



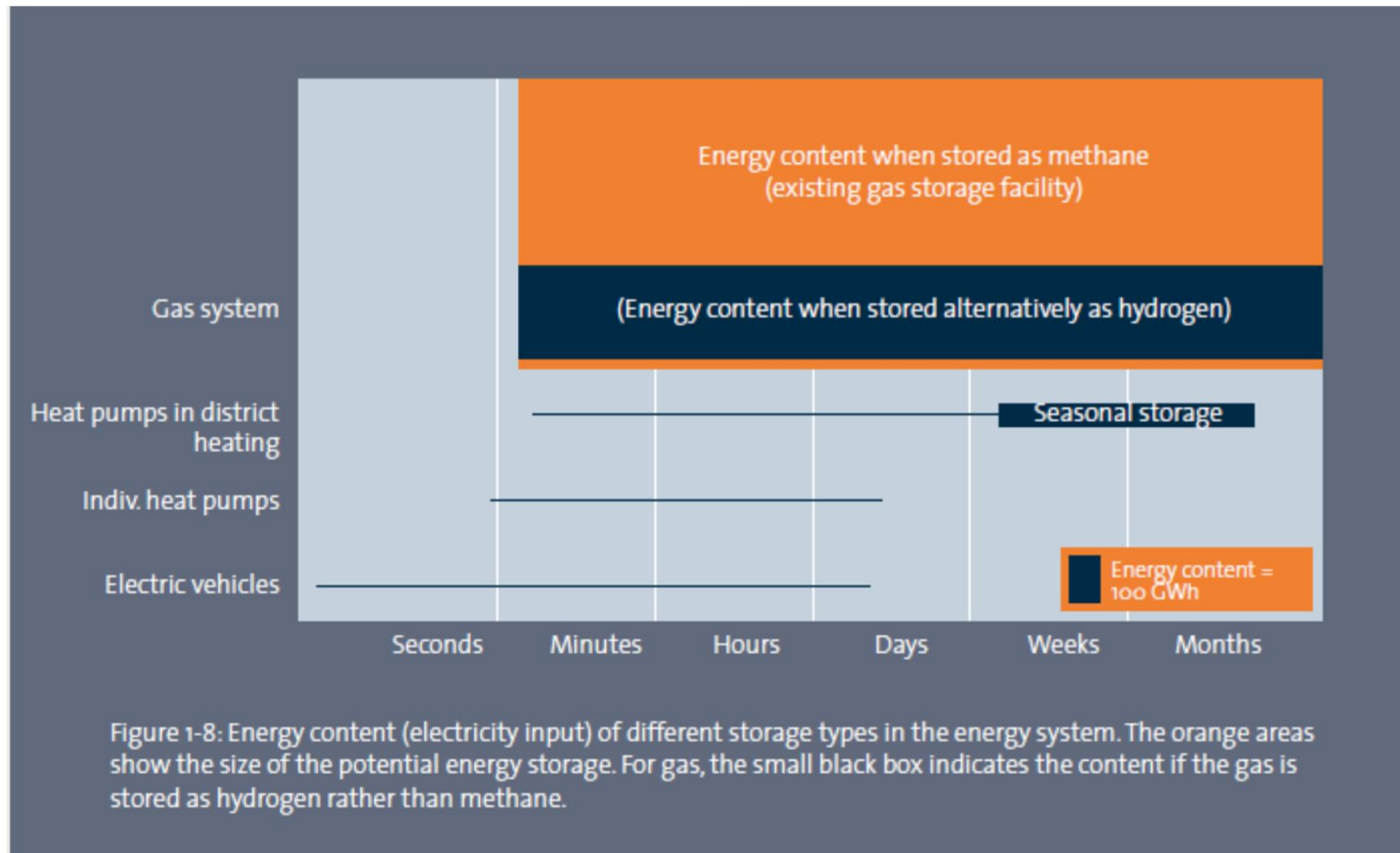
Chemical Storage in Future Energy Systems

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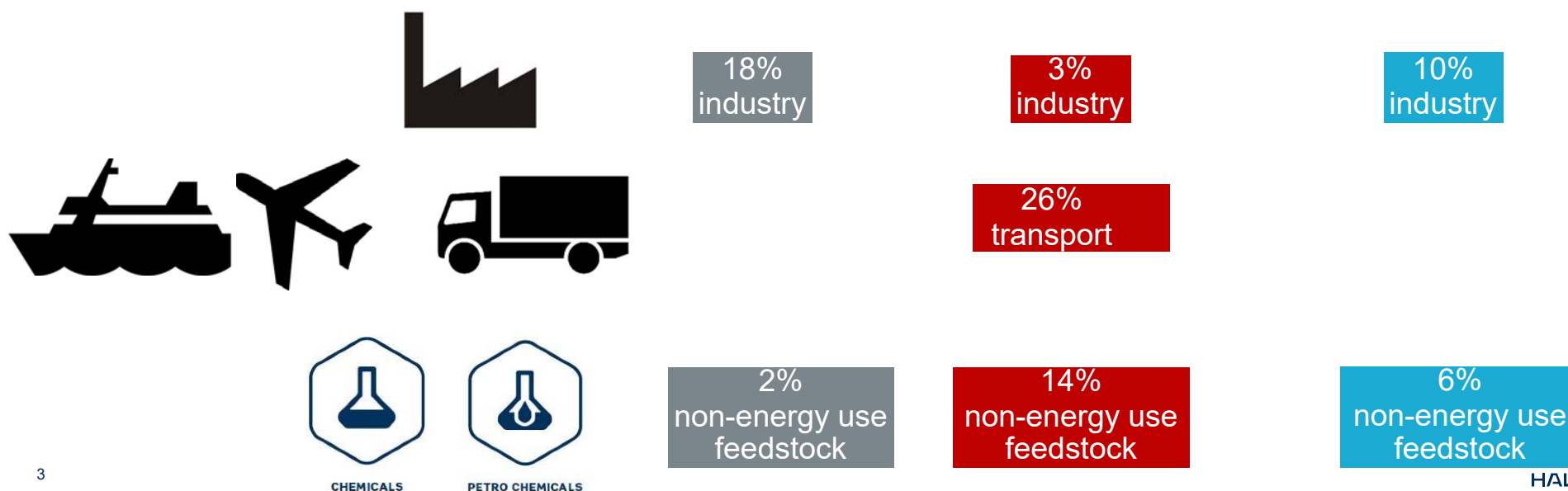
Storage of Wind Energy – Why Chemical Storage ?



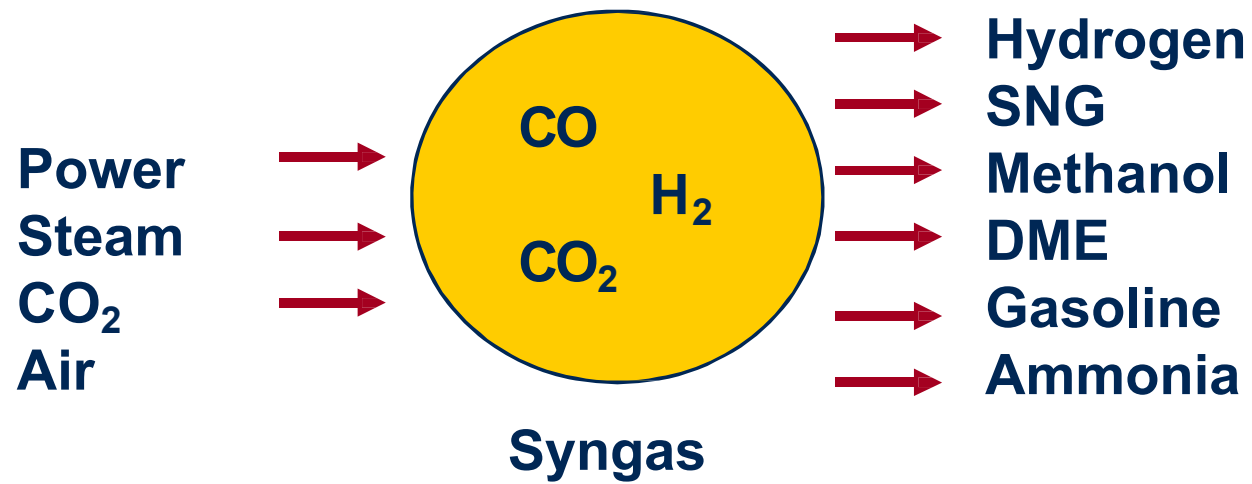
Substituting fossil with renewable resources

Most of the fossil energy can in principle be replaced with renewable energy

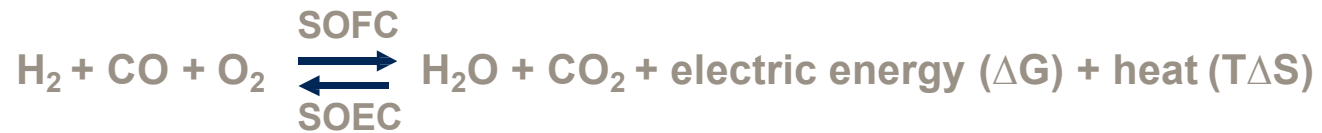
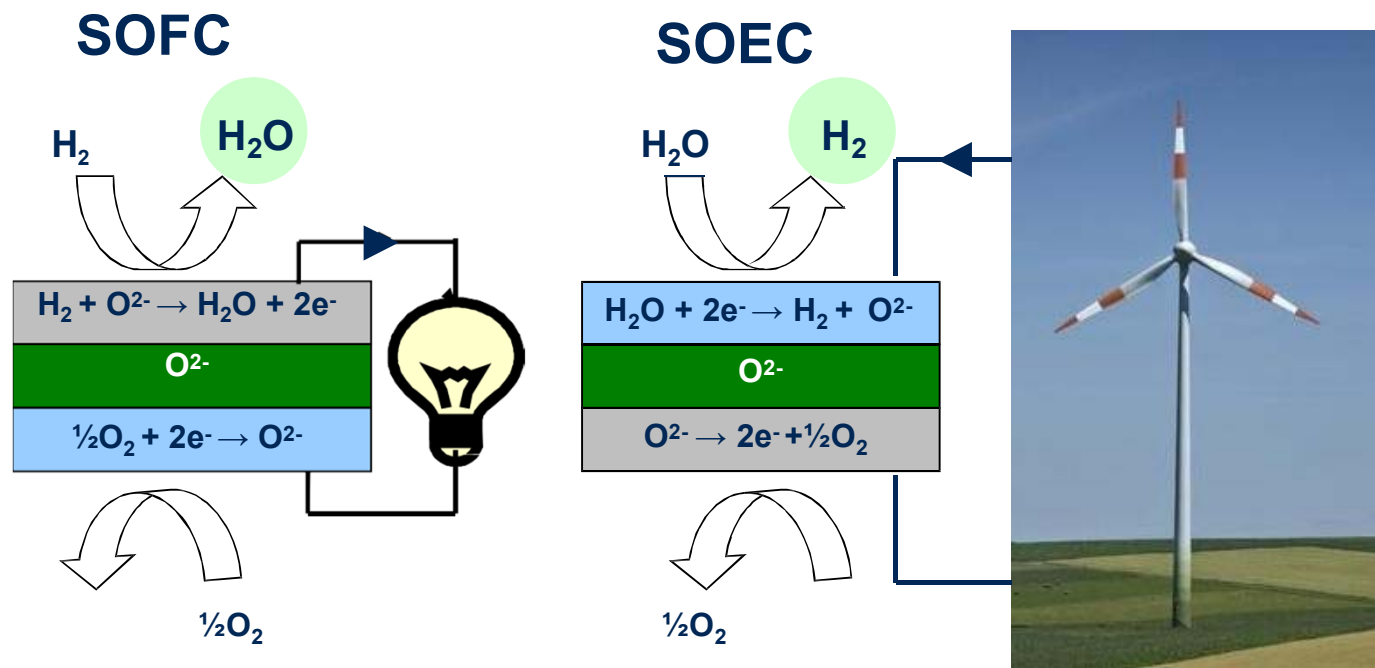
Energy source	Coal	Oil	Natural gas
% not easily replaced with current technologies	20 % of total coal use (6 % of total energy use)	43 % of total oil use (14 % of total energy use)	16 % of total NG use (3 % of total energy use)
Energy EJ (Mtoe)	33 (777)	78 (1863)	19 (454)



Electrolysis



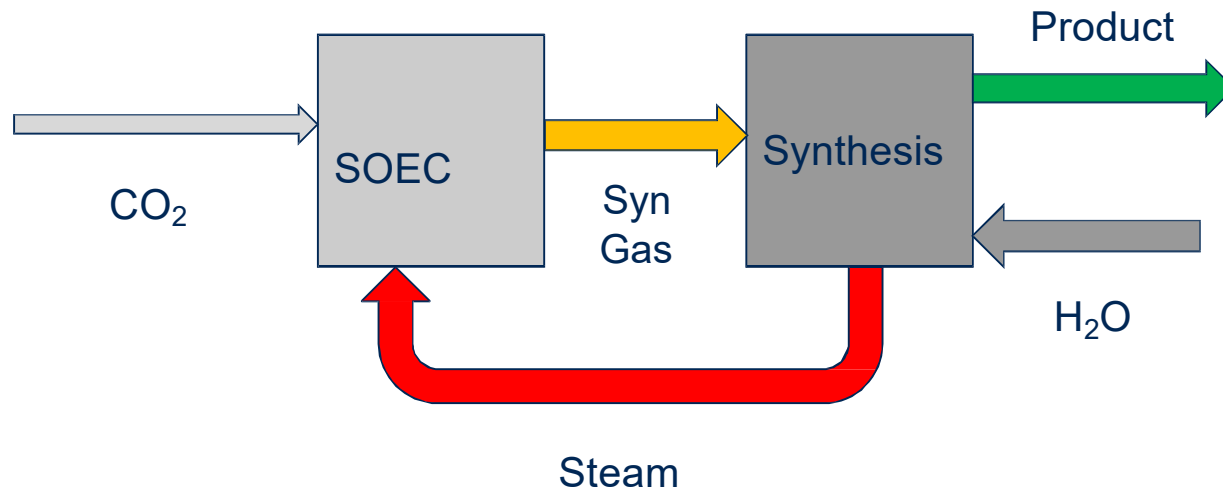
Fuel Cell and Electrolyser



Biogas upgrade by means of SOEC



Synergy between SOEC and fuel synthesis

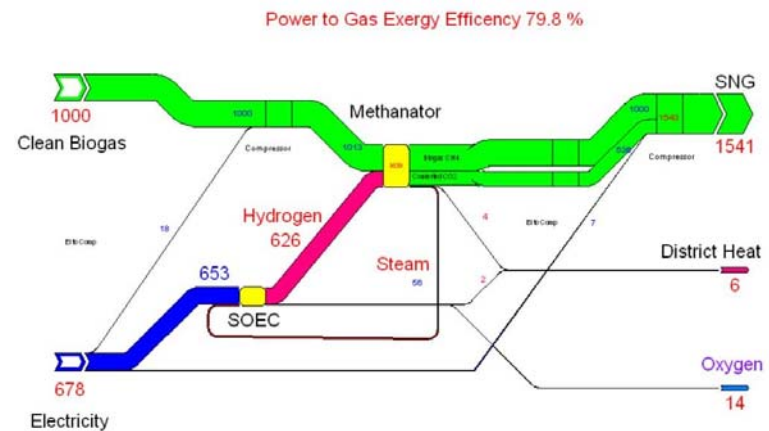


Biogas upgrading demonstration unit

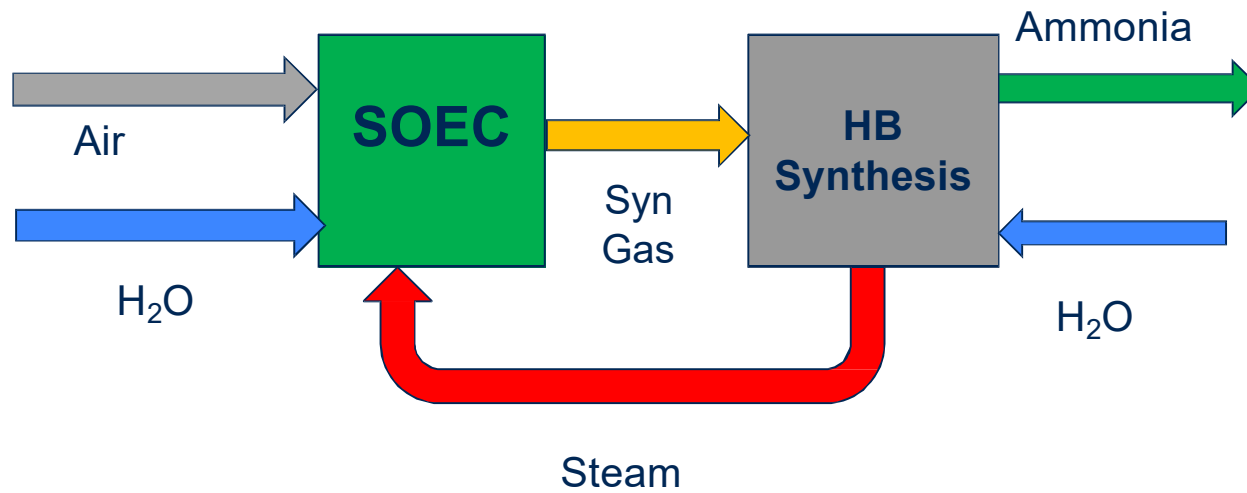
Operating in Foulum, Denmark



- 50 kW SOEC unit for steam electrolysis
- Catalytic methanisation
- The CO₂ in the biogas is upgraded to pure methane with pipeline quality.
- High Exergy Efficiency of 80%



Synergy between SOEC and fuel synthesis



New EUDP project : 1.5 kW SOFC and 50 kW SOEC and 20 Nm³/h NH₃ synthesis gas



Participants:

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Aarhus University
Energinet.dk
Vestas
Ørsted Equinor

Coordinator:

HALDOR TOPSØE 
CATALYSING YOUR BUSINESS

Duration:
January 2019
April 2022
Project sum:
26 mio DKr.
Location:
Foulum &
DTU

