

# The Future of Gas Hydrogen & Electricity

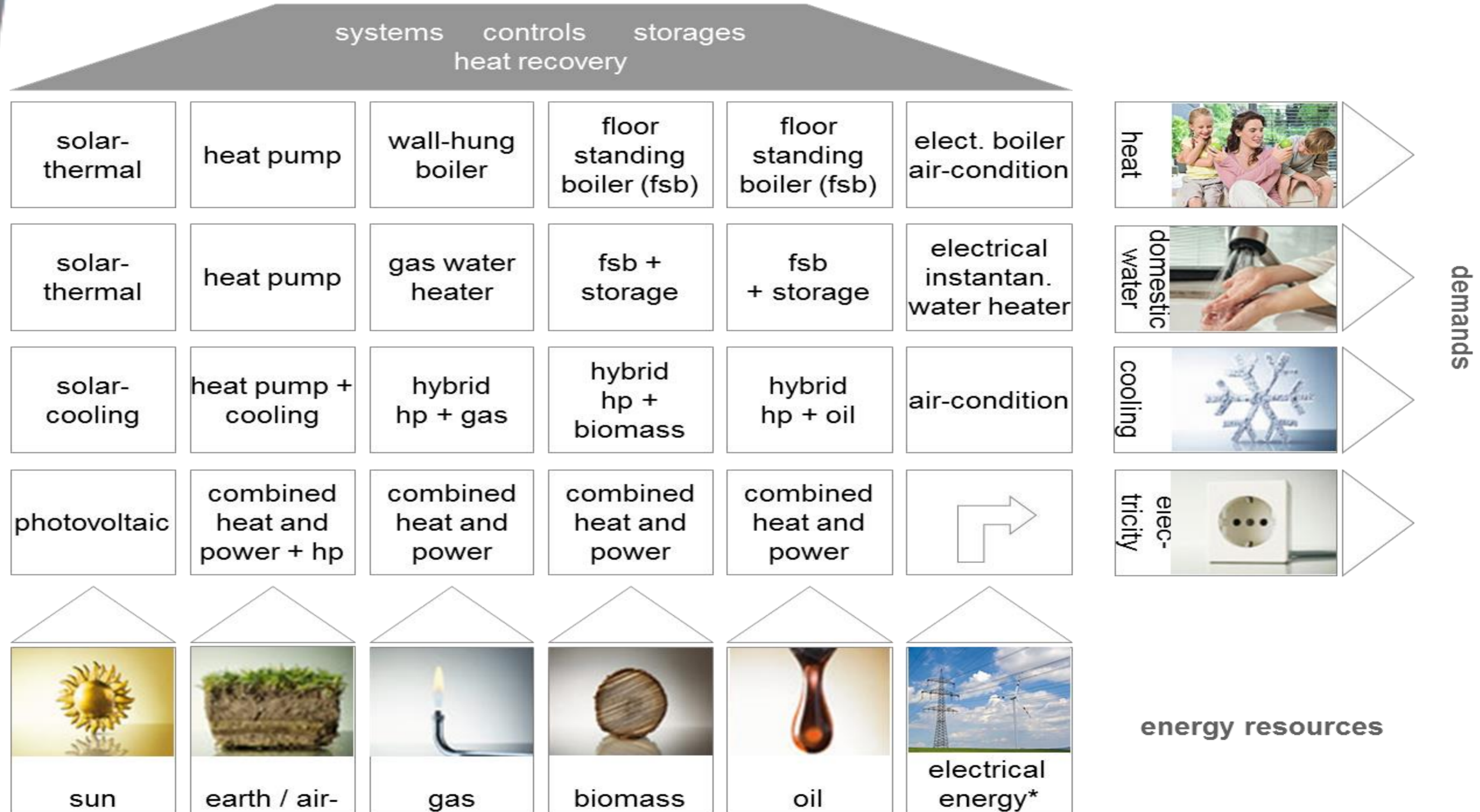
- Political Level
- Product Level

A hearty welcome from Cologne





# The actual Energy Matrix of Buildings

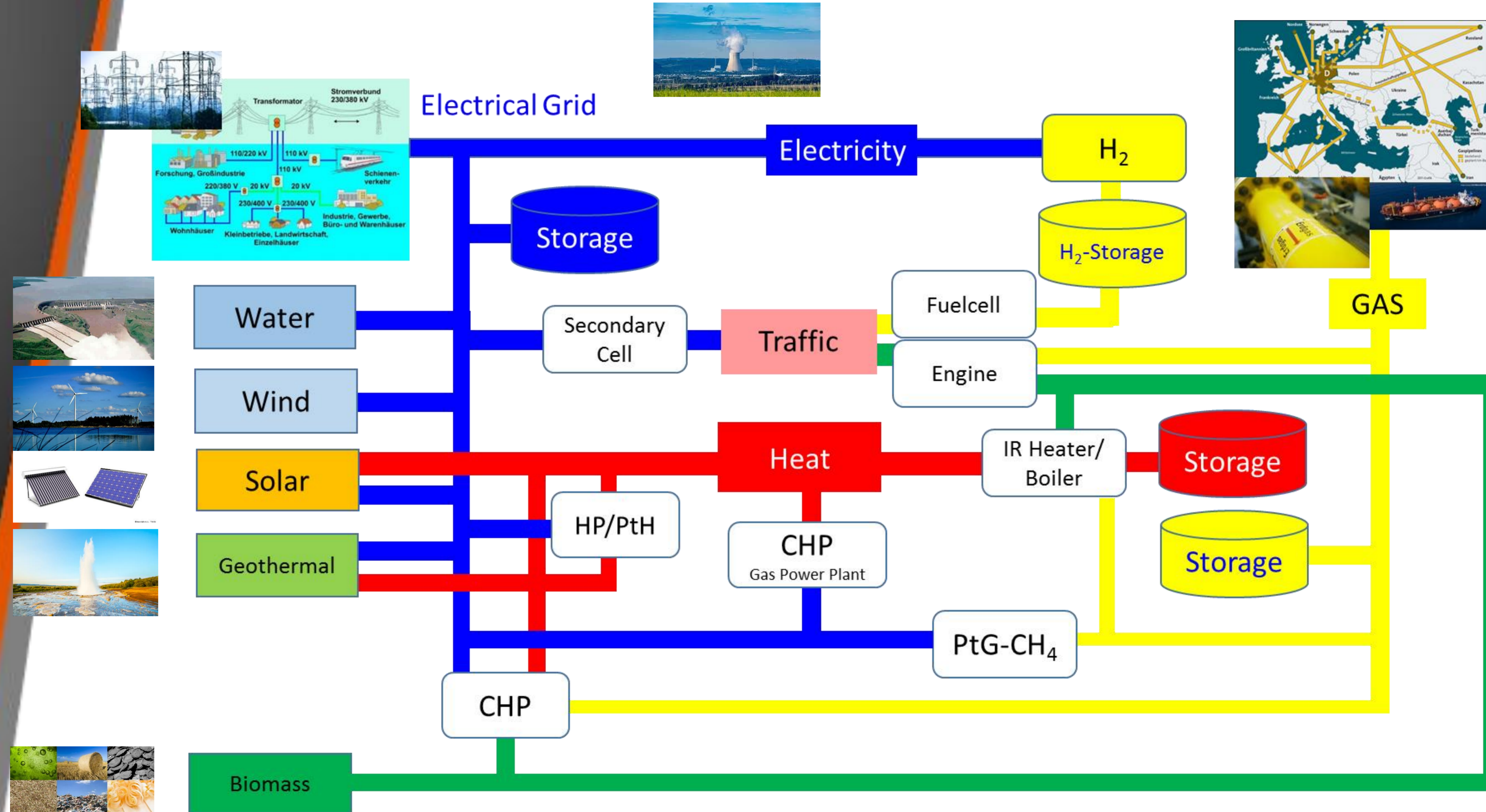


\* produced by wind, sun, nuclear, gas, coal, oil



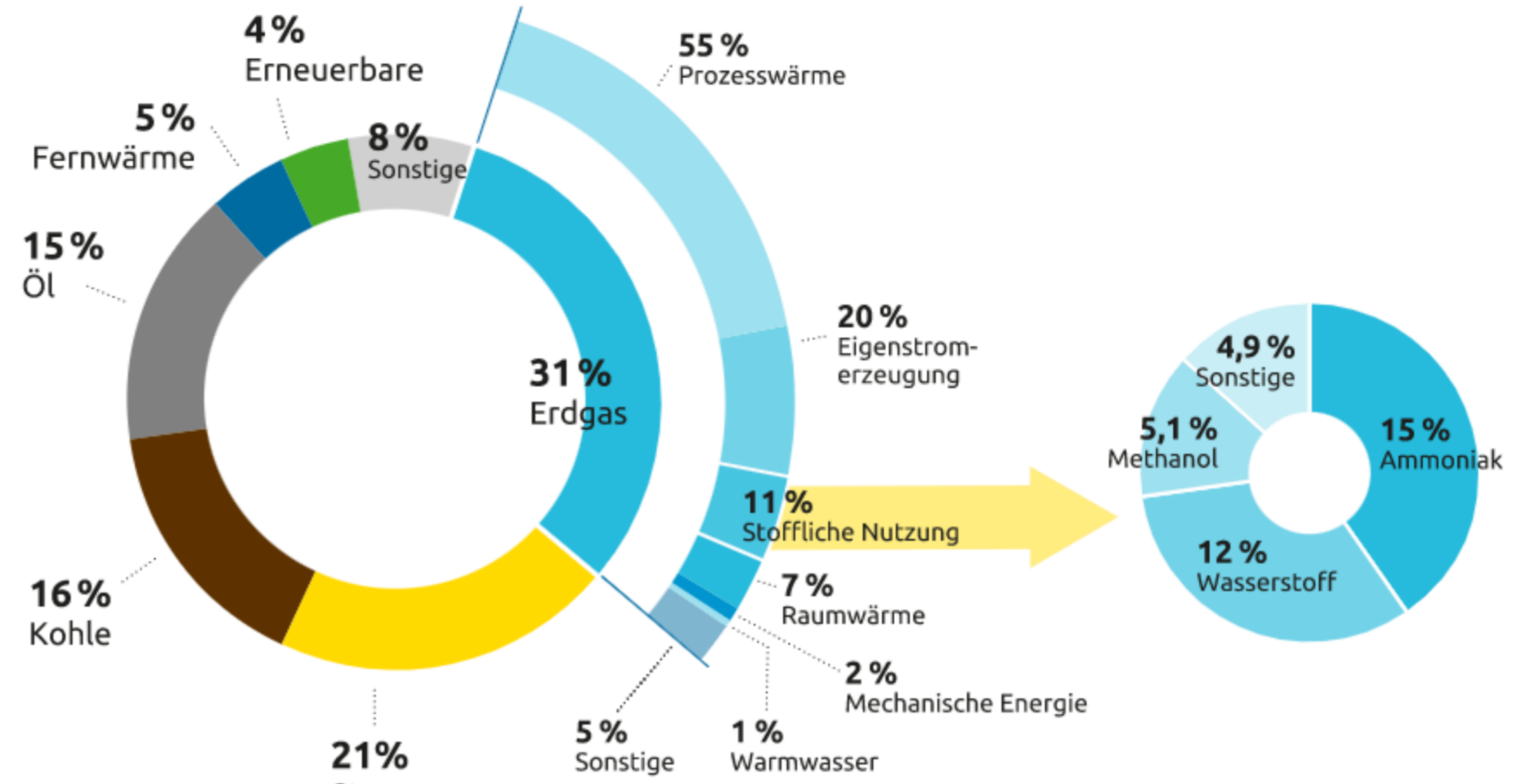
# Energy Grids and Important Elements

## Energy Playground





Political Influencers  
Users of Natural Gas



**29,7 %**  
Chemische Industrie

**17,9 %**  
Metallerzeugung und -verarbeitung

**15,3 %**  
Sonstige

**14,9 %**  
Nahrungsmittel

**9,2 %**  
Papier

**7,5 %**  
Glas & Keramik

**5,5 %** Verarbeitung Steine und Erden

Quelle: AG Energiebilanzen, EEFA 2022



## Political Influencers

# Avoid hydrogen for heating homes, urges energy efficiency coalition

By Frédéric Simon | EURACTIV.com

21. Jan. 2021

Advertisement



The direct use of hydrogen for heating on a large scale "is problematic because it comes with many uncertainties linked to the scalability, costs of its production and inefficiencies," say the signatories of the letter. [Jason Woodhead / Flickr]

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**A coalition of 33 business and civil society groups have urged the European Commission to prioritise renewables and energy efficiency over hydrogen as part of Europe's efforts to decarbonise buildings.**

Europe's upcoming gas market reform, expected to be tabled in June, "should be aimed at designing an energy system that goes beyond fossil gas" in order to reach climate neutrality by 2050, the coalition says in an open letter on Thursday (21 January).

The buildings sector needs to cut emissions by 60% over the next 10 years in order to reach the bloc's 2030 climate goals, the signatories underline. And to achieve this, renewables and energy efficiency should be prioritised – not hydrogen, they argue.

"While some believe that challenging renovation of buildings and the retrofitting of renewable heating systems could be avoided by introducing hydrogen for heating our buildings, the reality is different," the signatories write.

"It is true that renewable hydrogen can play a role in decarbonising hard-to-abate sectors" like steel and chemicals, they write. "But its direct use for heating on a large scale is problematic because it

**Renewable packaging for a fossil-free Europe**  
Paper Packaging Day

Date and time: 29 Jan 12:30 - 7pm  
Location: Renaissance Hotel, Rue du Parme 10, 1050 Brussels

**Event Culture**

- Workshop: How to design a sustainable packaging
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- Workshop: How to design a sustainable packaging
- Workshop: How to design a sustainable packaging

Event Organized by: [Logo]

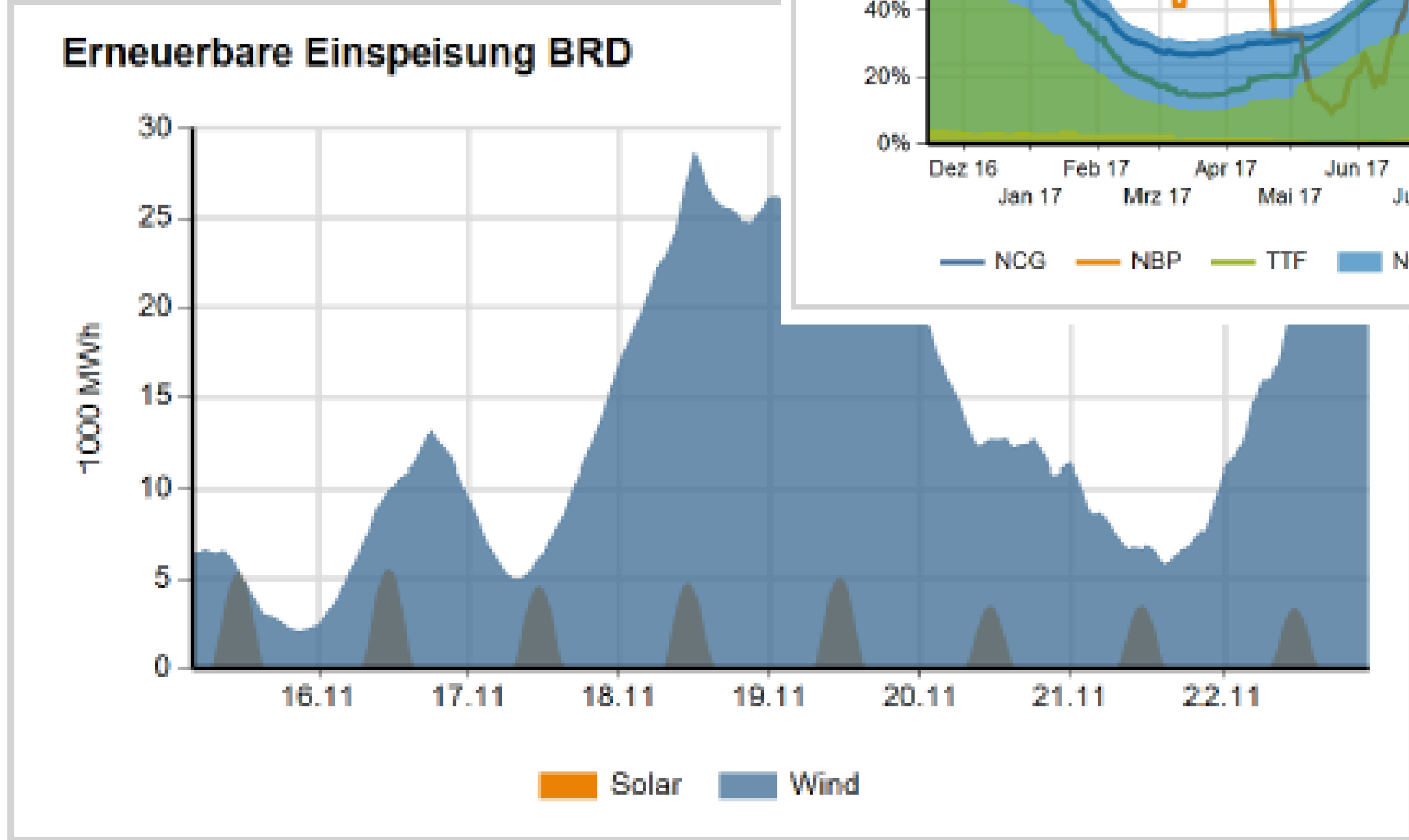
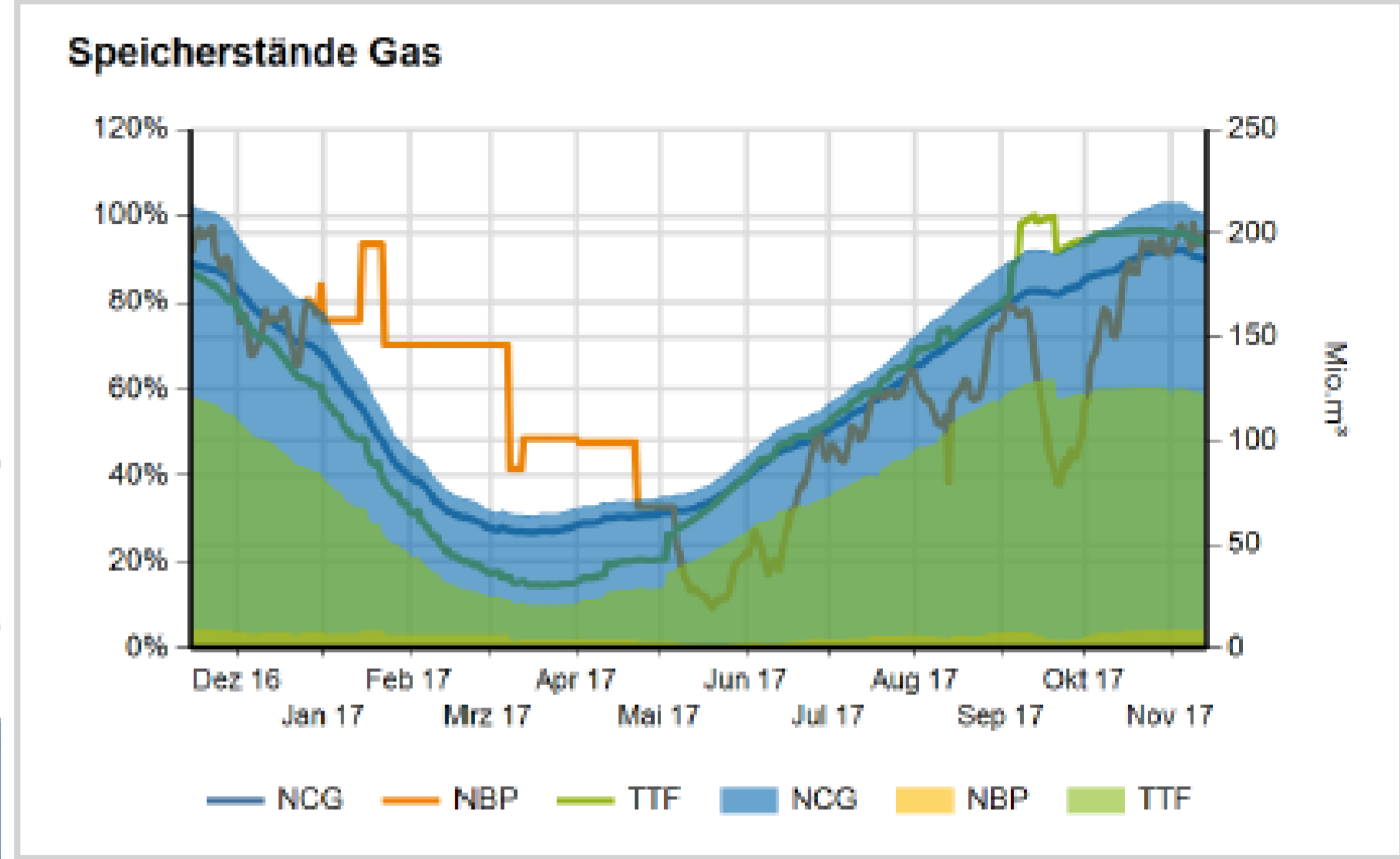
Partners: [Logos: Opel, etc.]

## EURACTIV Members

- 360° Foodservice
- APPLiA - Home Appliance Europe
- BSEF - The International Bromine Council
- CEPI - The Confederation of European Paper Ind...
- EBA - European Biogas Association
- ECI - European Copper Institute
- ENTSO-E - European network of transmission sys...
- EURIMA - European Insulation Manufacturers' As...
- EUROFER - The European Steel Association
- European Aluminium
- FEAD - European Waste Management Association
- FIA - Fédération Internationale de l'Automobile
- FIEC - European Construction Industry Federation
- GIE - Gas Infrastructure Europe
- IFRA - International Fragrance Association
- IndustriAll Europe
- Metal Packaging Europe
- NGVA Europe - The Natural & bio Gas Vehicle As...
- PETCORE Europe
- Wind Europe



Key Element: Energy Storage – Weekly & Seasonal View



### Energy Storages- Efficiency as a function of storage time

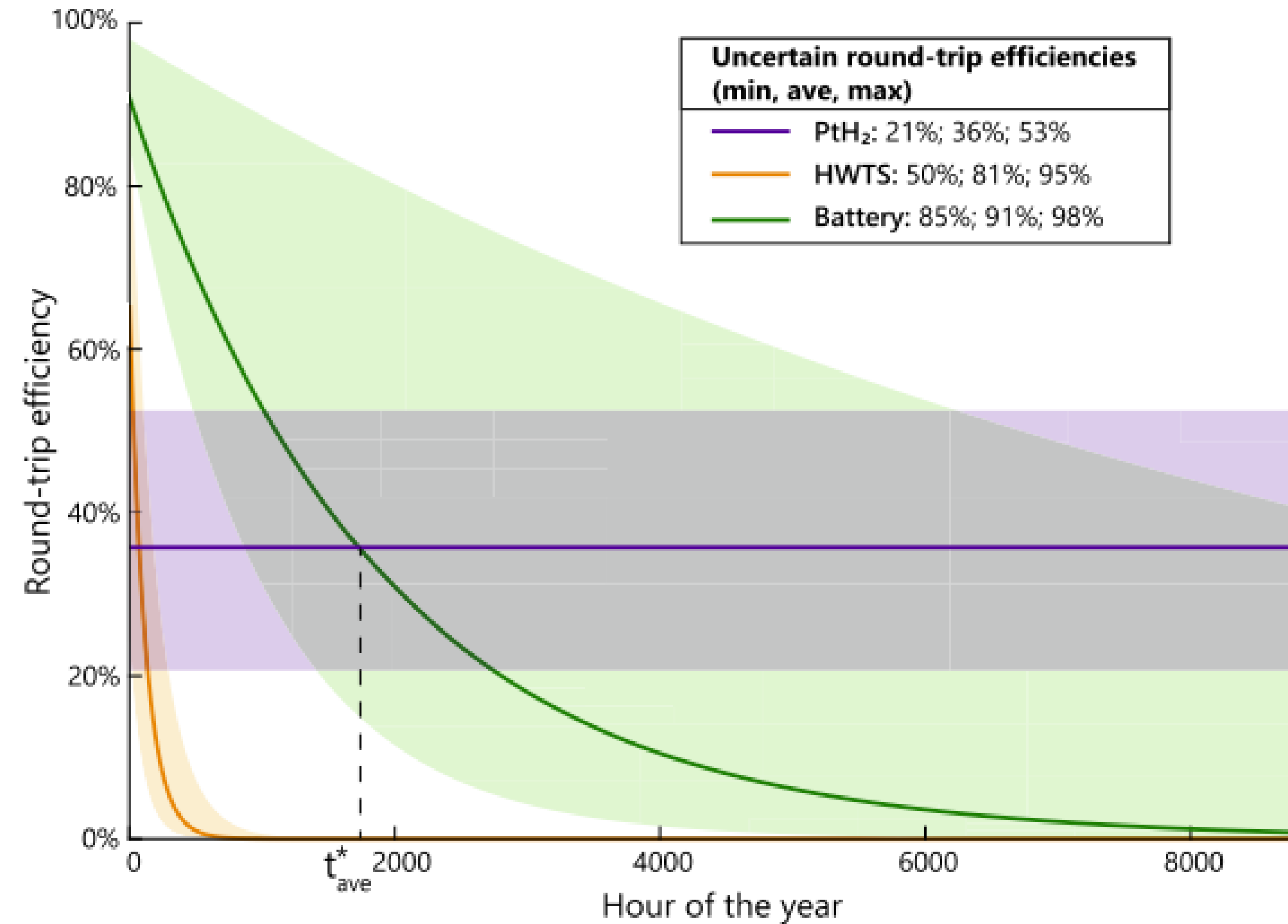
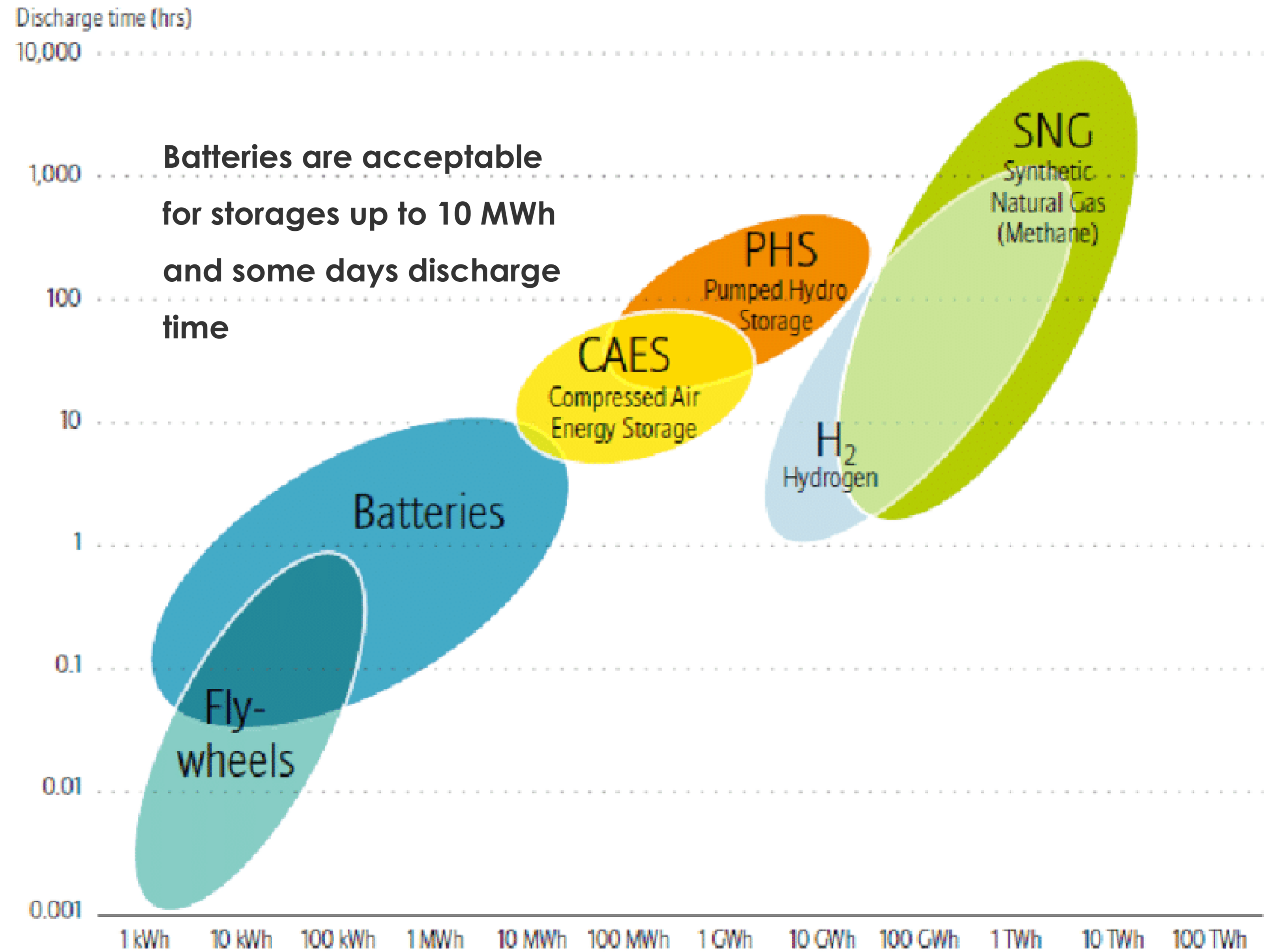


Fig. 9. Uncertain round-trip efficiencies and self-discharge of HWTS, battery and PtH<sub>2</sub> storage as function of time. The average values are indicated by the solid lines, and the corresponding uncertainty ranges by the shaded areas.

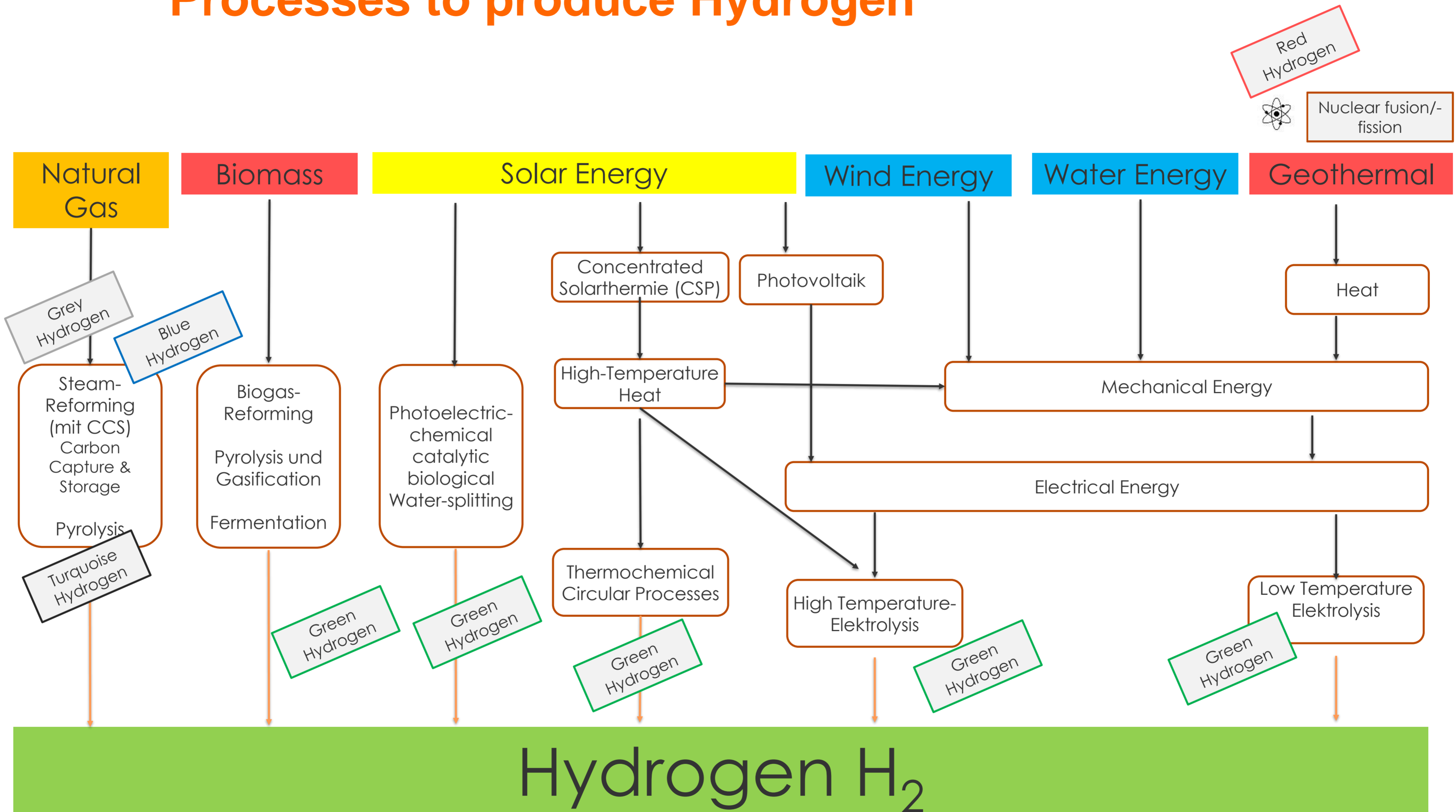
### Energy Storages- Discharge Time as a function of storage size



Batteries are acceptable for storages up to 10 MWh and some days discharge time



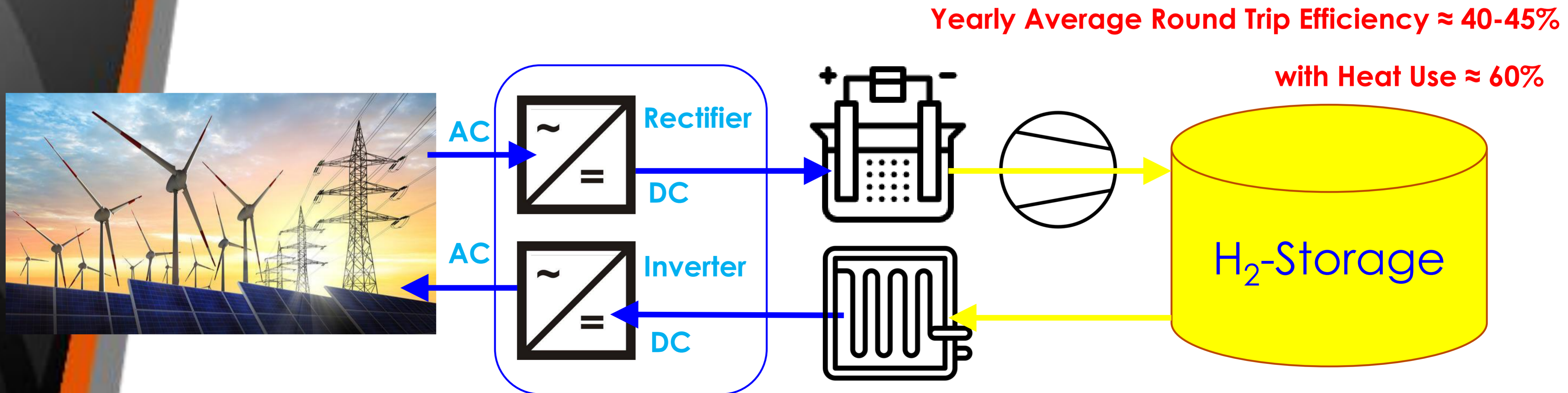
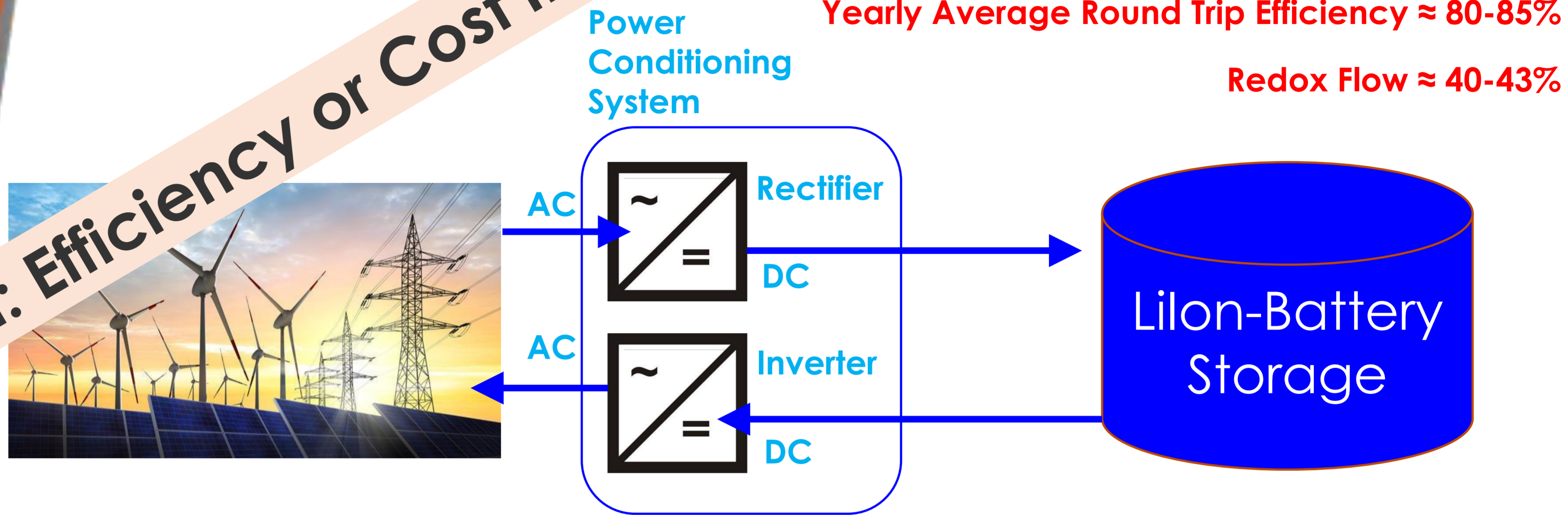
# Processes to produce Hydrogen





Future of Gas  
Efficiencies vs. Costs

Decision: Efficiency or Cost first???





# Future of Gas

Version: June 2021

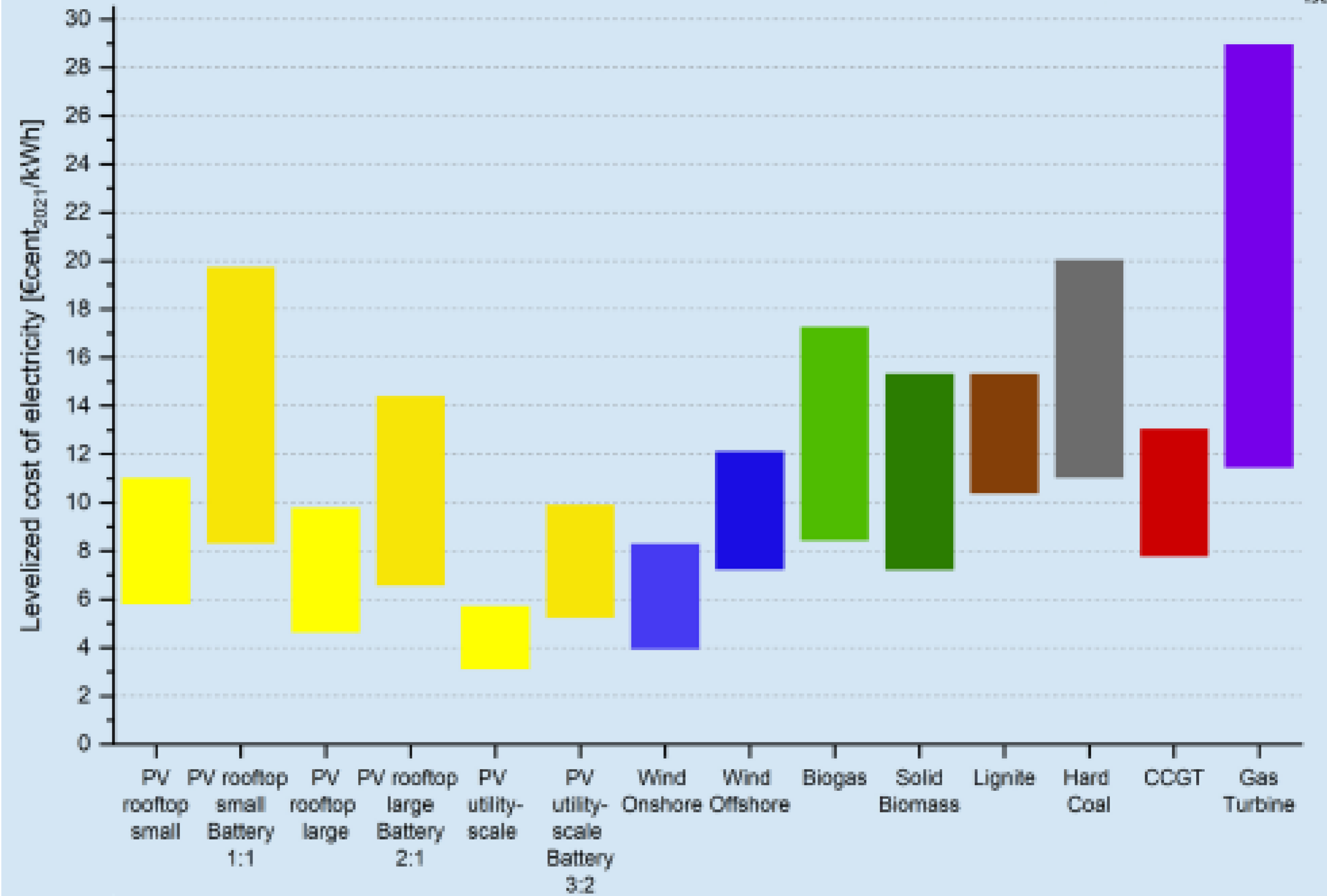
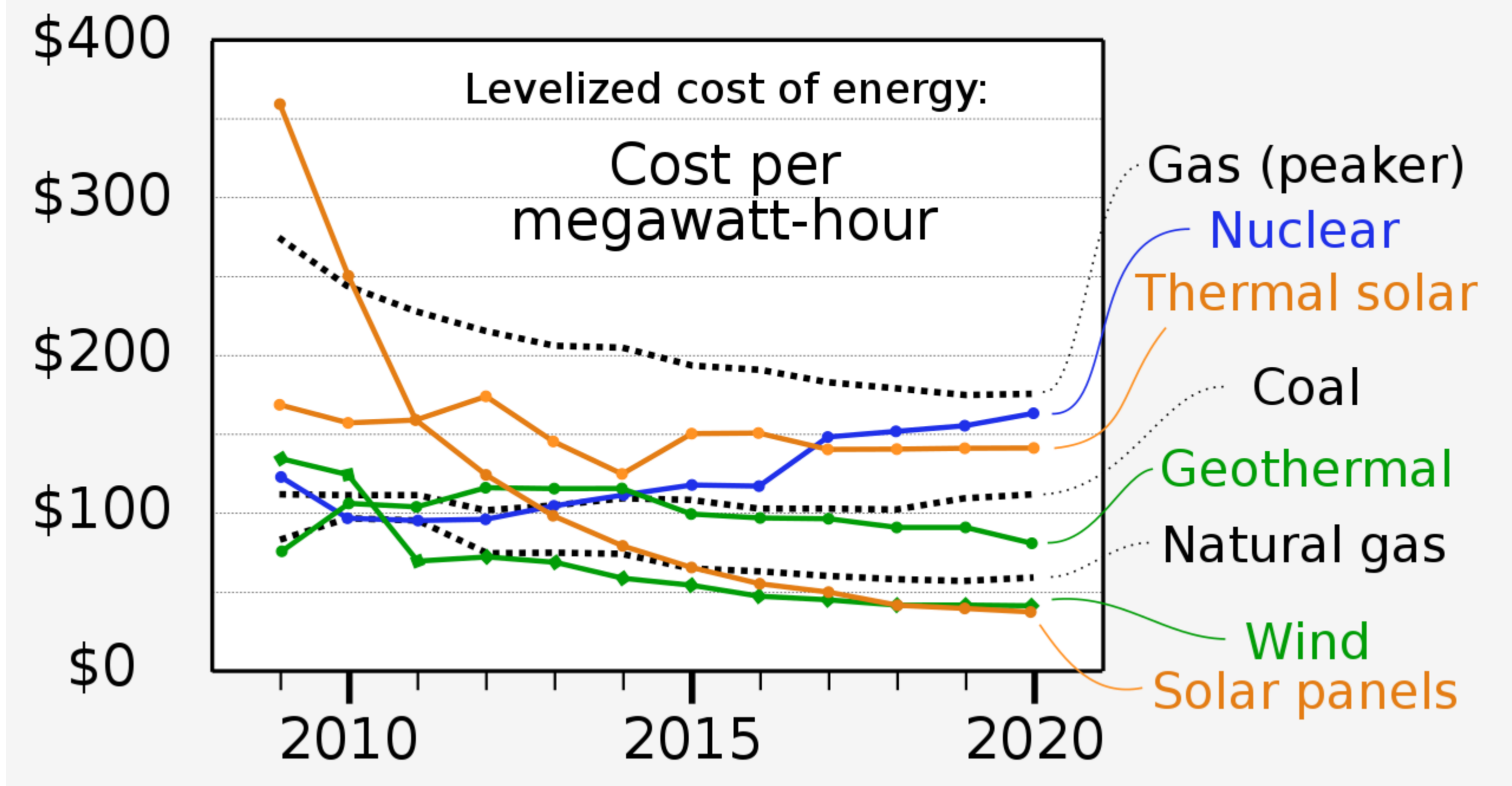


Figure 1: LCOE of renewable energy technologies and conventional power plants at locations in Germany in 2021. Specific investments are considered using a minimum and maximum value for each technology. The ratio for PV battery systems expresses PV power output (kWp) over usable battery usable capacity (kWh).



# Future of Gas



Average unsubsidized levelized cost of energy (at 12% discount rate at 25 years period): With increasingly widespread implementation of renewable energy sources, costs for renewables have declined, most notably for energy generated by solar panels.<sup>[1]</sup> Data source is [Lazard](#).

### Calculation [\[edit\]](#)

The LCOE is calculated as:<sup>[5][6]</sup>

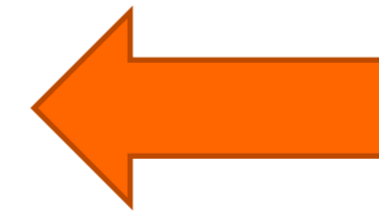
$$LCOE = \frac{\text{sum of costs over lifetime}}{\text{sum of electrical energy produced over lifetime}} = \frac{\sum_{t=1}^n \frac{I_t + M_t + F_t}{(1+r)^t}}{\sum_{t=1}^n \frac{E_t}{(1+r)^t}}$$

- $I_t$  : investment expenditures in the year  $t$
- $M_t$  : operations and maintenance expenditures in the year  $t$
- $F_t$  : fuel expenditures in the year  $t$
- $E_t$  : electrical energy generated in the year  $t$
- $r$  : discount rate
- $n$  : expected lifetime of system or power station



# H2 Tube Heaters

- Customer wants Self Sufficiency

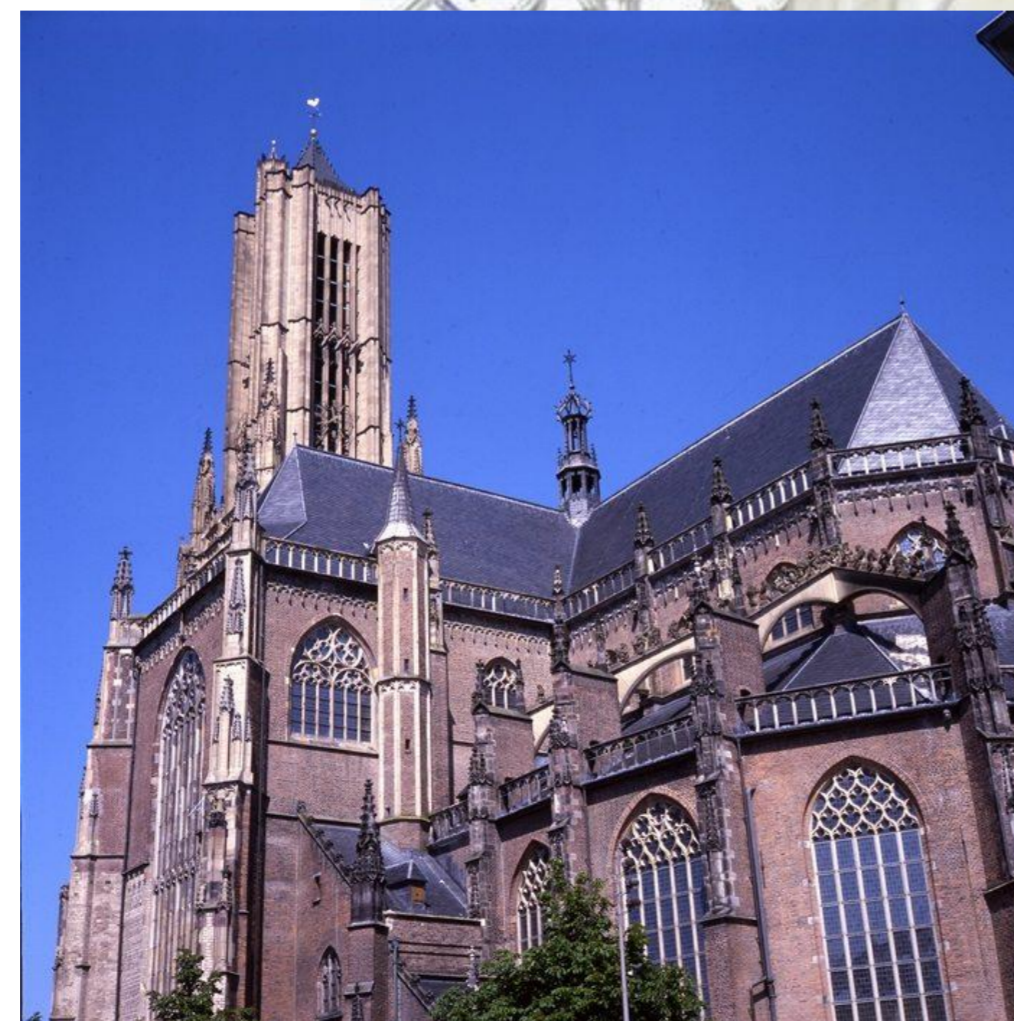
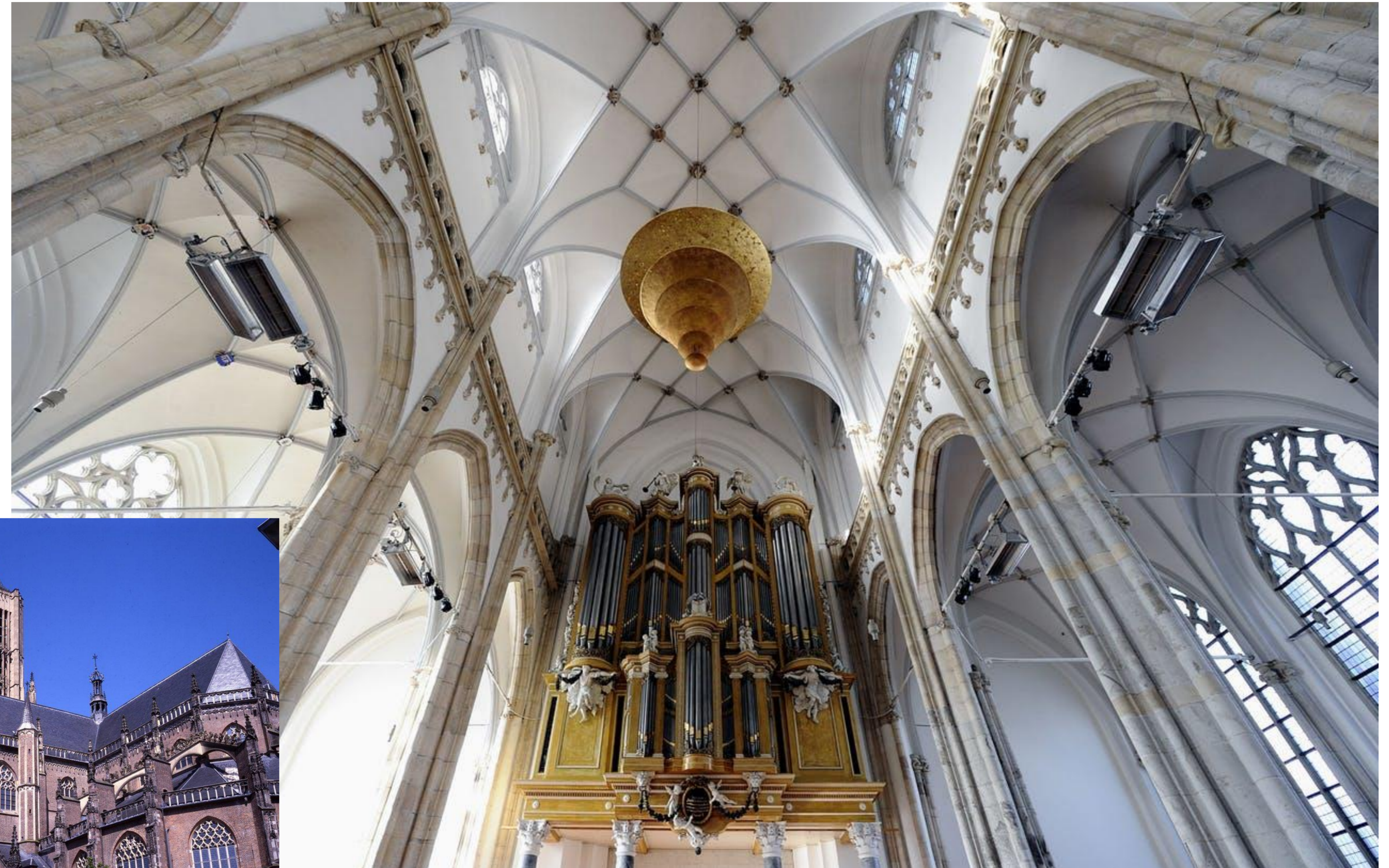




## H2-Project: Eusebiuskerk, Arnhem

### 3. H<sub>2</sub>- Prototyp Luminous Heaters

- ECO-H

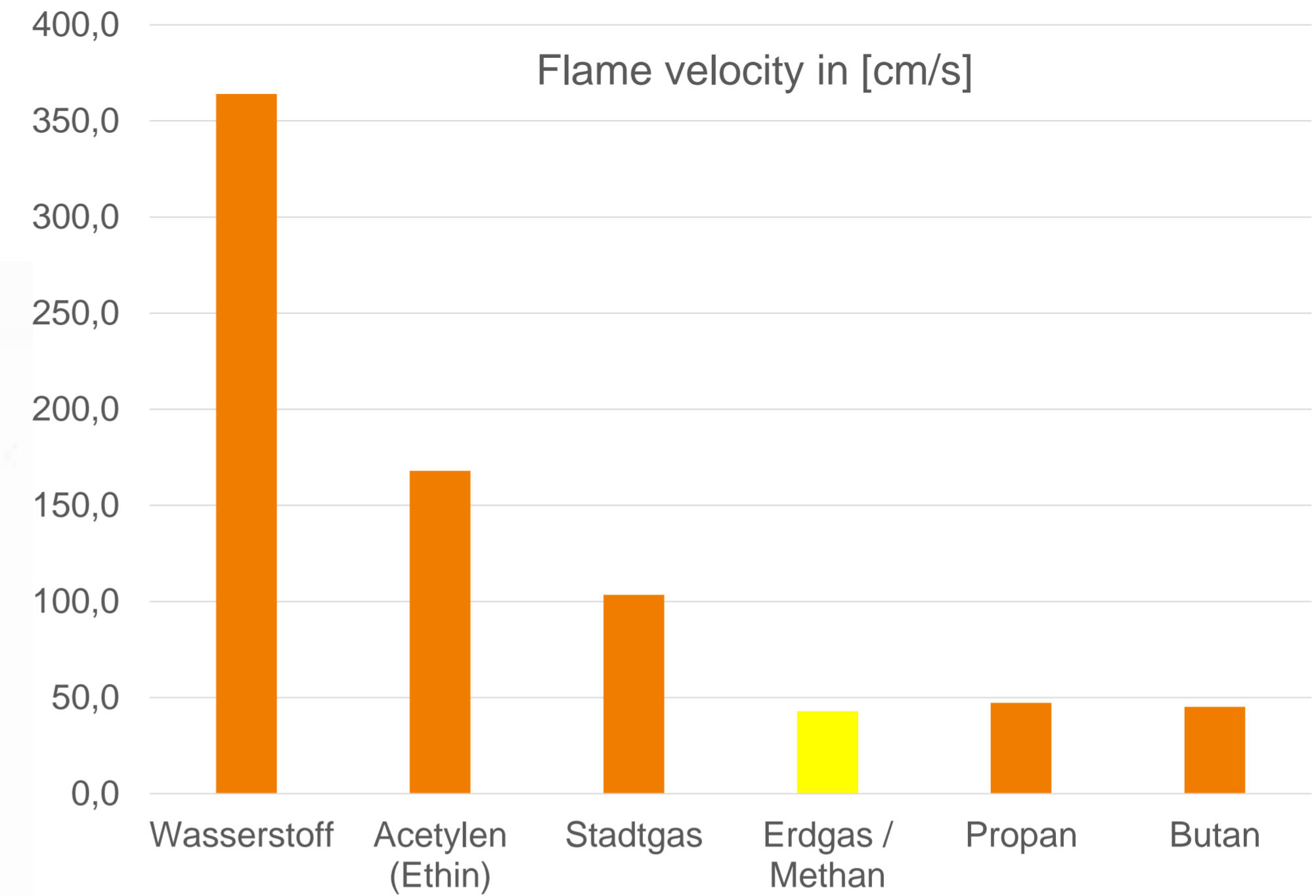
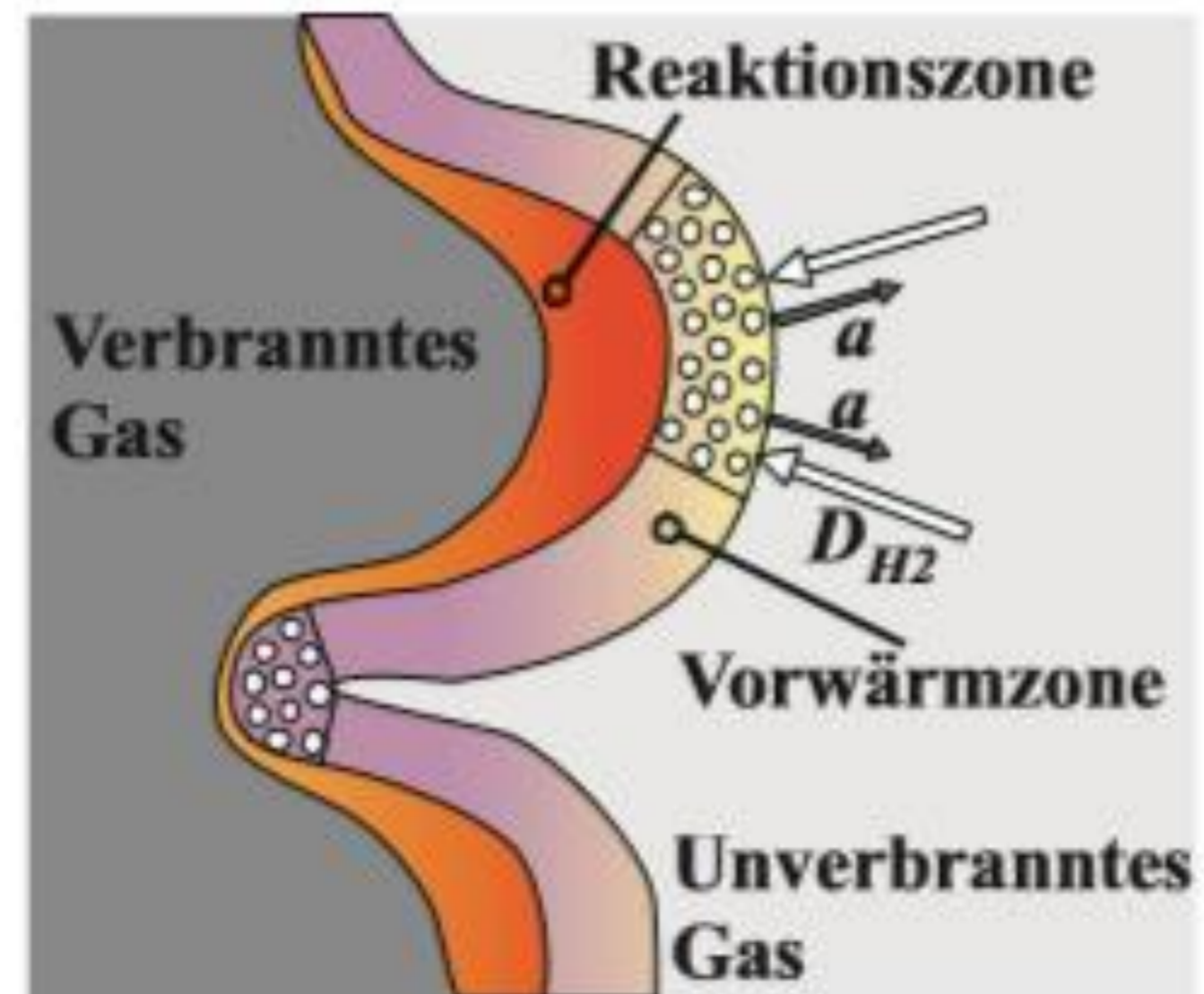




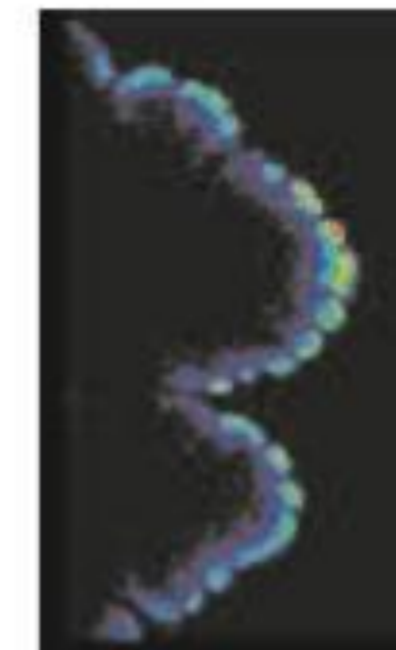
## H<sub>2</sub>- Prototyp

- Test Appliance ECO-H

- Start with 50% Hydrogen
- Tests up to 70% Hydrogen

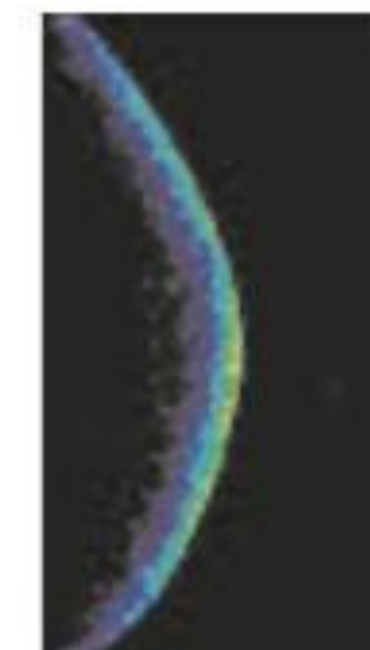


H<sub>2</sub> in Luft  
Le < 1



12.0 Vol %

CH<sub>4</sub> in Luft  
Le ≈ 1



9.5 Vol %