"The Importance of Metals to the Future of Energy in Europe"

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DG GROW

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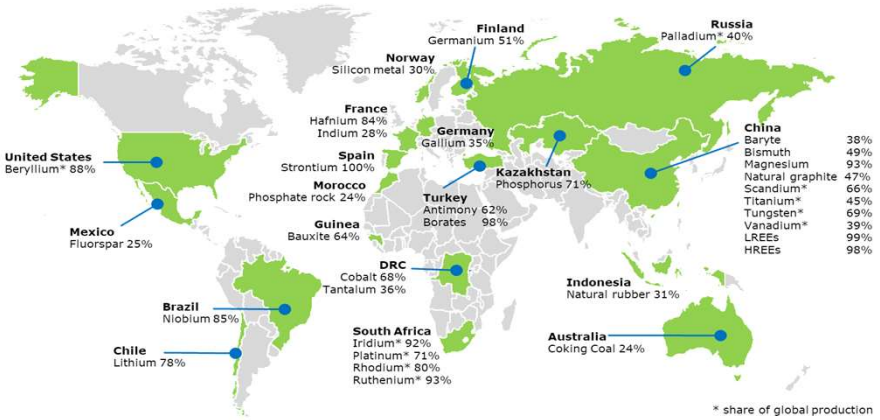
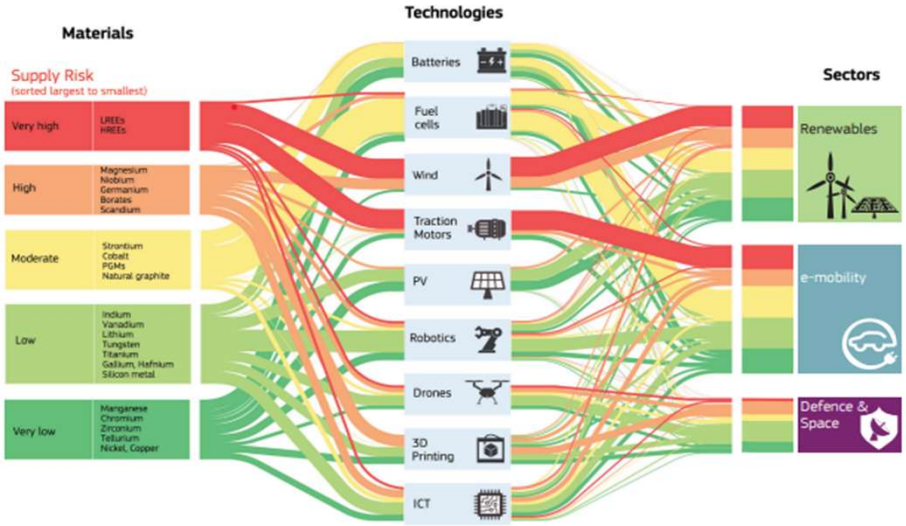
EU's dependence on concentrated supply sources for raw materials



Biggest supplier countries of Critical Raw Materials to the EU (CRM factsheet, 2020)

Result - supply risk for the twin transitions



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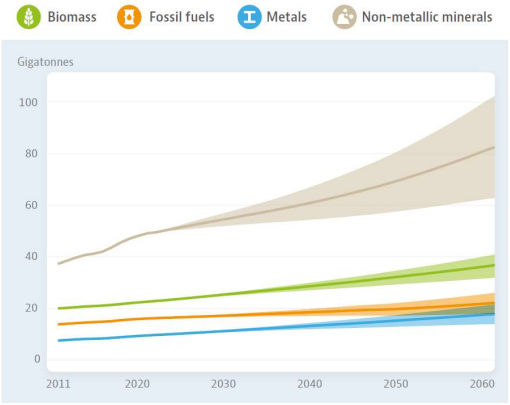
Global demand set to exceed global supply

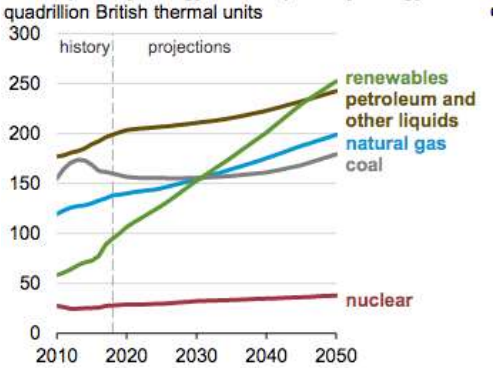
Figure 6. **Growth in materials use depends on population and economic growth assumptions**



Source: OECD, Global Material Resources Outlook to 2060, 2019.

Global primary energy consumption by energy source

quadrillion British thermal units



Source: Energy Information Administration, International Energy Outlook 2019.

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The energy transition is a commodities transition

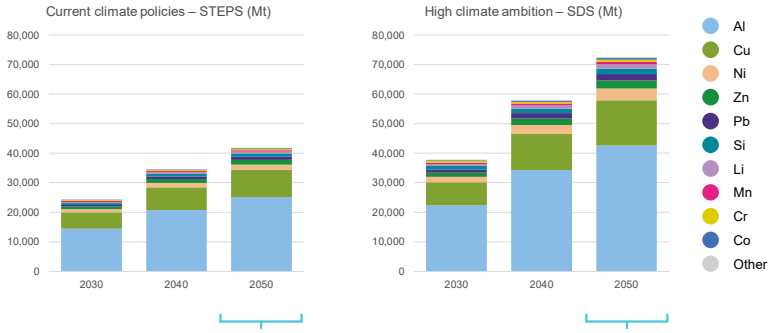
Fact

The faster the world decarbonises, the higher its metals requirements

Question

By how much?

Total metal demand by commodity in a STEPS and SDS scenario respectively (Mt)



2050 Metals demand **Current climate policy** | **45 Mt**

2050 Metals demand **Ambitious climate policy** | **75 Mt**

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Clean energy technologies will transform global metals markets

Fact

All based on metals: Batteries, Solar PV, Hydrogen, Magnets, Electric Cars, Wind Turbines, Power cables

Question

How will global demand for metals shift?

% metal required in 2050 for clean energy technologies vs. 2020 overall use (SDS ambitious climate scenario).

Li	**Lithium**	**2109%**	Si	**Silicon**	**62%**
Dy	**Dysprosium**	**433%**	Tb	Terbium	**62%**
Co	**Cobalt**	**403%**	Cu	**Copper**	**51%**
Te	Tellurium	**277%**	Al	**Aluminium**	**43%**
Sc	Scandium	**204%**	Sn	Tin	**28%**
Ni	**Nickel**	**168%**	Ge	Germanium	**24%**
Pr	**Praseodymium**	**110%**	Mo	Molybdenum	**22%**
Ga	Gallium	**77%**	Pb	Lead	**22%**
Nd	**Neodymium**	**66%**	In	Indium	**17%**
Pt	Platinum	**64%**	Zn	**Zinc**	**14%**
Ir	Iridium	**63%**	Ag	Silver	**10%**

Aluminium
Copper
Zinc
Silicon

Lithium
Nickel
Cobalt

Dysprosium
Neodymium
Praseodymium

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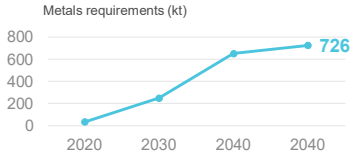
What about demand in Europe?

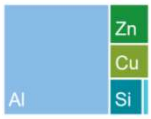
Until now, batteries, solar panels, magnets have been built elsewhere…

But Europe has concrete industrial plans to build its own technologies

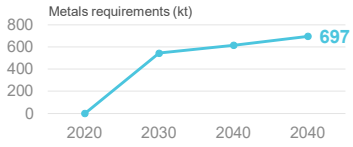
+ Al, Cu



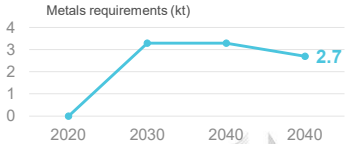
European Solar Initiative



+ Sn, Pb, Ag, Ni, Te, Cd, In, Ga, Ge



Rare Earth Magnets and Motors: A European Call for Action



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Europe's energy transition = Massive increase in metals demand by 2050

Base metals

Widely used today, in high volumes across the European economy

Al Aluminium	+33%
Cu Copper	+35%
Si Silicon	+50%

Top transition uses: EVs, Solar, Electricity networks

Battery materials

Low EU use today (except nickel), big increase from new battery cathode manufacture

Ni Nickel	+103%
Co Cobalt	+331%
Li Lithium	+3,500%

+ Manganese & Graphite

Top transition uses: EVs, Battery storage

Rare earths

Low EU use today, big increase if EU establishes permanent magnet value chain

Pr Praseodymium	+587%
Dy Dysprosium	+827%
Nd Neodymium	+2,666%

Top transition uses: EVs, Wind

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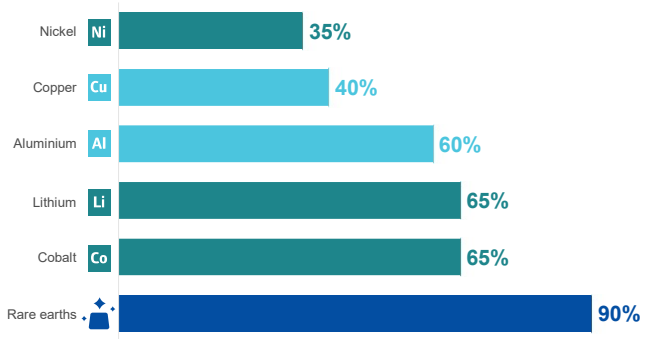
Europe's energy transition (Continued)

Challenge

How can we avoid filling Europe's demand gap only with imports from single suppliers?

China's share of global processing



+ Control of:

- Cobalt mines
- Majority of Indonesian nickel
- Growing South American lithium assets

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Magnesium shortage case-study

An identified dependency

- 2001: last plant closure in EU/EEA (Norway)
- 89% of global production in China
- 93% of magnesium used in the EU is from China
- Mg identified as a Critical Raw Material in EU (2011, 2014, 2017 and 2020 editions)

The consequences of inaction

- Energy crisis in China creates temporary plant closures and production slowdown
- Sept. 2021 shortage affect EU downstream industries : packaging, steel, defence, automotive, etc.;
- Orders cancelled; price increase; risk of supply shortages

Solution

- Boost EU production: identify projects and investments
- Diversify EU value chains: explore opportunities for alternative sourcing and cooperation

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Bridging Europe's energy transition metals supply gap
STARTING POINT
NOW
▪ Acceleration of clean energy transition
▪ Aim to improve strategic autonomy for energy
END POINT
2050
▪ Clean energy system with higher level of strategic autonomy & right level of sustainability
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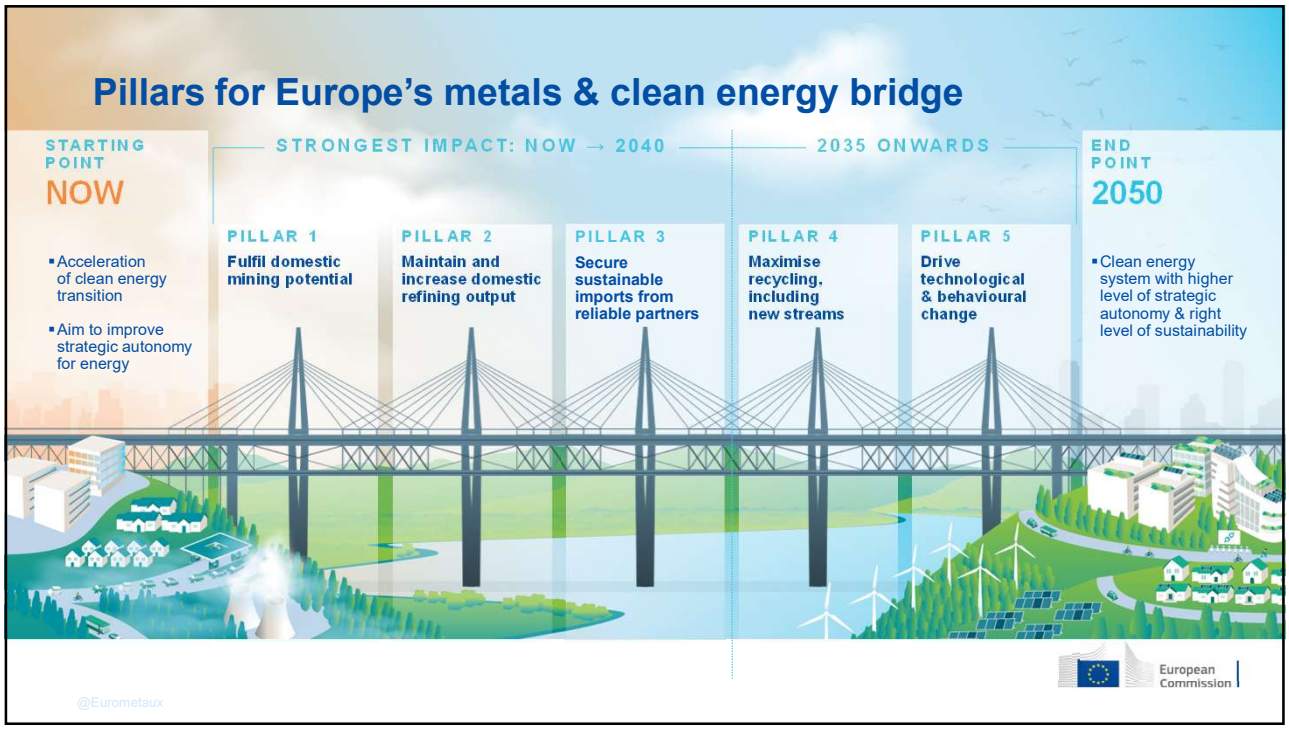
Pillars for Europe's metals & clean energy bridge
STARTING POINT
NOW
▪ Acceleration of clean energy transition
▪ Aim to improve strategic autonomy for energy
STRONGEST IMPACT: NOW → 2040
2035 ONWARDS
PILLAR 1
Fulfil domestic mining potential
PILLAR 2
Maintain and increase domestic refining output
PILLAR 3
Secure sustainable imports from reliable partners
PILLAR 4
Maximise recycling, including new streams
PILLAR 5
Drive technological & behavioural change
END POINT
2050
▪ Clean energy system with higher level of strategic autonomy & right level of sustainability
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1 Without new mines opening in mature markets, Europe's self-sufficiency will decline

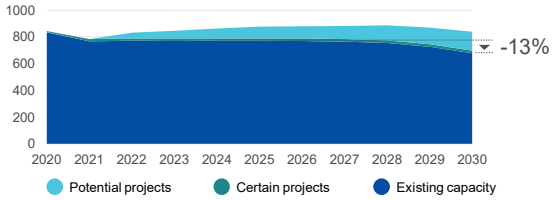
Copper, nickel, zinc, cobalt

- Thinner project pipelines
- Limited 2030 self-sufficiency rate (4-25%)
- 2030 depletion ranges of up to 20%

Challenges

Local opposition, challenging economics, permitting, untested technologies

Copper - European mine output



Copper - European self-sufficiency rate

Copper
up to + 3% uncertain projects
% domestic mining of overall 2030 demand

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2 Europe will need more refinery capacity in next 5 years to keep pace with energy transition

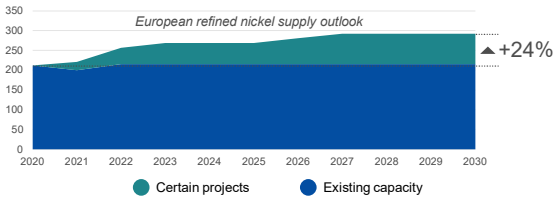
Nickel, lithium, rare earths

- New EU refining projects announced with medium-sized growth potential
- Allows European customers to bypass China route (and CO_2 impacts)

Question

Can Europe create competitive and predictable business conditions for long-term investment?

European metal output



European self-sufficiency rate

Nickel
% primary production of overall 2030 demand

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2 Keeping metals refining in Europe requires a fix to energy crisis

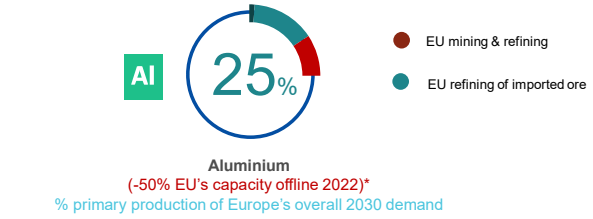
Aluminium, zinc, silicon

- High energy prices have critical impact on power intensive smelters, with 50% of capacity offline today
- Subsidised imports, require trade defence measures

Question

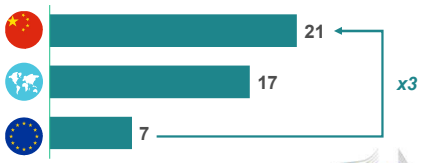
Can Europe stop its existing supply being replaced by more carbon-intensive imports?

European self-sufficiency rate



Aluminium
(-50% EU's capacity offline 2022)*
% primary production of Europe's overall 2030 demand

Average CO_2 footprint of primary production (tCO_2/t Al)



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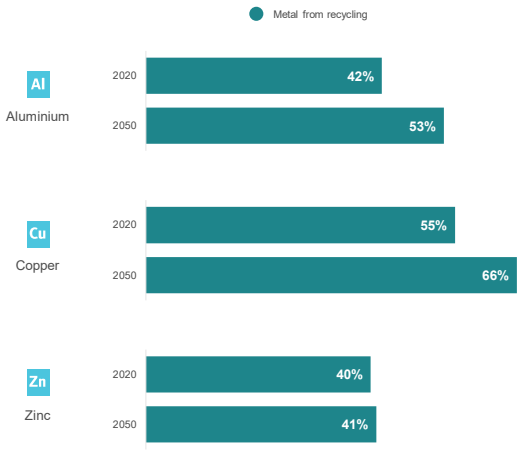
4 Recycling is Europe's key long-term driver in creating strategic autonomy
Circular Economy actions will raise base metals recycling rates

Mature markets
Aluminium, Copper, Zinc

- Recycling can supply 40-65% of Europe's higher base metals demand in 2050
- Recycling bottlenecks must be addressed to raise rates:
  - Improved collection and sorting systems
  - Smarter product design
  - Control of scrap leakage



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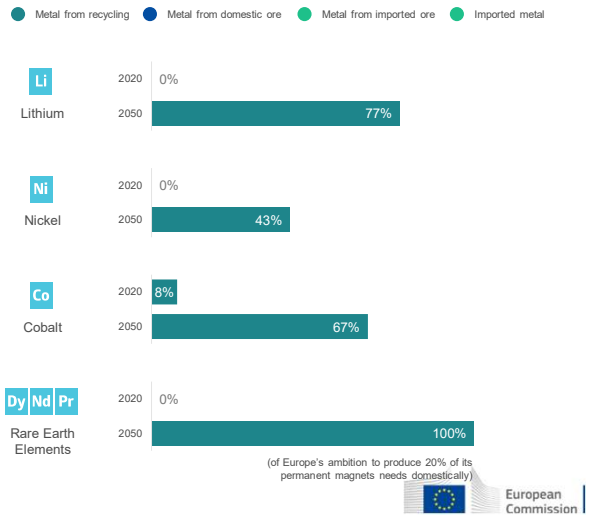
4

Recycling is Europe's key long-term driver in creating strategic autonomy
Massive potential after 2040 for new energy commodities

New energy commodities
Lithium, cobalt, nickel, rare earth elements

- Recycling volumes will rise after 2040, with potential in 2050 for:
  - 65-75% of Europe's battery cathode plans*
  - >100% of Europe's magnet supply chain plans*
- High supply from electric vehicles with 15 years expected lifetime
- Required:
  - New recycling capacity
  - Process improvements
  - Economic viability



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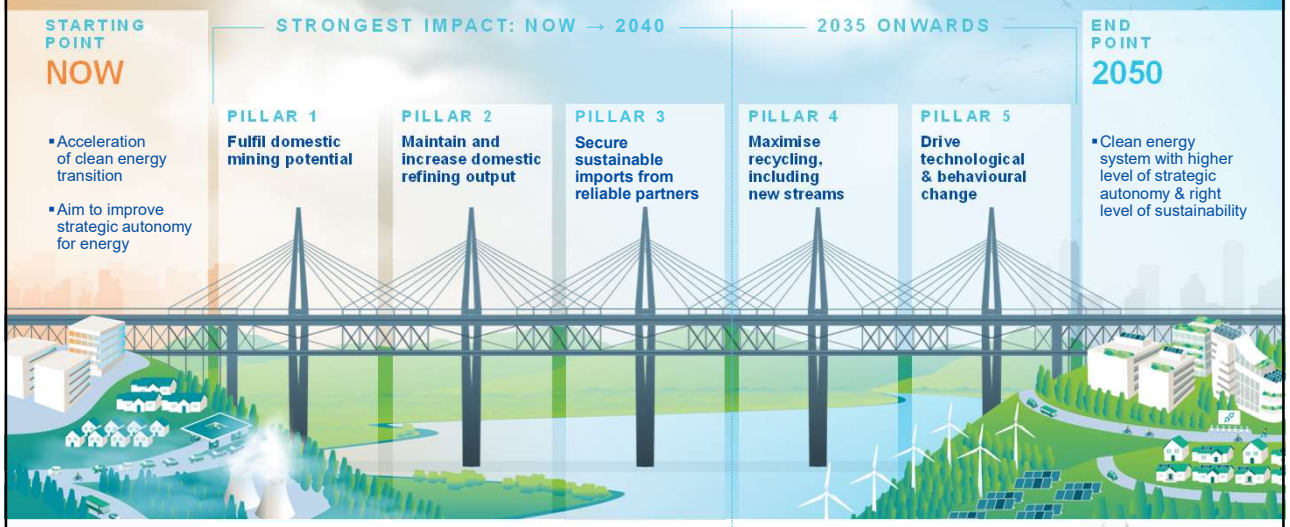
Five necessary pillars for Europe's metals & clean energy bridge



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Action plan on Critical Raw Materials, 10 actions

1. European Raw Materials Alliance
2. Develop sustainable financing criteria for mining
3. Research and innovation on waste processing, advanced materials and substitution
4. Map the potential supply of secondary CRM from EU stocks and wastes
5. Identify priority mining and processing projects for critical raw materials in the EU
6. Develop expertise and skills
7. Deploy Earth observation programmes for exploration, operation and post-closure environmental management
8. Develop research and innovation projects on exploitation and processing of CRMs
9. Develop strategic international partnerships to secure CRMs supply
10. Promote responsible mining practices for CRMs

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Time for action – the political mandate

Heads of State/Government Versailles Declaration on 11/3/2022

Reducing our strategic dependencies - secure EU supply of Critical raw materials by means of

- strategic partnerships,
- exploring strategic stockpiling and
- promoting a circular economy and resource efficiency;

REPowerEU Plan on 18/5/2022

- Intensify the work on the supply of critical raw materials and prepare a legislative proposal.

The State of the Union speech by President von der Leyen on 14/9/2022

The European Commission intends to table proposal on

- European legislation on Critical Raw Materials;

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Thank you