

# Can remote green hydrogen production play a key role in decarbonizing Europe?

A cradle to gate LCA of hydrogen production in Austria, Belgium and Iceland.

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EGU 2022, Date: 24th of May, 2022

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# Introduction

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- Green energy capacity in Mainland Europe currently cannot suffice the growing H<sub>2</sub> demand (95% of the global H<sub>2</sub> production is derived from natural gas and coal [1])
- Some European countries are looking to import H<sub>2</sub> (eg. Germany – expects 80% of its H<sub>2</sub> needs from imports in the long-term) [3]
- **Why Iceland?**
  - Iceland already runs on 100% renewable electricity
    - Hydro- & geothermal baseload power = increased operation compared to wind & PV, excess hydro power potential.
  - Abundant green energy expansion possibilities (e.g.: on/off-shore wind farms [5])
  - Iceland is not far from some of the largest ports in Europe (eg. Rotterdam, Antwerp, Hamburg).

# Methodology

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- Life cycle assessment (LCA):
  - **Scope:** Austria & Belgium - Cradle-to-gate (manufacturing & operation)
  - Iceland - Cradle-to-site (additional liquefaction, storage and transportation).
  - **functional unit:** 1 kg H<sub>2</sub> produced
- Integrating the decarbonization plans of Austria and Belgium between 2020 and 2040.
- Three, most relevant electrolyzer types analyzed:
  - i. Alkaline (AEC),
  - **ii. polymer electrolyte membrane (PEM)**
  - iii. Solid oxide (SOEC)
- Future parameter enhancements for the electrolyzers (efficiency & lifespan) are accounted for based on the IEA's 'Future of Hydrogen' report [2].

# LCIA – PEM scenarios (Global warming potential)

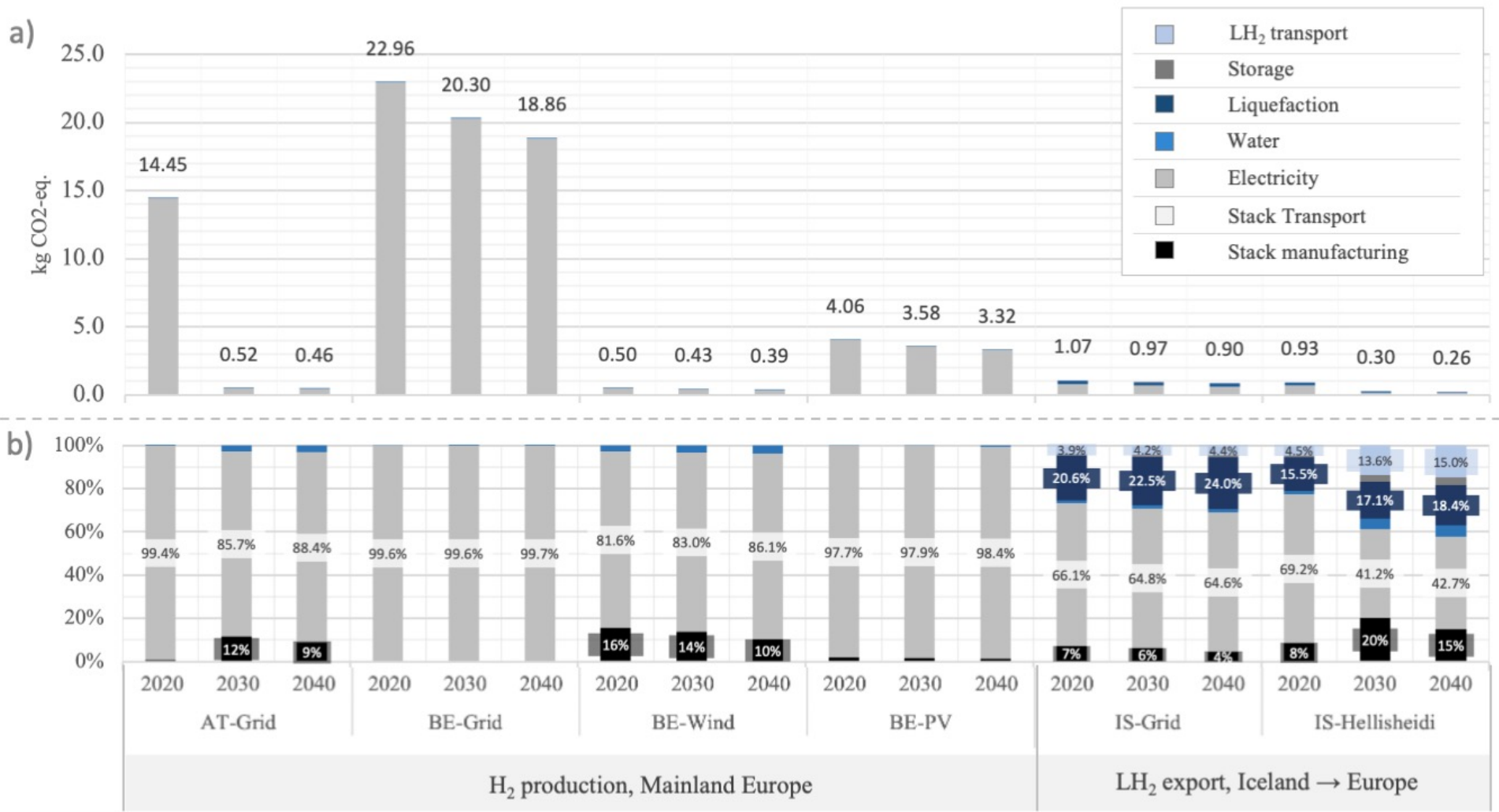


Figure – Global warming results for the PEM scenarios (2020-2040) per 1 kg H<sub>2</sub> produced

## Discussion & Conclusion

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- Largest impact associated with the operation of the electrolyzers
  - Decarbonization plans significantly reduce the emissions between 2020-2040
  - Transportation does not have a drastic affect on the footprint
  - The financial side would impact the feasibility of such a project significantly.
  - The environmental assessment clearly favours Icelandic H<sub>2</sub> over European.
  - The Austrian grid's carbon intensity will become compatible with that of Iceland's by 2030.
  - However, Iceland benefits from its baseload power = more potential for excess power.
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# Thank you for your attention

## Acknowledgments:

- Energy Institute at the JKU, Linz.
- Reykjavik University
- ON power and Reykjavik Energy (OR) for contributing to data acquaintance



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