



Coiltech World Magnetic Conference



RARE EARTH PERMANENT MAGNETS

Global Market Trends & Challenges for Permanent Magnets

Dr. Richard ARLOT / IMAG Consulting

Dr. John ORMEROD / JOC

REPM – Market Trends and Challenges

- IMAG Consulting
- Market size ?
- Market tensions
- Challenges
- New trends
- Conclusion

Dr. Richard ARLOT

CEO

30 years experience in Permanent Magnets

- Ph.D. in Physics from **Grenoble & Osaka Universities**
- 3 years Rhône **Poulenc / Rhodia / Solvay**
- 12 years in automotive with **Sonceboz Group**
- 6 years with **Maxon Motor**
- 10 years in Permanent Magnet industry in Europe (**Cibas, Bomatec**) and China (**HPMG**)
- More : richard.arlot@imag-consulting.com / www.imag-consulting.com / linkedin.com/in/richardarlot



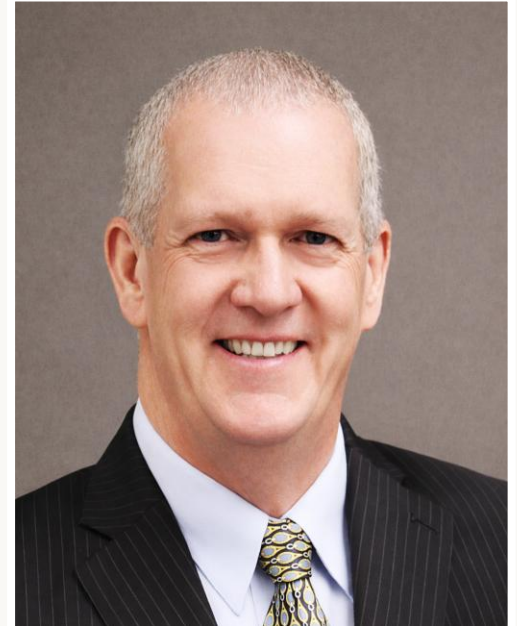
Richard is supporting industry actors in making informed decisions and capturing the full value of **magnetic technologies** in a rapidly evolving context.

Dr. John ORMEROD

CEO

40 years experience in Permanent Magnets

- Ph.D. in Metallurgy from University of Manchester 1978
- 11 years with **Philips**
- 12 years with **Arnold Magnetics**
- 12 years President of **Res Manufacturing** in Milwaukee
- Co-editor **books** about PM industry and Modern PM
- More : john@jocllc.com / www.jocllc.com / [linkedin.com/in/jormerod](https://www.linkedin.com/in/jormerod)



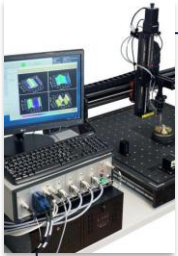
John offers a unique combination of intellectual property guidance, market intelligence, and technical expertise to support strategic growth in the REPM industry



STRATEGY & BUSINESS DEV.



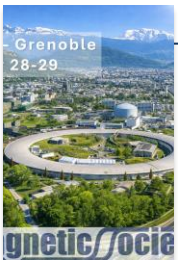
MAGNETS & MAGNETIC MATERIALS



FIELD MAPPERS & TESLAMETERS



MAGNETIZERS & MAGNETIZING FIXTURES



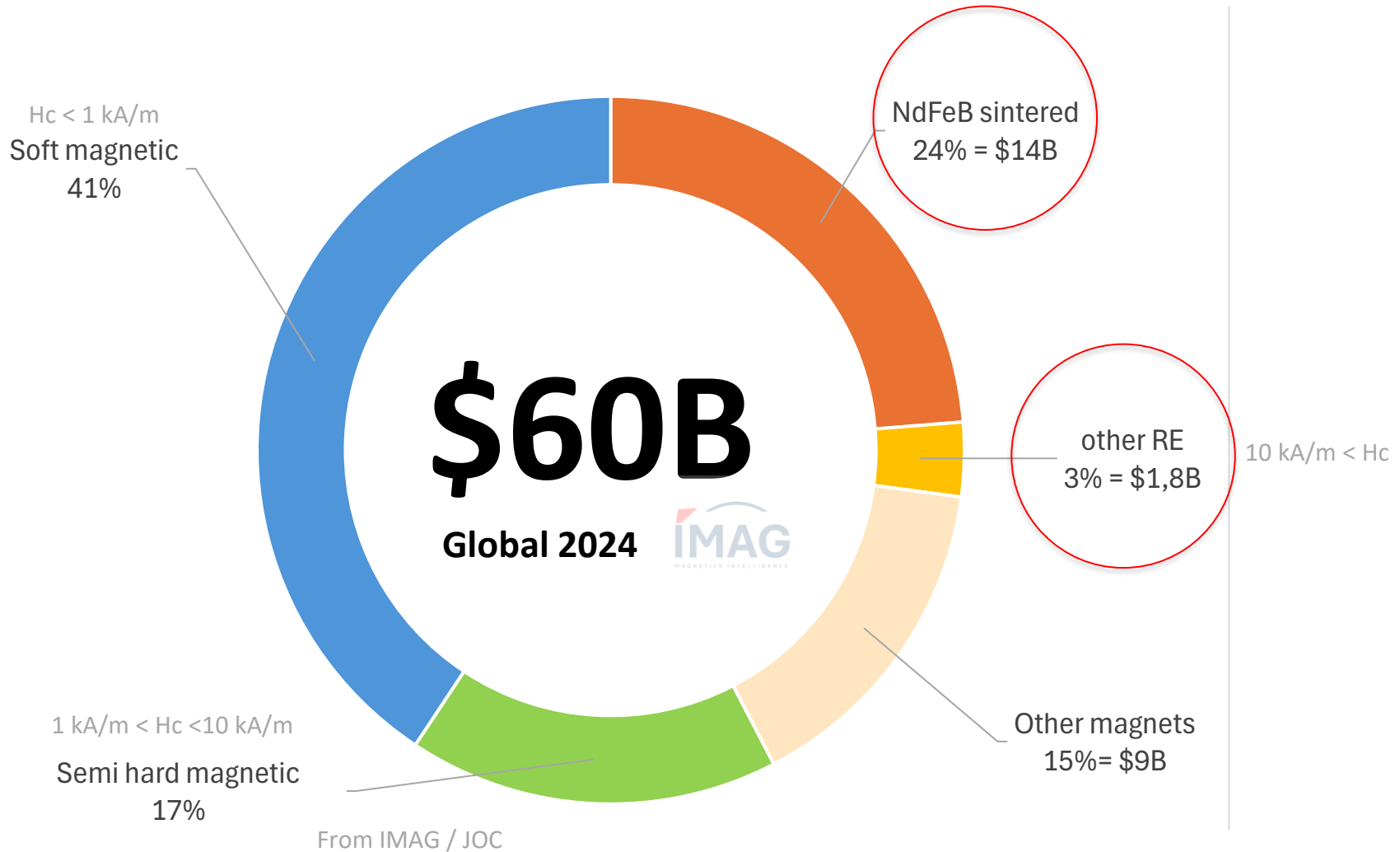
EVENTS & TRAINING



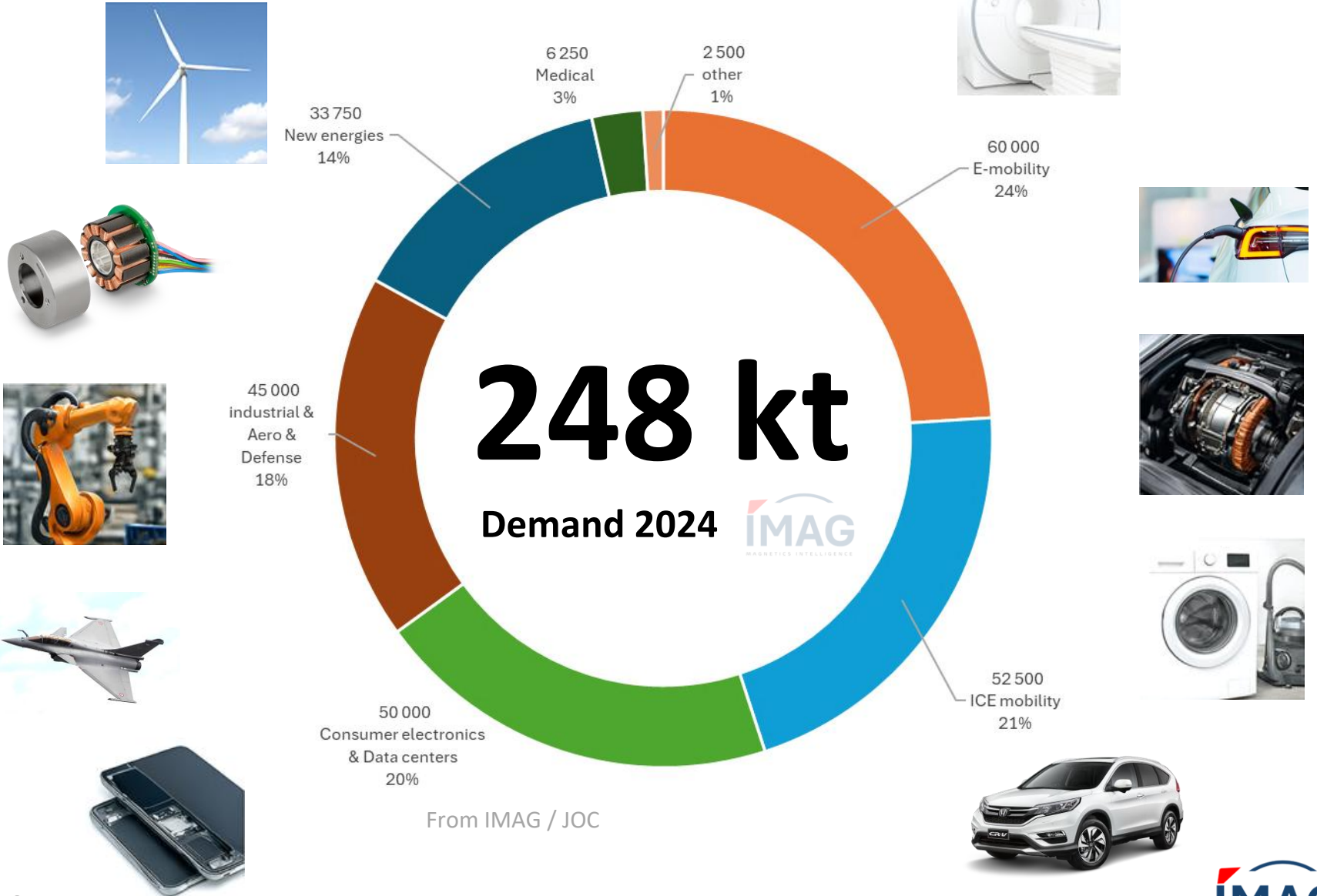
INNOVATION & PATENTS

Market size ? 

Global Magnetic Materials



Permanent magnet markets

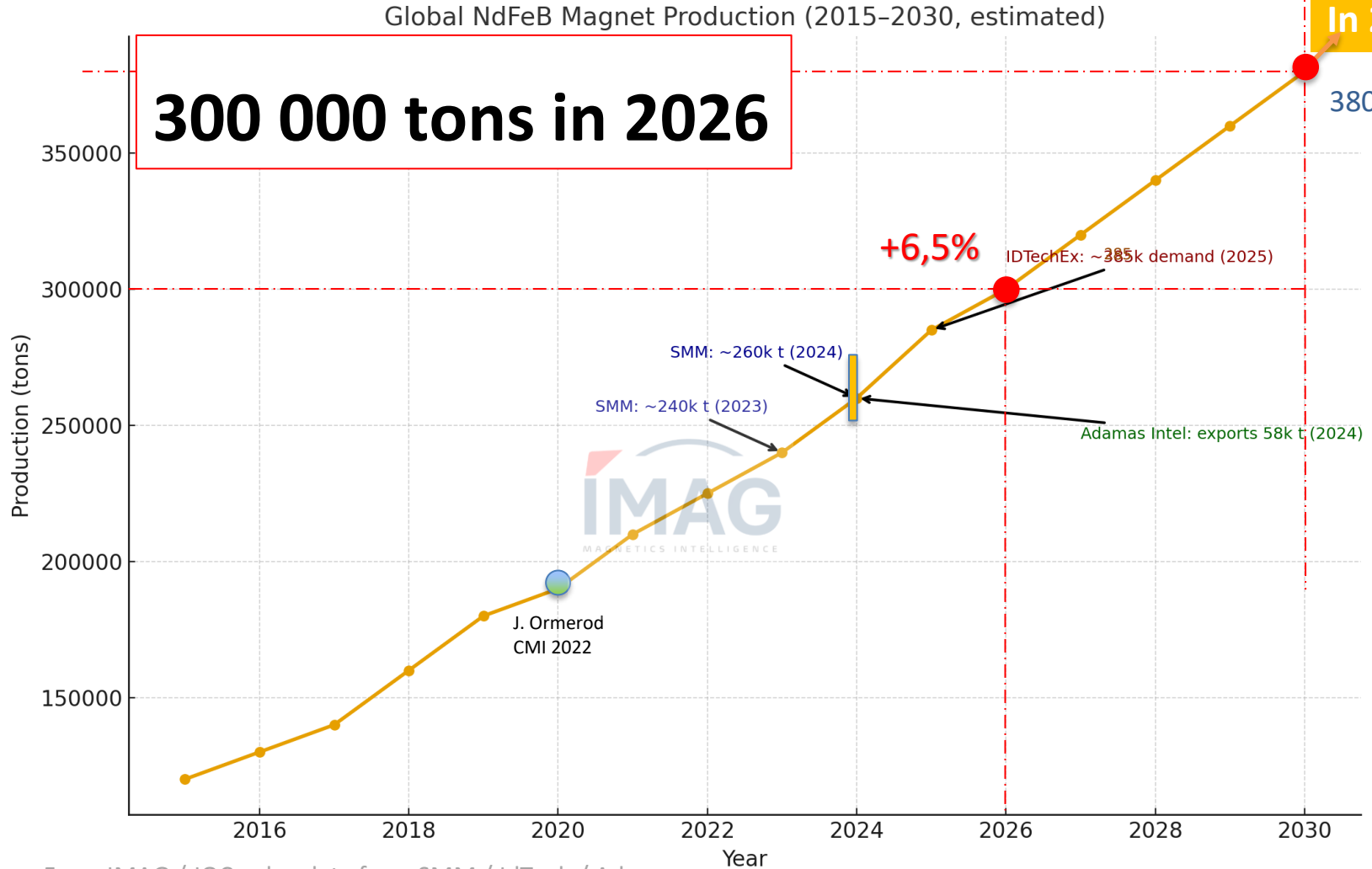




Global NdFeB demand

J. Ormerod
CMI 2022

**760 ktons
In 2050?**



From IMAG / JOC ; also data from SMM / IdTech / Adamas



300 000 tons NdFeB ?

NdFeB; 300 000
2026

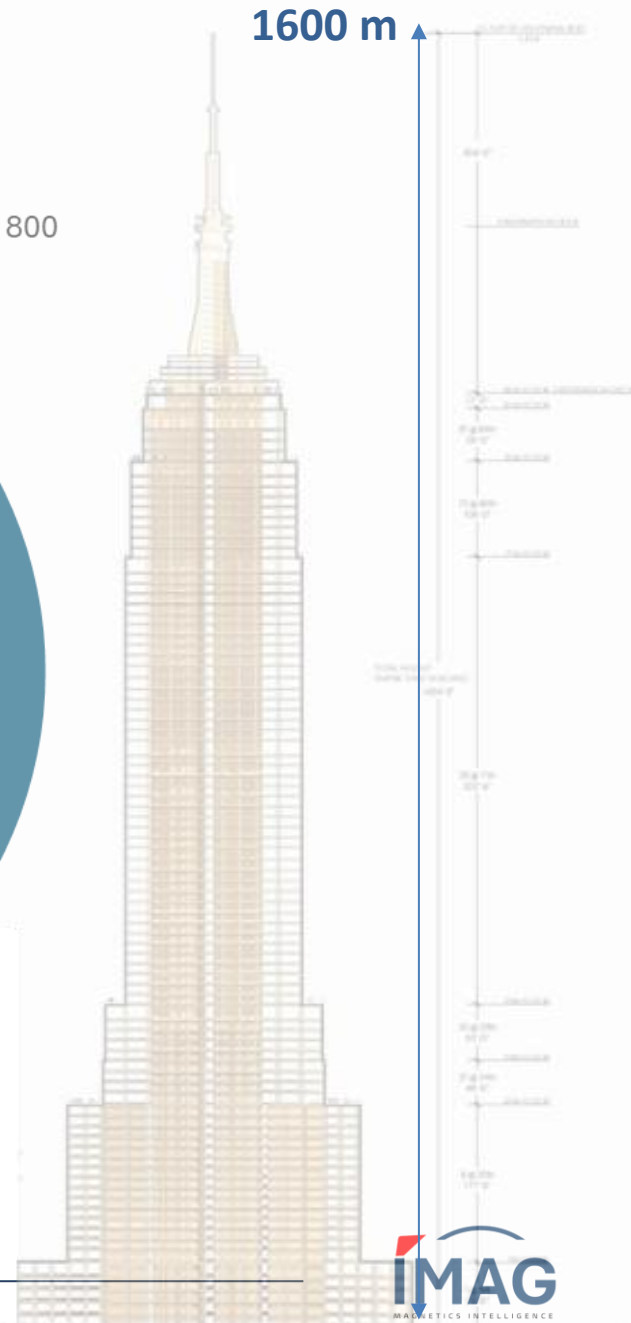
NdPr; 88 500

Dy; 2 700

Tb; 1 800

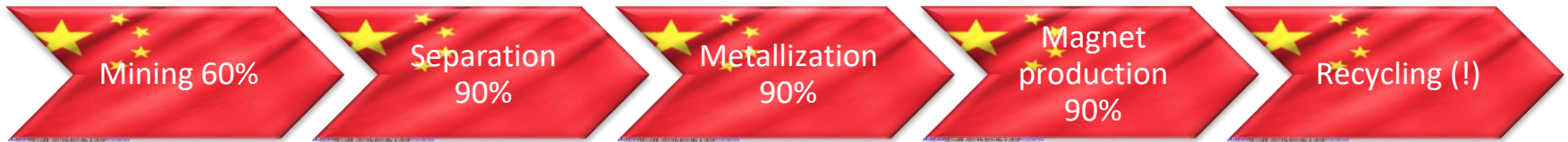


From IMAG / JOC



China vs. rest of the World

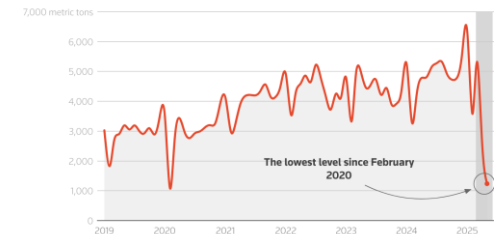
China is market leader for all steps of **RE supply chain** ...



... and they are not afraid to take full advantage of this position



China's exports of rare earth magnets hit more than a five-year low in May
Exports halved in May from April



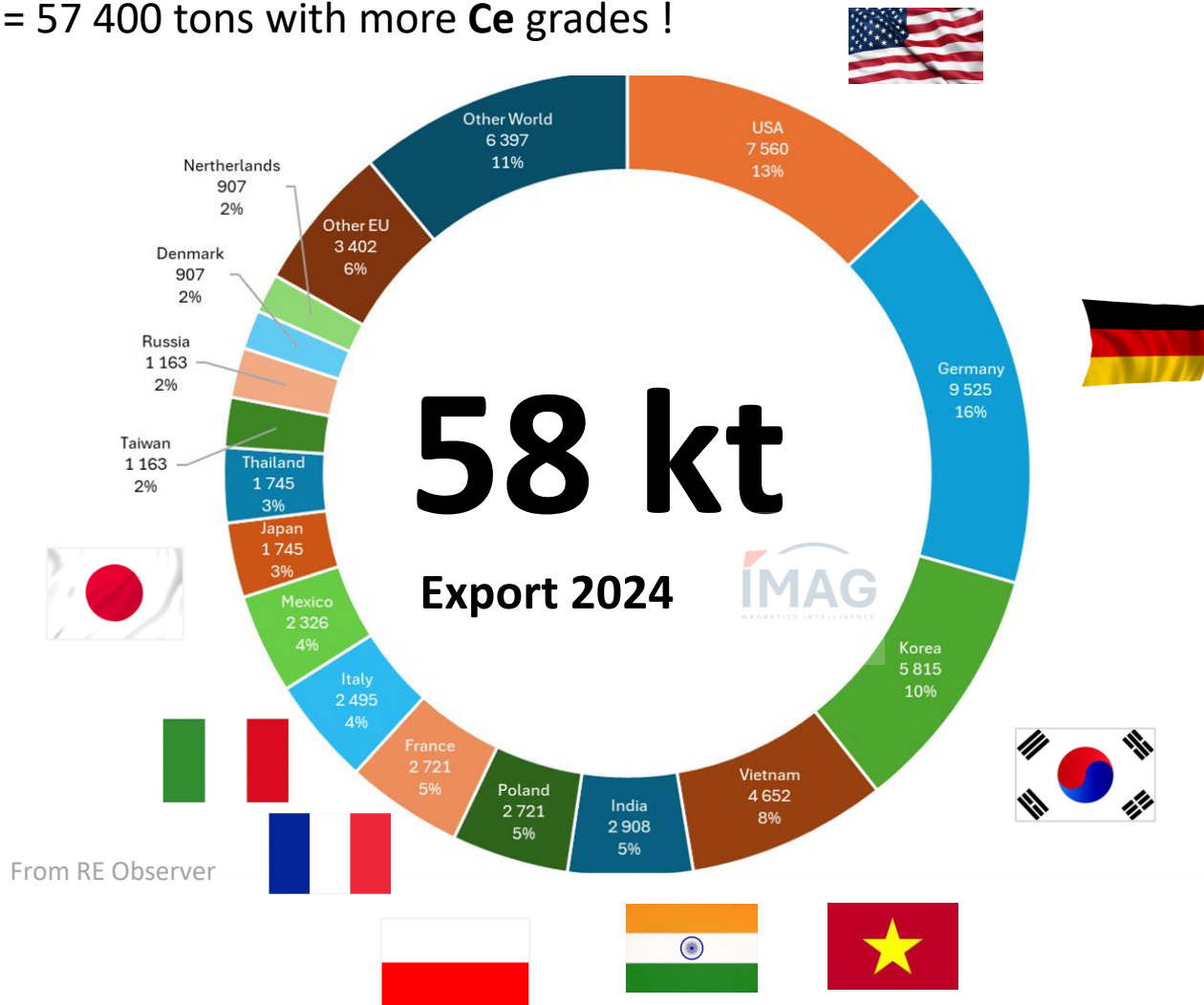
“China increases scrutiny over rare earth magnets with new tracking system” - Reuters

“China’s rare earth power reshapes global supply chains” - Asia Daily

Export curbs on rare earth magnets deepen global supply chain fears” – Financial Times

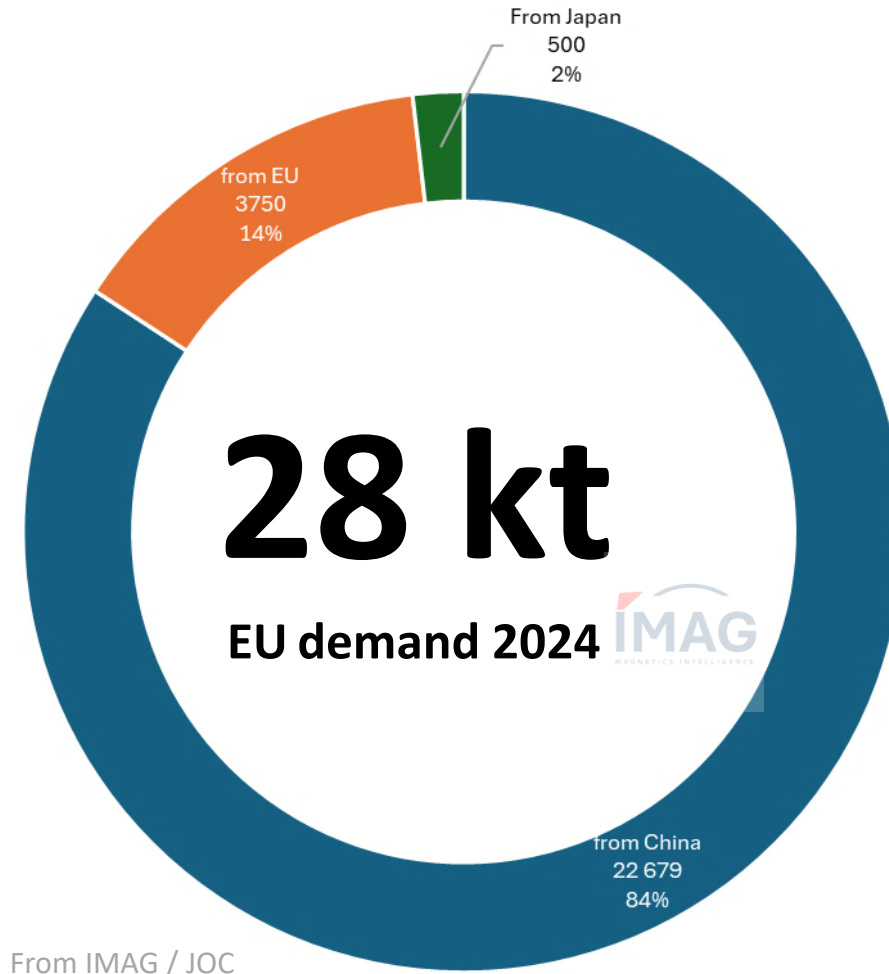
China vs. rest of the World

- In 2025 = 57 400 tons with more Ce grades !



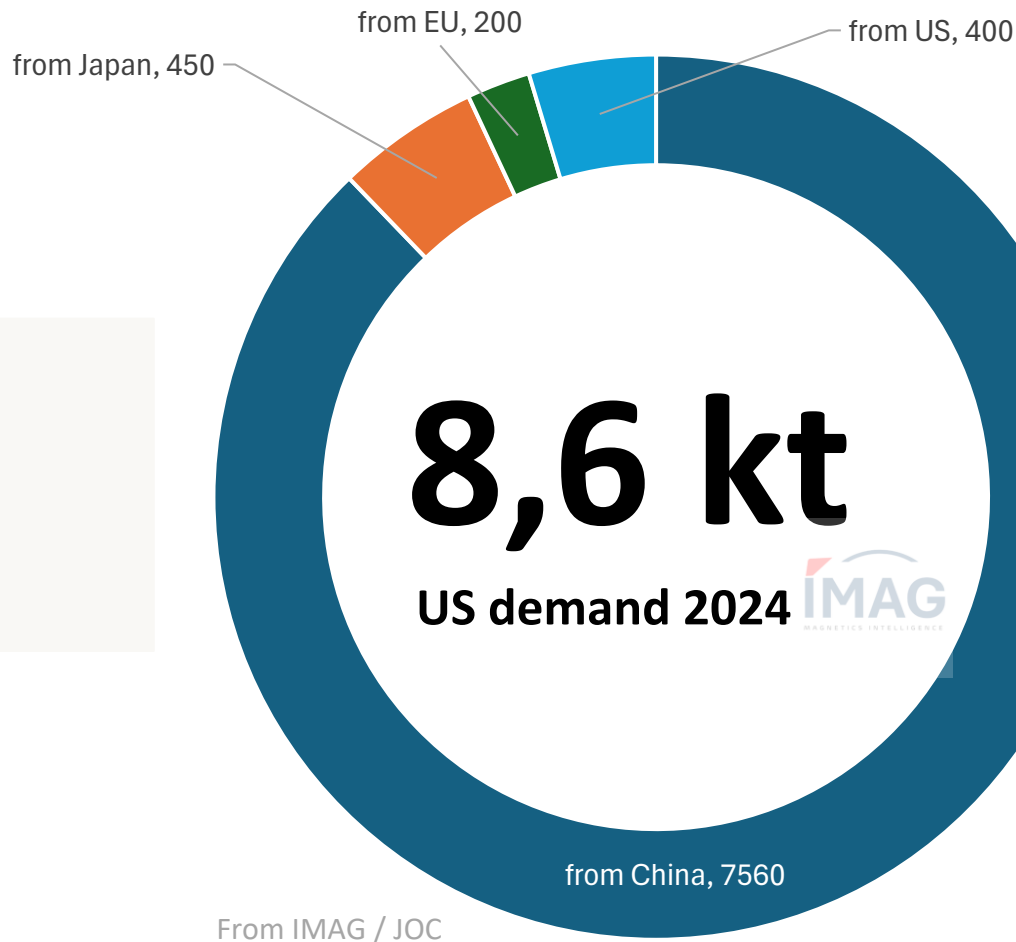
European market size

10%



8300 tons NdPr
252 tons Dy
168 tons Tb
% Automotive grade

USA market size



3%

2500 tons NdPr
78 tons Dy
52 tons Tb
% Automotive grade

(!) 6500 kt NdFeB recorded by official US Import (UD Dept Commerce) in 2024

Market tension

Market trends and challenges

2018 – 2020

Tariffs on Chinese products
First discussions about dependency on China

2023-2024

Import control for Semiconductor + Ai

April 2025

Tariffs on Chinese products

October 2025

Again 100% Tariffs

November 2025

8 months without tariffs ?

In 2026

- **Automotive** : suppliers should source OUT of China
- **Defense** : no Chinese magnets anymore in US military equipment



2009

Quotas restriction to 30 000 tons

2023 - 2024

Export restrictions on Ga + Ge

April 2025

Export restrictions on Dy + Tb + Ga + Sm + Lu + Sc + Y

October 2025

Export license for additional RE elements : Ho + Er + Tm + Eu + Yb

January 2026

Ban on Japan Defense applications

In 2026

NdPr suspended for 1 year due to limited quotas ?

New conflict (Iran) !

From AI

How to get the next delivery ?

Market trends and challenges

Critical Raw material Act

produces 10%,
processes 40% -
recycles 25%

47 projects

RESource EU action plan

tightening exports of REPM
scraps and waste
Establish a European Critical Raw
Materials Centre to provide

- market intelligence,
- support joint purchasing,
- stockpiling and
- supply chain resilience.

Horizons and beyond

R&D and innovation on REPM

Recycling

New ISO standard

Industrial Acceleration Act

Made in Europe



From AI

Open new mines in Europe ?

Greenland as an option ?

Partnership

- Japan as partner ?
- US as partner ?
- China as partner ?
- Brazil as partner ?
- Vietnam as partner ?
- India as partner ?

Tariffs on imported cars

+10%

Additional Anti-subsidy tariffs

on Chinese EV

+10%

2024

Net Zero Industry Act

In 2026

Defense : small quantities - have

NO alternative to SmCo

materials and quasi- export ban

China

Produce locally ? Or import?



Challenges

The European way

Partnerships

Europe is developing a **complete value chain** to meet its strategic market demand.



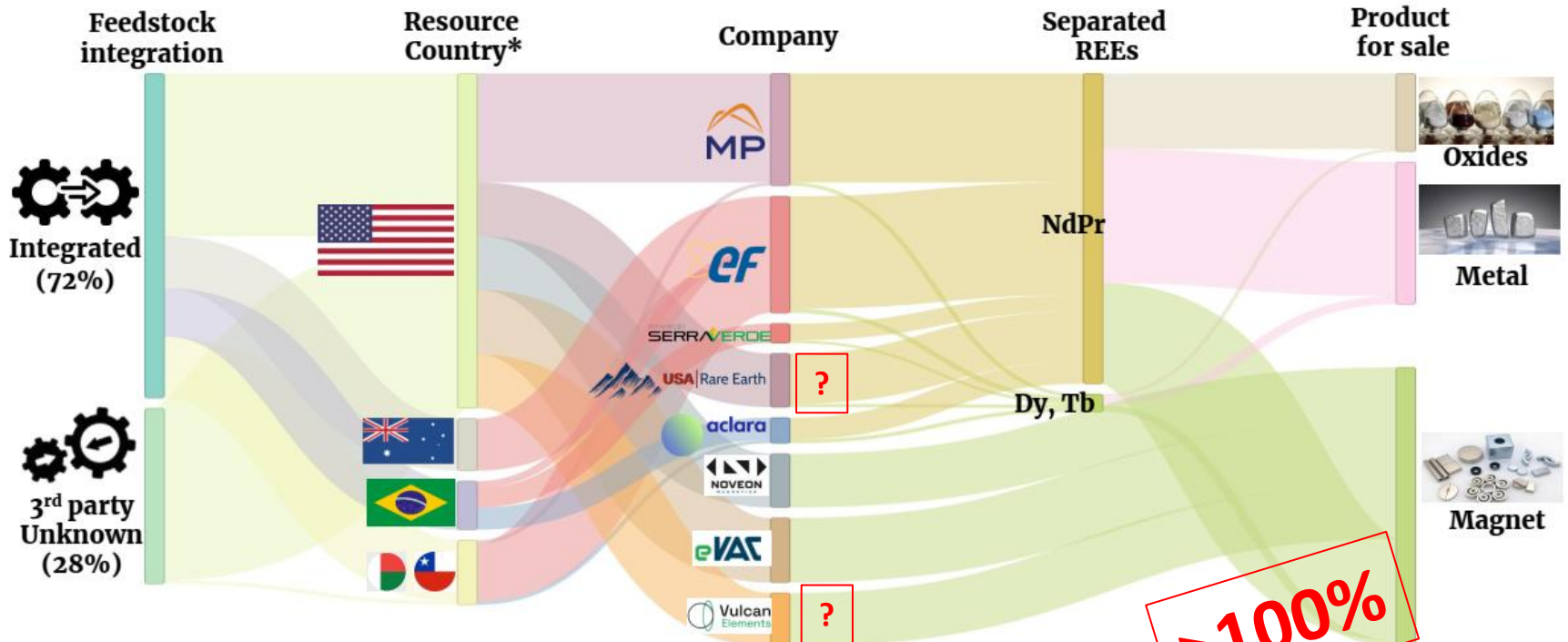
Lynas (AUS)	Neo (CAN)	LCM (USA)	VAC (EU)	MagReesource (EU)
MP (USA)	Solvay (EU)	ASM (KR)	ARNOLD (CH)	Orano (EU)
Serra Verde (BR)	Carester (EU)	SRC (CAN)	ML (EU)	Carester (EU)
Iluka (AUS)	...	Santoku (JP)	Neo (CAN)	Hypromag (CAN)
...		...	MagReesource	Neo (CAN)
				...
	3000 tons NdPr 2025-2027	1500-3000 tons 2026-2028	3000-8000 tons 2025-2028	100-2500 tons 2025 - 2028

10-35%

REPM – The US way

Independant

US REE supply chain map



>100%

42-ktons-

* Assuming magnet producers source feedstock from US-based mining projects
Source: Company reports; Argus



?

(!) mostly MP
6500 – 10000 tons NdPr
2026-2028

8000-10000 tons
2026-2028

4000- up 10000 tons
2025-2028

Raw material Prices

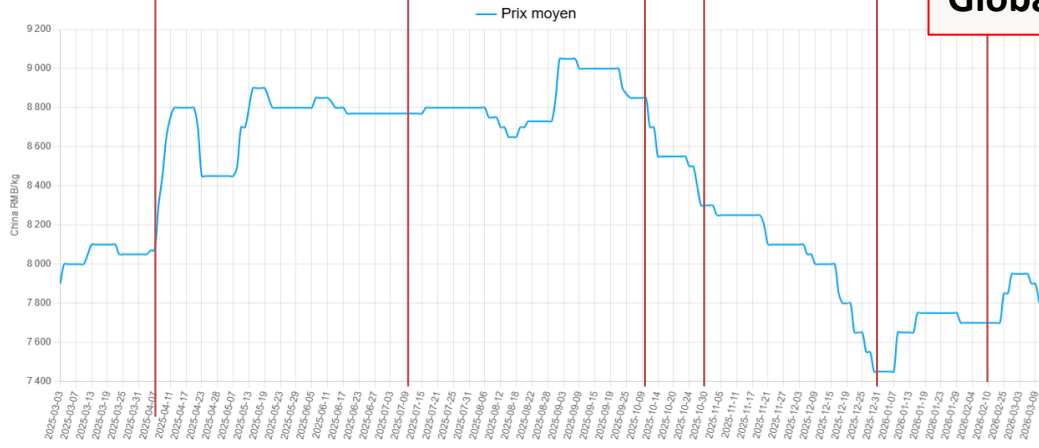
Nd



Les données de ce paragraphe sont fournies par Asian Metal.

CN - October 2026 ?
US - New deal Trump-Xi ?
CN - Quotas NdPr ?
Global - Conflicts ?

Tb



From Asian Metals

New trends

New Trends – Current situation

Market will **not** return to normal

Prices !

Delivery time !

Information leak !



15th 5-year plan

Bring more innovation

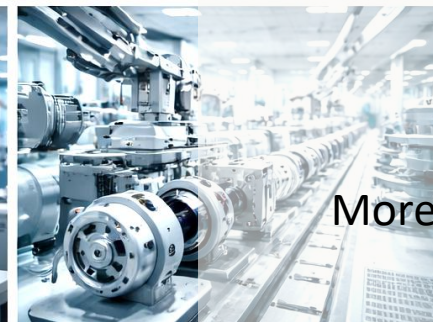
Magnet Industry 5.0

From mine to motor

Ban on SmCo for Defense

Risk on Ferrite (Iran !)

Shipping time & price (Iran !)



NdPr Quotas ?

More restrictions in

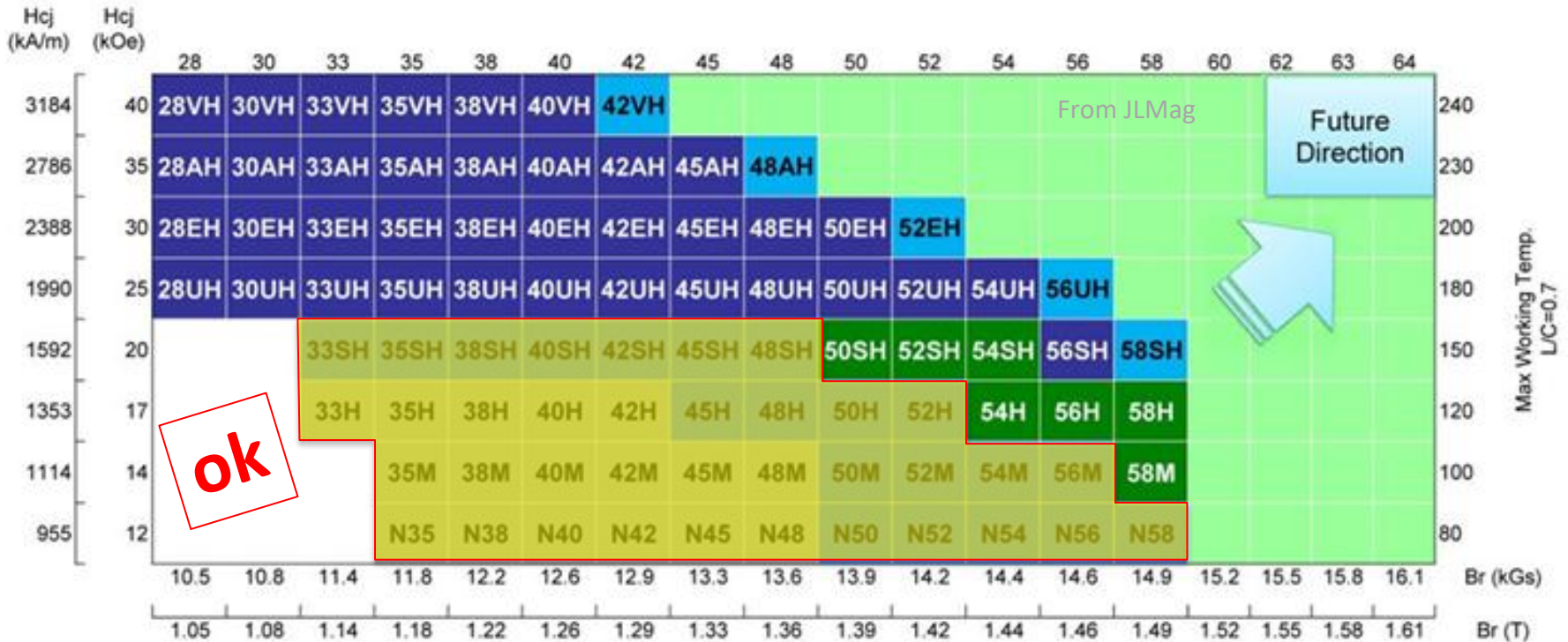
October ?

From AI

Invest in China ?

New Trends – No HRE / less LRE

NdFeB Grades Matrix as per Process



	Normal Process
	LOP+GR

	Dy Diffusion
	Tb Diffusion

	R&D Direction in three years
	Future Direction

From JLMag

New Trends – **Less HRE / Rationalizing** usage

Improved rotor “direct” cooling

Segmentation

GBD process

Multi-grades assembly

Rotor design

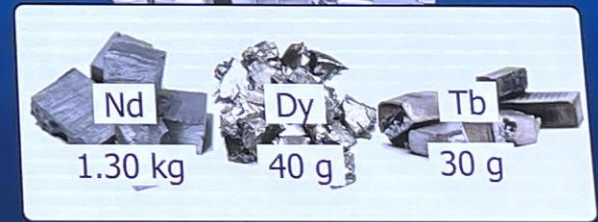
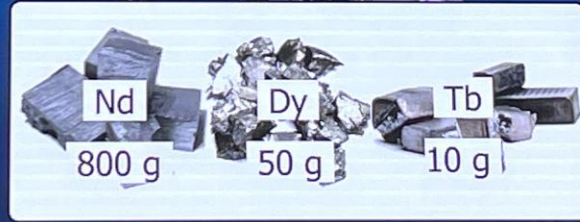
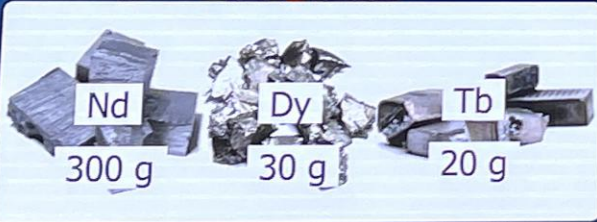
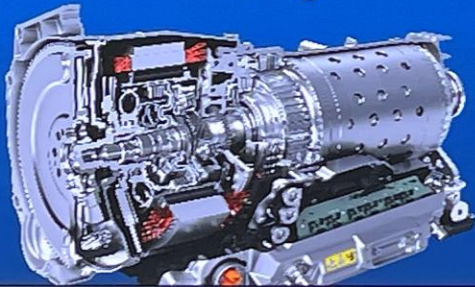
Improved (2 steps) GBD

From ZF

hybrid
1.10 kg

e-drive
2.3 kg

e-drive performance
4.4 kg



27,2 wt% 2,7 wt% 1,8 wt%

34,7wt% 2,17 wt% 0,4wt%

29,5 wt% **0,9 wt%** **0,6wt%**

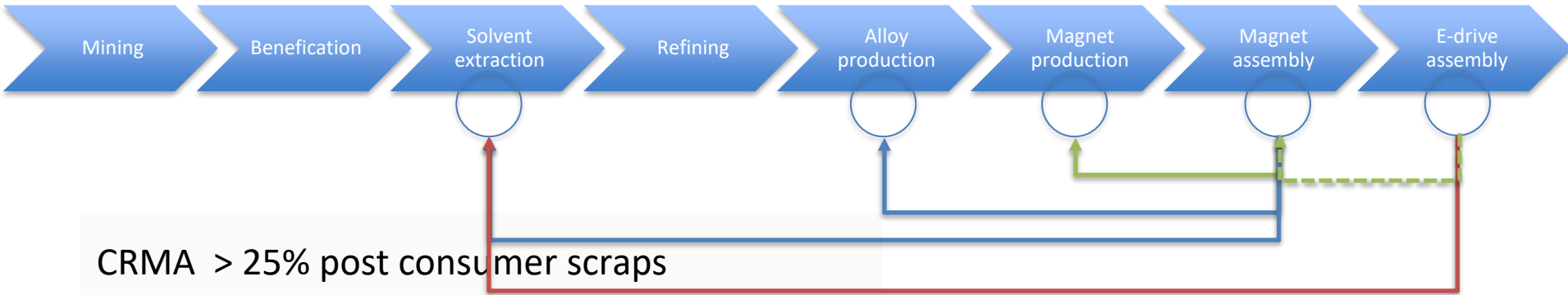
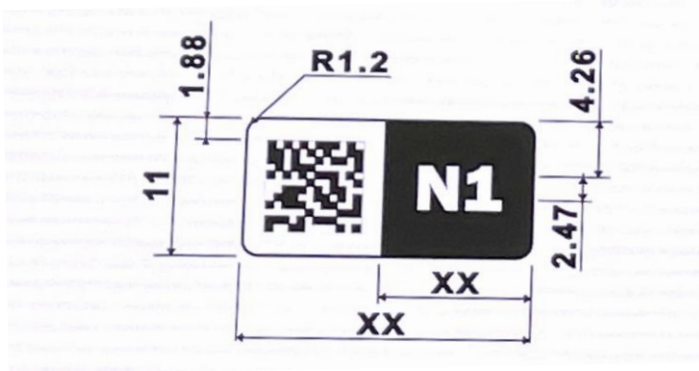
Grade ~ 42EH



Grade ~ 50 UH
Multi-grades

Grade ~ 52 SH
Multi-grades

New Trends – Recycling / Re-Use



CRMA > 25% post consumer scraps

Article 29 = Adapt design for recycling (!)

Article 28 = Labelling CEN TC 18263

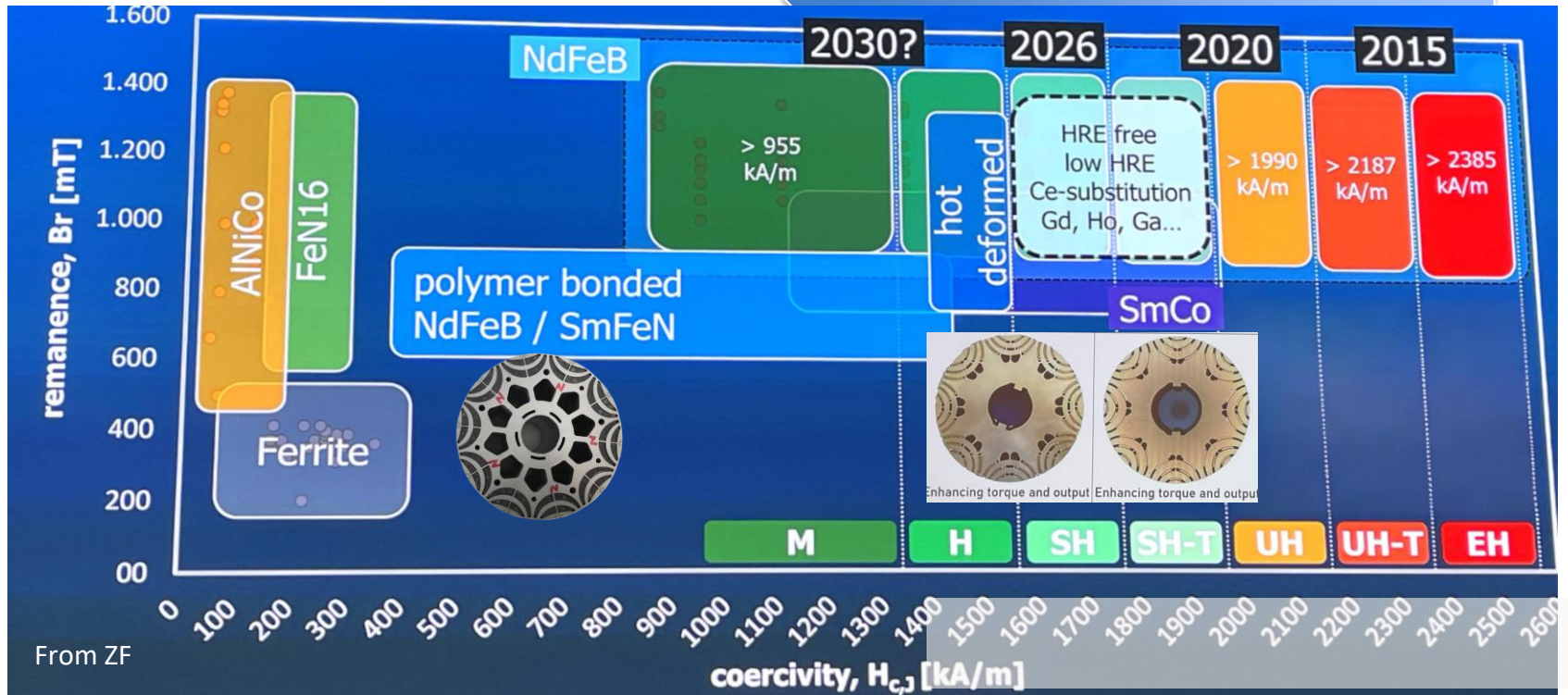
Coating & Glue contamination

Option for recycling SmCo magnets ?

Price ?

Quantities ?

New Trends – New Magnet



(CeLaNd)₂Fe₁₄B = HRE free

Hot deformed NdFeB HRE free (net shaping)

Polymer bonded as possible alternative

Fe₁₆N₂ – Low Hc (210 kA/m)

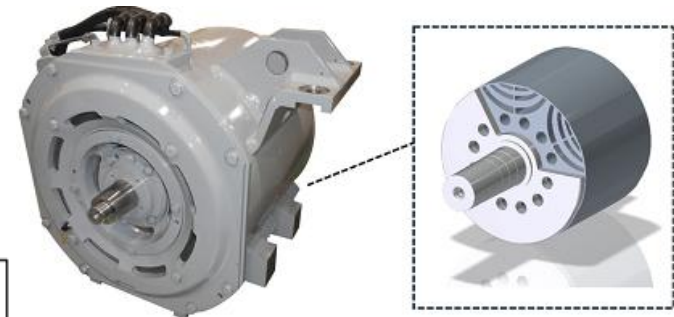
Super **Ferrite** ?

Alternative for **SmCo** magnets ?

(NEW) Low Temperature sintering of SmFeN



New Trends – No Magnet



Synchronous reluctance motor (SynRM) and rendition of its internal rotor

From Mitsubishi



From BMW



From ZF

ok

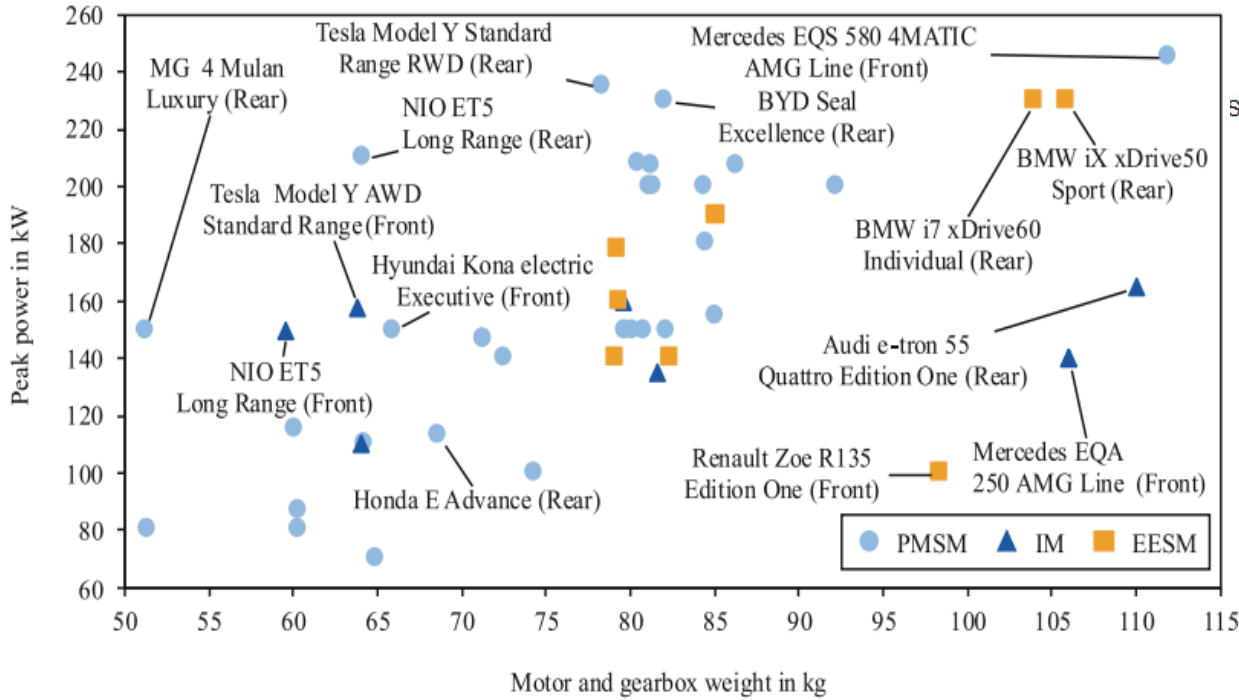


Fig. 3 Peak power of the motors plotted against the weight of the motor and gearbox depending on the motor topology, PMSM Permanent magnet synchronous motor, IM Induction machine, EESM Externally excited synchronous machines

Drexler et al. Advanced electric motors

Conclusions

1 Europe is strategically balancing between Chinese supply chains for rare earths and magnets and US/Japanese independence initiatives. **Still work to do !**

2 Rare earth and magnet **prices** remain a **critical, uncontrollable factor**, highly sensitive to Chinese production, global demand, and geopolitical tensions.

3 **Automotive sector**: still dependent on NdFeB magnets for electric motors but **alternative** are possible.

4 **Defense Sector** : SmCo magnets are indispensable: **no viable alternatives** currently . **Recycling and optimization** of existing magnets is required to reduce dependency.

5 **Other Supply Chain Risks** : **Ferrite** magnets and already **transportation** could be disrupted by international conflicts (Iran!)

6 **Opportunities** : **SmFeN** and **Plasto-magnets** as emerging alternative as sintered magnet (!)

Japan is investing in these technologies for Drones and e-mobility

7 Strategic Recommendations

Rationalize (!)

Adapt supply = stockpiling / recycling / diversify supply sources

Invest in alternative magnet technologies

Collaborate and develop partnerships !

From AI



 Thank you for your attention !

Happy to hear
your questions and thoughts ...



Stay in touch :

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Event Announcement

