

BELGIUM'S NEXT CENTURY SAF / E-FUEL ECOSYSTEM

Neutral Kero Lime Presentation to Energia

Autoworld, Octobre 28th, 2021

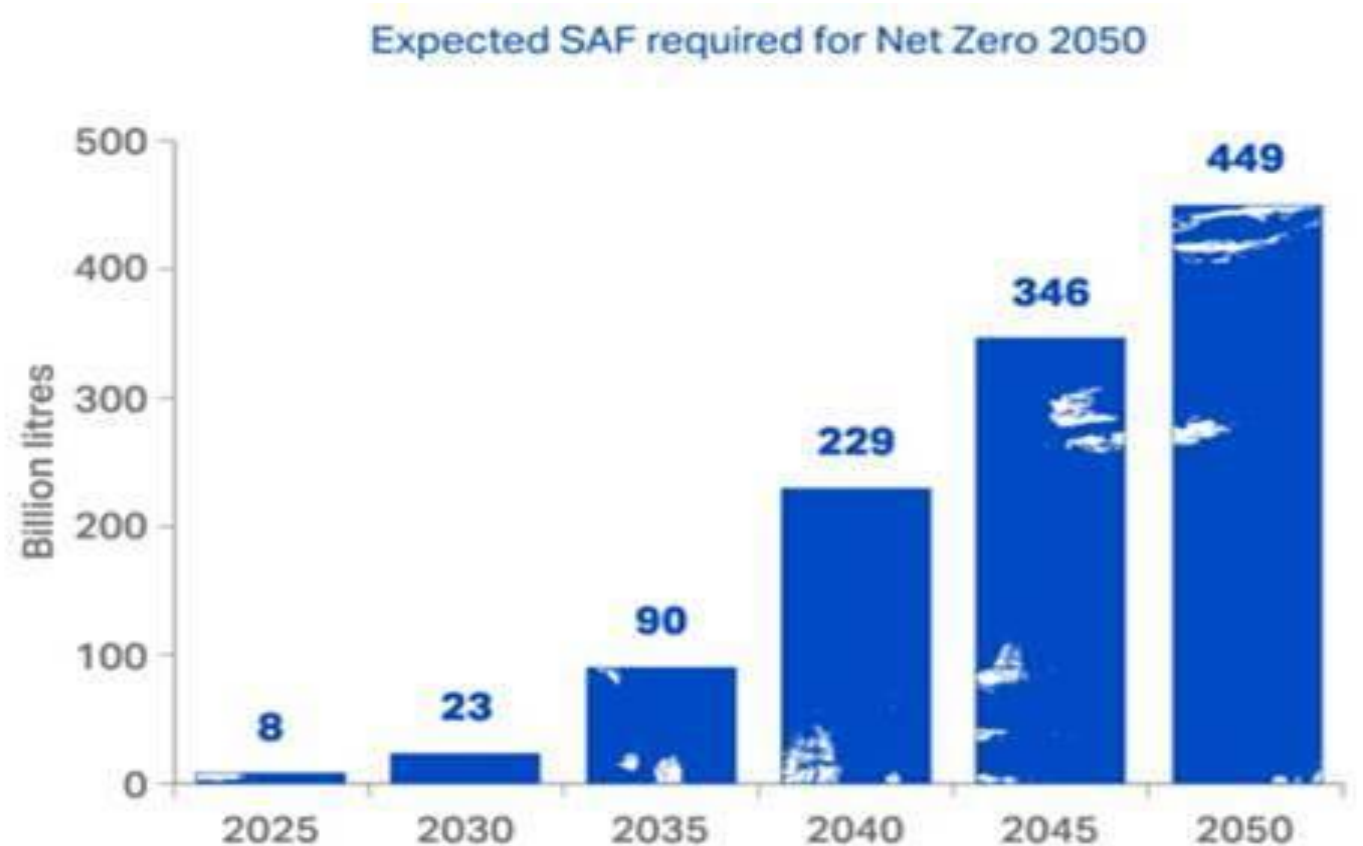


FLUXYS



NKL

- ❑ Defossilize aviation by 2050
- ❑ SAF / E-Fuel is the most credible solution
- ❑ Market
 - ❑ EU: Fit for 55: min. 0,7% (~0.5Mt) in 2030 to 28% (~26Mt) in 2050
 - ❑ IATA: 65% SAF for Net Zero by 2050 (23 bn liters in 2030)



Most Europeans are thinking SAF ... and Belgium?



Some decisions pending



The UK

The **Renewable Transport Fuel Obligation (RTFO)** rewards SAF production with the same economic incentives given to road vehicles



The Netherlands

SAF Roadmap under development with a **blending mandate** at the national or EU level. Focus on **advanced feedstocks**. First SAF plant (SkyNRG) in 2022



Germany

National legislation for **GHG reduction of fuels** (to transpose the RED II) and the German National Hydrogen Strategy **foresee an SAF energetic sub-quota of 2% in 2030 and ONLY for PtL-kerosene**



France

SAF roadmap to reach a SAF supply of **2% in 2025 and 5% in 2030**. Focus on advanced feedstocks



Spain

Climate Change Law: **2% SAF supply objective in 2025**. Several new bio-refineries under planning with special focus on **wastes and residues**



Portugal

Roadmap for Carbon Neutrality (RNC2050) – integrated approach to **transport decarbonization including aviation**



Norway

SAF blend **0.5% mandate started in 2020**. Considering a **30% target for 2030**



Sweden

A carbon neutral country by 2045. Legislative proposal for **SAF blend ratios from 1% in 2021 to 30% in 2030**. Fossil-free Sweden industry initiative



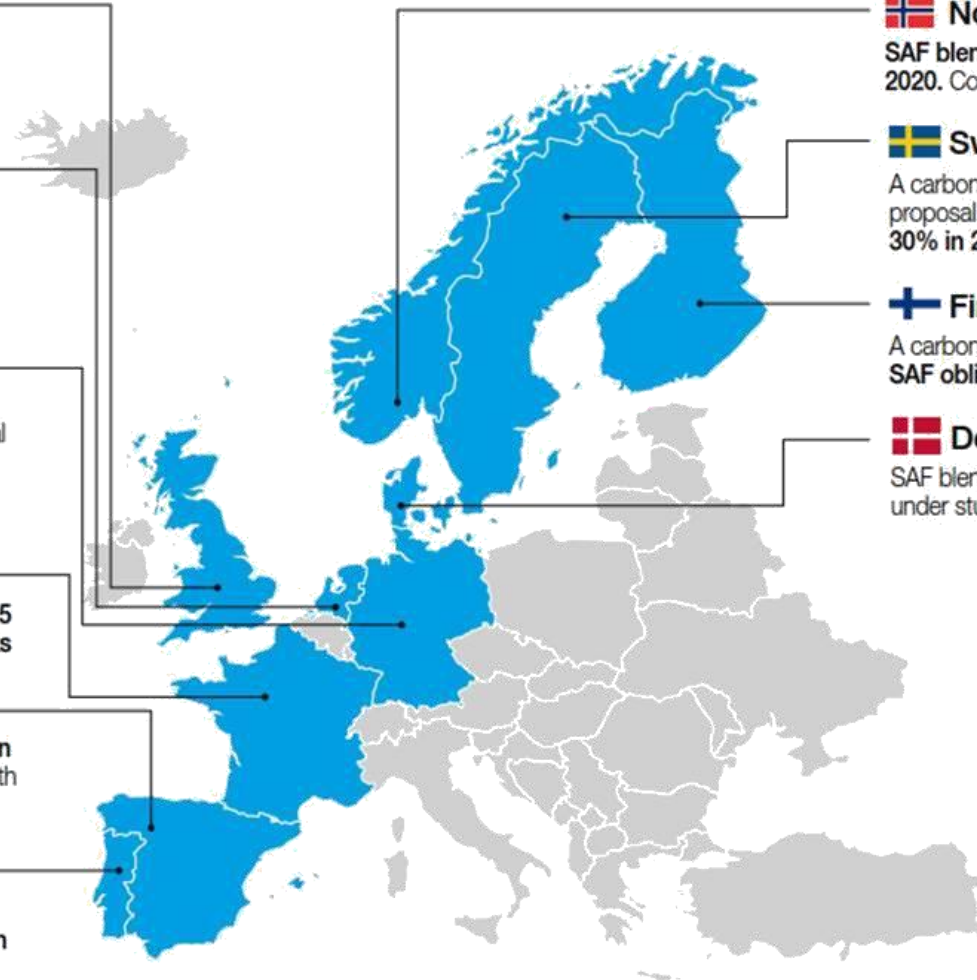
Finland

A carbon-neutral country by 2035 – **increasing SAF obligation to reach 30% in 2030**



Denmark

SAF blend obligation under study



N-kero ideal for long haul and large cargo freight



Hydrogen/electric

Energy volumic density much too low:

- ⇒ Forced to cool/pressurise H₂
- ⇒ Impossible to store in the wings
- ⇒ Security issues (flash point)
- ⇒ Complete redesign required (blended wing, propulsion)
- ⇒ Environment issues (NO_x)

Not before 2035 for Airbus demo plane
Never for large aircraft (e.g. long haul, freight)



Biofuel

- Energy density similar to kerosene
- Current fleet or airport infrastructure compatible
- Land pressure on food
- Cost-effectiveness: 4 x more expensive than fossil kerosene



e-fuel

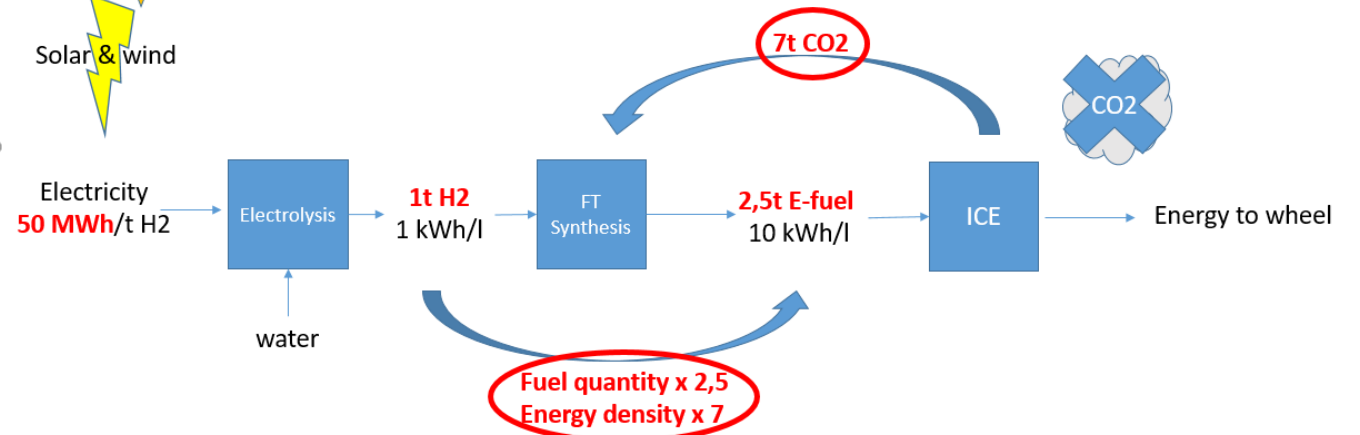
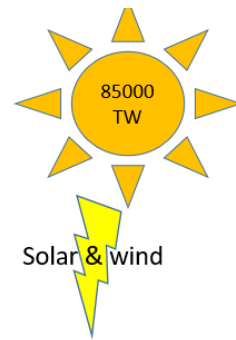
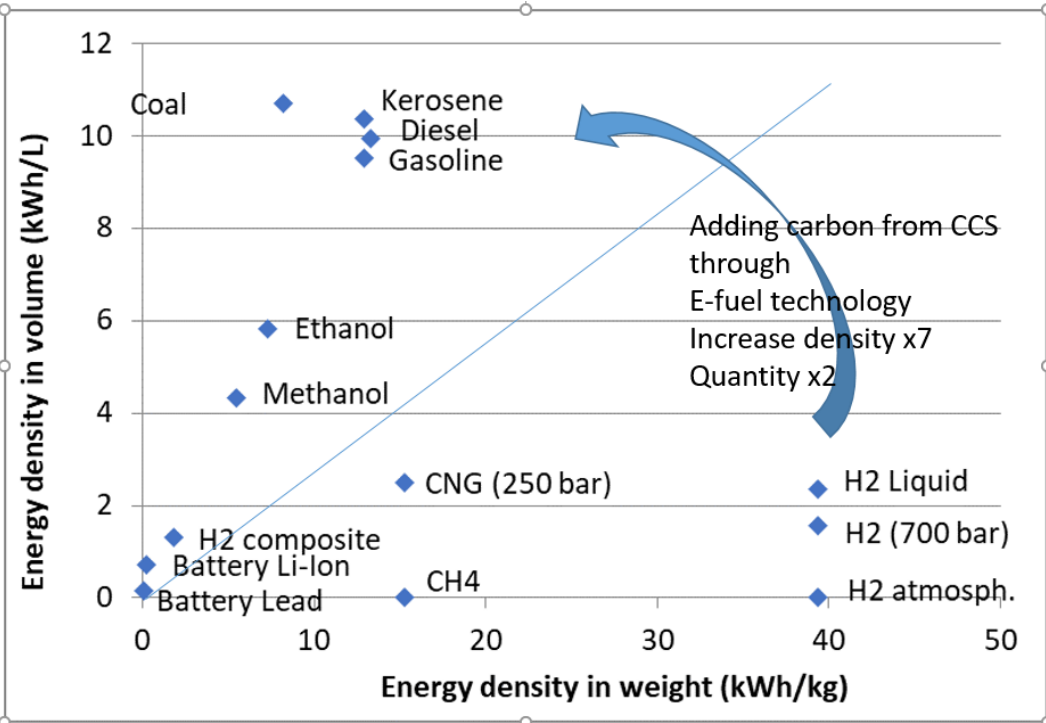
- Energy density similar to kerosene
- Current fleet or airport infrastructure compatible
- Cost expected to be reduced down to 1.5 to 2 x fossil kerosene



H2 Strategy enhanced with Carbon Recycling

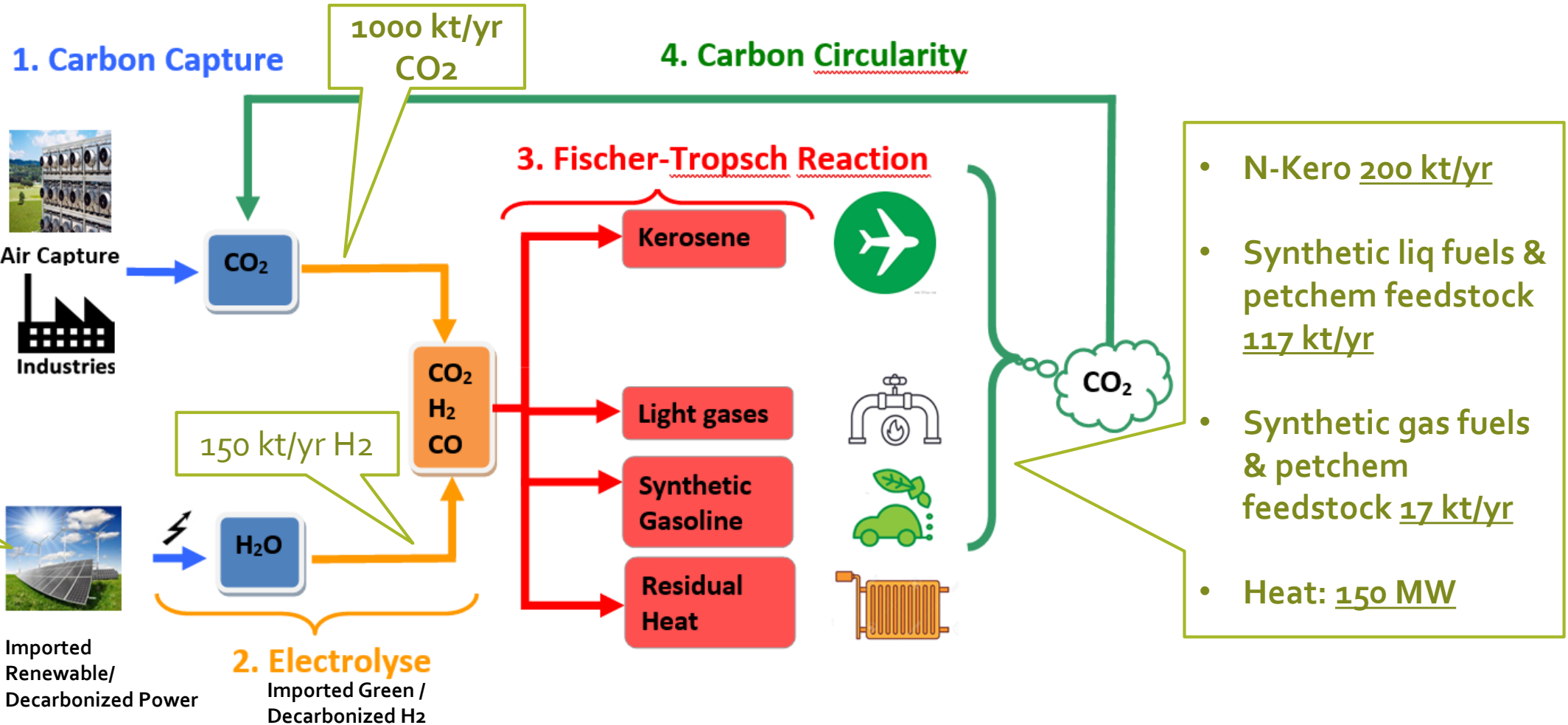
Energy density matters...

.... as it provides efficient energy systems



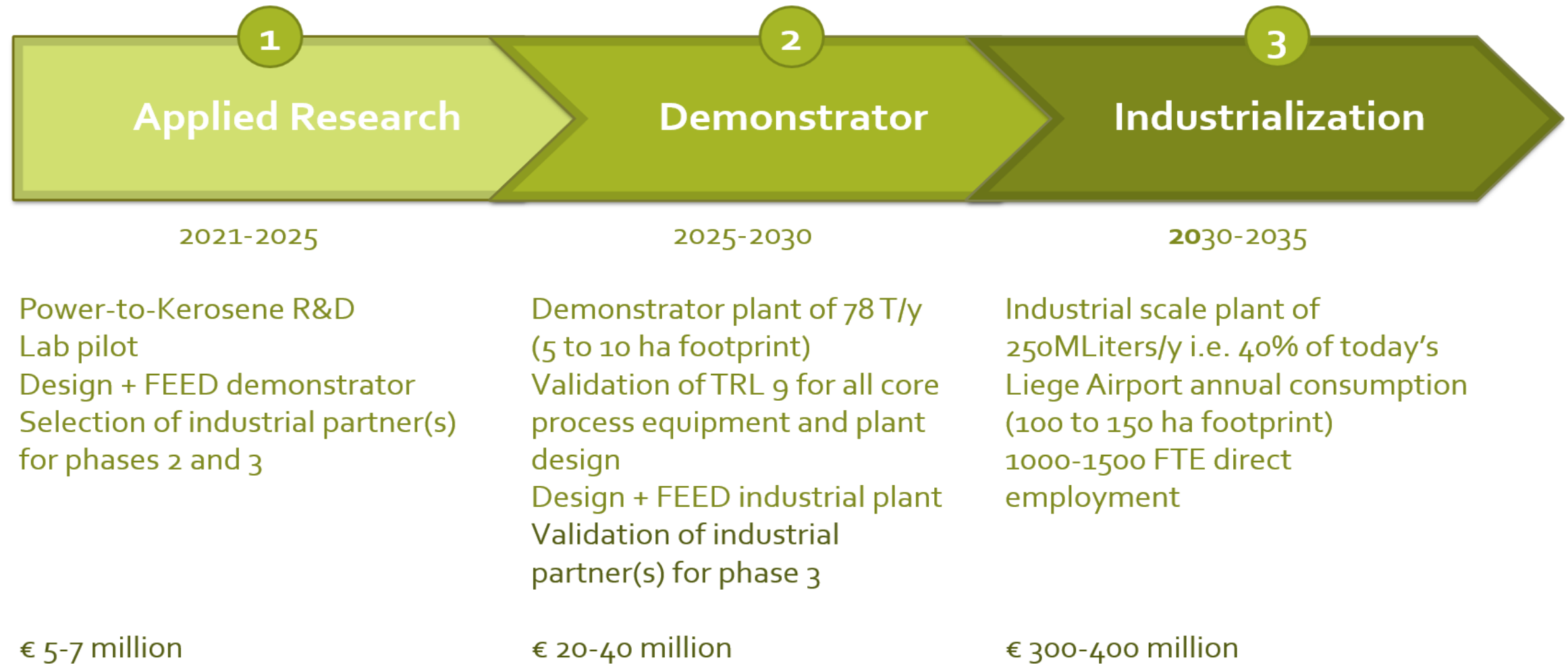
Recycling carbon transforms hydrogen into more efficient, safer and readily actionable energy

NKL at a glance



Deep technology integration within existing industrial eco-systems

A three-phase challenge achievable by 2035





Hamon Group, a Belgian company established in 1904, is specialist in Cooling & Flue Gas Treatment systems

Fabrice Orban, CEO
Hamon



Process intensification in the chemical industry based on systems analysis
Faculty of Applied Sciences Dept of Chemical Engineering

PhD. Dr. Ir. Grégoire Léonard,
Professor PEPs, ULiège