# Green Hydrogen from Iceland: A Clean Energy Pathway to Decarbonizing Teesside's Industry

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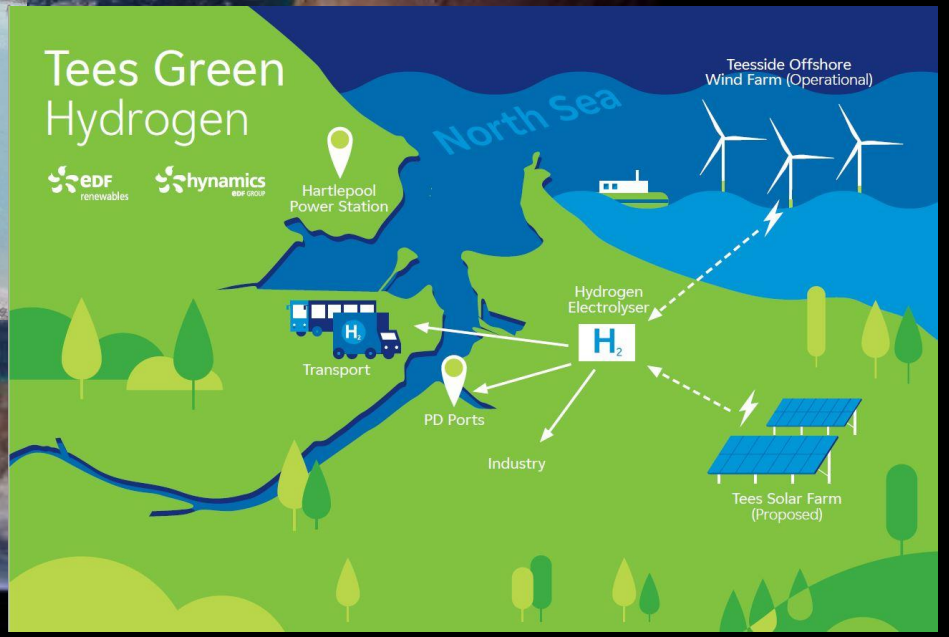
# The opportunity

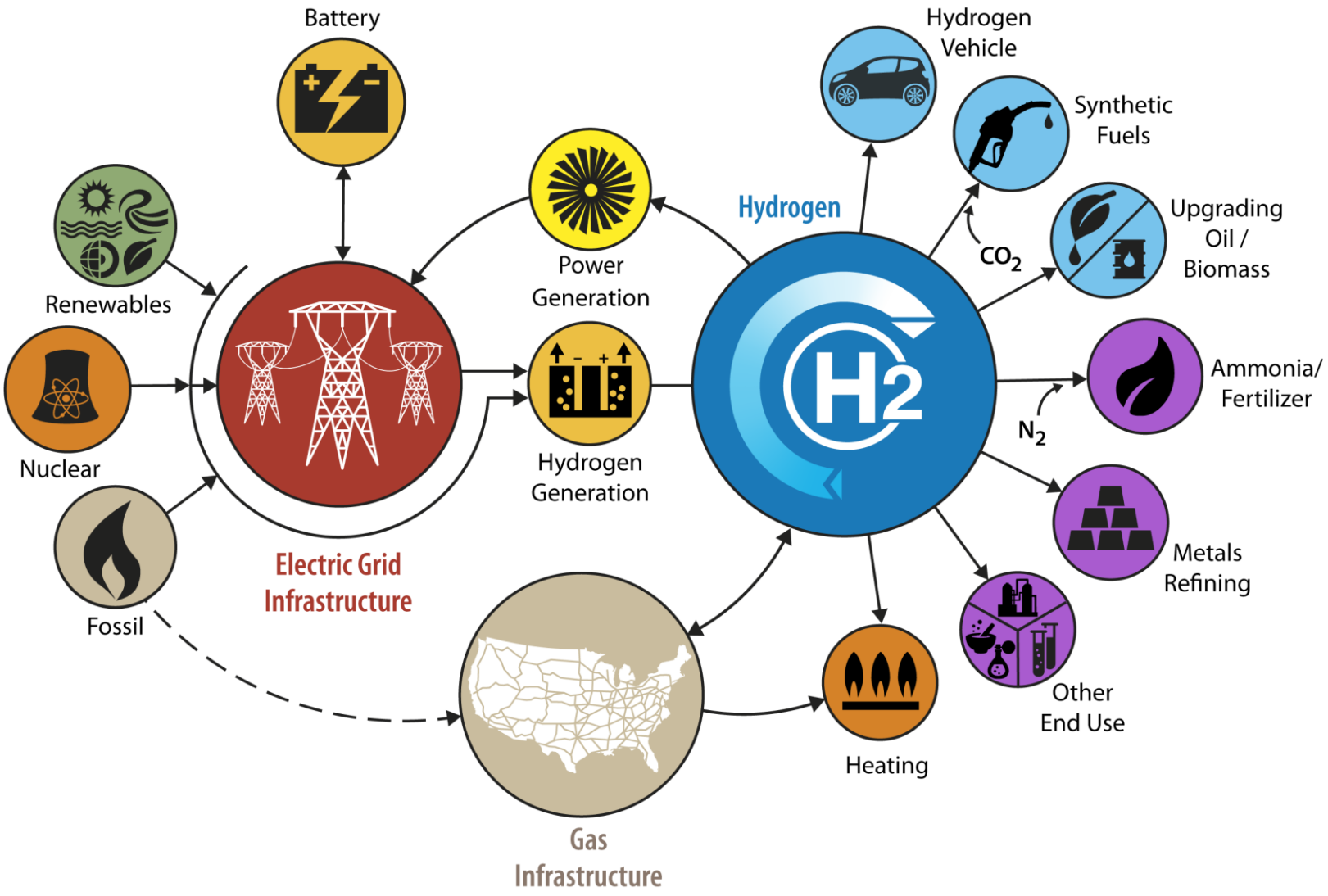
Greenland

Iceland

Teesside



# Hydrogen as an energy carrier



# Can green Hydrogen be exported from the Arctic?

# Yes, we do already!!!

Tanks für den Transport von verflüssigtem Methan

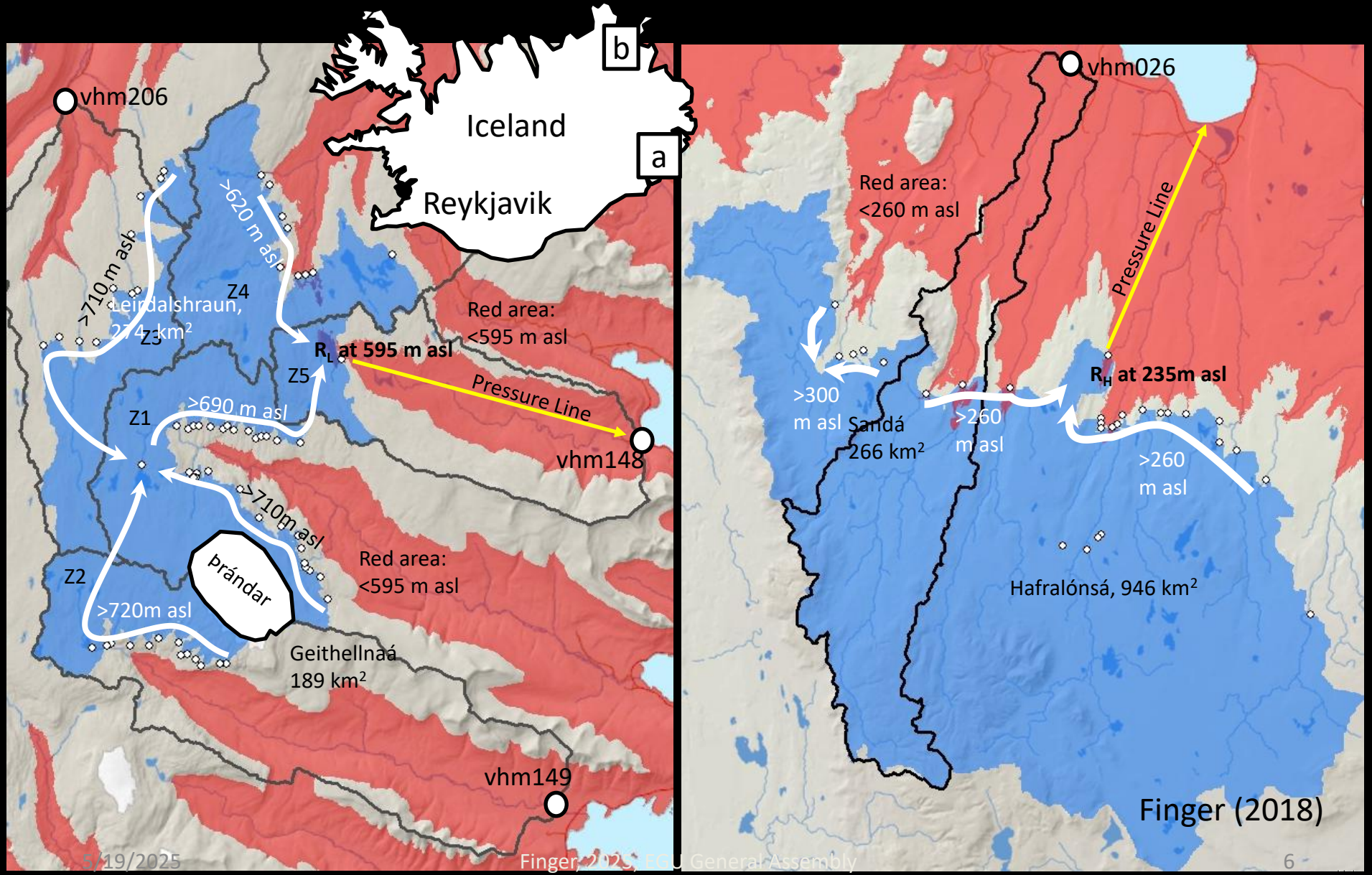
Abbildung: Broadview Energy Solutions

Einspeisung von LBG ins Basler Gasnetz bei Kleinhüningen 2018


Abbildung: Nordur

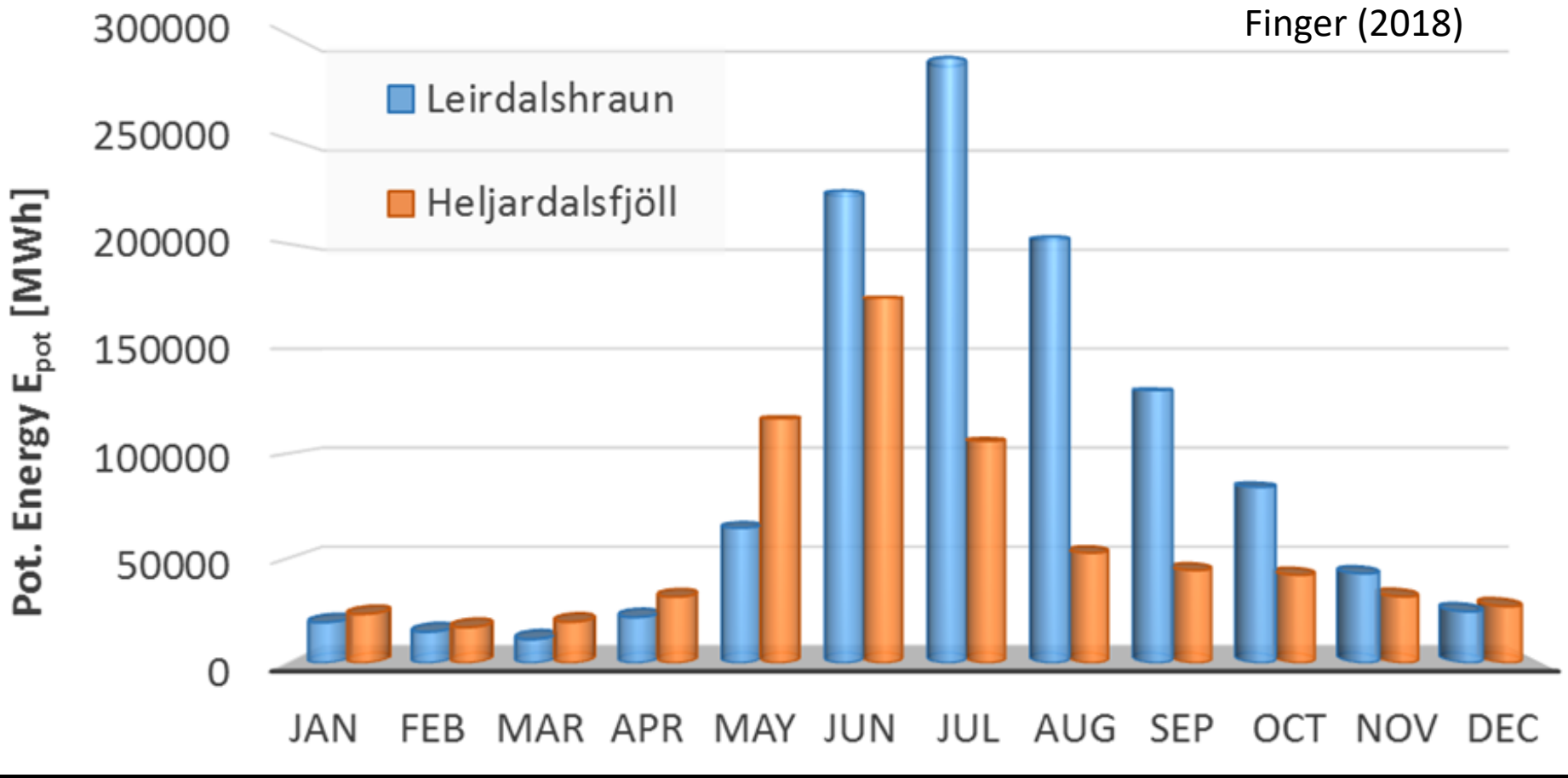
# How to assess the power potential?

# How much Hydrogen can be produced?

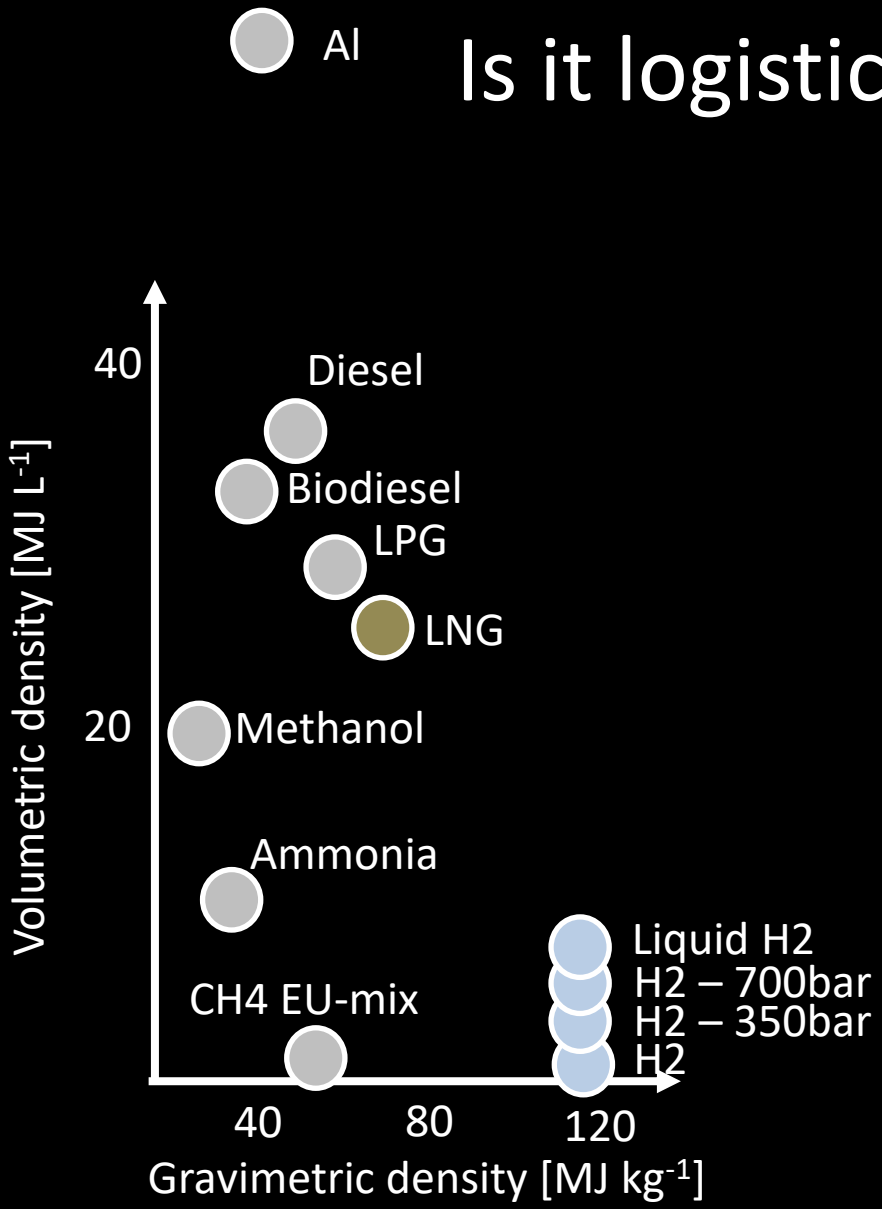


# We can calculate it!

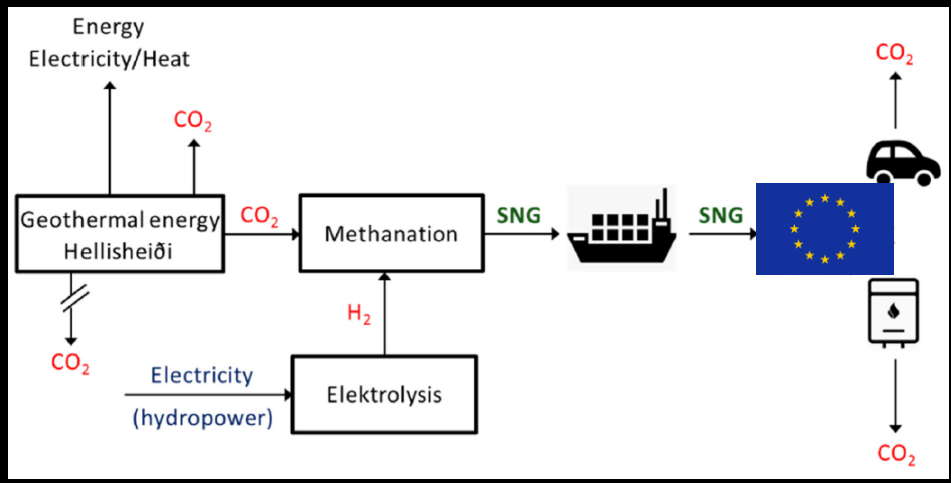
Leirdalshraun: 274 km2; 595 m asl; 5.7 % glacierized
Heljardalsfjöll: 946 km2; 235 m asl;



# Is it logistically possible?








https://www.psi.ch/en/ta/impega

# LNG Logistics for 100 GWh (300 times 22t-containers; 6 per week)



1) The Hellisheiði Power Station
- 303 MWelec 133 MWth
- Electrolysis (65 – 70% efficiency)
  - Polymer Electrolyte Membrane (100% electr)
  - Solid Oxide Electrolysis (25% heat: 75% electr)
- Methanation and Liquification (83% efficiency)

2) Storage

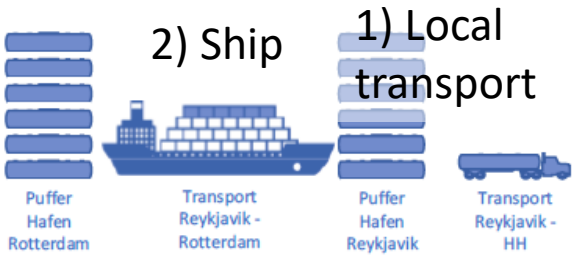
3) Transport with Truck (Hellisheiði – Reykjavik Harbour)
- 6 containers per week
- 22t containers

4) Transport by ship (Reykjavik Harbour – Teesport Harbour)
- Currently twice a week

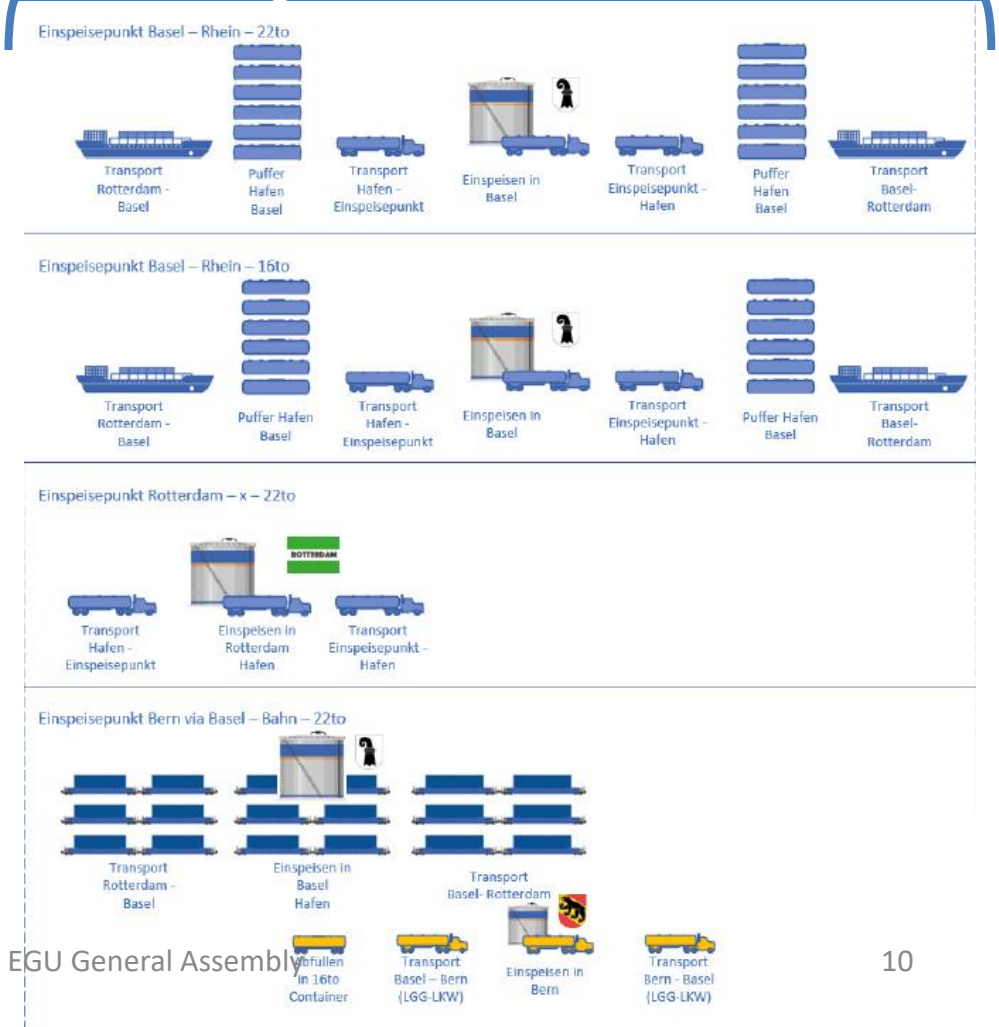
5) Options in Teesport
- Injection into the gas grid
- Transport by train
- Transport by truck

# LNG Logistics for 100 GWh (294 times 22t-containers; 6 per week)


Case 1.0 bis 7.0








Transport option in the EU

i) By truck to injection point (16t or 22t)

ii) Injection in Rotterdam

iii) By train to injection point

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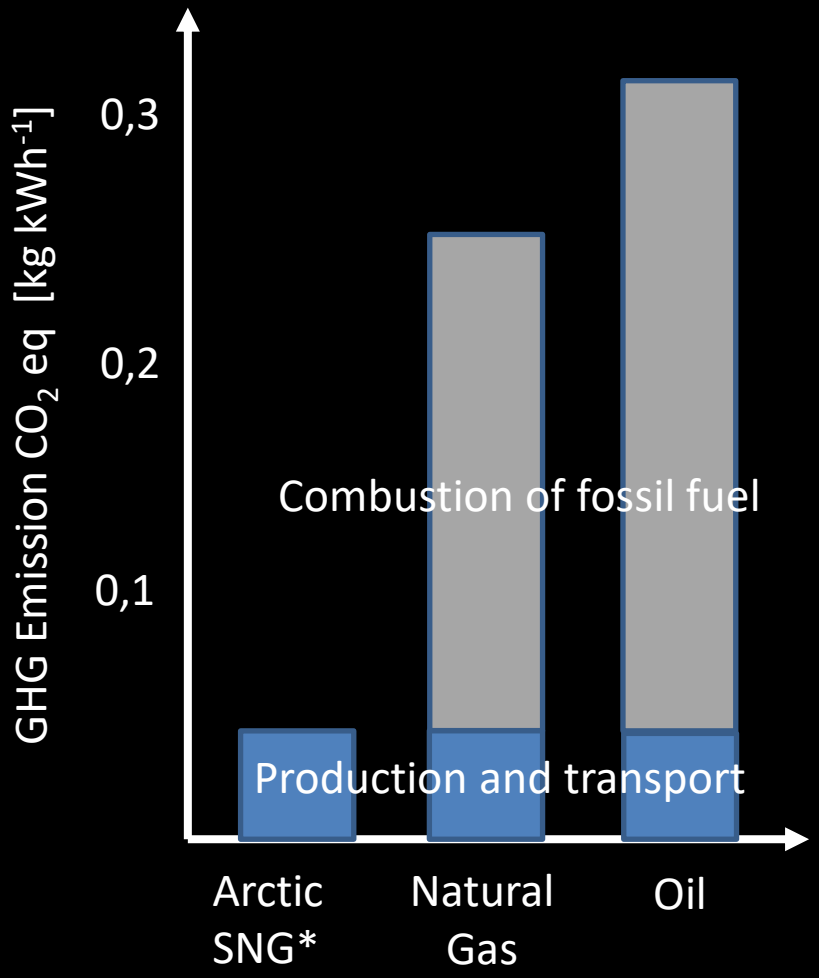
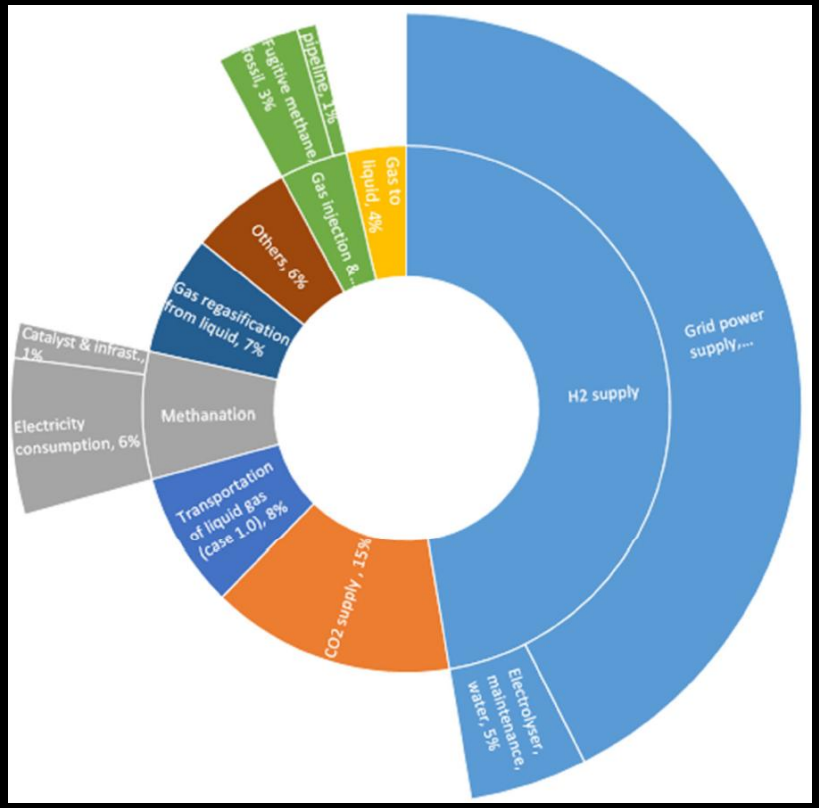
# The carbon footprint

GHG intensity grid mix Iceland, as used in this analysis: 19 g CO2eq/kWh (similar to wind power)




*Using CCU and $CO_2$ is allocated to power plant

https://www.psi.ch/en/ta/impega

# Kangerlussuaq, Greenland

# Greenland hydropower projects


Client: NUKISSIORFIIT

Contractor: ÍSTAK for 3½ of the 5

Construction time: see below

**Hydro Projects:**

Nuuk / Buksefjord 30 MW, started 1993

Tasiilaq 1,2 MW, 2002 - 2004

Qorlortorsuaq 7,5 MW, 2004 - 2007

Sisimiut 2x7,5 MW, 2007 - 2010

Ilulissat 3x7,5 MW, 2010 – 2013

The last three were turn-key projects

# Hydropower potential in GReenland)

- Theoretical capabilities for mid West Coast Greenland is 900+2300MW=3.2GW installed capacity (12 hydropowersites in one grid, distance up to 600KM
- Practical roadmap: Cornerstone 900MW then add on 270MW and subsequent 240MW – 1.4GW capacity all under 100KM from each other
- Up to 6.5 TWh annual electricity production in Tasersiaq and Tarsartuup Tasersua.

## Conclusion:

- Green Hydrogen production to decarbonize the Industries is technically and economically possible
- Greenland can play a key role in the energy transition
- Lets work together and learn from each other


Thank you for your attention
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