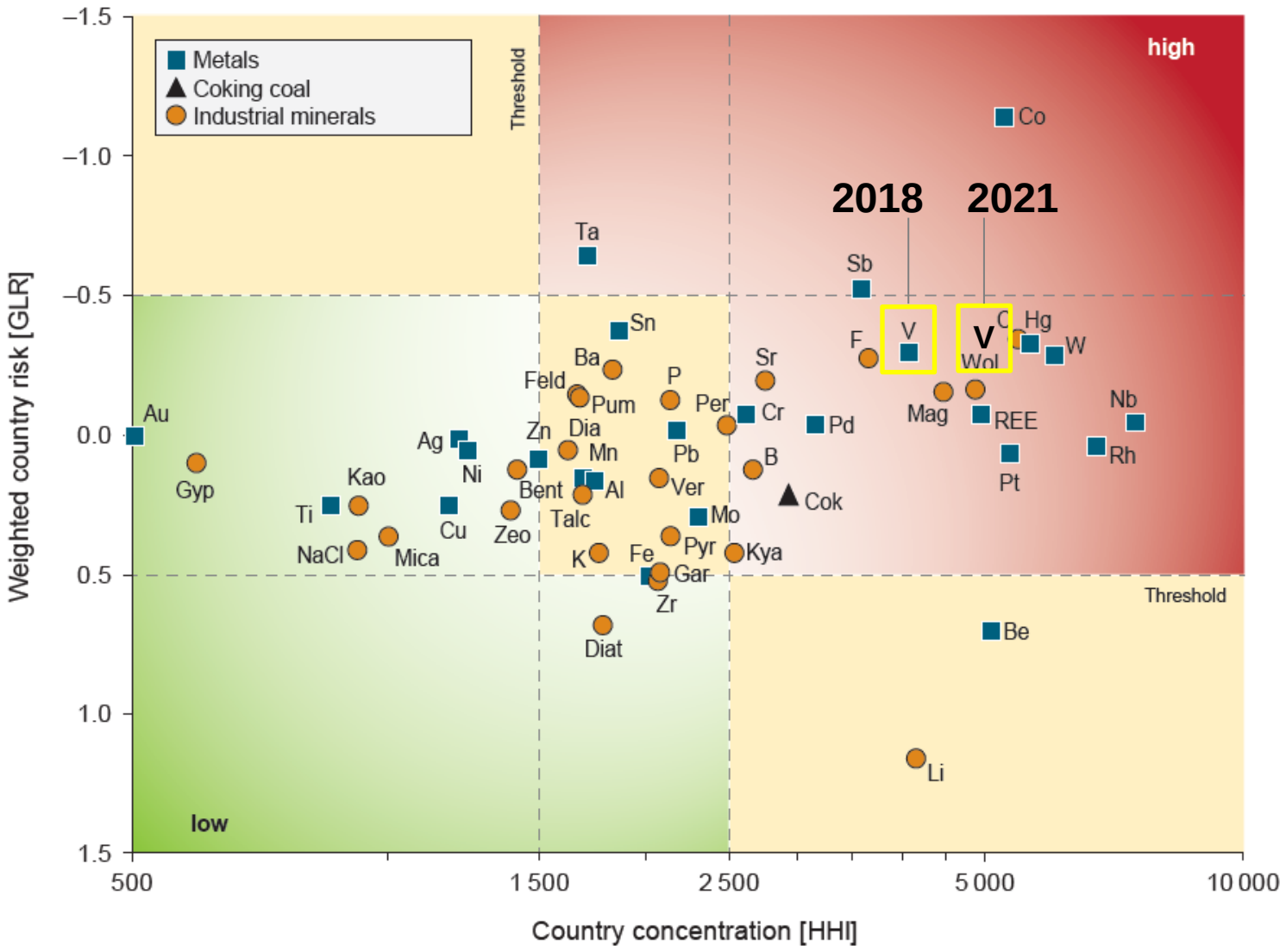
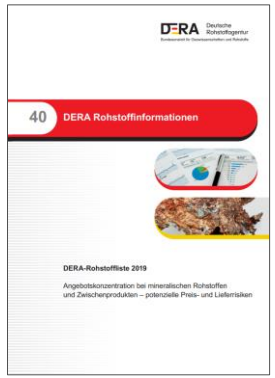
SUPPLY – DERA Criticality List – Mine Production

	2018
Herfindahl-Hirschman Index	4,104
Weighted Country Risk	- 0.3

	2021
Herfindahl-Hirschman Index	5,006
Weighted Country Risk	- 0.3





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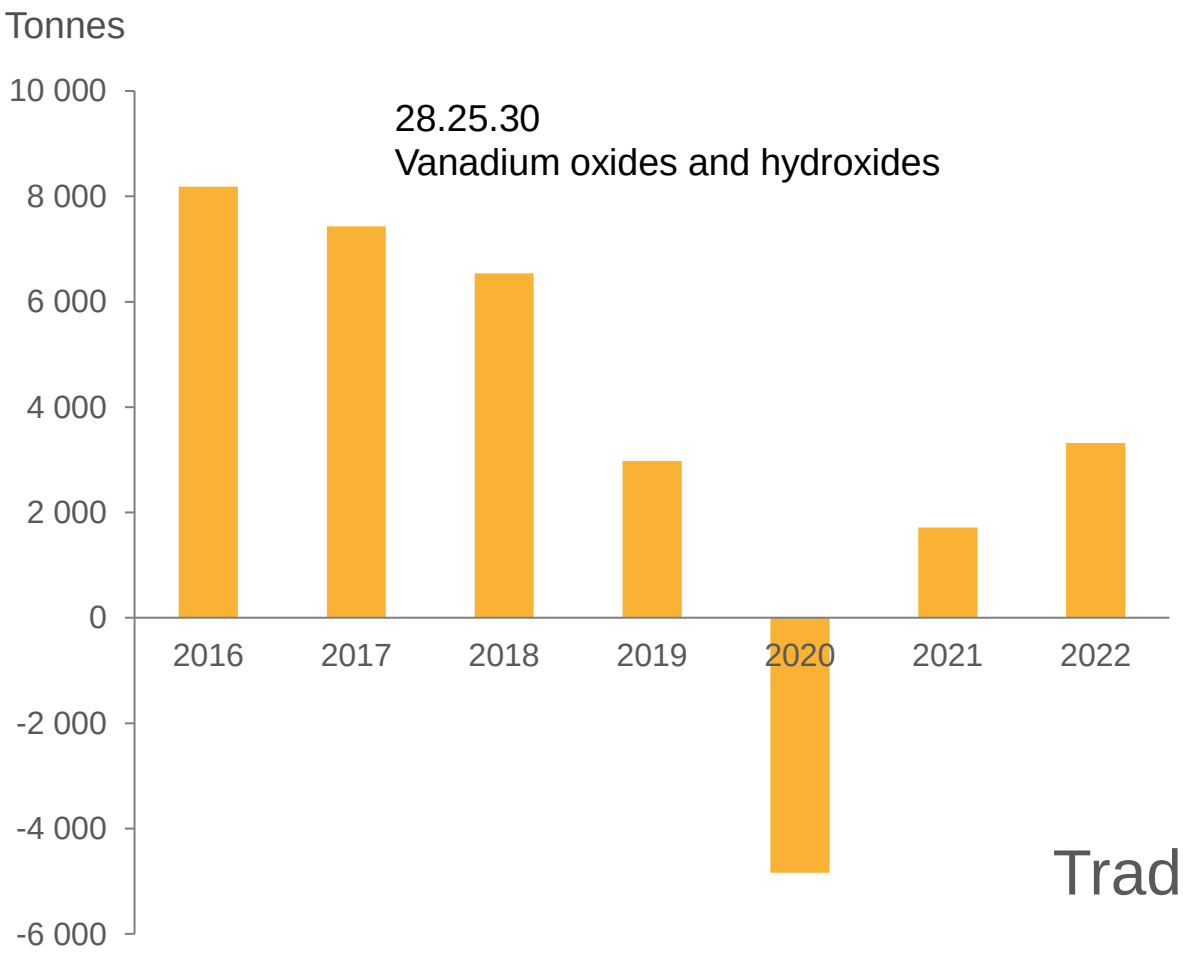
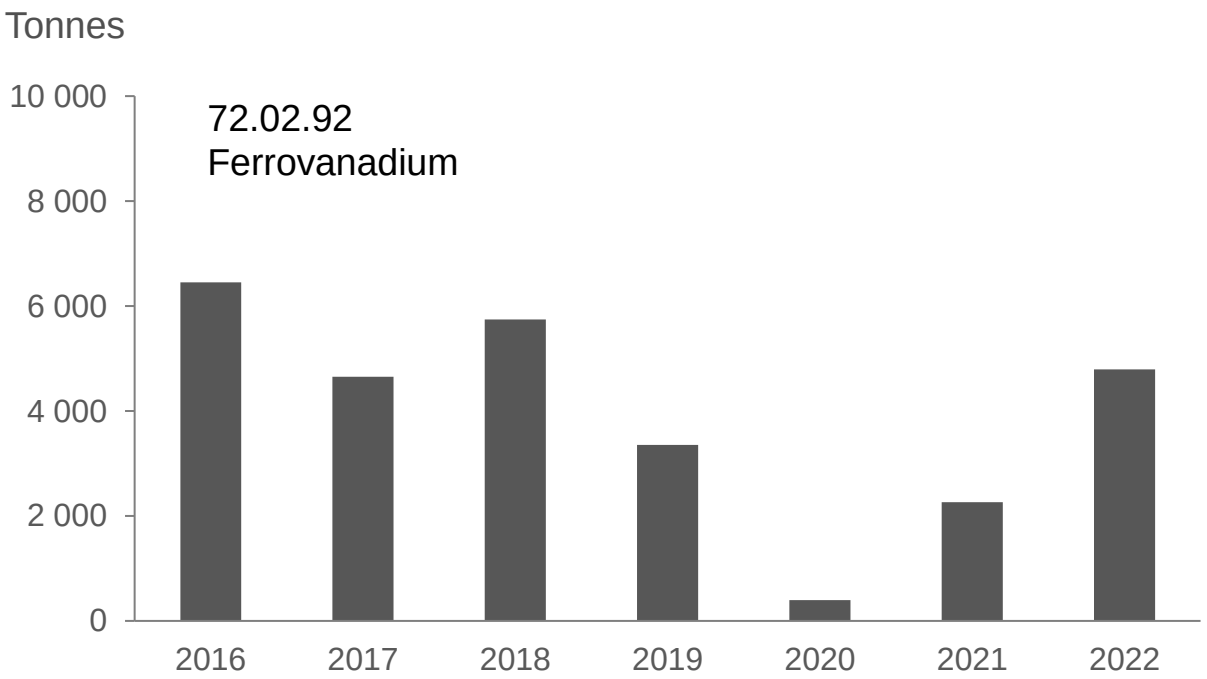
High

Moderate

Low

SUPPLY – China a new net importer of vanadium?



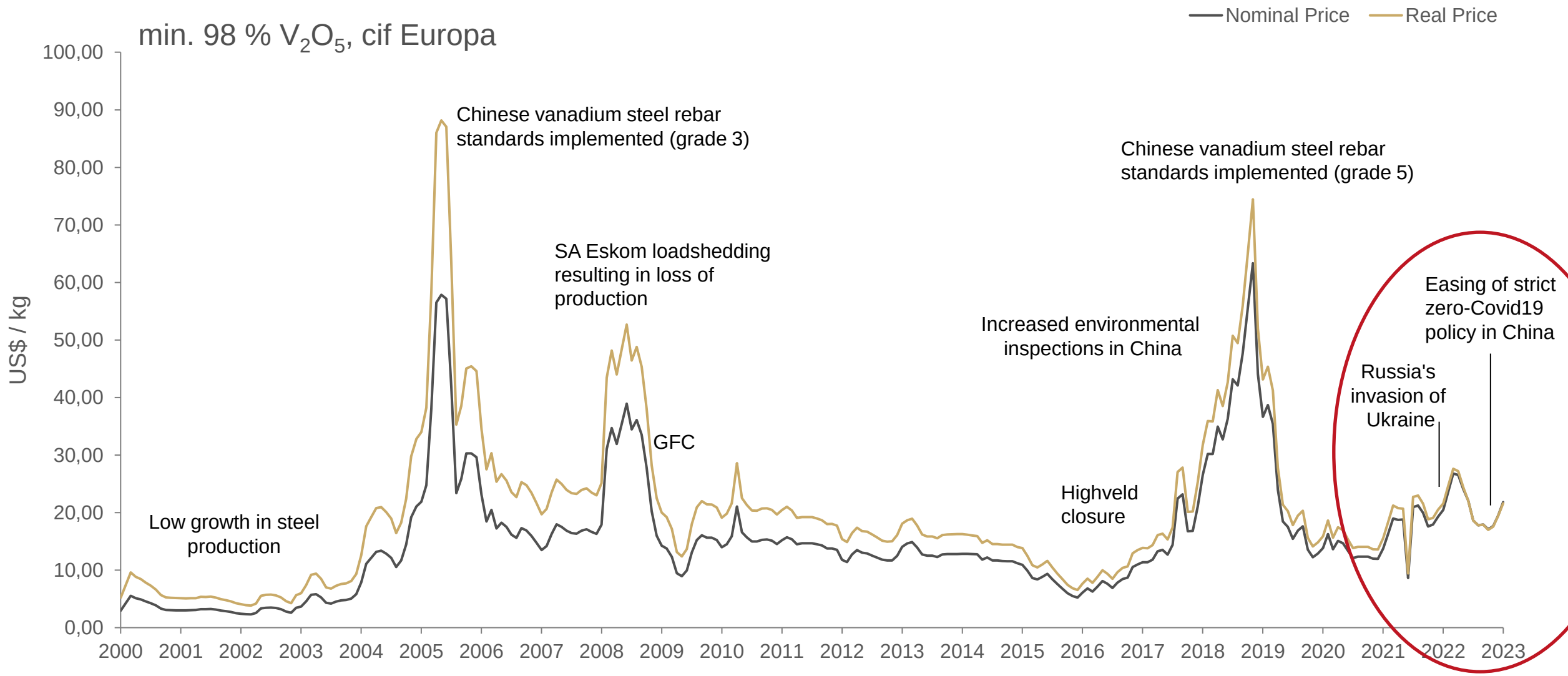


Trade Balance

China-World

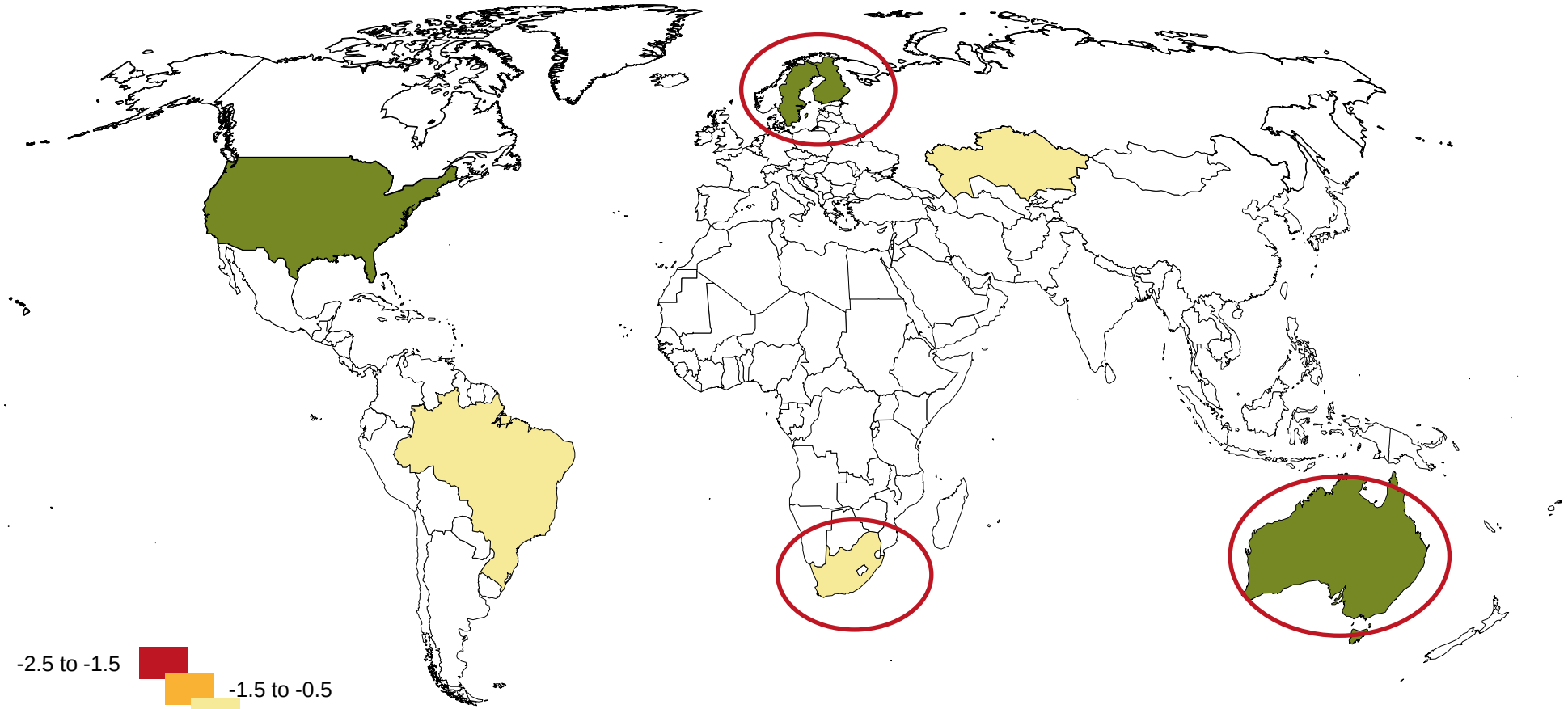
Global Trade Tracker 2023

SUPPLY – Long-term price trends amid global developments



BGR 2023

FUTURE SUPPLY



High

Moderate

Low

-2.5 to -1.5

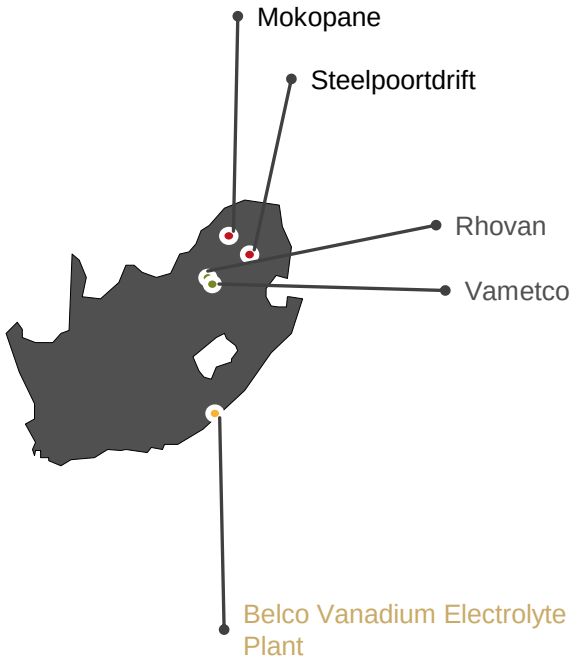
-1.5 to -0.5

-0.5 to +0.5

+0.5 to +1.5

+1.5 to +2.5

FUTURE SUPPLY – South Africa

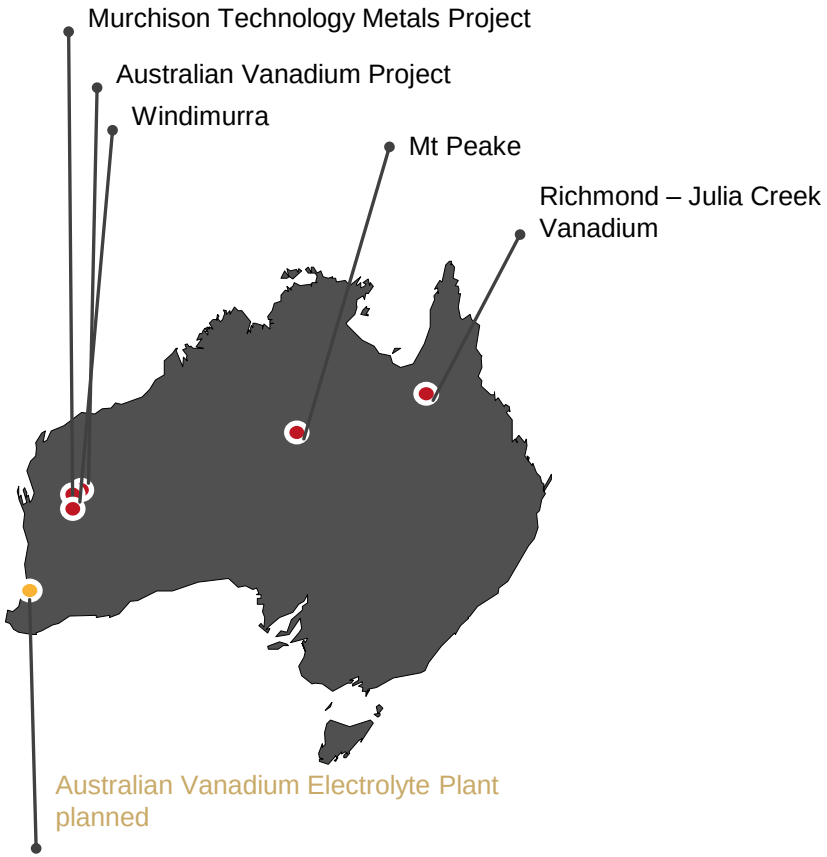


Project	Vametco	Rhovan	Mokopane	Steelpoortdrift
Company	Bushveld Minerals	Glencore plc	Bushveld Mienrals	Vanadium Resources
Status	Operating	Operating	Feasibility Study started	Feasibility Study started
Reserves	46.4kt @2.02% V_2O_5	28.2kt @0.5% V_2O_5	28.5kt @1.41% V_2O_5	78.8kt @0.72% V_2O_5
Annual Production	6.9ktpa V_2O_5 (2022 incl. Vanchem)	9ktpa V_2O_5 (2022)	9.25ktpa V_2O_5	12ktpa V_2O_5
Planned start	-	-	2026	2026

37ktpa V_2O_5

= 21ktpa V cont.

FUTURE SUPPLY – Australia

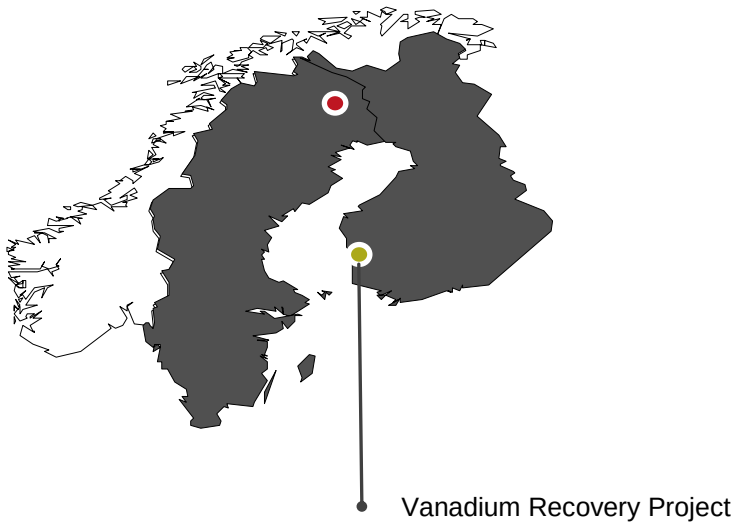


Project	Mt Peake	Windimurra	Australian Vanadium Project	Murchison Technology Metals Project	Richmond – Julia Creek Vanadium
Company	Tivan Ltd	Atlantic Vanadium Pty Ltd	Australian Vanadium Ltd	Technology Metals Australia Ltd	Richmond Vanadium Technology Pty Ltd
Status	Pre-Construction	Pre-Construction	Feasibility Study	Feasibility Study	Pre-Feasibility Study
Reserves	173kt @ 0.42% V_2O_5	429kt @0.49% V_2O_5	337kt @1.09% V_2O_5	396kt @0.89% V_2O_5	459.2kt @0.49% V_2O_5
Annual Production	6ktpa V_2O_5	7.6ktpa V_2O_5	11.2ktpa V_2O_5	12.5ktpa V_2O_5	12.7ktpa V_2O_5
Planned start	2025	n. a.	2024	2025	2028

50ktpa V_2O_5

= 28ktpa V cont.

FUTURE SUPPLY – Europe

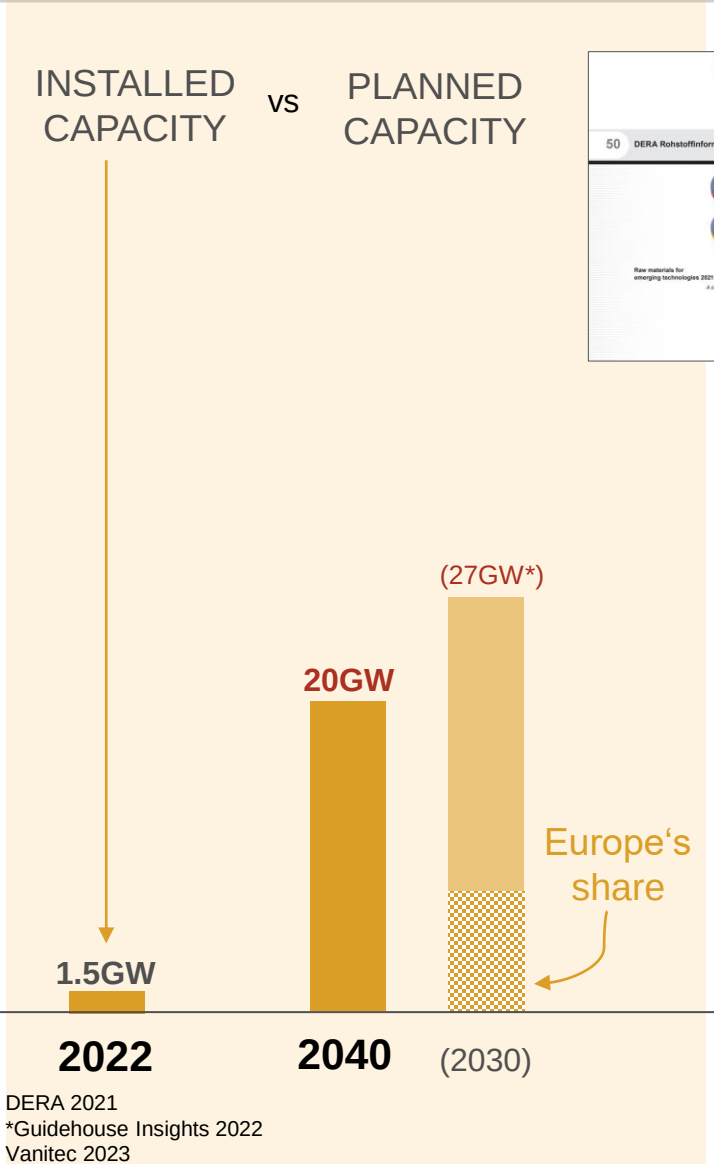


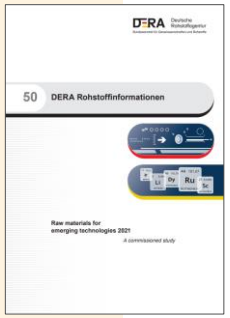
Project	Vanadium Recovery Project	Airijoki		
Company	Neometals / Critical Metals / SSAB	Kendrick Resources		
Status	Feasibility Status	Prefeasibility		
Reserves	n. A Vanadium-bearing slag at 3-4% V_2O_5	-		
Annual Production	8.6ktpa V_2O_5	n. a.		
Planned start	2026	n. a.		

8.6ktpa V2O5

= 4.8ktpa V cont.

FUTURE SUPPLY – DEMAND SCENARIO – VRFB





2022

DERA 2021
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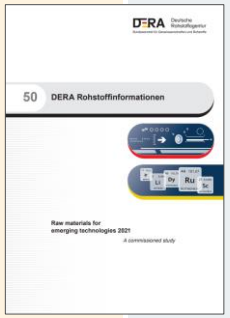
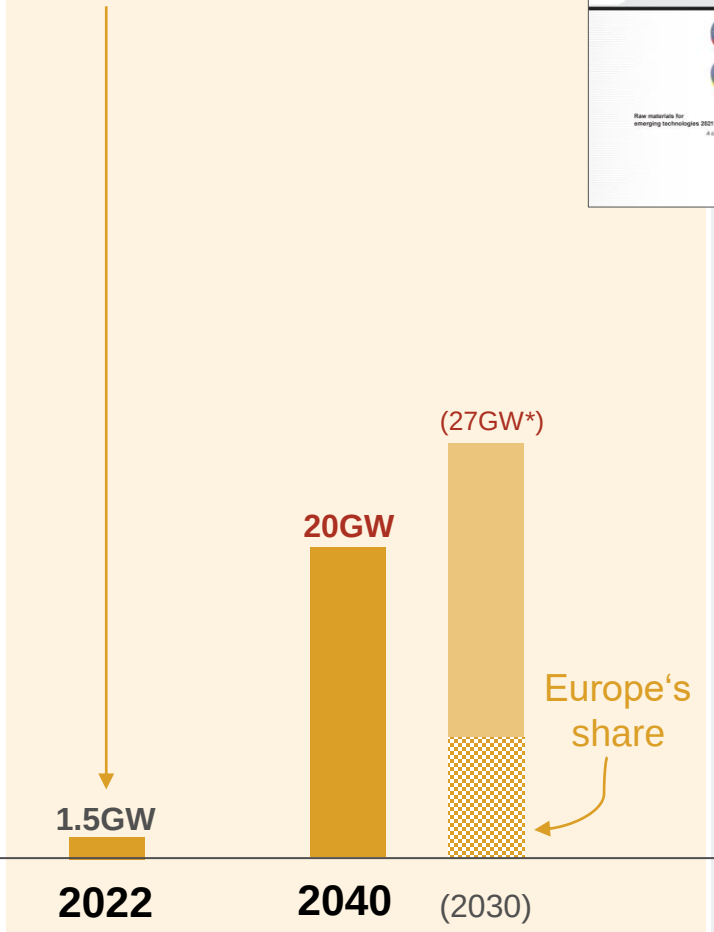
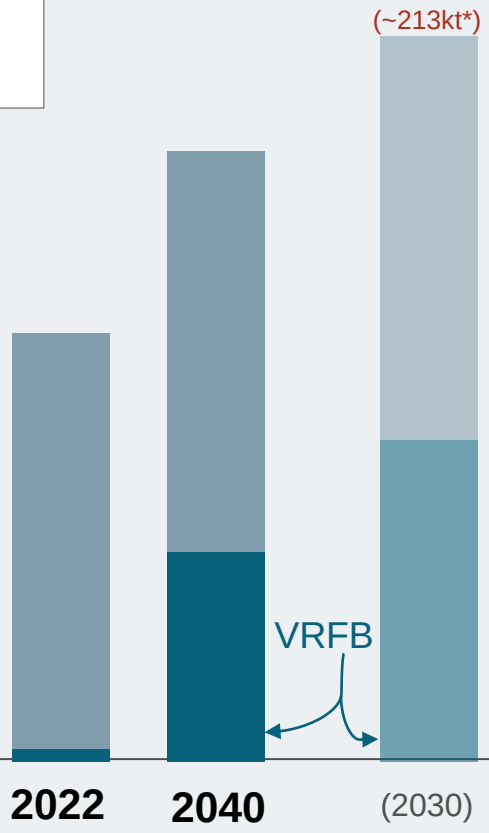
FUTURE SUPPLY – DEMAND SCENARIO – VRFB

INSTALLED CAPACITY vs PLANNED CAPACITY





VRFB SHARE & VANADIUM DEMAND (BASED ON PLANNED CAPACITY AND 2022 TOTAL DEMAND)



Based on 3.02kg vanadium / kWh

DERA 2021
*Guidehouse Insights 2022
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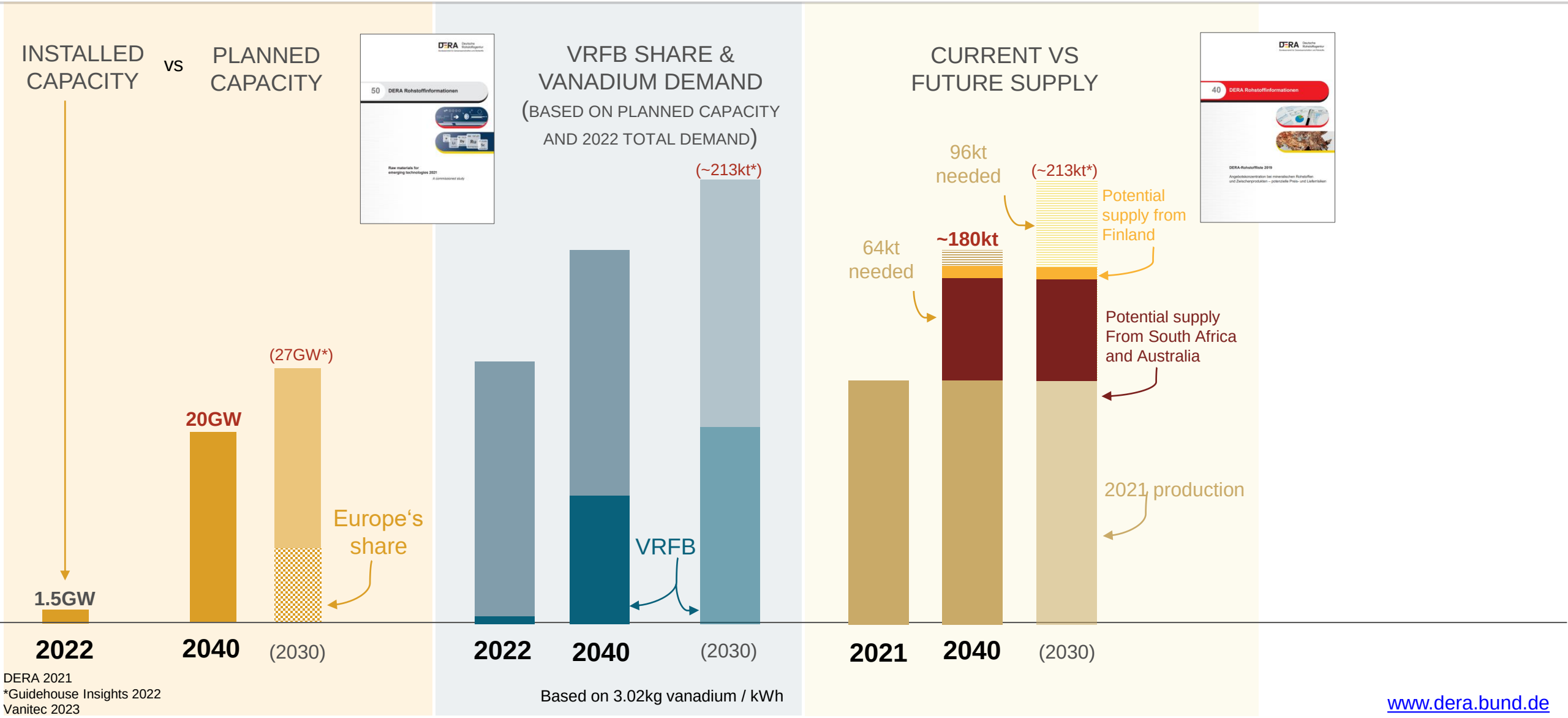
FUTURE SUPPLY – DEMAND SCENARIO – VRFB



DERA 2021
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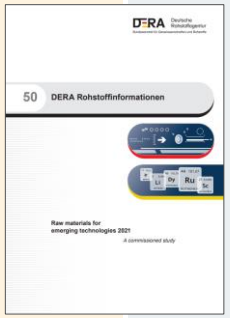
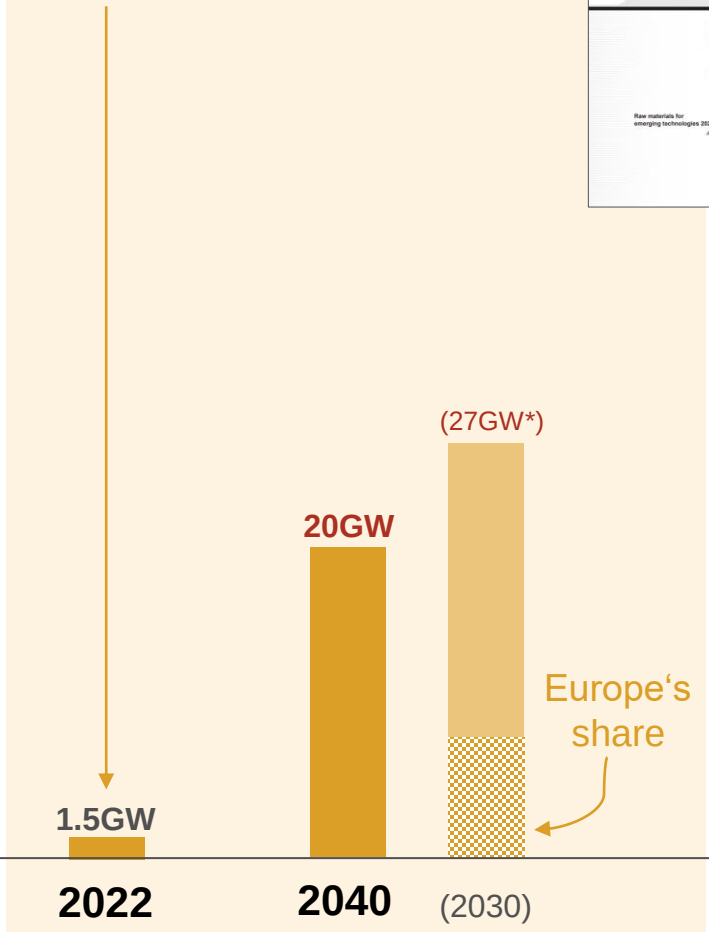
FUTURE SUPPLY – DEMAND SCENARIO – VRFB

INSTALLED CAPACITY vs PLANNED CAPACITY





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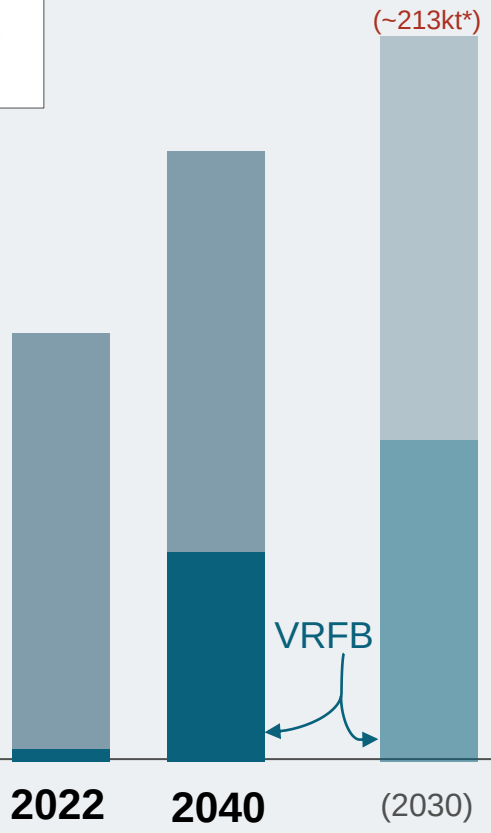
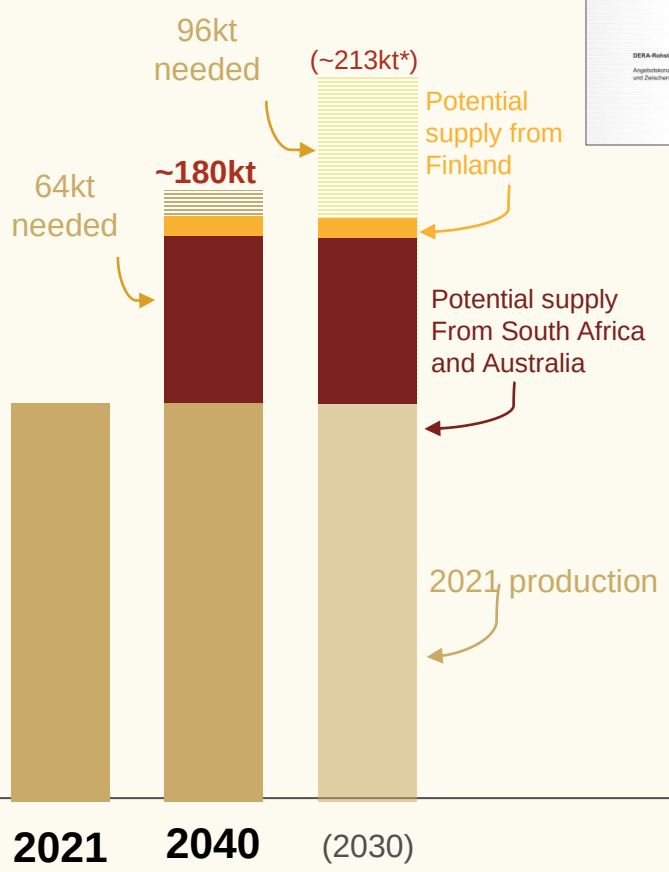
VRFB SHARE & VANADIUM DEMAND

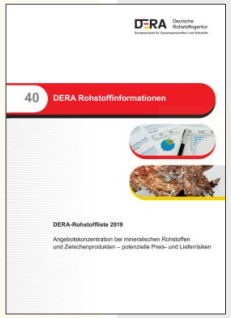
(BASED ON PLANNED CAPACITY AND 2022 TOTAL DEMAND)



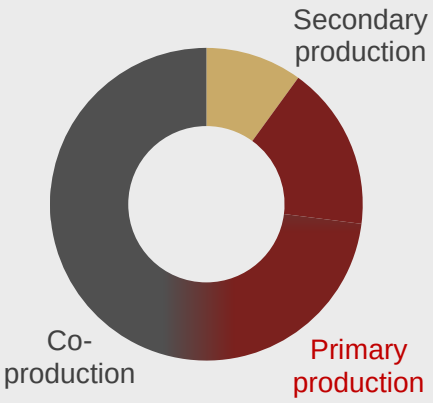
Based on 3.02kg vanadium / kWh

CURRENT VS FUTURE SUPPLY





	2021	2040
HHI	5,006	↓
WCR	- 0.3	↑



Detailed market report → **Vanadium 2023**

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KEY TAKEAWAYS

Vanadium market undergoing major structural changes with **increasing demand from VFRB**

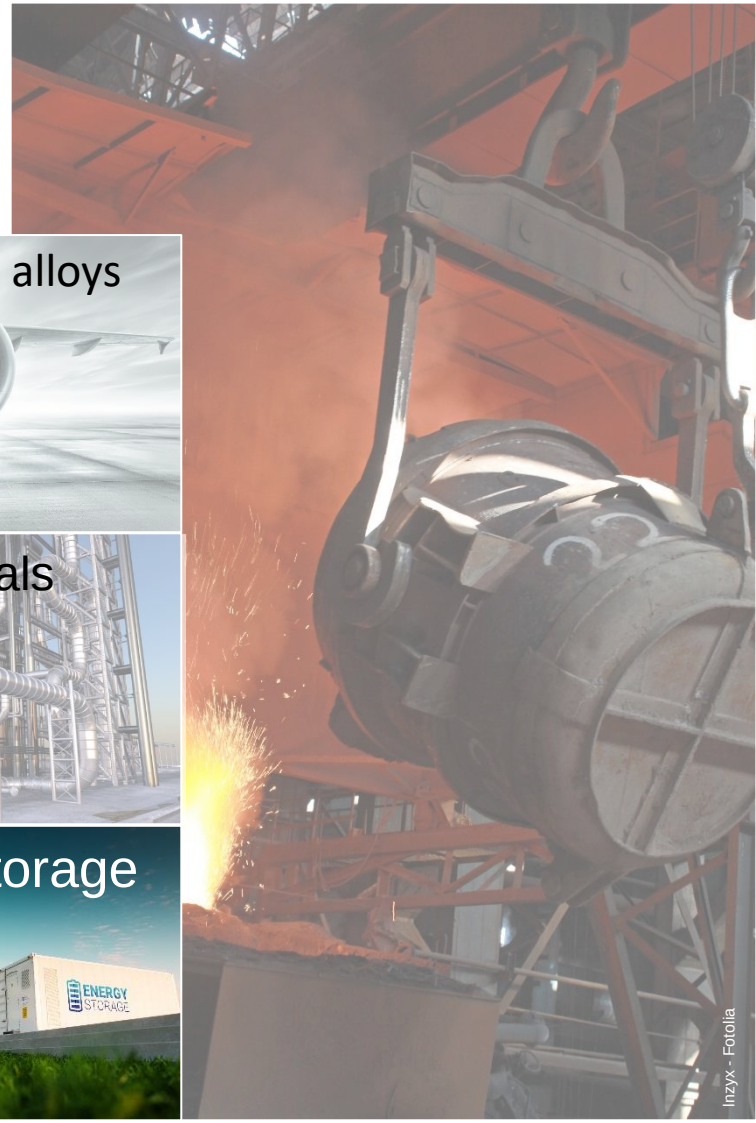
Demand and supply potentially **decoupling from the steel** industry

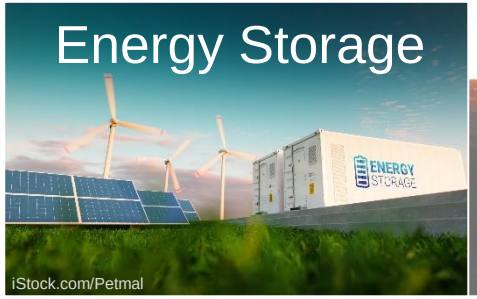
Additional primary supply from new mines in the next decade

Increasing share from primary production, allowing **greater diversification** for consumers

Future supply from low-risk jurisdictions **lowering overall supply risks**

Increased global competition if **China becomes net importer of vanadium** amid increasing domestic demand





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30th March 2023

Thank you!

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