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Erneuerbare Energie e.V.

Defossilizing the German Industry

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Bundesverband Erneuerbare Energie e.V. (BEE)

German Renewable Energy Federation

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The German Renewable Energy Federation (BEE) is an umbrella organization that represents the interests of associations and companies. E.g.: The German Wind Energy Association, the German Solar Association, the German Biogas Association and the German Geothermal Association.
Our goal is 100 per cent renewable energy within the electricity, heating and transport sectors.

Agenda

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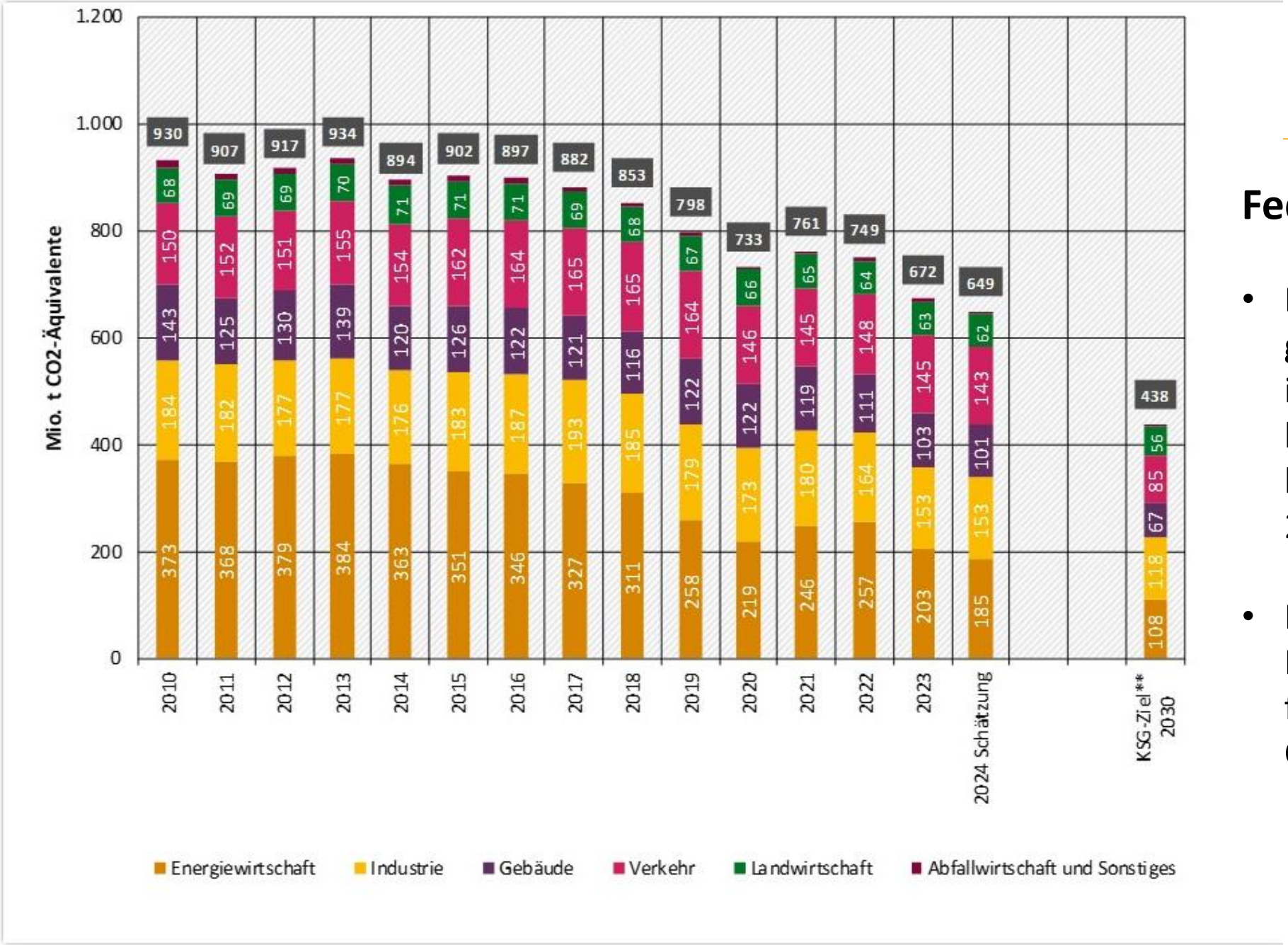
I……Political Context

II……Current State

III……Defossilizing

Political Context

- Importance of Industry
  - 8 million employees
  - 19,7% of Germany‘s GDP from the manufacturing sector
- European Green Deal
  - At least 55% less net greenhouse gas emissions by 2030, compared to 1990
  - No net emissions of greenhouse gases by 2050
- Outlook: Clean Industrial Deal
  - Decarbonisation as a driver of growth for Europe's industries
  - Focus on Energy intensive industries & clean tech sector



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Federal Climate Action Act

- Emissions of greenhouse gases are gradually reduced in comparison with their levels in 1990: by at least 65% by 2030; by at least 88% by 2040.
- In order to reach 2030 goal Industry needs to reduce from 153 to 118 billion tons CO2 equivalent.

https://www.umweltbundesamt.de/presse/pressemitteilungen/klimaziele-bis-2030-erreichbar

Coalitions agreement

between the CDU, CSU and SPD on industry:

- duration of authorisation procedures
- Electricity price package aims to achieve permanently low and predictable, internationally competitive energy costs with special industrial electricity price. The reduction is to be financed with the revenue from CO2 trading.
- Carbon capture and storage (CCS) for emissions that are difficult to avoid
- Rapid development of a hydrogen economy
- Individual mentions of steel industry, chemical industry, automobile industry -> all to be kept in Germany

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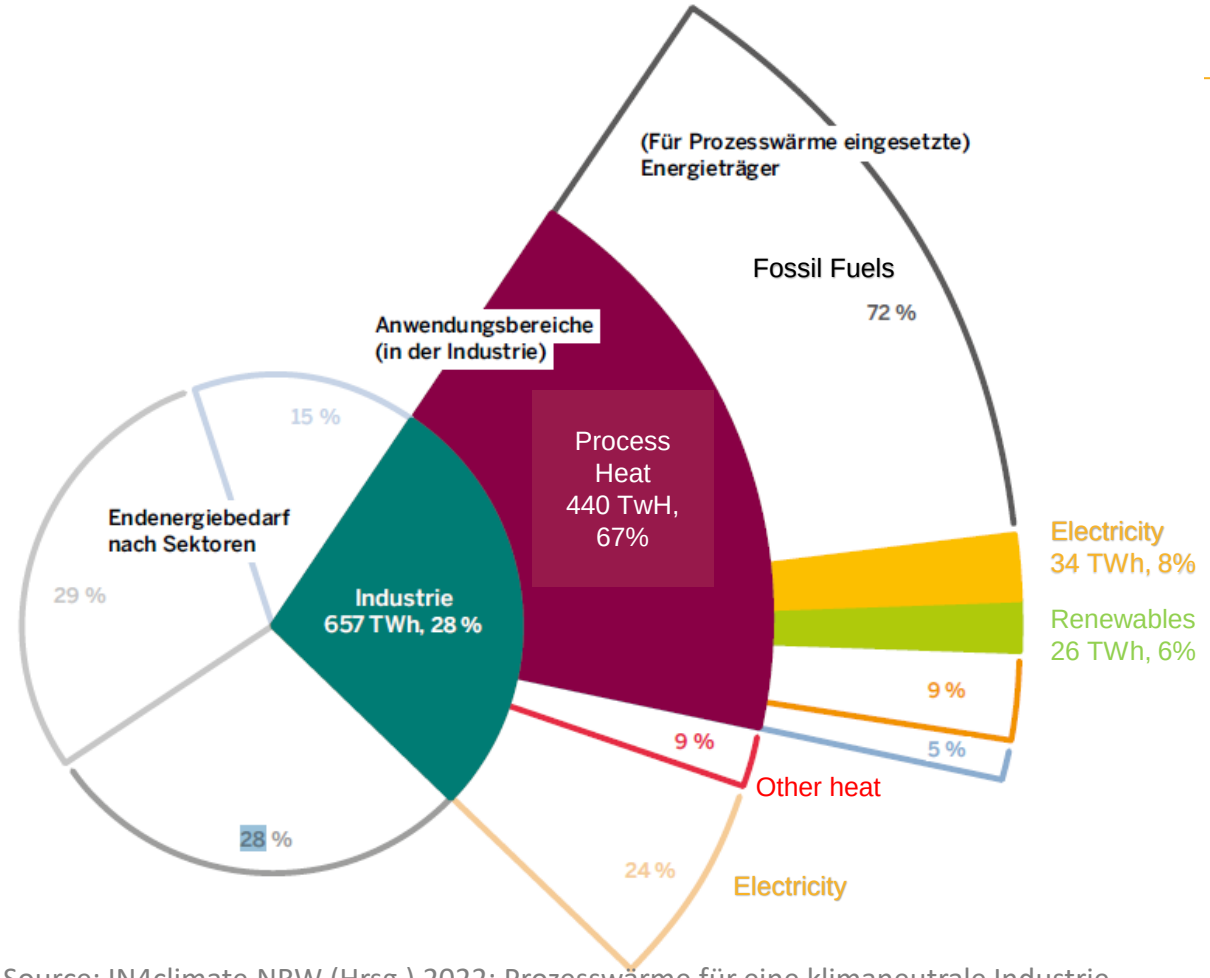
Energy Demand of the German Industry



Source: IN4climate.NRW (Hrsg.) 2022: Prozesswärme für eine klimaneutrale Industrie

Industrie 657 TWh
Verkehr 637 TWh
Haushalte 670 TWh
Gewerbe, Handel, Dienstleistungen (GHD) 354 TWh

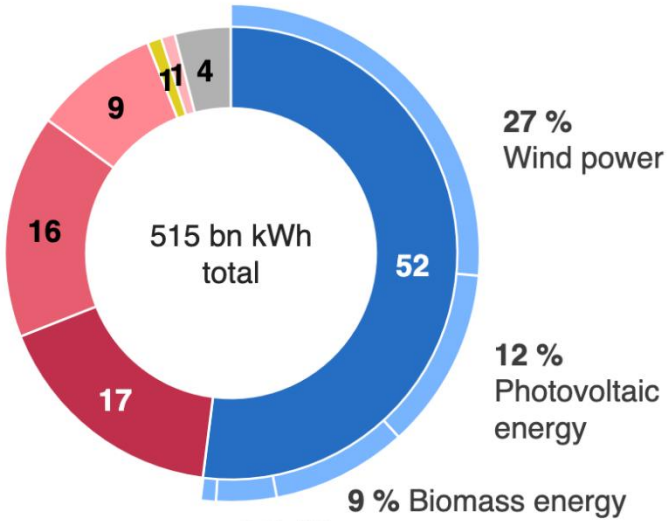
Prozesswärme 440 TWh
Sonstige Wärme[a] 58 TWh
Elektrizität[b] 159 TWh

fossile Energieträger[c] 317 TWh
Strom[d] 34 TWh
Erneuerbare[e] 26 TWh
Fernwärme 42 TWh
Sonstige 21 TWh

- 28% of Germany's energy is used by industry
- 68% of the Industry's energy demand is in the form of process heat
- 19% of Germany's total energy goes to process heat
- Only 6% of process heat is produced with renewable energy (BMWi 2021a)

Electricity

Gross electricity production 2023
Percent

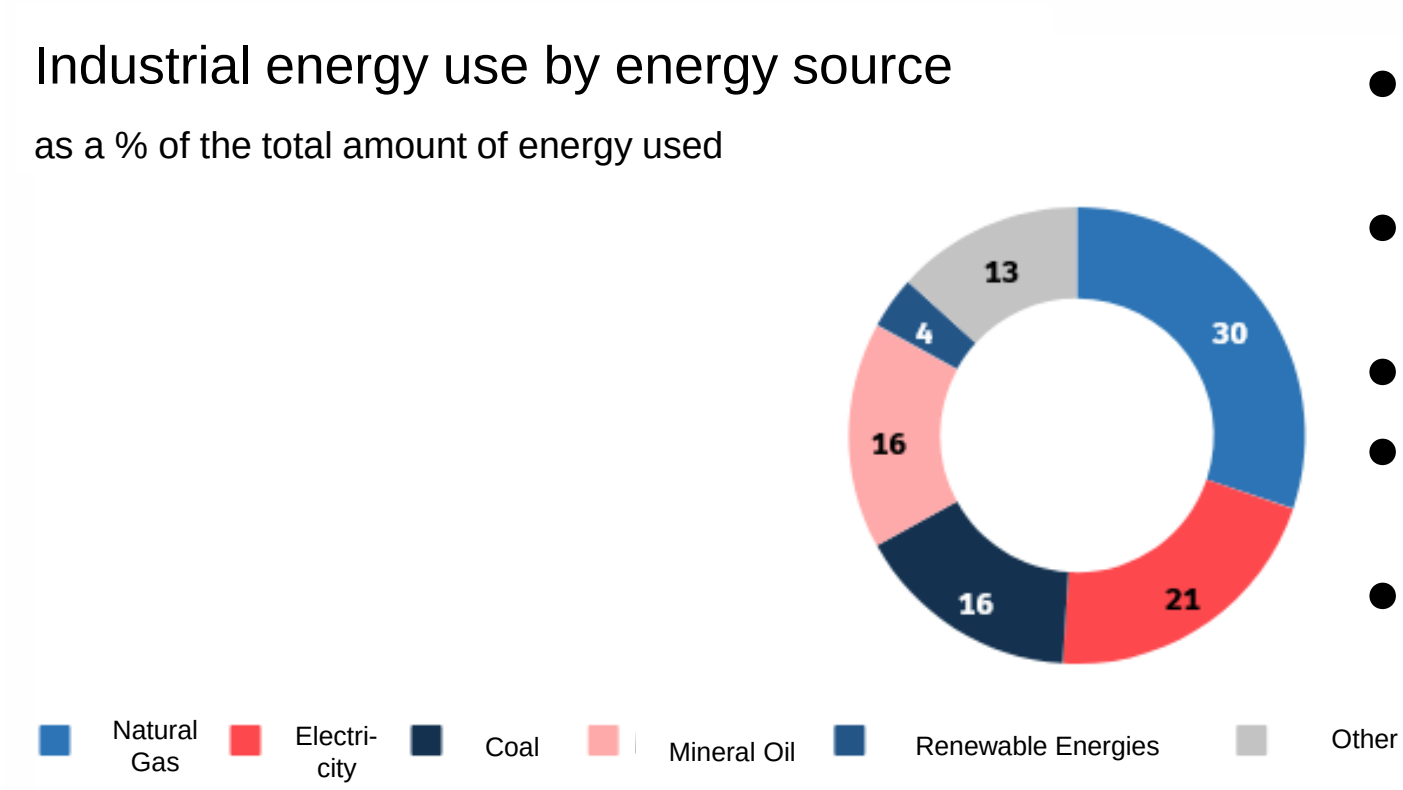


Renewable energy sources | Brown coal | Natural gas | Hard coal | Nuclear energy | Mineral oil | Other

Differences may occur due to rounding. Preliminary result. Source: AGEE-Stat and AGEB

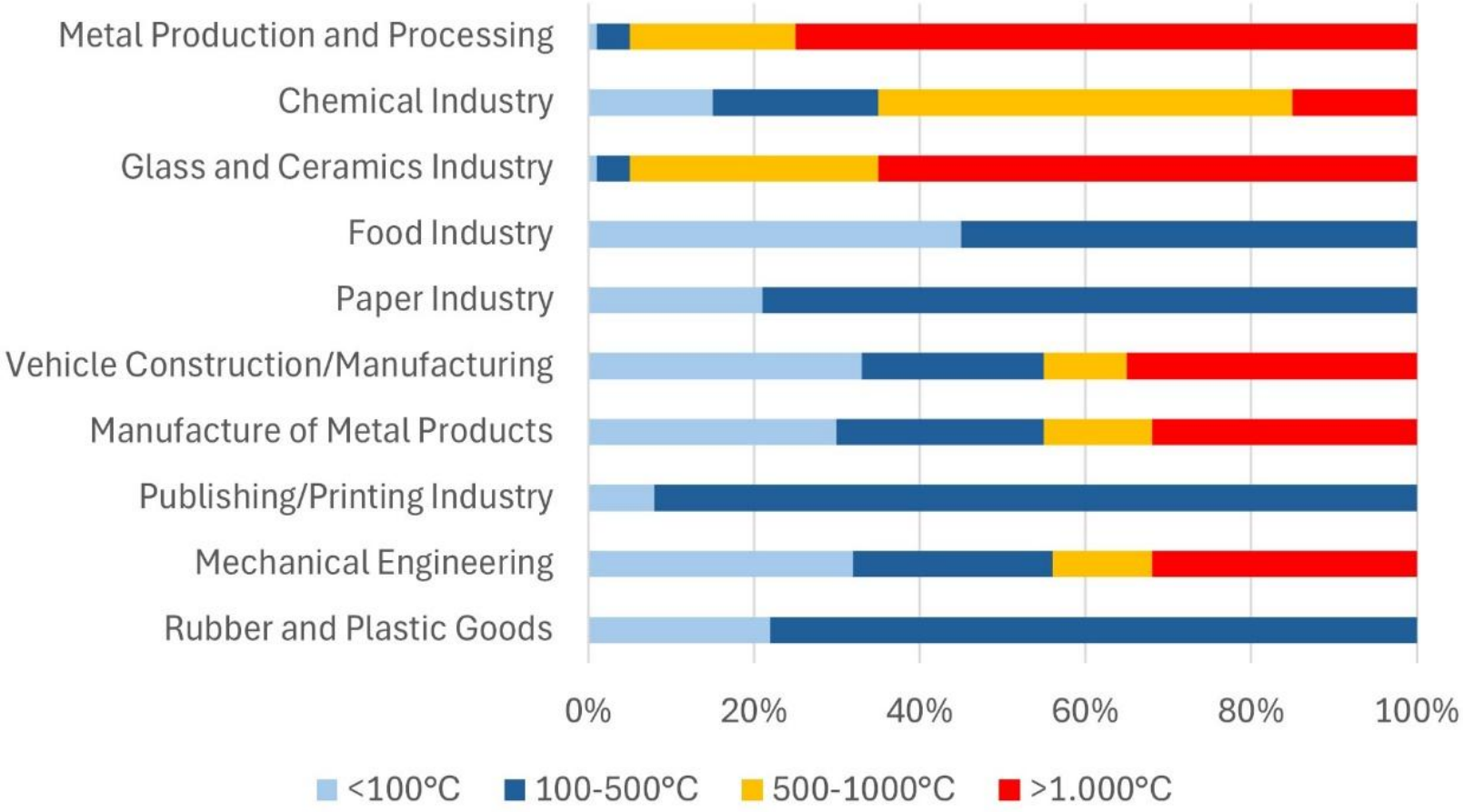
- 2024: 59,4% from renewable sources
- 431.5 billion KWh of electricity production in 2024
- 3.6% less than in 2023
- Lower electricity demand in 2024 caused by decrease in manufacturing

Natural Gas -> Gas Crisis



- Natural gas: key energy source & raw material
- Post-March 2022: production in energy-intensive industries drops sharply
- Energy prices rise significantly during this period
- Mid-2023: prices ease but remain high
- No recovery yet in energy-intensive production
- Overall industry shows signs of stabilization

Process Heat Demand by Industry



- Industry in order of total energy supply: Chemical, Metal, Coke & Mineral Oil, Glass& Ceramics, Paper
- Processes include smelting, drying, melting, welding.
- Some processes require a permanent heat supply.
- The lower the temperature, the easier it is to defossilize.
- Ca 25% of total Industrial Heat Demand in Germany under 150°C.

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Power to X

Most common: PtHydrogen

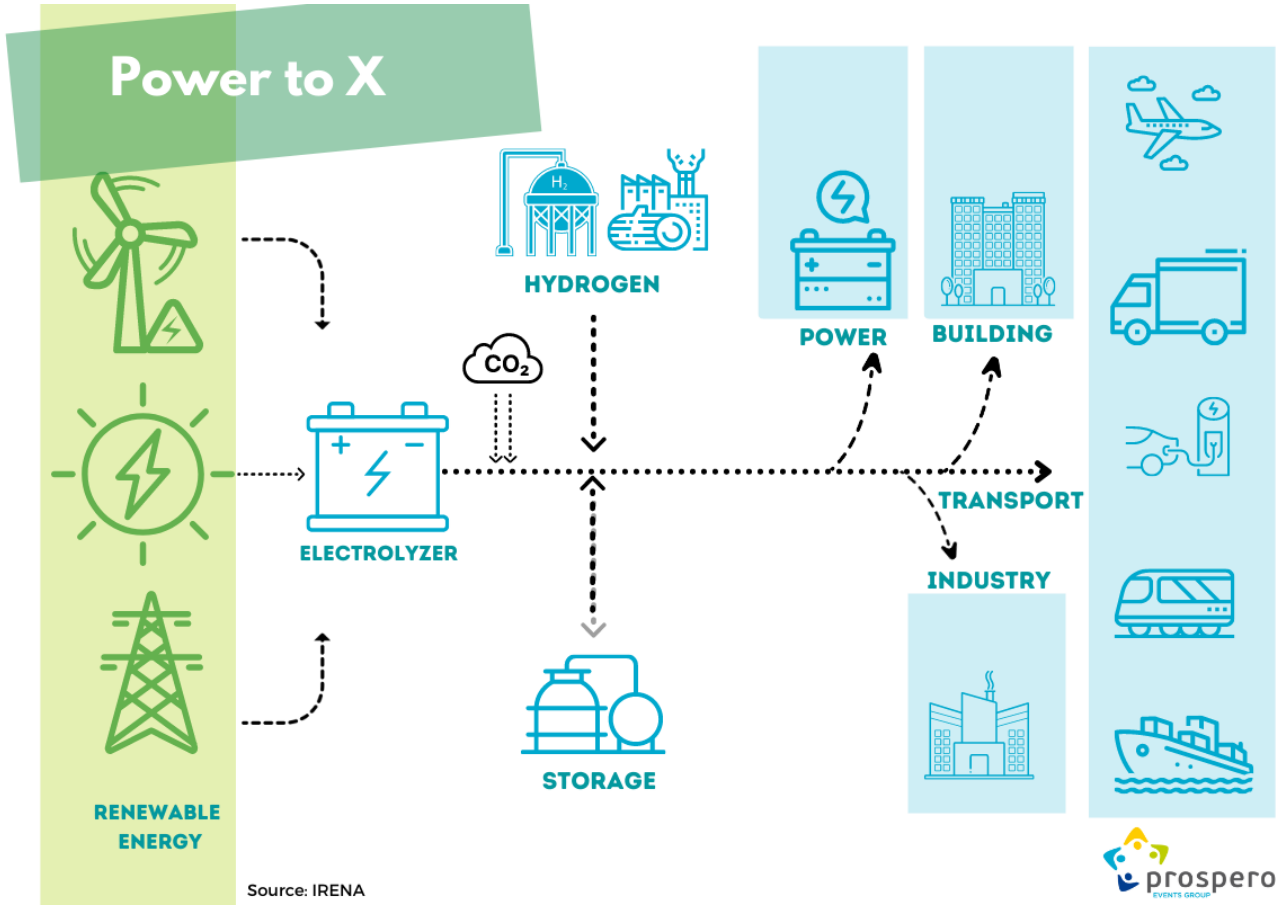
- Can generate temperatures **over 1000°C**
- Can be used as energy storage

Chemical Industry

- Highest share of natural gas consumption
- Used as raw material
- Replacement of raw material through hydrogen and methanol
- Conversion to electricity-based processes wherever possible

Steel industry

- Hard coal can be replaced by hydrogen



Renewable Heat Sources

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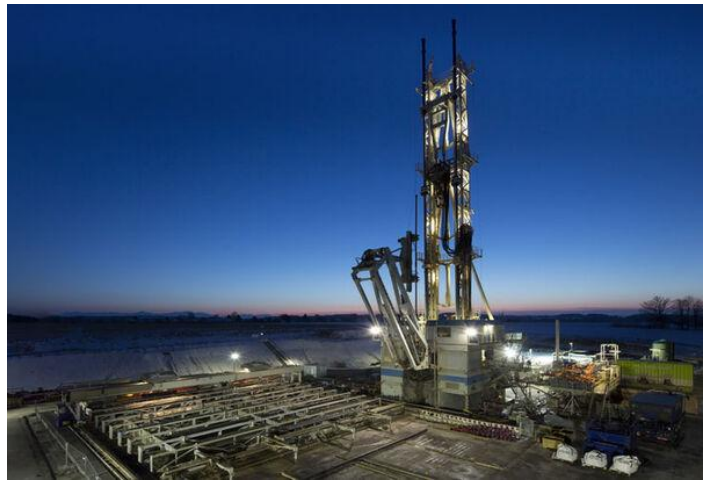
High-temperature heat pump

- can achieve **temperatures up to 200°C** (some models even 300°C)
- Requires **four times less electricity** than the electrode boilers currently in use

Deep Geothermal

- Potentially can cover **a quarter of industrial heat demand up to 200°C**
- Provides **base-load heat**



Source: HAS Innova Rig

Source: CO2-Leuchtürme-Industy.de

- **Solarthermal Collectors**
  - Can generate **up to 250°C**
  - Concentrated solarthermal power can theoretically cover temperatures of **up to 400°C** at German latitude

Renewable Heat Sources

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Biomass Power Plants

- Direct thermal use of solid biomass **temperature levels up to 500 °C**
- **Temperature levels up to 1500°C** for processed biomass

Increasing Efficiency

- Reducing waste heat through isolation
- Capturing and using **waste heat** at every step of the process, either internally or externally
- **Digitalisation** and **dynamic management** of processes to smartly adapt to current energy supply, e.g. turning on electric heating devices during phases of high renewable electricity supply
- Incorporating heat **storage**
- Choosing the **heating technology** carefully: What is locally available? Does the process need Carbon, which is produced through biomass heating? What is the base temperature needed? How high and frequent are energy peaks?
- Recycling of e.g. steel waste

Thank you for your attention!

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