

Copper: The strategic, circular, and sustainable raw material of the HVACR industry

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Electrification: Relying on copper's superior properties

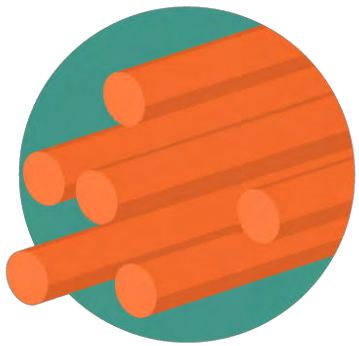
Excellent Electrical & Thermal Conductivity

Metal	Electrical (IACS)	Thermal (W/m.k)
Silver	105%	430
Copper	101%	401
Gold	70%	310
Aluminium	61%	237



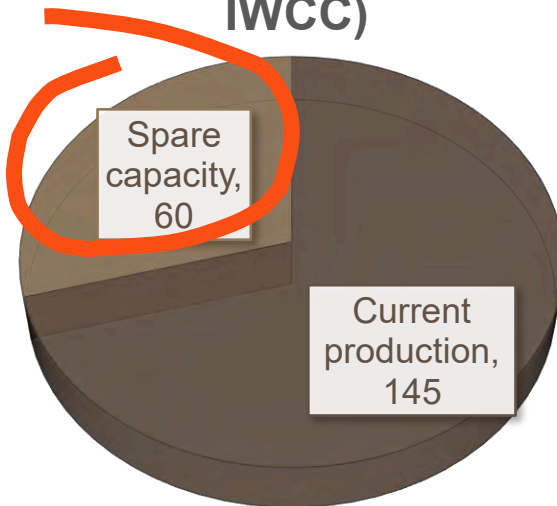
Superior properties

- Low coefficient of thermal expansion
- **Highly corrosion-resistant**
- **Machinability (brazing, bending)**
- Mechanical performance (fatigue and creep resistance)
- **Sustainability and circular economy benefits, high recyclability**



Copper tube production well established in Europe

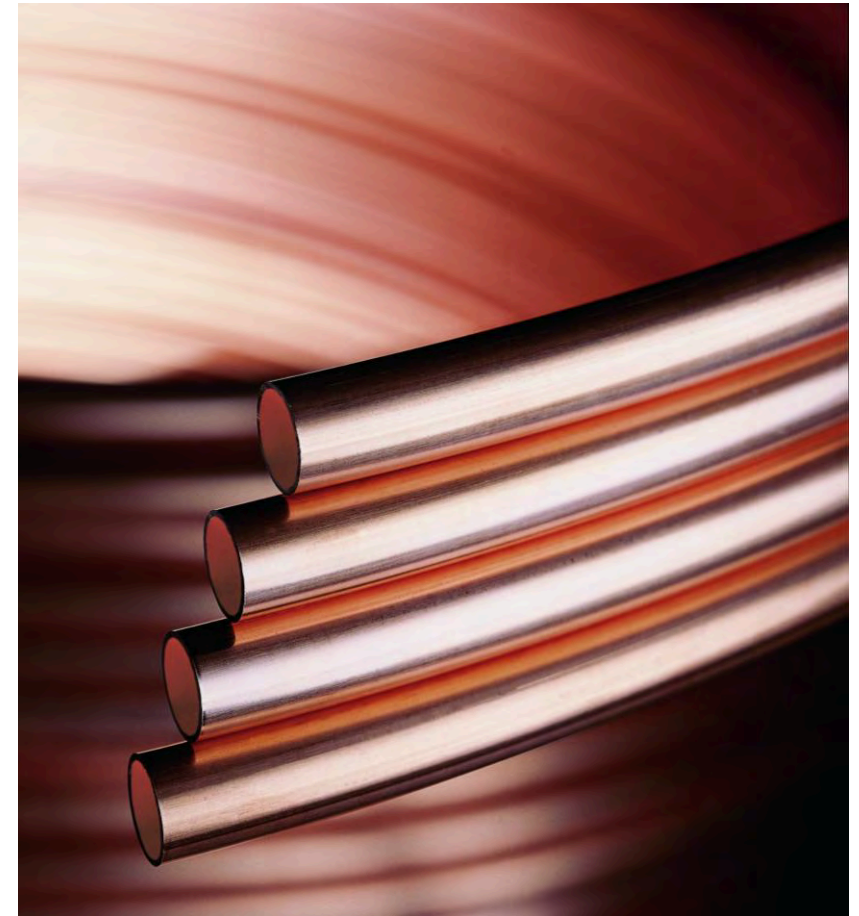
INDUSTRIAL COPPER
TUBE PRODUCTION
CAPACITY IN EU
(205KTPA IN 2024, SOURCE
IWCC)



Sustainability

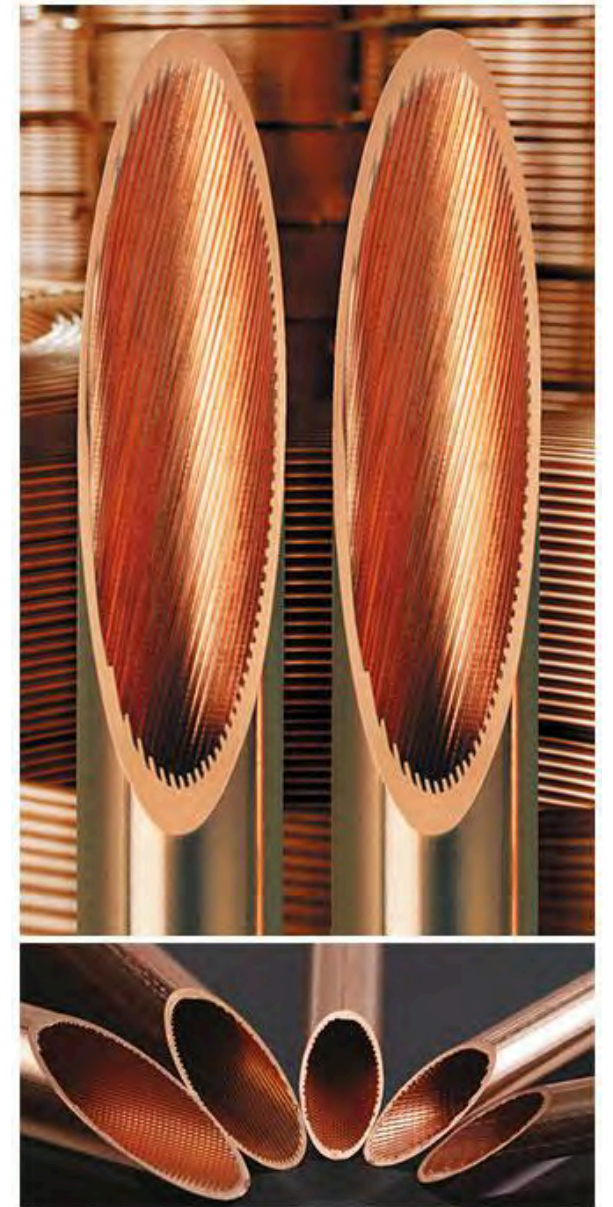
- Good potential of the use of recycled material
- The carbon footprint of European tubes is continuously improved, contributing to better life-cycle data of final products

Global avg:	2.763 kgCO ₂ eq/kg
European ex.:	0,515 kgCO ₂ eq/kg



Small diameter inner grooved copper tube

- Innovative copper tubes suitable for refrigerant-to-air heat exchangers, including evaporators, condensers and gas coolers
- European suppliers available
- Key advantages:
 - Well suited for new refrigerants, uses less refrigerant (F-gas regulation)
 - Smaller size, less weight and lower material costs
 - Cost-effective fabrication and assembly
 - Higher heat transfer coefficients
 - Overall reduction in system costs



Most of EU copper demand is met by domestic smelting, refining and recycling capacity

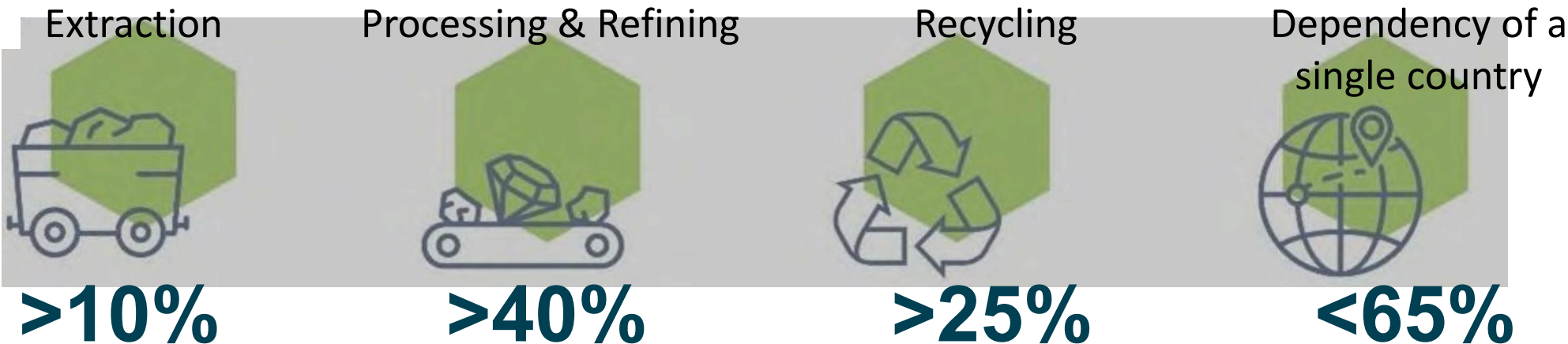


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Copper already meets Critical Raw Materials Act thresholds



CRM Act
2030 targets
for self-
sufficiency



Copper (2020)

~ 50%
(ore & concentrate)

~ 90%
(refined)

~ 50%

Aluminium

~ 11%
(bauxite)

~ 42%
(aluminium)

~ 32%

Largest supply sources
for the EU

Mining	Refining
Poland (19%)	Germany (17%)
Chile (14%)	Poland (14%)
Peru (10%)	Spain (11%)

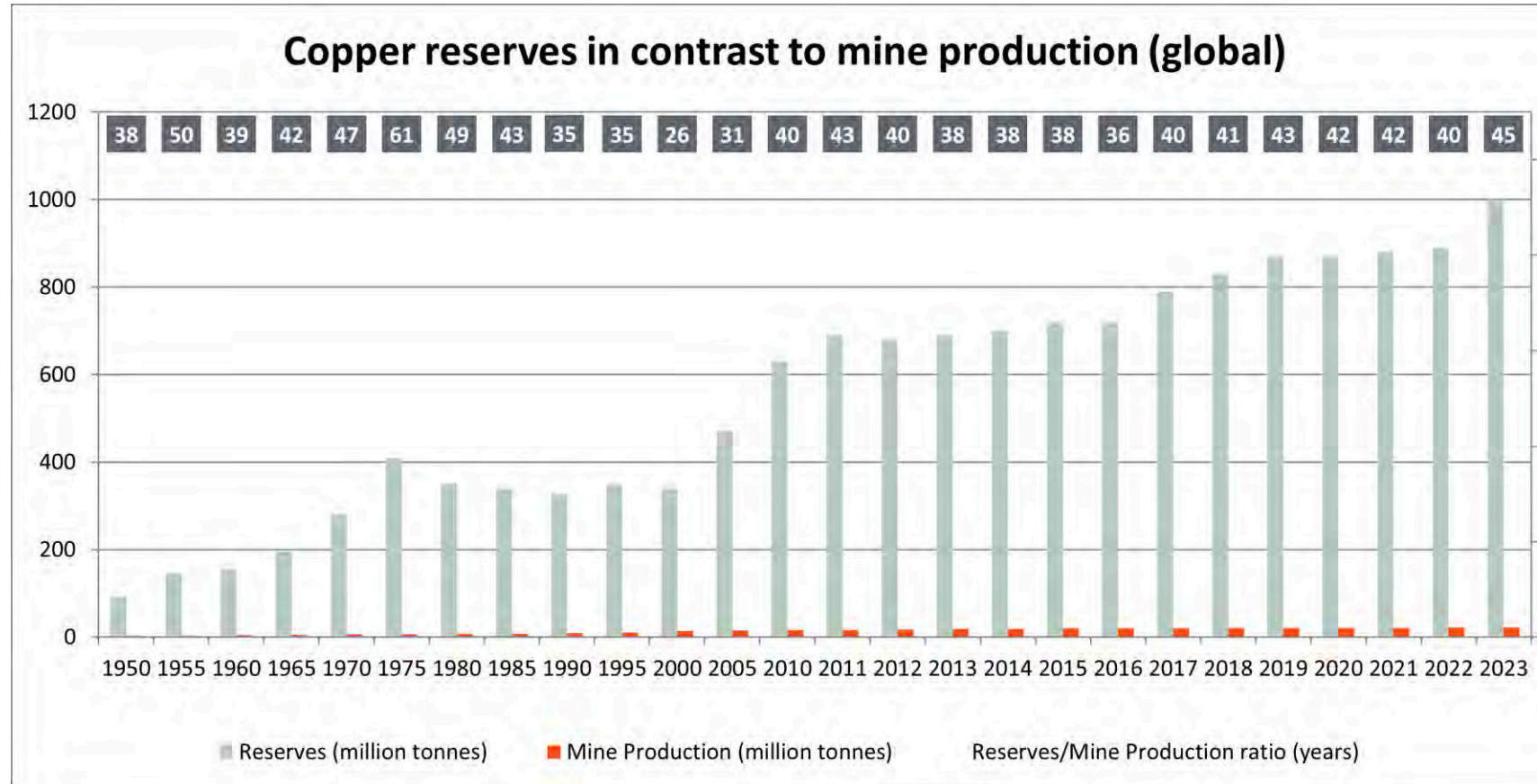
Guinea (63%)	Russia (19%)
Brazil (12%)	Germany (10%)
Greece (10%)	Mozambique (9%)



Source: Study on the critical raw materials for the EU 2023, European Commission, 2023 (<https://op.europa.eu/s/z8yV>)



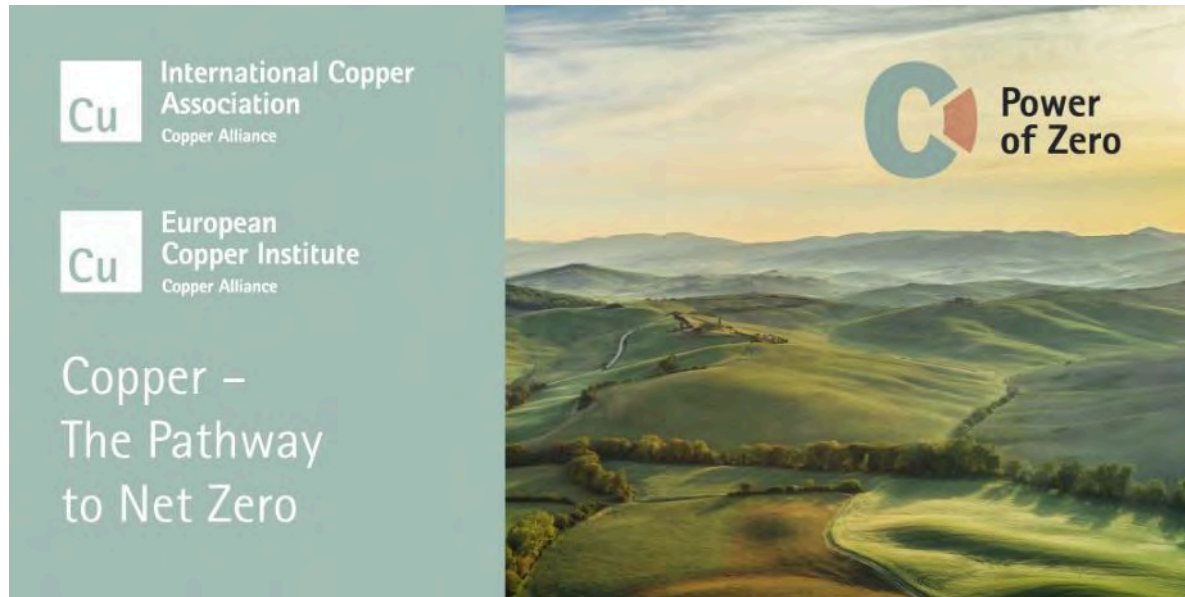
Copper reserves have consistently averaged a 40-year supply



Since 1950, there has always been, on average, **40 years of copper reserves** and over 200 years of resources remaining.

Source: <https://internationalcopper.org/sustainable-copper/about-copper/cu-demand-long-term-availability/> according to United States Geological Survey 2023

ICA members are committed to increasing capacity in a sustainable way



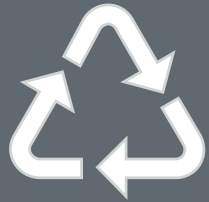
Commitment to bringing scope 1 and 2 GHG emissions to net zero by 2050 and increase recycling

Leading assurance framework to promote responsible practices across the copper, molybdenum, nickel and zinc value chains





Recycling of copper



Copper can be recycled repeatedly **without loss of properties**



Recycling won't suffice!
Meeting the growing demand requires **mining, recycling, and trade**



Improving **design for recyclability** and EoL collection are the priorities



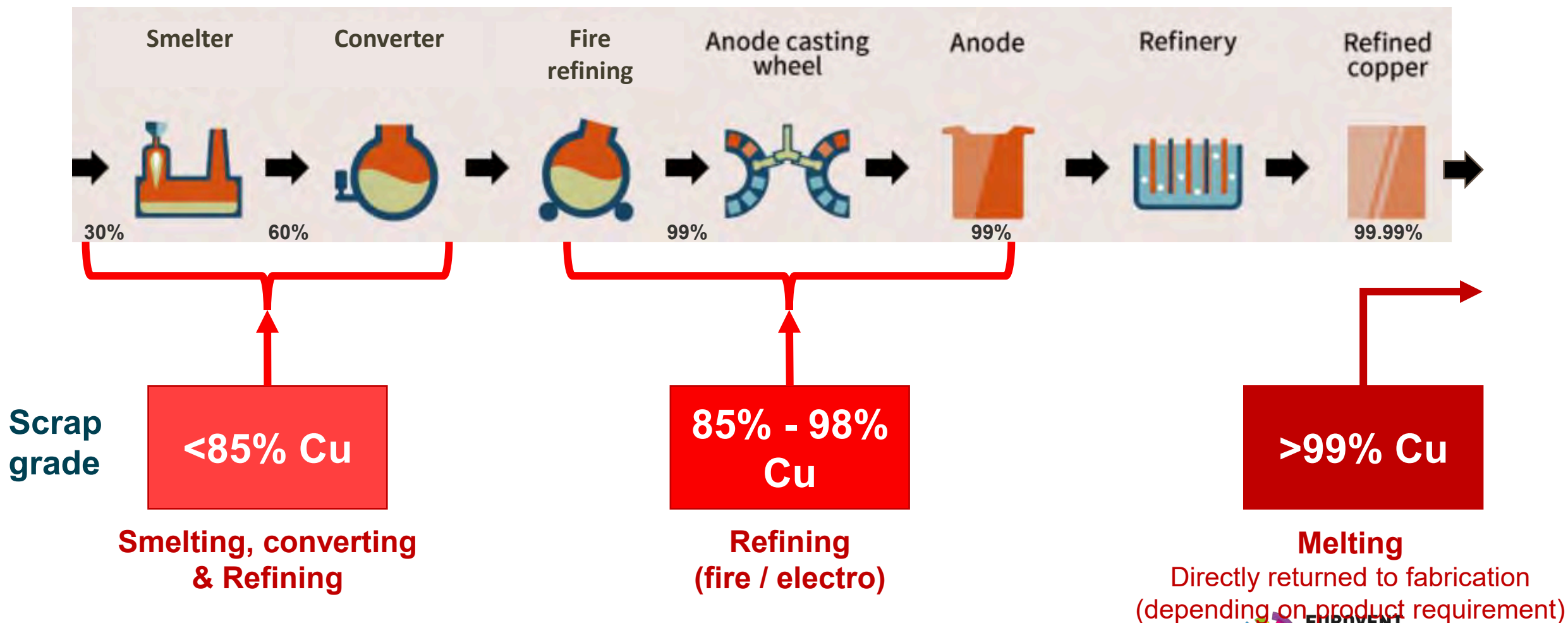
Avoid the pitfall of **Recycled Content** requirements

Circularity: our society holds a massive urban copper mine

2/3 of all copper produced since 1900 is still in use,
it represents **~ 470 Mt** (2024)



Recycling route depends on scrap purity and on product requirements, but **same end purity** can be reached with the right process

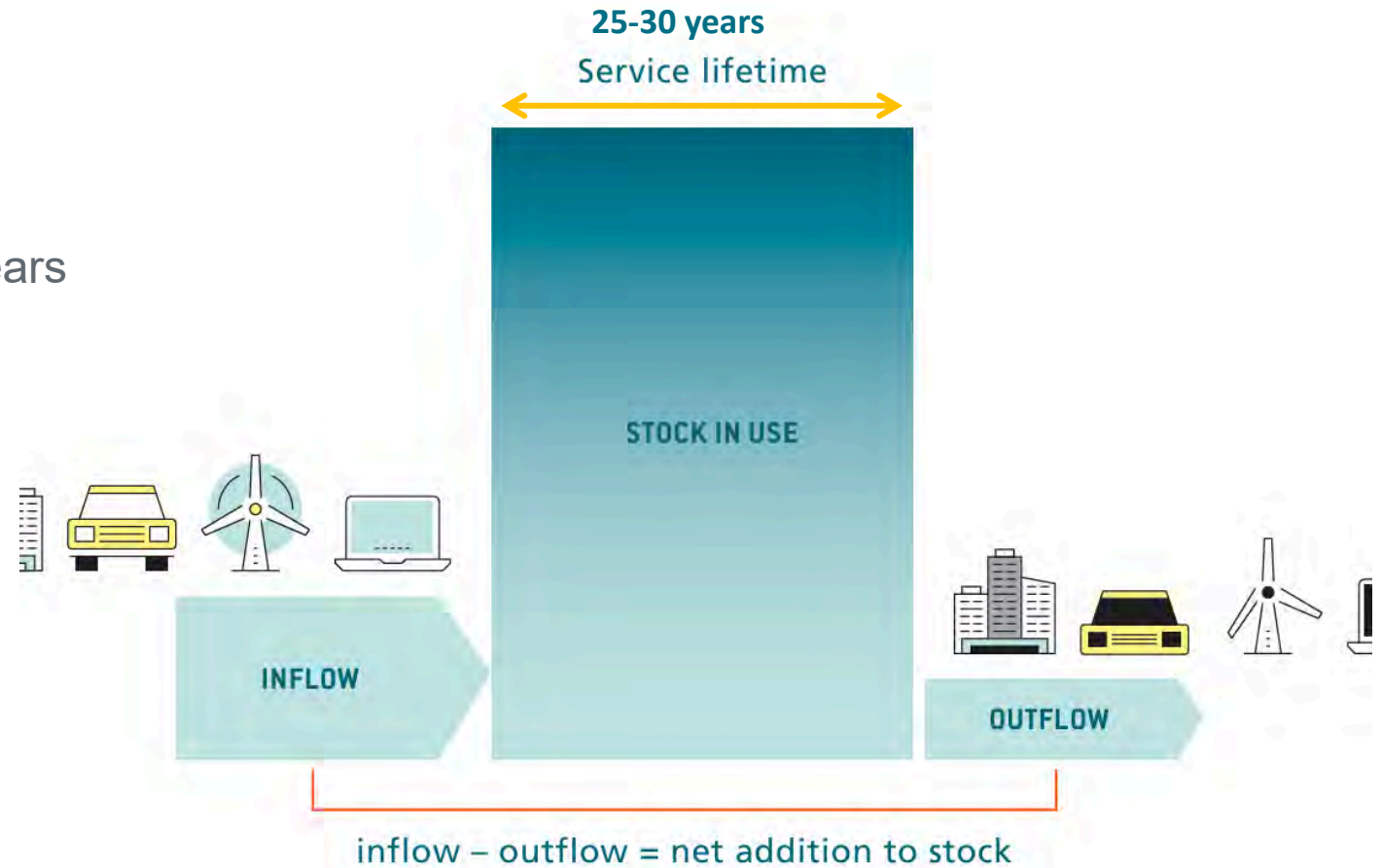


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The long lifetime in use and the historical growing demand limits the potential availability of secondary material

- Copper demand roughly doubles every 25 years
- Average lifetime in use is 25-30 years

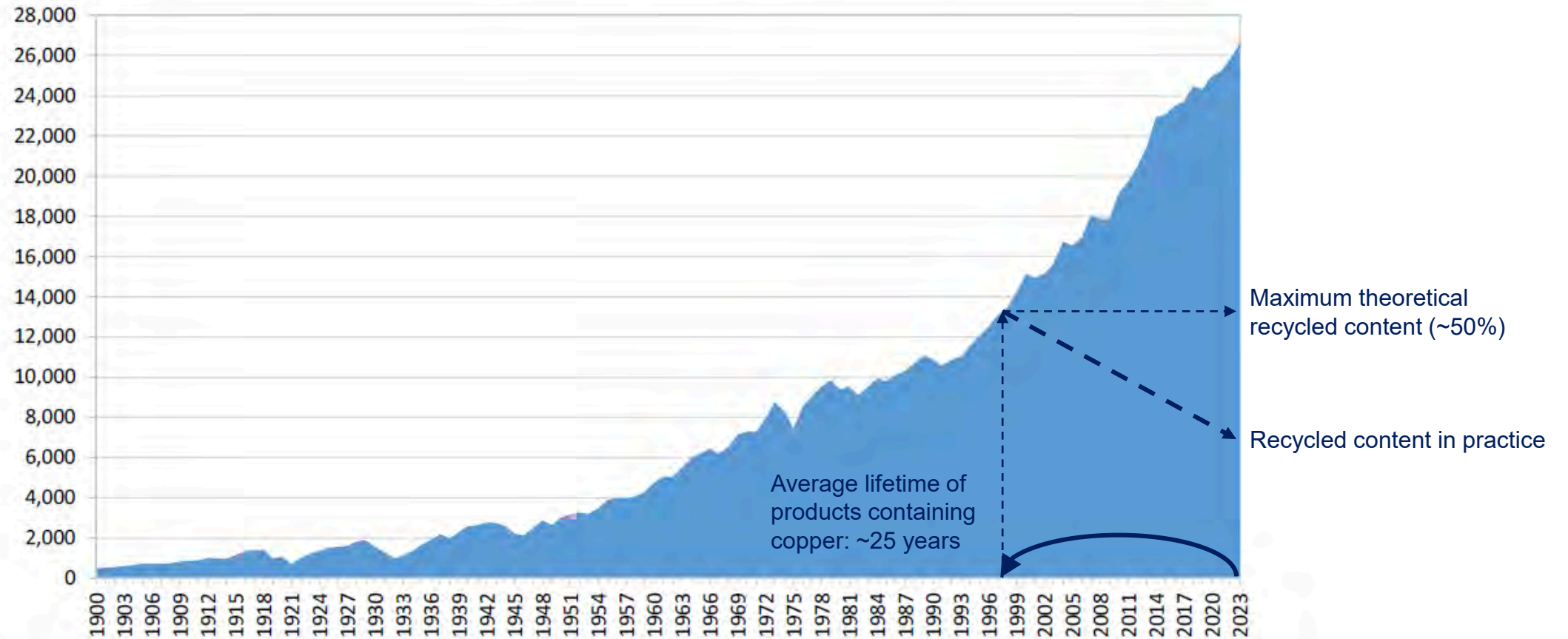


Recycled copper content: practical limits

WORLD REFINED COPPER USAGE, 1900-2023

Thousand metric tonnes of copper

Source: ICSG



Since 1900, apparent usage for refined copper has increased from less than 500 thousand tonnes to 26.5 million metric tonnes in 2023 as usage over the period grew by a compound annual growth rate of 3.3% per year.

Source: The World Copper Factbook 2024 <https://icsg.org/copper-factbook/>

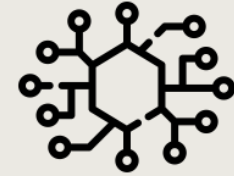
Factors affecting scrap availability



Design-for-sustainability



Incentives to improve
collection rates



Progress in sorting technologies
Trained AI systems
Innovative shredding



Increasing product
complexity



Policies requiring more durable
products, longer lifetimes



Copper is a strategic material. It is not critical because its supply is very well diversified

Primary copper is on the path to net zero

Copper is strongly recyclable, but recycling won't suffice

Securing EU copper's supply requires to boost mining, refining, recycling and global partnerships

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