Decarbonizing industrial process heat:
Stakeholder Consultation Workshop

The event will start at 9:30 CET

Opening remarks

European Commission

Political context: The Clean Industrial Deal

- The Clean Industrial Deal (CID) is a response to **strengthen European industry's competitiveness**.
- A clear commitment to the **2050 objective** of the EU becoming the first climate neutral continent, including through the proposed **intermediate 2040 target of 90%.**
- Public and private **financing is one of 6 drivers** presented in the CID.
- Helping European industry to invest by **improving the business case of decarbonisation projects**.
- The CID proposes a new auction in the Innovation Fund, in addition to the existing hydrogen auctions:
- *"the Commission will launch in 2025 a pilot with a **EUR 1 billion auction** on the decarbonisation of key **industrial processes** across various sectors [...], using [...] resources under the Innovation Fund and Auctions-as-a-Service."* (CID, February 2025)

INNOVATION FUND

Funded by the EU Emissions Trading System

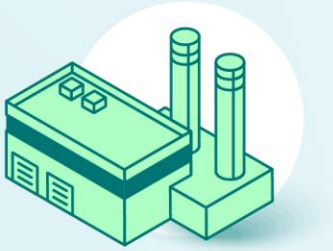
Deploying innovative net-zero technologies for climate neutrality

€40 billion* available between 2020-2030

grants awarded through regular calls and auctions

avoid GHG emissions, boost competitiveness

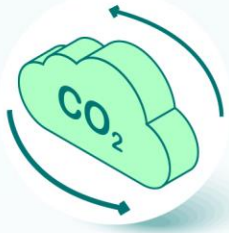
supporting innovation in:



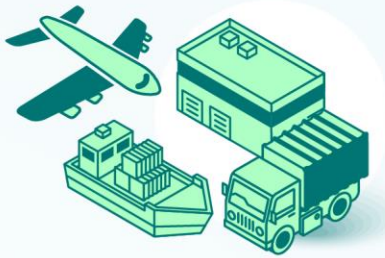
Energy-intensive industries

Renewable energy

Energy storage



Carbon capture, use and storage



Net-zero mobility and buildings

*based on a carbon price of €75/tonne

Goals of this workshop

The pilot auction, to be launched end of 2025, will support the **decarbonisation of industrial process heat** and preparation is kicked-off with today's workshop:

The goals for today:

- Understand the **current landscape of industrial process heat** incl. challenges, opportunities & priorities of stakeholders.
- **Explain and discuss key design elements** of the envisaged auction to ensure draft T&Cs will be attractive and workable for industry and project developers.
- Establish contact and **build a stakeholder community** for future events; build& understand project pipeline.

European Commission

Workshop etiquette

- Please **name yourself** “F. Lastname, Organisation” in Webex.

- Online participants, please **keep your microphone muted and cameras off**, unless you’re called on for a question during Q&A.

- If you would like to ask a question during Q&A please use the **online hand-raise function.**

- More than 1000 participants are registered for the event, so not all questions will be answered. However, there will be the opportunity to send feedback during a **survey** following the event.

- The event is being **recorded and live-streamed**.

Auctions in the IF

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The Innovation Fund (IF) uses different types of funding instruments

Regular grants:

- Support allocated through a multi-criteria evaluation and scoring process (5-7 evaluation criteria).
  Longer application, longer evaluation process.
- Targeted at early-of-a-kind commercial application of innovative technological solutions.
- Covering all eligible IF sectors.
- 10 calls launched with total budget of EUR 15.6bn

Auction grants:

- Allocated through an auction with competition on price. Qualification criteria pass/fail only.
- Fewer documents requested, faster evaluation.
- Targeted at scale-up and roll out.

- Only for renewable hydrogen production.
- 2 auctions launched with total budget of EUR 2bn.

What is an auction in the context of a subsidy?

- An auction is a process in which goods or services are offered for bidding.
- In the case of a subsidy scheme, what is auctioned is *not the product itself*, but rather a *subsidy* for the specific activity or product. Examples:
    1) Renewable energy auctions e.g. in Poland, Germany or UK.
    2) EU-wide renewable H2 auction under the Innovation Fund.
- Typically, bidders requiring the *lowest* public subsidy for an auctioned activity or product will win the subsidy.
- Core qualitative elements still checked through qualification.

Key differences between auctions and regular grants

Regular grants		Auction
• Coverage of up to **60%** of relevant cost possible. Cumulation allowed.	⇨	• Coverage of up to **100%** of funding gap possible. No cumulation with other funds.
• Reliance on relevant cost **calculation / financial model** to determine funding gap.	⇨	• Reliance on price **competition** to reveal funding gap.
• **Payments before entry into operation** possible. Some construction risk taken by the IF.[1)]	⇨	• **No payments before entry into operation**. Construction/tech risk remains with private sector.[1)]
• **Milestone-based** payments. Flexibility in the definition of milestones.	⇨	• **Output-based** payments of certified and verified production. Proportional to output.
• Due diligence fully covered through application & evaluation process.	⇨	• Due diligence can be partially rolled onto **completion guarantee** (“forfeited deposit” in ETS Directive).
• Possibility to support various products in a single call.	⇨	• Need to focus on one uniform auctioned good.

1) Please note that *both* instruments can cover OPEX and CAPEX costs.

What are the advantages of using auctions for technologies that are moving towards market roll-out?

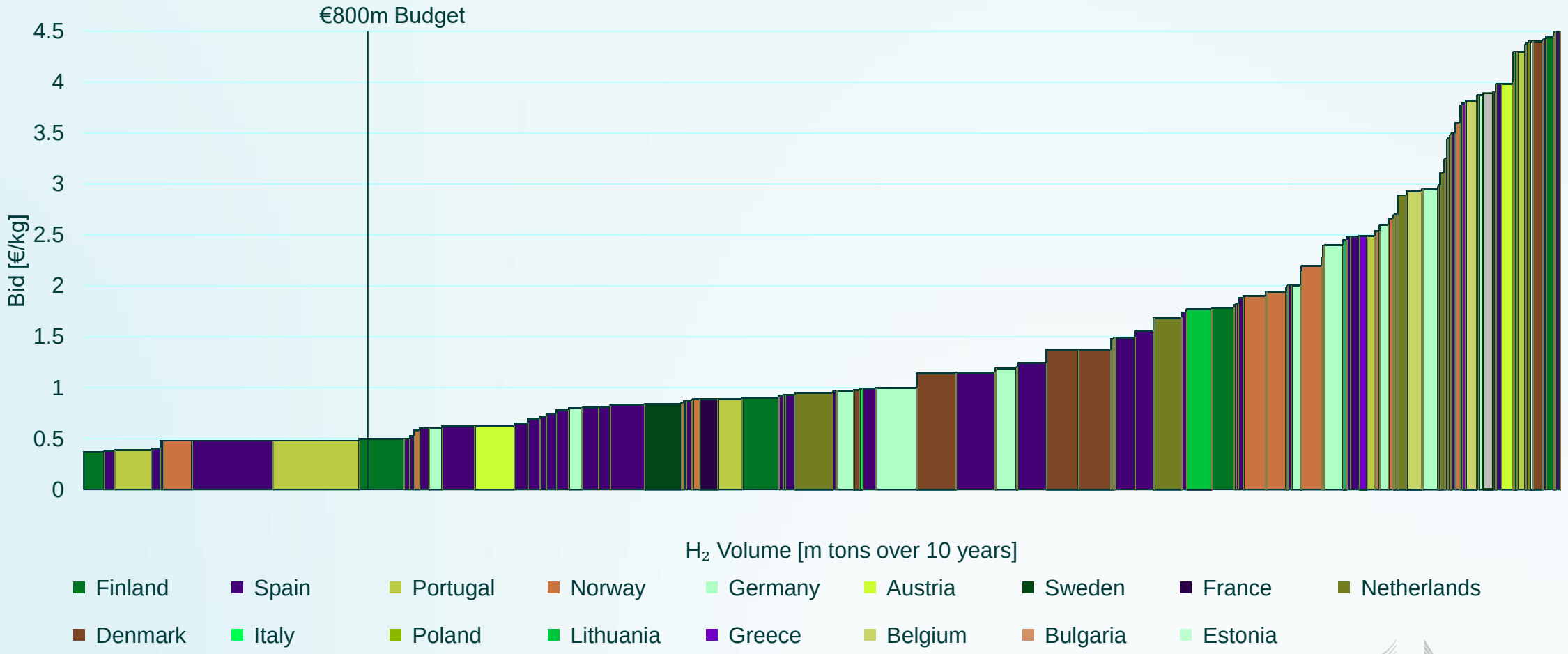
1. **Cost-efficiency:** Auctions have been a major success story in the power sector in many Member States, bringing down funding needs for renewables and creating competition between project developers.

2. **Project risk distribution:** Auctions that allocate a production-based subsidy leave technology- and project development risks with the project promoter to a much larger degree than grants that include pre-financing components.

3. **Price discovery and market formation:** If there is sufficient competition, auctions reveal the 'real' private sector cost of engaging in a specific decarbonisation activity.

4. **Reduced administrative burden:** Reliance on incentive structures and bid/completion bonds can partially replace documentation-heavy evaluation processes. Faster time from application to grant.

We will build on the experience of two successful auctions for H2 production in 2023 & 2024



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Decarbonising Industrial Process Heat

European Commission

Contents

1. Status quo of process heating in European industry
   - GHG Emissions of the European industrial sector
   - Distribution of process heat use by sector and temperature level
2. Potential technologies for process heat electrification
   - System studies insights
   - Impact of lifetimes of new investments
   - Technical potentials for direct electrification
3. Cost analysis of direct process heat electrification
4. Analysis of cumulative GHG emissions among Member States
5. Key take-aways

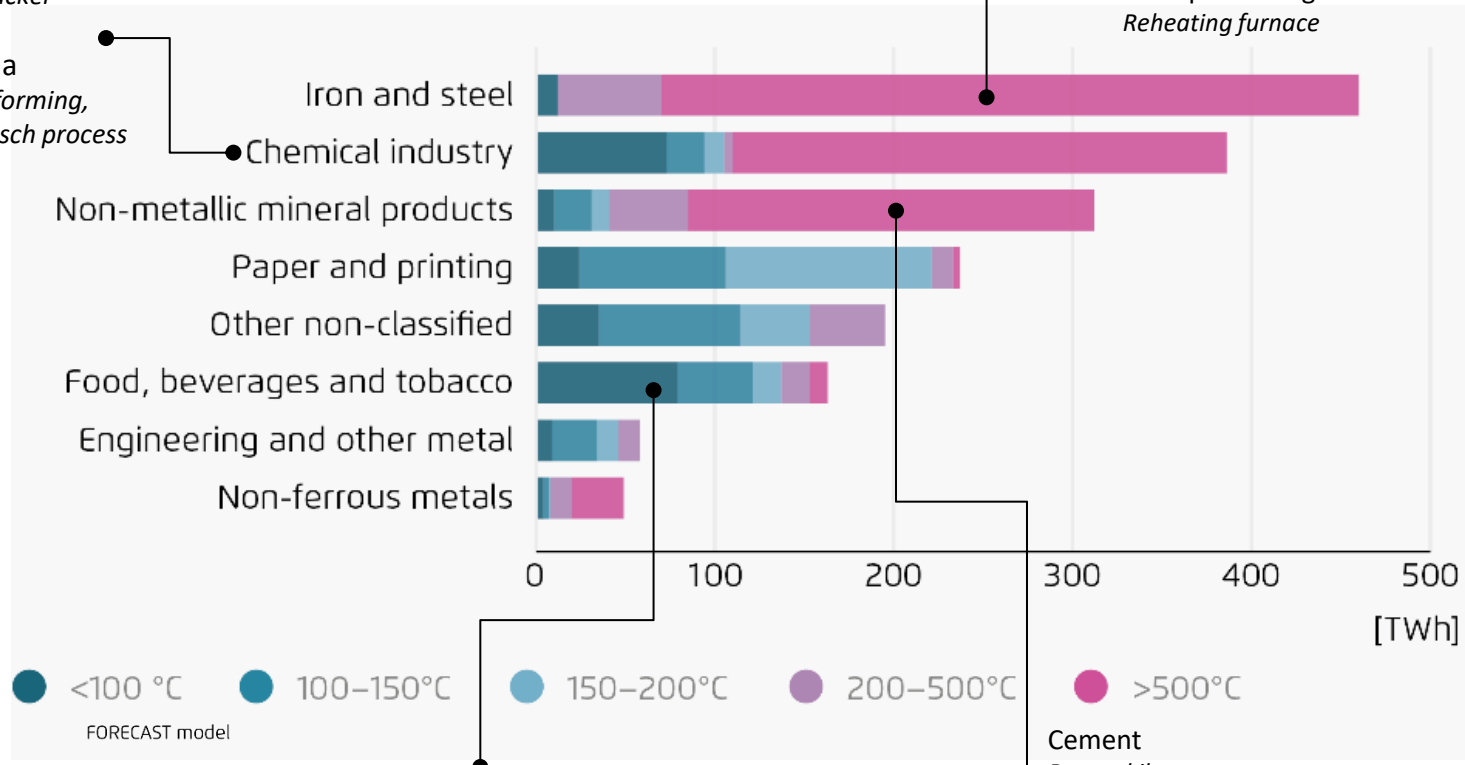
Currently half of estimated total final energy demand for process heating is used in high temperatures levels above 500°C

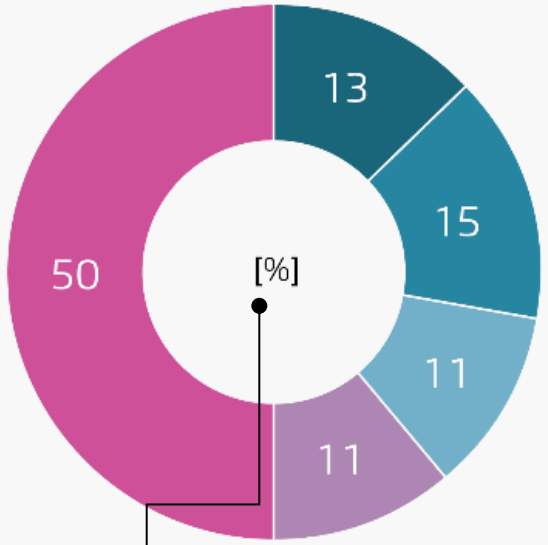
Steel production
Blast furnace/basic oxygen furnace, electric arc furnace

Steel processing
Reheating furnace

Olefins:
Steam cracker

Ammonia
Steam reforming, Haber-Bosch process





Total: 1861 TWh (17% of EU27 total FED in 2019)

Food
Steam generation, steam-drying, sterilization, cooking

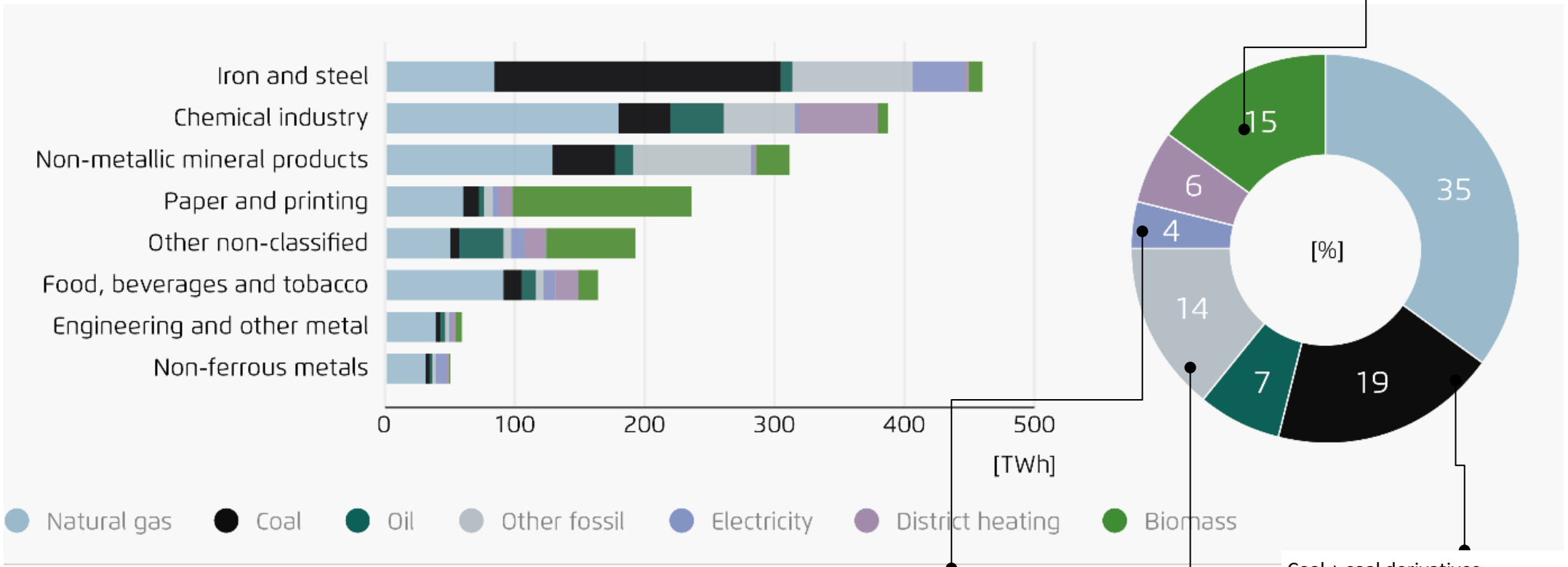
Cement
Rotary kiln

Lime
Shaft furnace

Data: UNFCCC, Eurostat, AGEB, Fraunhofer ISI

Natural gas accounts for a third of industrial energy use - the reference energy carrier for heat production in all applications

EU27, 2019



FORECAST model

Biomass
Used by availability (i.e. production residues in paper, wood processing).

Electricity
Limited use, e.g. in electric arc furnaces and induction heating.

Coal + coal derivatives
~1/3 of energy use.
Reducing agent in iron production.
Limited use for other heat production.

Data: UNFCCC, Eurostat, AGEB, Fraunhofer ISI

Fraunhofer ISI

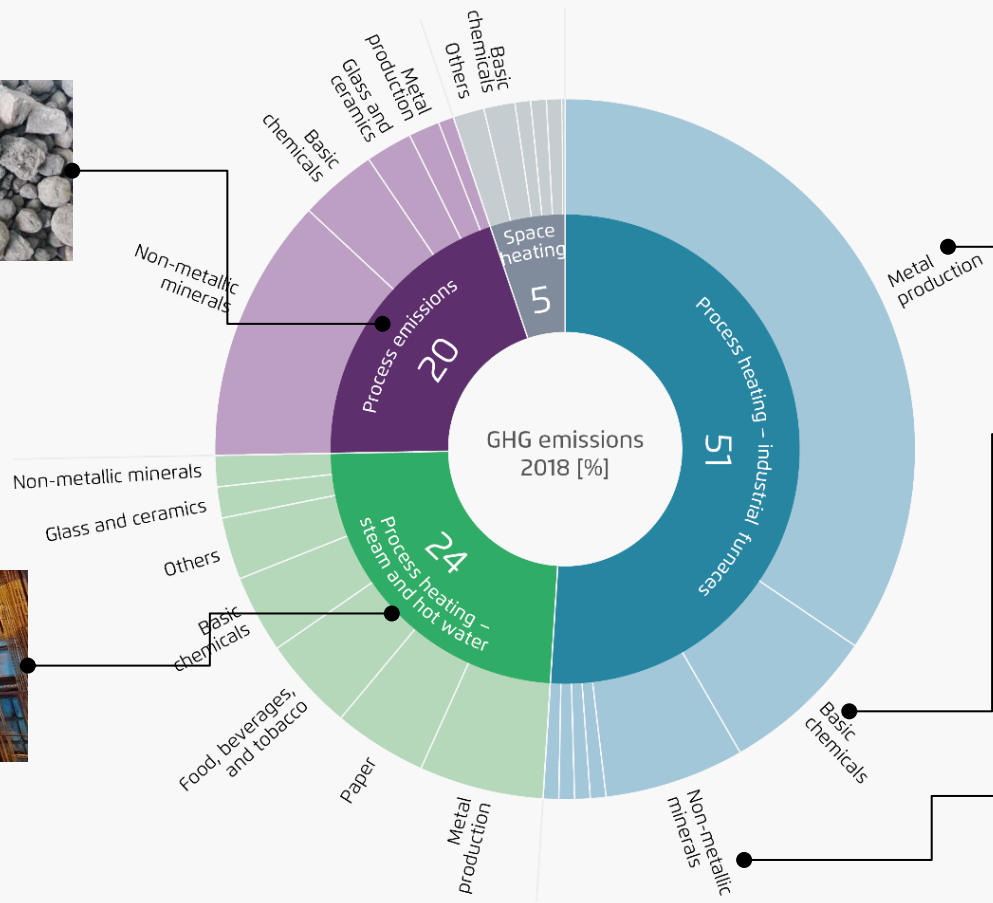
Approximate structure of GHG emissions of European industry sector

EU27, 2021

Chemical reactions releasing CO_2 – regardless of heat generation

Hot water, steam

Sanitary paper, shipping boxes, processed food



Reheating, smelting, melting

Buildings, cars, electronics...

Cracking, reforming

Fertiliser, plastics, detergents, cosmetics...

Calcination, sintering

Buildings, roads, bridges

Fraunhofer ISI

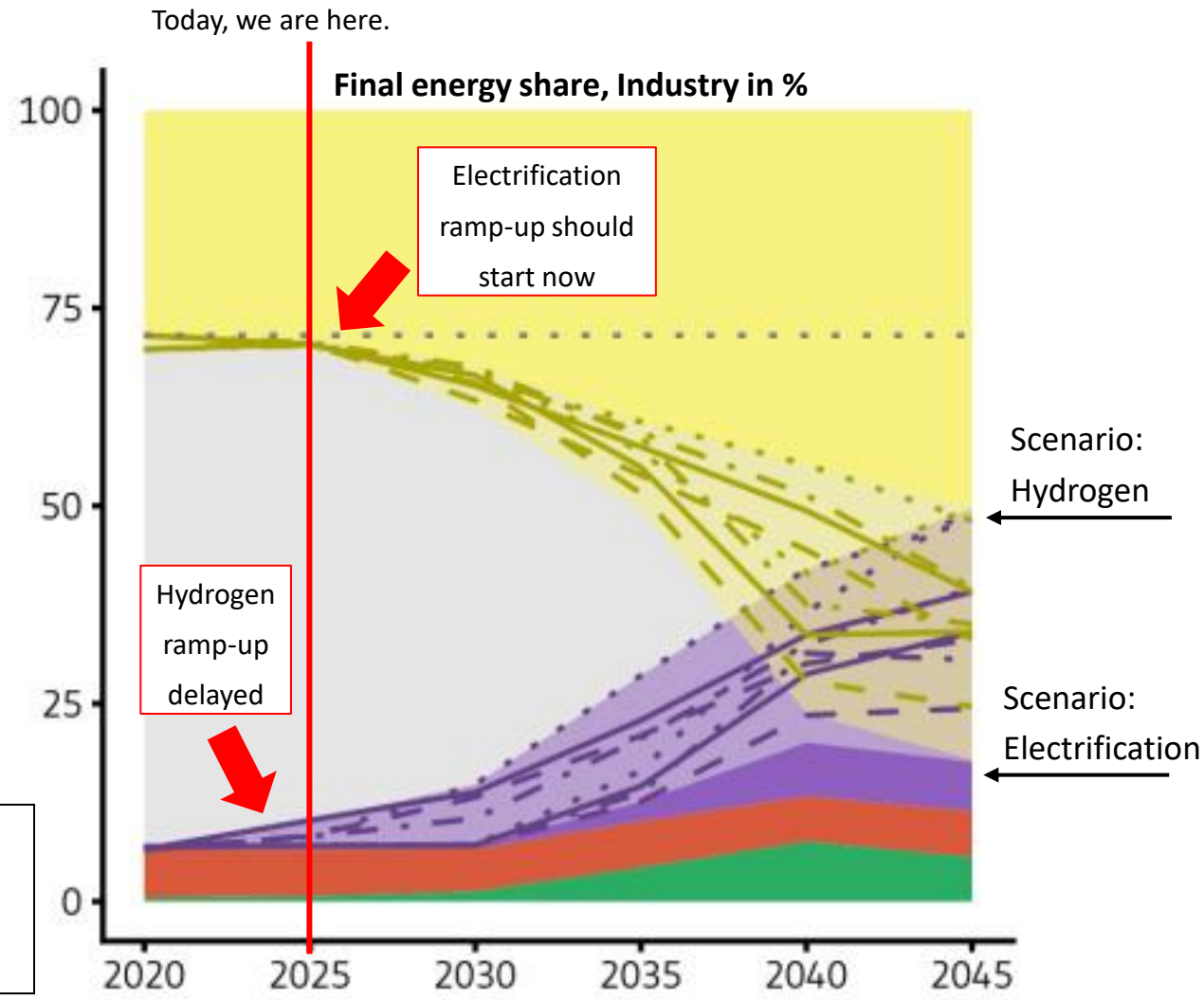
Total: 663 Mt GHG CO2 eq. (EU27 total FED in 2023)

Images: Leube Baustoffe, NLMK Group, BASF, Shutterstock

Data: UNFCCC, Fraunhofer ISI

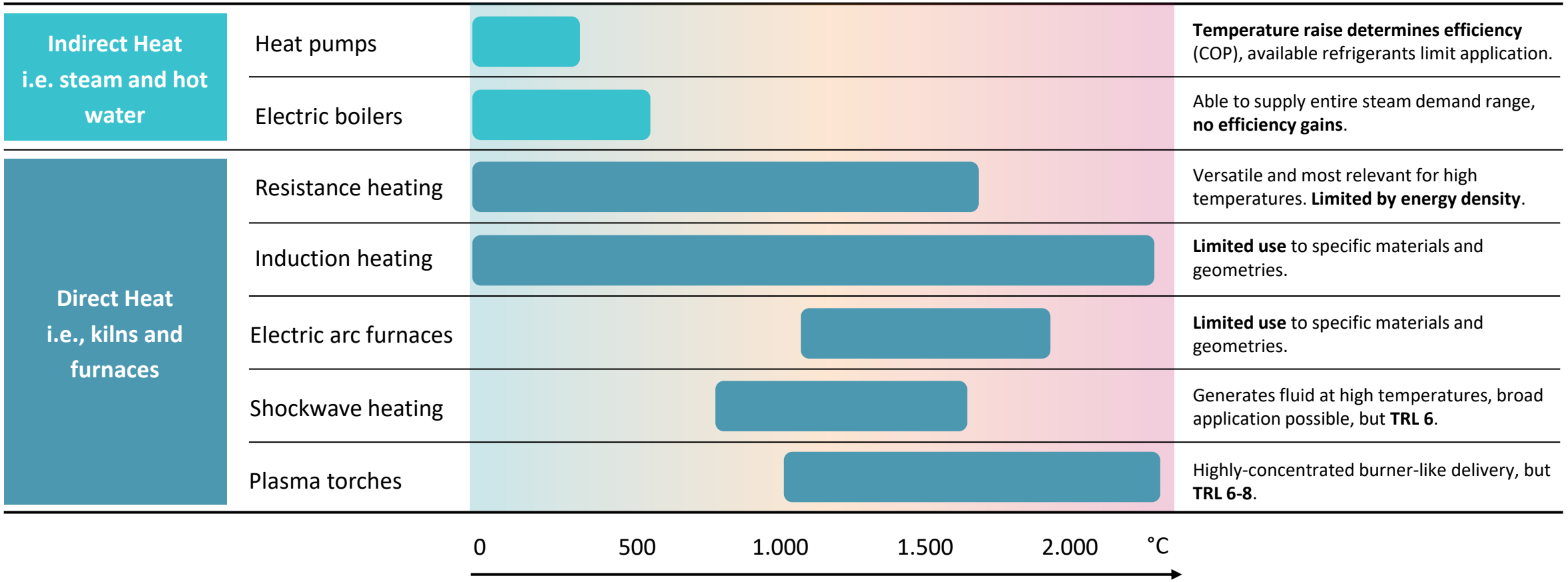
Systems studies identify robust and cost-effective direct process heat applications

- Several energy system studies analyse decarbonisation pathways.
- Comparisons of scenarios identify robust electrification and hydrogen demand as well as areas of uncertainty.
- A high share of direct electrification is expected for industry (~50-80%).
- Even scenarios with high hydrogen usage expect strong increase in direct electrification.

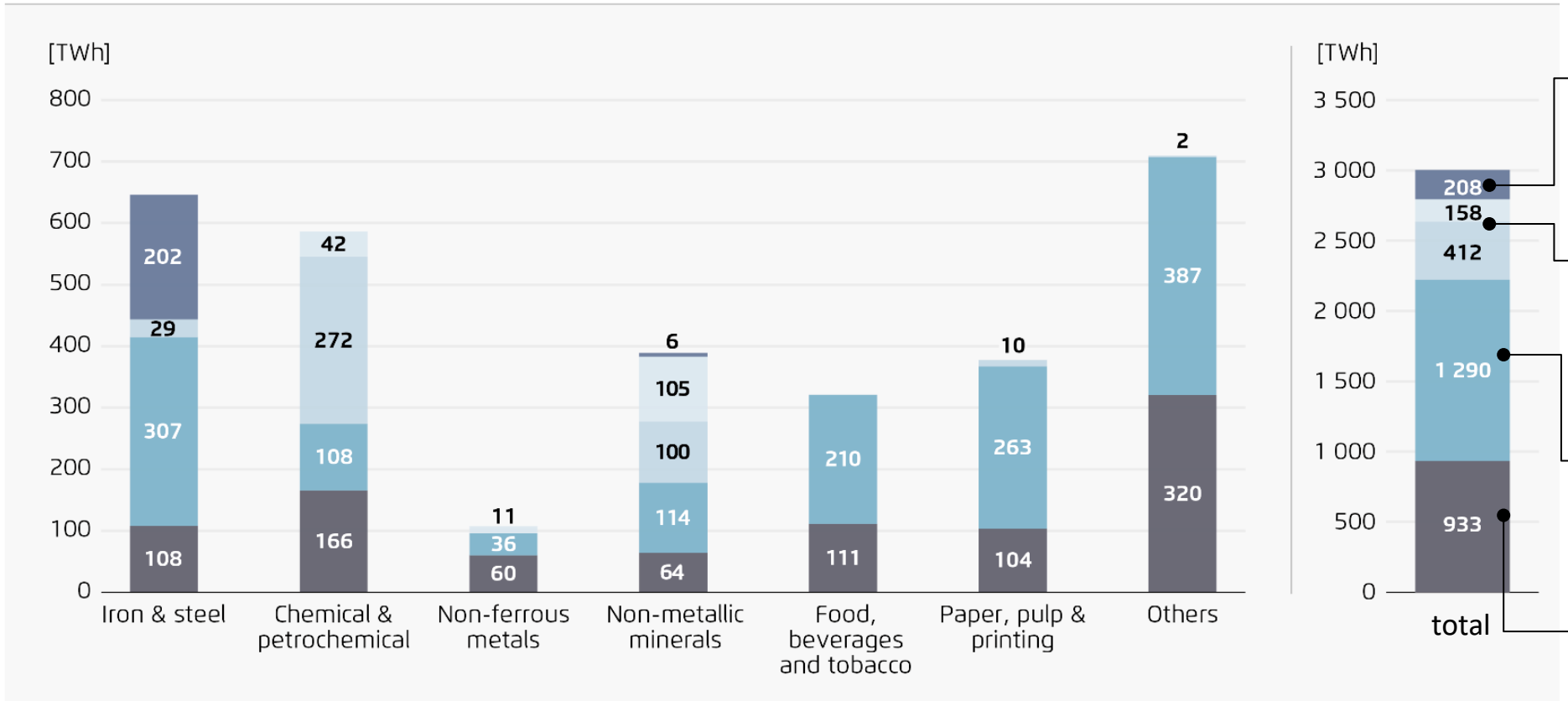


Data: Falko Ueckerdt et al. (2021): *Taking off despite uncertainties: Key points of an adaptable hydrogen strategy. How policymakers can find hydrogen pathways to climate neutrality by 2045. Ariadne policy brief*

Direct electrification faces technical limitations at high temperatures, but low-temperature technologies are advancing rapidly



With available technologies, up to 40% more industrial energy demand can be electrified until 2030



EU27, 2019

Less than 10%
require molecules *as feedstock, i.e. iron ore and non-energy use in the chemical industry.*

Additional 20%
requires ***technology development*** *(availability estimated 2030/2035), especially for* ***high-temperature and high-density****.*

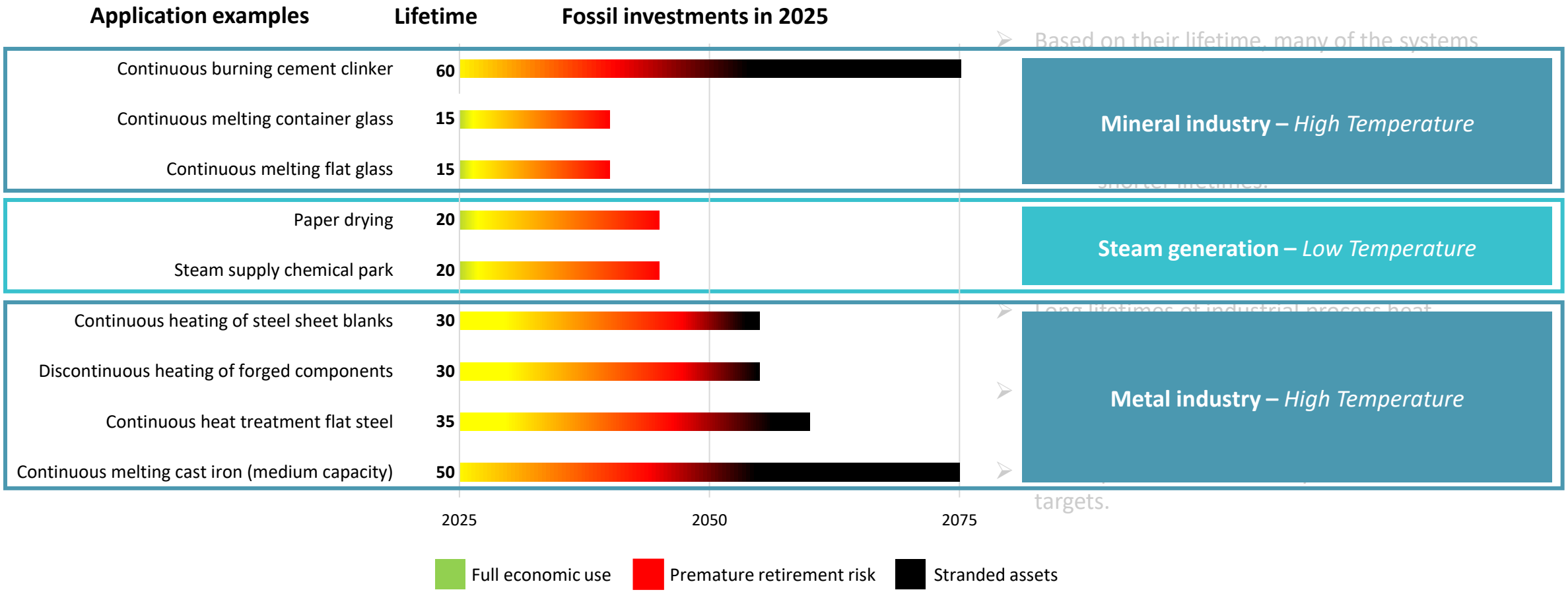
Additional 40%
could be electrified with ***existing and available technologies****, particularly* ***low-medium temperature*** *demand, also* ***some high-temperature*** *areas.*

About 1/3 of industrial energy demand is already electricity. *Mostly for cooling, motors, lighting.*

Data: Fraunhofer ISI(2024) https://www.agora-industry.org/fileadmin/Projects/2023/2023-20_IND_Electrification_Industrial_Heat/A-IND_329_04_Electrification_Industrial_Heat_WEB.pdf

Fraunhofer ISI

Many post-2025 investments in fossil heat are incompatible with net-zero pathways and risk becoming stranded assets



- Based on their lifetime, many of the systems
- Long lifetimes of industrial process heat
- targets.

Data: Fraunhofer ISI

Fraunhofer ISI

What is the cost impact when transitioning from natural gas to electrified heat in Steam, Metals, and Mineral Processing?

- **Industrial heat pumps are a key technology for electrified steam generation** because of high efficiency but cannot be used for high temperatures.
- **Electric boilers can support** steam generation up to 500°C.
- **At high temperature levels, limited efficiency gains** through electrification can be realised.
- Technologies such as **resistance heating and induction heating** will become available and cover all ranges up to 2,500 °C.

➔ **Let's take a closer look at a cost analysis.**

Assumptions for sensitivity analysis on economics of electrified industrial heat:

Scenario	Electricity Price €/MWh	Natural Gas Price €/MWh	Carbon Price €/MWh
2024 Prices	138	41	75
€100/t carbon price	76	31	100
€200/t carbon price	76	31	200

Vast range of heat applications analysed for the following industries:

Steam generation *Low Temperature*

Metal industry *High Temperature*

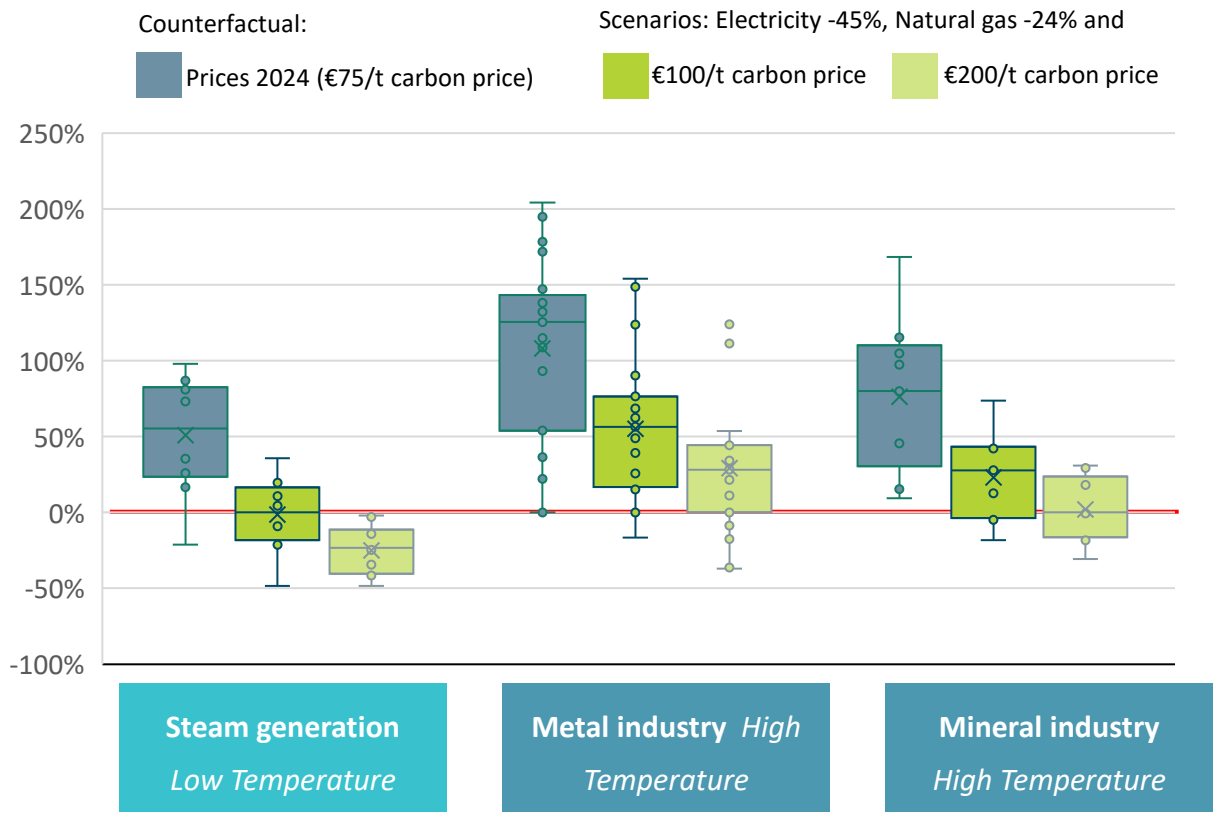
Mineral industry *High Temperature*

Quelle: Fleiter, T.; Rehfeldt, M.; et al. (2023): CO2-neutral process heat generation. Ed. by Federal Environment Agency (UBA)

Cost competitiveness of electrified heat applications are determined by the development of the carbon price and prices for electricity and natural gas

- **Currently**, **in all industries, cost gaps** of heat electrification and cost ranges vary significantly.
- **Assuming €75/MWh electricity price** for industry:
  - **Steam generation:** Cost competitive with small increase of carbon price to around €100/t.
  - **Mineral industry**: High carbon price of €200/t is needed to make electrification economically viable.
  - **Metal industry**: Carbon prices of more than €200/t are needed to close cost gap.
- For cost parity, **additional subsidies needed in all industries**:
  - In low-temperature application, compensation for electricity price might be sufficient.
  - In high-temperature applications additional carbon price of €200/t required, in metal industry even more.

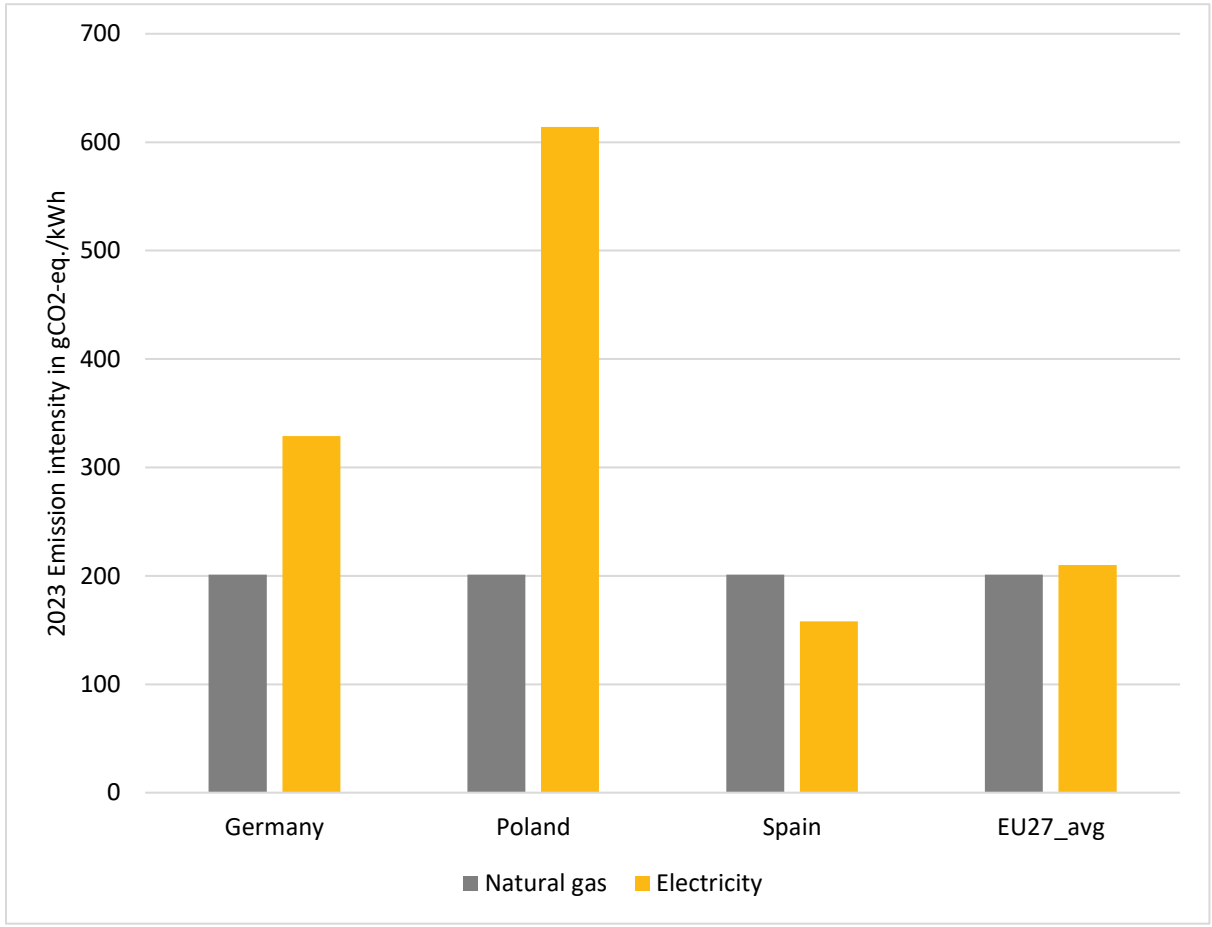
Additional levelised costs of electrical heat compared to fossil reference



Source: Fleiter, T.; Rehfeldt, M.; et al. (2023): CO2-neutral process heat generation. Ed. by Federal Environment Agency (UBA)

In 2023, electricity was more emission-intensive than natural gas in nearly half of EU Member States. What is the climate impact of industrial heat investments made today?

- With the continued expansion of renewable energy, **total emissions are expected to decline** steadily over the coming years.
- But how does this trend affect the GHG footprint of a new **investment in electrified heat generation made in 2025**?
- A brief analysis:
  - **Assumption:** Linear reduction in electricity emission intensity until 2050
  - **Use case:** 5 MW heat generation capacity
  - **Operation:** 8,000 full load hours per year

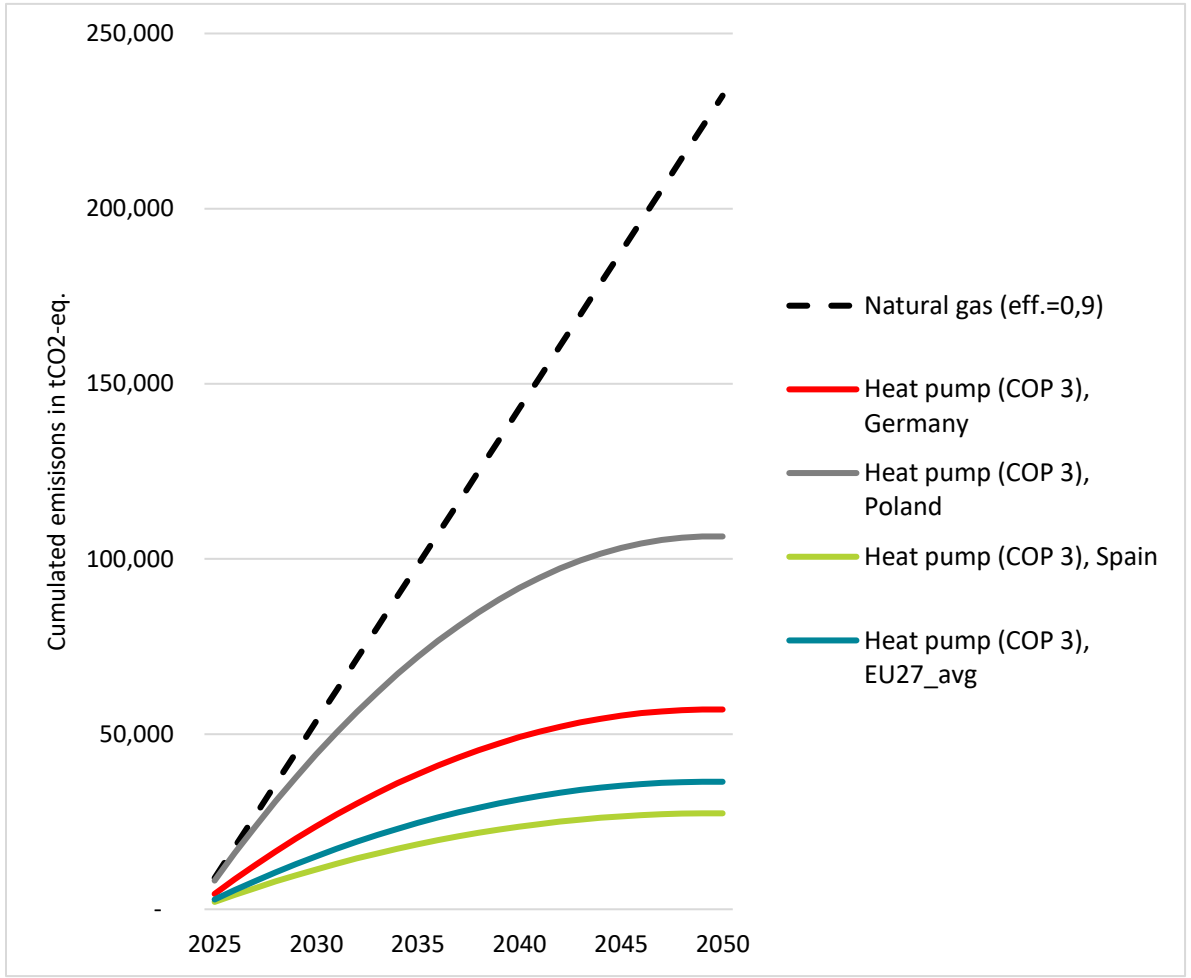


Data: Fraunhofer ISI

Despite current grid emissions, heat pumps already reduce GHG emissions in low-temperature heat generation

Heat Pump steam generation *Low Temperature*

- Assumption of **heat pump efficiency*of 3** in all Member States**.**
- The greater the **temperature lift**, the lower the efficiency of heat pumps.
- Using **geothermal, solar thermal, district heating or waste heat** can **reduce temperature lift** and improve heat pump efficiency.
- Additional **electric boilers needed to boost temperatures** may lower overall efficiency.



*COP = Coefficient of Performance

Data: Fraunhofer ISI

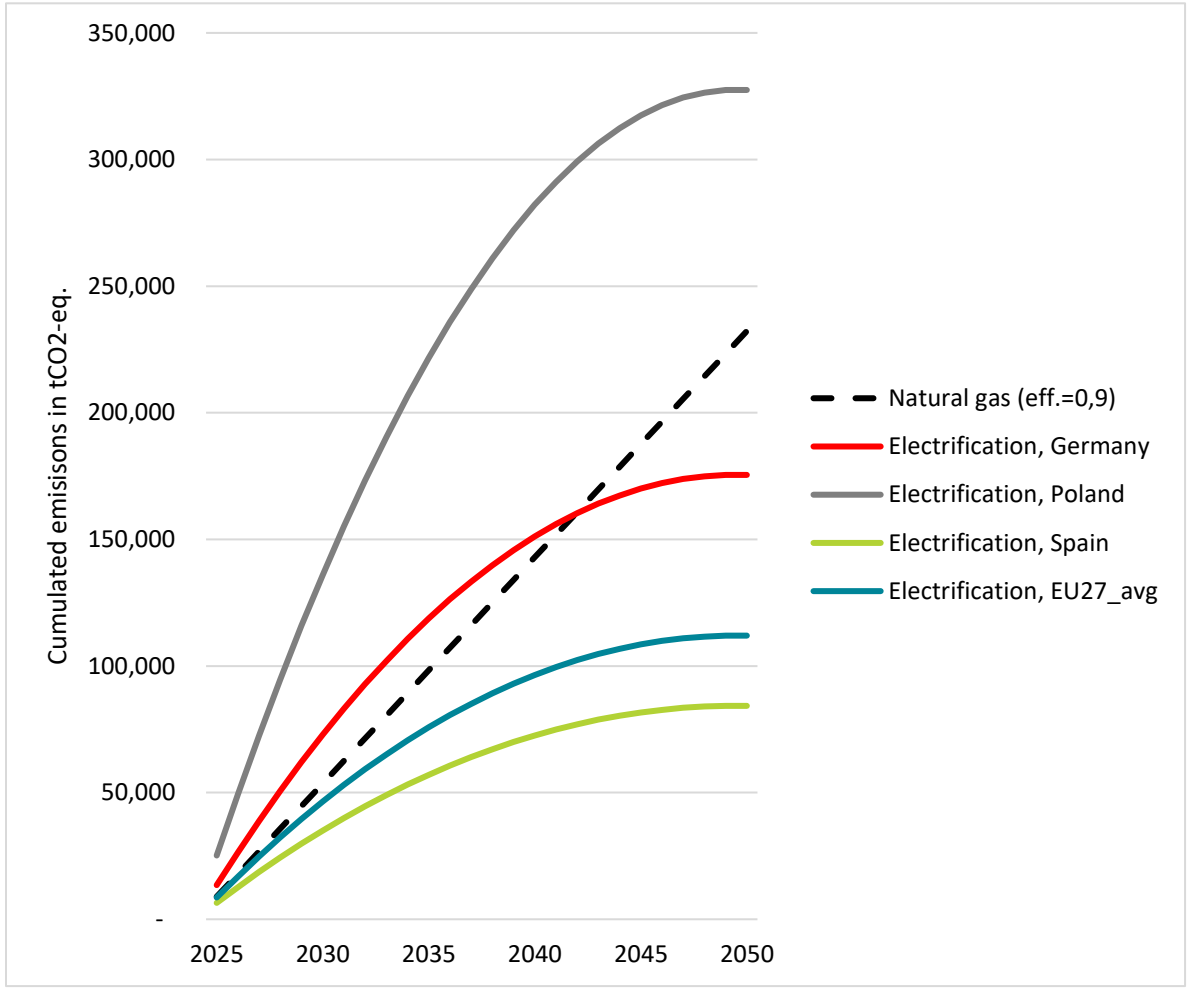
Fraunhofer ISI

In high-temperature process heat production, the electricity emission factors of 22 Member States will yield lower total emissions if electrified now

Resistance heating in furnace *High Temperature*

- **Electrifying industrial furnaces does not result in significant efficiency gains** (Assumption of 97,5% efficiency in electrified furnaces vs. 90% with natural gas).
- Assuming a linear reduction in electricity production's emission intensity, **installations in Member States with lower emission intensity than Germany will result in lower total emissions if electrified now**.

  ➔ That's in all but 5 countries (e.g. Poland).
- Investments in electrified heat **after 2025** will lead to **lower cumulative emissions** as the emission factor of electricity grids continues to decrease.



Data: Fraunhofer ISI

The key take-aways: Limited technical barriers for electrifying process heat remain – focus must shift to economics and implementation.

- Decarbonising industrial heat is essential as three quarters of industry's CO_2 emissions come from fossil process heat.
- Direct electrification can technically cover 90% of industrial heat demand by 2035 – most of it with today's technologies.
- There are cost gaps in all applications of electrified heat, with steam generation coming nearly cost competitive when heat pumps are integrated.
- Although electrification of high temperature processes might lead to higher cumulative emission in a few Members States, market ramp-up needs to start today to reach carbon neutrality and avoid stranded assets in 2050.
- Total GHG emissions will not increase with electrified heat as electricity generation is below the ETS emissions cap.
- Electricity infrastructure access is a major requirement. Site-specific challenges need to be overcome.
- Technology learning must be facilitated by early market introduction and platforms transporting the knowledge.

Considering the importance of heat emissions, there is potential for increased support from the IF

Food and beverage sector in Croatia

- Combined **heat pump, solar thermal heating plant** and **storage system**
- Provides renewable energy in **energy-intensive malt production process**
- **EUR 7.5 million IF contribution**
- Operation entry in **July 2027**
- Project name and link: DMC2

Glass sector in Czechia, Italy, Netherlands, Slovenia and Spain

- Several IF projects support direct electrification of process heat (incl. **hybrid solutions**) in glass production
- **EUR 36.7 million** in total for 7 different projects
- Entry into operation between **Jan 2024** and **Dez 2025**
- Project names and links: VITRUM, HFP, BEAR, PRIMUS, Volta project, MAGNUS, FELIX

Chemistry sector in Norway

- 2 highly innovative projects: Industrial-scale **electric cracker** (e-cracker) for VCM production and **electrified steam methane reforming** (eSMR) technology biomethanol production
- **EUR 55 million** IF contribution for the two projects
- Operation entry planned in **Sept.** and **July 2028**
- Project names and links: eReform

Iron steel sector in Italy

- **Innovative Heating Material System** technology for the production of steel bars
- Higher **energy efficiency** than alternative heating systems
- **EUR 7.5 million** IF contribution
- Operation entry foreseen in 2028
- Project name and link: LowCO2bars

Why decarbonisation of industrial process heat?

- Large, cost-effective and not sufficiently exploited decarbonisation potential **across all industrial sectors**.
- Vast technology improvements for decarbonised industrial heat making electrification in previously unthought of applications possible.
- Strong **benefits for companies of all sizes** facing capital constraints to make the switch.
- Strong **geographical balance** of projects.
- High current **reliance on natural gas** poses security of supply risks – availability & price.

Proposed scope: direct electrification + solar & geothermal

- **Technical potential** for direct electrification is large **across industrial sectors**, and technological developments are rapid (higher temperatures etc.).

- Electrification has **energy efficiency advantages** across almost all sectors ranging from 5% in the ceramics and brick industry to 60% in steam-generation.
- Electrification as a clear priority in the Clean Industrial Deal.
- Electrification applications cover & are accessible to many **SMEs and mid-caps** (as opposed to e.g. CCS or H2 infrastructure connection)**.**
- Large potential across all EU countries **(geographical balance**).
- **Missing-money problem** in many electrification applications across industry.
- **Heat and electricity storage solutions** as well as investments in other **demand-side flexibility** options would also be incentivised as they could be priced into bids to ensure **flexibility.**

Out-of-scope: hydrogen, CCS, biomass & waste burning

Hydrogen:

- Already receives dedicated support in the Innovation Fund through the European Hydrogen Bank.
- High efficiency losses on systems level, high cost, scarcity: rationale to focus on electrification where electrification is possible & push the boundary of where direct electrification can work.

Biomass / waste (both renewable and non-renewable):

- Low availability & high demand for feedstock and biofuel production in the long-term. Priority use for liquid hydrocarbon fuels such as methanol and SAF, which require sustainable carbon.
- Low degree of innovation to replace burning fossil fuels to create with burning biogas / mass / waste.

CCS:

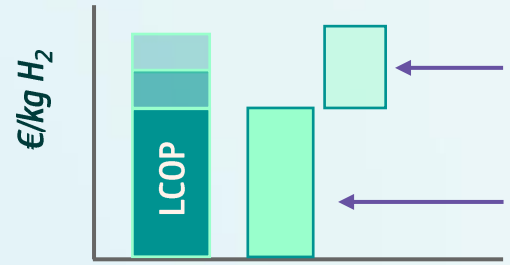
- Already heavily supported in the Innovation Fund.
- Low geographical balance of mature storage sites.
- Low accessibility for SMEs / midcaps due to lack of storage & transport infrastructure.
- CCS is prioritised for inevitable process emissions.

District-heating:

- Infrastructure not core scope of the Innovation Fund. Focus on specific heat generation technologies in industrial installations.

What different type of auction are we proposing for heat?

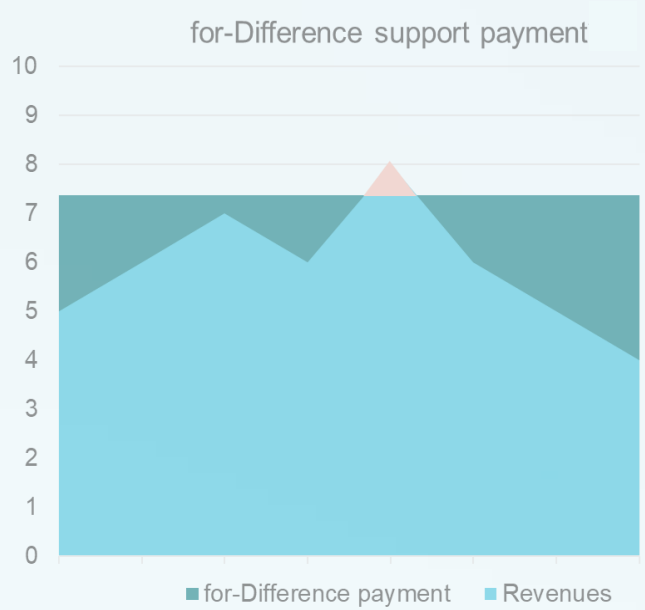
Fixed-premium auction

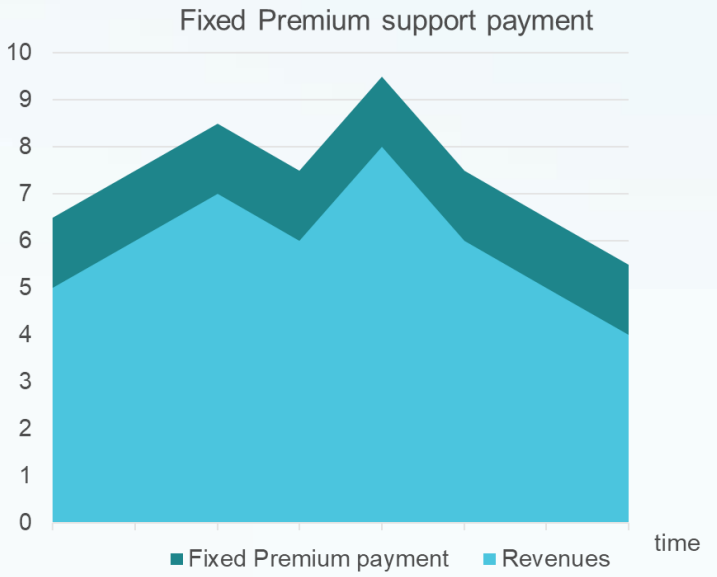


Need for subsidy: premium sought in the auctions

Revenues, including green premium

Bids ranked on price only, prequalification pass/fail





Broad outlines of an auction to support projects decarbonising industrial process heat

Who would be the bidder / beneficiary?	➢ Companies that switch to (brownfield) or deploy (greenfield) electrified or direct-renewable industrial process heat solutions, and realise emission reductions.
What would be auctioned?	➢ A **fixed-premium subsidy** in EUR/MJ of electrified or direct-renewable industrial process heat, or EUR/ tonne of CO2 abated.
What would the bid consist of?	➢ A **price** in EUR/MJ of process heat or EUR/t of CO2 avoided; a **volume** in MJ of process heat or t/CO2 abated per year, over XX years, and the thermal **capacity** of the project.
How are payments structured	➢ Projects would receive payments **from Entry into Operation onwards**, proportionate to their electrified or direct-renewable heat use/production or CO2 abatement.
What could be priced into the bid?	➢ Any costs that need to be covered in order to make the project financially viable (CAPEX, OPEX, DEVEX…), including costs for thermal or electricity storage to incentivise flexibility.

Coffee Break

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Auction design – first thoughts

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What do we mean with ‘auction design’?

- Auction design = how the auction will be organised + requirements for bidders
- Auction design → Terms & Conditions (‘T&Cs’) → Call text
- **Main elements in the T&Cs:**
  1. **Key auction parameters** (objective, auctioned good, type of support, budget of EUR 1 billion & possible budget baskets for differentiated auctioned goods)
  2. **Auction procedure** (static auction, single stage, pay-as-bid, price-only ranking, calendar)
  3. **Qualification requirements** (which projects are eligible, non-price award criteria)
  4. **Rights and obligations** for auction winners (monitoring and payments, mandatory milestones, completion guarantee, completion guarantee, flexibility of production, penalties, rules on combination with other public support)
- Some of the aspects are **already established**, **some need discussion** with stakeholders

Objective of the auction and project ranking

Objective of the pilot auction: to cost-efficiently support the reduction of GHG emission in industrial process heat

→ **Price-only ranking**

Which **other aspects** do we care about?

- **Innovation** spill-overs & replicability of clean solutions
- **Project maturity** (i.e. projects realised on time, no speculative bids).
- **Resilience** (i.e. 'EU value added' and/or avoiding dependencies on single third countries)
- Good **geographical balance** of projects able to bid into the auction.
- Auctioned good that benefits many **different sectors.**

→ Other aspects addressed through **qualifications, baskets, bid bonds** etc.

Qualification requirements

- Project located in **EEA/EU** (but no restrictions on nationality of project promoter)
- Minimum **size requirements of the installation**
- **New capacity installations (brownfield or greenfield)**
  - Those new installations can be partial refurbishment of existing industrial sites (i.e. fuel switch) and co-exist with existing fossil fuel heating solutions (e.g. use of waste heat from gas boilers by a new heat pump)
  - Project should not lead to expansion of fossil fuel capacity.
- **Time** to Financial Close / Entry into Operation
- **Minimum requirements** for the equipment
- Project Maturity (and completion bond)
- Resilience

Indirect emissions

Objective of the auction: to cost-effectively support the reduction of GHG in industrial process heat:

- Support only to projects with **no direct emissions**.
- In some cases (depending on technology, possibility for flexibility, power grid GHG intensity), increased **indirect emissions** may risk outweighing avoided direct emissions (mostly in short term).
- Should this be addressed through **additional requirements/conditions** for bidders?

Low temperature heat electrification solutions are generally **flexible**, don't need to operate continuously and react strongly to the power price signal reflecting emissions intensity / ETS price signal.

In addition, for **Heat Pumps**, especially with a high seasonal performance factor (COP/SPF), efficiency gains are by far offsetting any indirect emissions, regardless of the grid mix

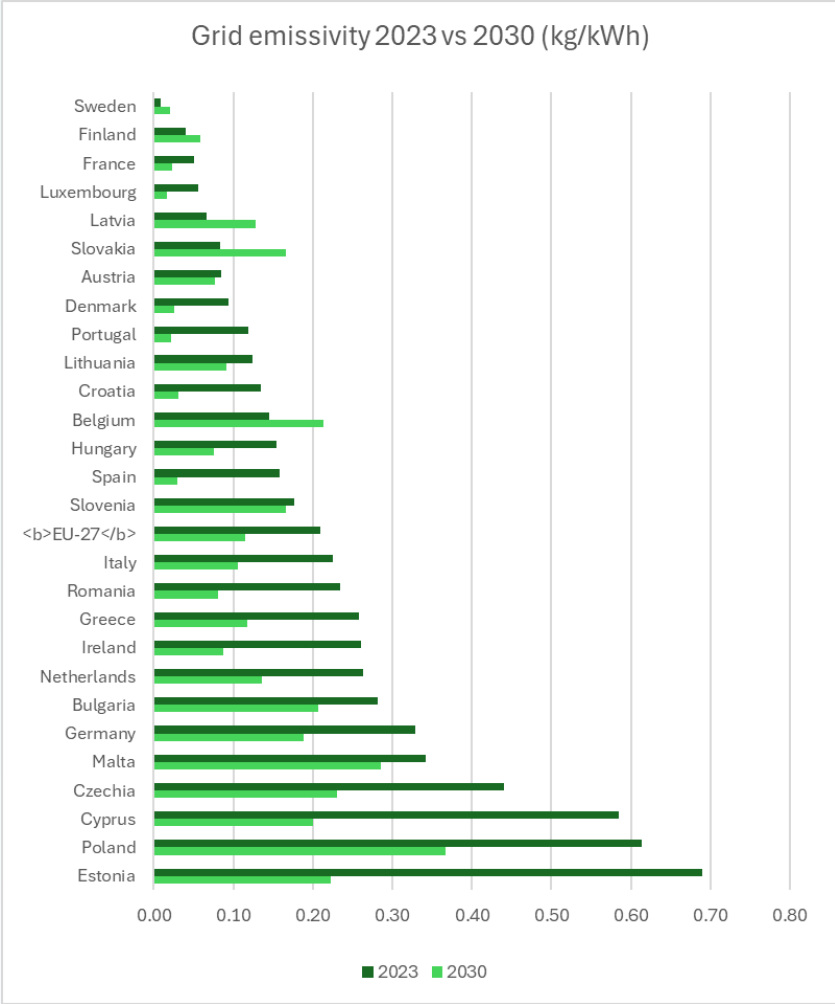
For **high temperature, baseload** processes, **without efficiency gains**:

- In some bidding zones, today, indirect electricity emissions would offset direct GHG savings.
- In the longer term, the grids decarbonize.

Discussion: does this need to be addressed with additional **requirements/conditions** around **demand-side flexibility solutions** and **power use** (full-load hour restrictions, PPAs, …)?

Indirect emissions cont'd

- Emissions of boiler fired with gas: 0.2 kg_CO_2/kWh
- Emissions of boiler fired with coal: 0.3 kg _CO_2 /kWh
- Average EU grid **GHG intensity today**: 0.21 kg _CO_2 /kWh, the **efficiency gains further reduce emissions (e.g. for HPs).**
- Possibility of short-term increase in indirect emissions needs to be compared with danger of **carbon-lock-ins** through new fossil investments, as reinvestment cycles come up.
- Grid GHG intensity in EU in 2030: 0.12 kg_CO_2/kWh (88% of low-carbon sources in electricity generation)
- The **ETS price signal** already today incentivises industrial consumer to consume in hours with a low-carbon electricity mix, notably via demand-side flexibility solutions.



Source: EEA for 2023, PRIMES scenario (Fit for 55 modelling) for 2030

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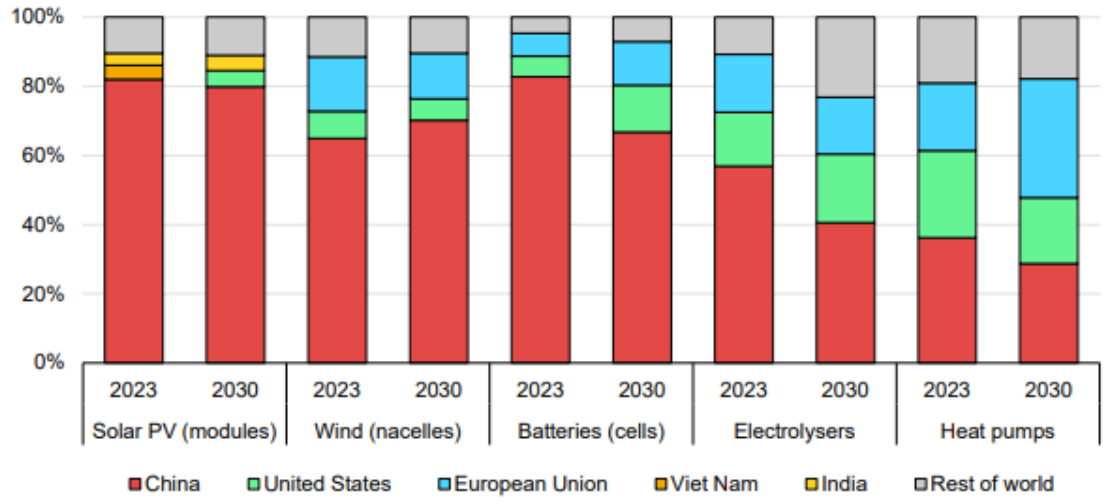
Resilience

- **What does 'resilience' mean**:
  - **Acting in case of dependency** (or risk of it) on supply of equipment/components from a single third country (**mirroring NZIA IA on on-price criteria** in national auctions/procurement/other funding instruments)
  - Projects contribution to EU industrial leadership and competitiveness ('**EU value added**')
- Resilience is a **strong priority for the EU, increasingly so under the new mandate** (EU Economic Security/Open Strategic Autonomy, NZIA, CID)
- Implemented **already in all 2024 IF calls**:
  - In hydrogen/batteries instruments: **'China clause'** (mirroring NZIA) as qualification
  - In batteries/net zero technologies calls: **'Contribution to EU industrial leadership and competitiveness'** as an award criterion
- **Is there a (risk of) dependency** for equipment/components of the projects bidding in the auction?
  - JRC report on heat pumps: EU is the world leader, but China is rising fast. No differentiation between residential and industrial equipment.
  - On other heating technologies & applications
  - *Do stakeholders have insights to share?*

Resilience cont'd

- For HPs: less **geographical concentration** than in other technologies.
- Assessment of the situation in **JRC CETO**: Strong position of the EU manufacturers of heat pumps.
- For other applications we are looking for data.
- Situation to be monitored under **NZIA** (heat pumps+ 'transformative industrial technologies for decarbonisation').
- If no reason to a have specific country clause, then general **"Contribution to EU industrial leadership and competitiveness"** is an option (e.g. working with European suppliers, jobs created, trainings, cluster creation, research centres).

Figure 8 Geographical concentration of current and announced manufacturing capacity, 2023-2030



Notes: 2030 value includes all operational capacity in 2023 together with the capacity of announced manufacturing projects through to 2030. For electrolysers, the analysis only includes projects for which location data was available. Shares are based on manufacturing capacity. Refer to the Technical annex for more details on the analytical boundaries and methodologies used in this analysis.

Sources: IEA analysis based on data from Benchmark Mineral Intelligence, Bloomberg New Energy Finance, EV Volumes, InfoLink, S&P Global Commodity Insights, UN Comtrade, WoodMac and announcements by manufacturers and personal communications.

Cumulation

Cumulation: the same project (costs) receive support from 2 public support schemes

Objective: level playing field among the bidders: winners should be projects with best economics not with the already secured subsidy

- Projects can **bid to cover their entire funding gap.**

X Project cannot receive CAPEX or OPEX (i.e. support for electricity use) public support for the **same installation** that will be supported by the IF pilot auction

- Mapping the subsidy schemes that could be overlapping is on-going
  - Example of indirect cost compensation: it is possible to withdraw from support on yearly basis
- Some exemptions could be possible, cf levies/taxes reductions for environmental objectives

V Equipment manufacturers can receive public support

V Offtakers/consumers (e.g. buyers of glass or aluminum) can receive public support

For discussion: Should there be a restriction on subsidized renewable power ?

Possible differentiation of the auctioned good: temperature baskets

- Low and high-temperature heat have very **different cost structures**. Letting projects bid against each other on price is likely to favour low-temperature solutions.
- Possible solution: separate budgets & corresponding bid curves ("baskets"):
  - Option 1) Low vs. high temperature -> What would be a reasonable threshold?
  - Option 2) Steam vs. furnace solutions -> What about other technologies falling in neither category?
- Higher-temperature solutions have a higher **degree of innovation** & higher investment needs, but also possibly carry **higher risks of indirect emissions**.
  - Option to have differentiated rules on flexibility / indirect emissions for **high-temperature applications**?
  - Option to have differentiate rules based on **continuous and non-continuous processes**?
  - Is this a problem, or is it solved through power prices / ETS coverage of the power sector?
- Even in the "lower" temperature basket, we might want to introduce a **minimum eligible temperature level**, to ensure innovation and avoid paying for solutions that would already be implemented anyways.
  - What would be a good minimum temperature level to ensure innovation & additionality of the subsidy?

Payments, monitoring & verification

- Payments per unit of (output) heat not (input) electricity to **preserve incentives for conversion efficiencies**.
- **Heat production/use** by the new installation will be measured and payments will be tied to each unit of heat.
  - Discussion point: need to differentiate between use & production? For which technologies are heat transfer losses relevant?
- **Hybrid solutions** (e.g. HP added to gas boiler) will be eligible as long as they can separately measure the heat use from the heat pump
- If heat is **not measurable** then electricity coming to the installation is measured and formula applied to calculate amount of heat (equipment must have boilerplate efficiency that can be reported and checked)

Monitoring & verification – cont'd

- We may ask projects to bid not in EUR/MWhth or MJ of heat, **but in EUR/t_CO2 abated**.
- Different approaches could be envisaged:
  - Uniform application of the heat-benchmark to all projects.
  - Differentiated benchmarks for brownfield projects, based on which fossil fuel is displaced (gas, heating oil, coal…) and generic heat benchmark for greenfield projects.
  - Other.

Closing remarks

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Next steps

1. **Survey** open for 4 weeks. Slides & recordings will be published.

1. **Second stakeholder** workshop June/July (TBC).

2. Publication of **Final Terms and Conditions** for the Auction (End August/Beginning September 2025).

3. **Open the auction** for receiving bid (end of 2025).

4. **Selection** of bids (spring 2026).

Thank you

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