European Copper Institute
Copper Alliance

Energy efficiency and copper: Creating leverage for decarbonisation in industry and SMEs

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European Copper Institute

Part of

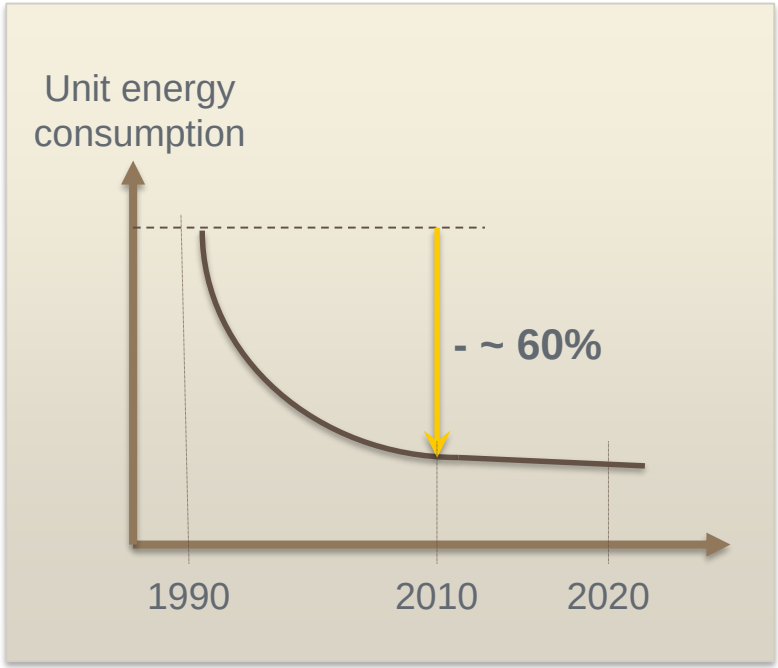
International Copper Association
Copper Alliance

Leading advocate of the copper industry

Non-profit organization

- Uniting the copper industry and its partners
- Positively contribute to UN Sustainable Development Goals
- Support markets for copper

Energy intensity of copper production -60% since 1990*



Best available technologies for energy efficiency in place

- Increased use of **flash smelting** technology
- New and modernised **furnaces**
- Renovated **electrical equipment**
- Efficient **drying technologies**
- **Energy Management Systems** (ISO 50001 or equivalent)

** Smelting and Refining industry*

Source: Copper's Contribution to A Low-Carbon Future, pp 18 (November 2014) - https://copperalliance.eu/benefits-of-copper/sustainable-development/low-carbon

Low carbon footprint

Reduced carbon footprint

- **High input of recycled materials**
  (~ 43% of copper produced in EU is from secondary sources)
- **Lower emissions from purchased electricity**
  Recovered residual heat, on site renewables

Limitations to further reduce carbon footprint

- **Higher energy intensity for material processing** due to
  - Decreasing quality of raw materials
  - Increasing material efficiency, recycling requirements, environmental protection systems (electricity)
- **Copper production is electro-intensive**
  - ~75% of CO2 emissions are indirect (Scope 2 and 3)

** Smelting and Refining industry*

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Innovation – Examples in extraction and manufacturing processes

ENERGY SAVINGS

Aurubis

Hafencity East supplied with industrial residual heat from Aurubis, Hamburg

KGHM POLSKA MIEDŹ

Fuel switching

Electrification of extractive processes

CIRCULAR ECONOMY
Adaptation to new material feeds

Atlantic Copper
A Freeport-McMoRan Company

Implementation of bismuth and antimony removal + Nickel recovery

Aurubis

Implementation of data science methods + process optimisation

TRANSPORT
Offsetting GHG

Electrification of mining trucks

NEW BOLIDEN

KGHM POLSKA MIEDŹ

Aurubis

Water barges to replace trucks

Copper is a key material in the energy transition

- *Generator*
- *Transformer*
- *Power cable*

- *Modules*
- *Power cable*
- *Inverter*

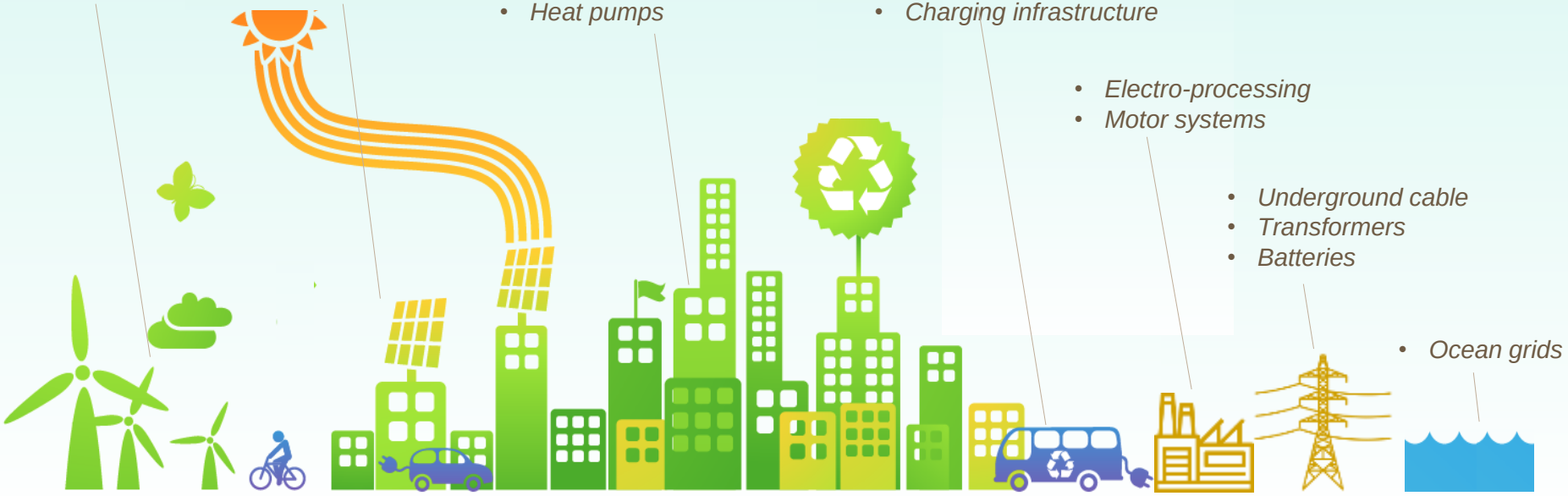
- *Automation and control*
- *Demand flexibility*
- *Smart devices*
- *Heat pumps*

- *Batteries*
- *Cabling*
- *Motor*
- *Charging infrastructure*

- *Electro-processing*
- *Motor systems*

- *Underground cable*
- *Transformers*
- *Batteries*

- *Ocean grids*



Conductivity | Strength | Corrosion resistance | Connectivity | Ductility | Alloyability | Electrochemistry

Energy savings in motors by using more copper to reduce losses

+1 kg Cu -> - 3 Tons CO2

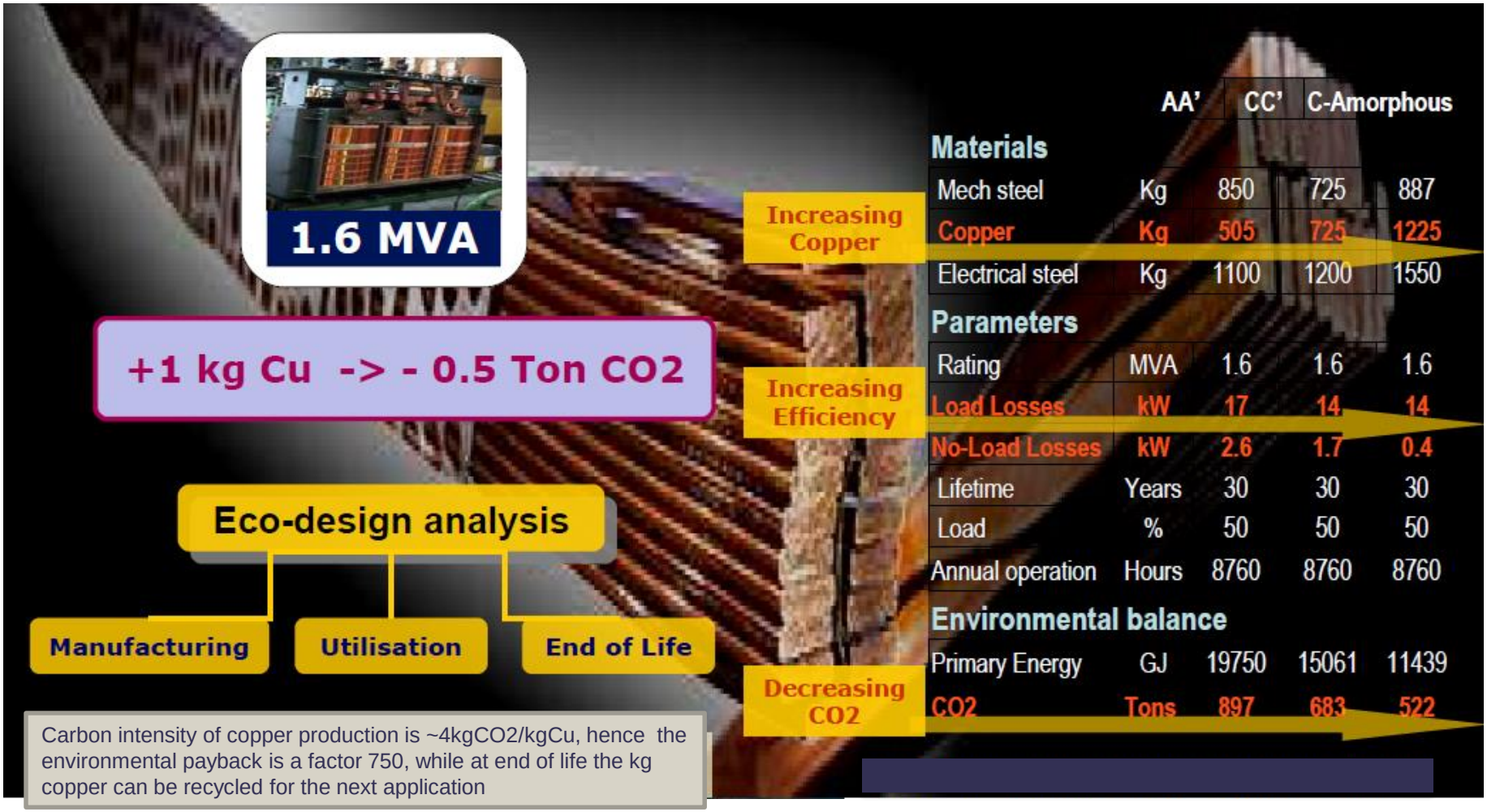
Eco-design analysis

- Manufacturing
- Utilisation
- End of Life

Carbon intensity of copper production is ~4kgCO2/kgCu, hence the environmental payback is a factor 750, while at end of life the kg copper can be recycled for the next application

		Type 1	Type 2	Type 3
Materials				
Aluminium	Kg	3,5	3,5	4
Copper (Increasing Copper)	Kg	8,8	12,9	13,9
Electrical steel	Kg	108	108	108
Parameters				
Rating	Kw	22	22	22
Efficiency (Increasing Efficiency)	%	89.5	91.8	92.6
Lifetime	Years	20	20	20
Load	%	50	50	50
Annual operation	Hours	4380	4380	4380
Environmental balance				
Primary Energy	GJ	1233	940	841
CO2 (Decreasing CO2)	Tons	56	43	38

Energy savings in Transformers by using more copper to reduce losses



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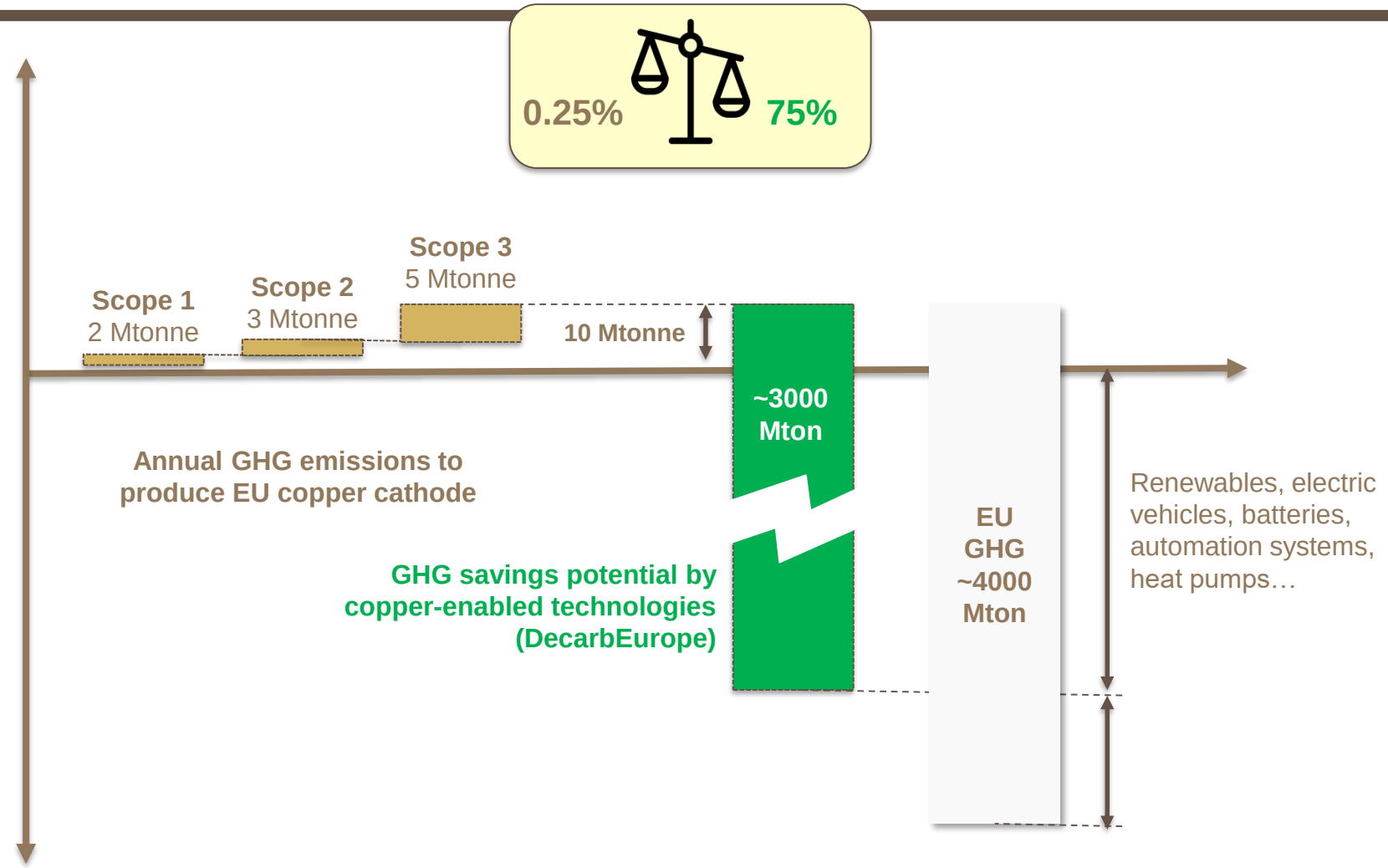
Copper has a low contribution to carbon emissions but a high contribution to decarbonisation

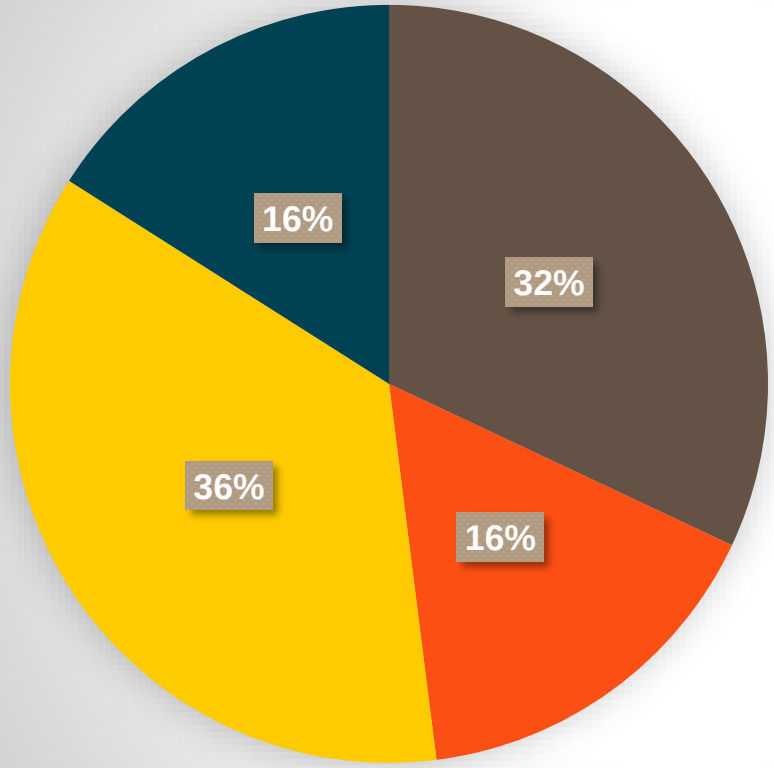


Scope 3 upstream: based on world average for cathode production
Source: http://copperalliance.org.uk/uploads/2018/01/the-env-profile-of-copper-products_lifecycle.pdf

ECI’s actively promotes and supports energy efficiency in industry

Energy management practices in SMEs: online survey (2021)

Does your company implement energy efficiency measures within a systematic approach?

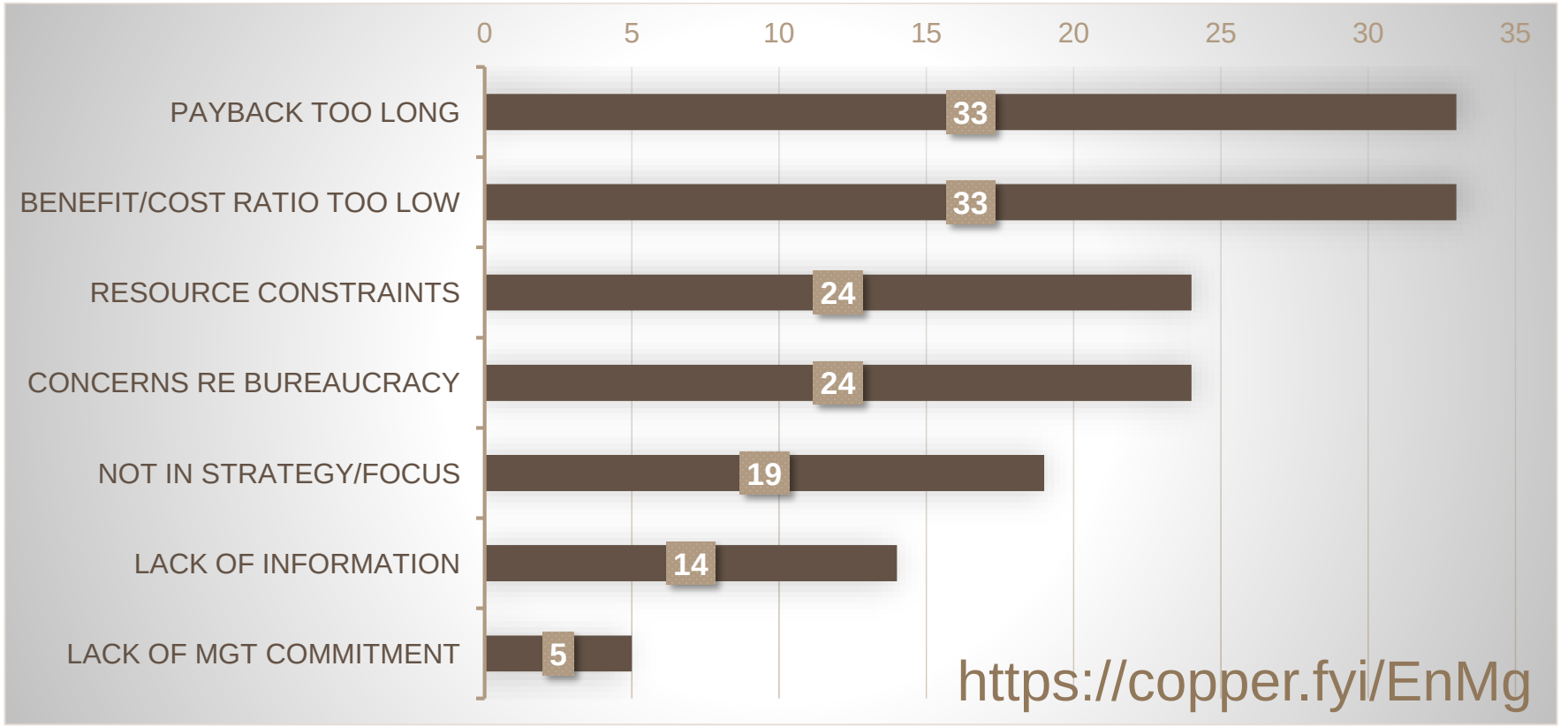


- Not really
- Ad hoc, no systematic approach
- Systematic approach but no EMS
- Energy Management System

https://copper.fyi/EnMg

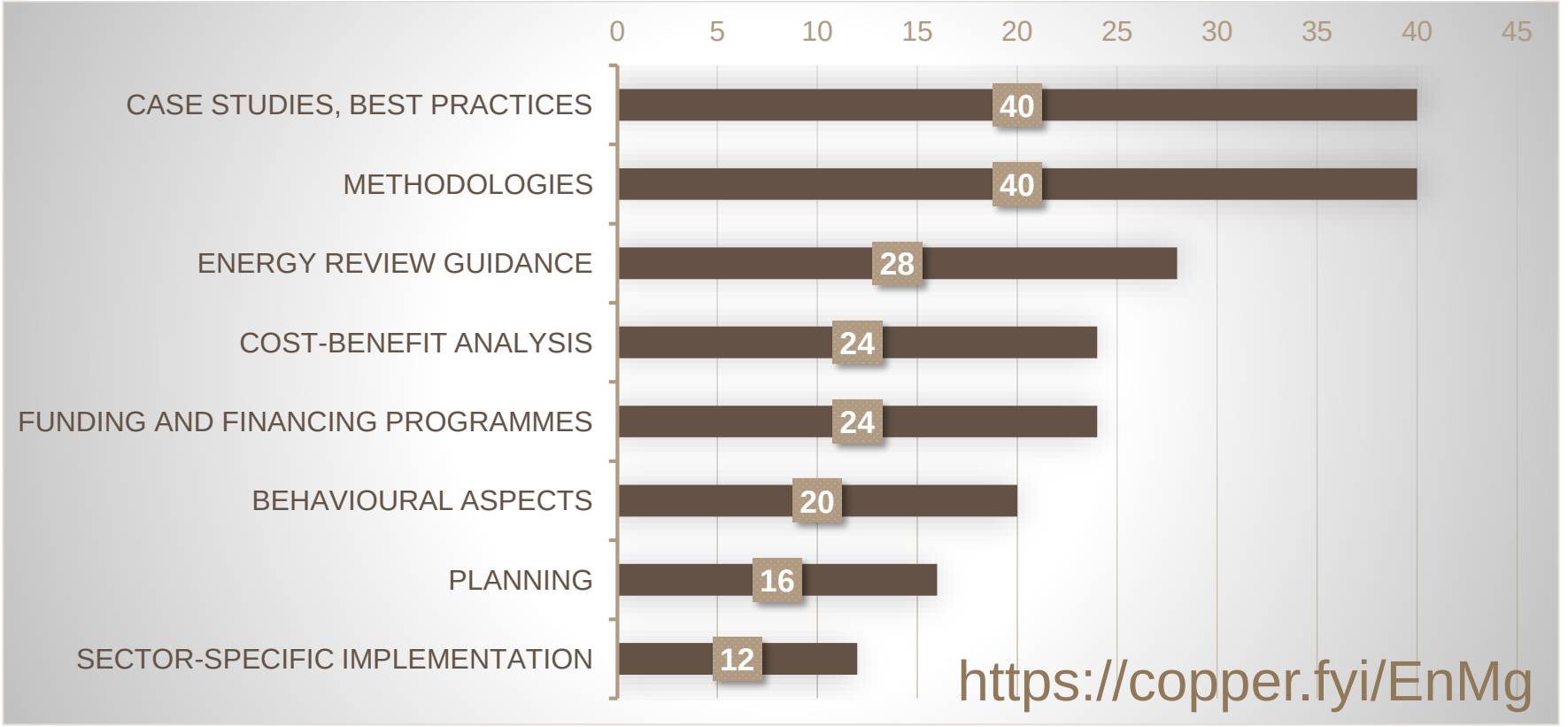
Energy management practices in SMEs: online survey (2021)

What is the main resistance in your organization towards implementing Energy Management System?



Energy management practices in SMEs: online survey (2021)

What info/training is missing on energy efficiency measures and in particular Energy Management Systems?



ECI activities to support SMEs and promote energy efficiency in industry

Energy Management in SMEs

Application Note to implement Energy Management (like ISO50001 standard) in a simplified and pragmatic way, tailored to the type and size of the SME

» copper.fyi/EnMg

Frequently Asked Questions

Online helpdesk on the implementation of Energy Management practices

Good Practice Guide

60+ Application Notes

- **more practical** guidance than informative articles
- **lighter to read** than technical guides

» lpqi.org

Accelerated motor replacement (1/2)

Motors in industry & tertiary are used **far beyond their expected lifetime** (significant % of operating IE1 and below still in service).

New motors installed must meet Ecodesign regulation, but **dedicated motor renovation** initiative could harvest earlier an important contribution to EU target.

Saving opportunity, replicated over several years:
18 TWh/y for motors only
45 TWh/y (4Mtoe/y) for system-level

Energy savings obligations (EED art.7) provide the **right framework** for motor renovation;
yet some open issues to be addressed

Accelerated motor replacement (2/2)

April 2021 WORKSHOP
ECI & University of Coimbra

- Barriers for implementation
- Policy options
- Wide expression of interest

June-Aug 2021
SURVEY (ECI)

- 10 EU Member States
- 75% of EU27 motor electricity consumption in tertiary and industrial sectors
- National authorities and energy agencies involved in the implementation of EEOs

- Receive support
- Assessment of savings potential
- Development of a methodology for savings calculation

Confirmed strong interest to take forward

Partnerships

ReFreeDrive

U4E United for Efficiency

INTAS

stream SAVE

Energy Efficiency Directive (recast): ECI's position

- EED recast proposal reinforces the role of energy efficiency in the energy transition (EE1st in all sectors)
- Provisions include the shift towards better energy efficiency **monitoring**, the wider scope for **energy management practices**, and the reinforcement of the quality and follow-up of **energy audits**.
- Need focus on those economic sectors and application domains with vast **untapped cost-effective energy efficiency improvements:**
  - In the segment of small and medium-sized companies (SMEs);
  - In the heating and cooling sector, eg. via the recovery of heat;
  - At the systems level, such as indoor electrical installations (2% of electricity generated is lost in indoor electrical installations due to improper cable sizing for heavily loaded circuits)

Energy Efficiency Directive (recast): ECI's position

- **Improve the quality** of energy audits and the **level of adoption** of cost-effective recommendations from energy audits, **without making such implementation mandatory**
- Welcome the strengthened provisions on promoting energy management systems, however:
  - industry (especially SMEs) should be **supported in the implementation;**
  - **certification** should not be a barrier for the uptake;
  - simplified and pragmatic approaches that are tailored to the type and size of the company should be considered

Thank you

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