Environmental considerations of H_2 production from wind power

Patrick Schmidt | LBST | Munich
Workshop «Hydrogen, key enabler of wind power & industry leadership in Europe»
Brussels, 8 October 2019

The HyBalance project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 671384. The Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation program. www.fch.europa.eu. The HyBalance project has furthermore received funding from the Danish EUDP program, which is administered by the EUDP Board.

HyBalance

Outline

- LBST and our role in HyBalance
- HyBalance hydrogen supply pathways
- Environmental performance preliminary results
- Outlook & take-aways

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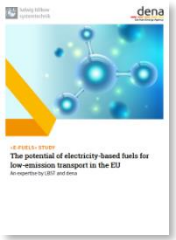
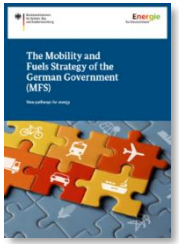
LBST · Ludwig-Bölkow-Systemtechnik GmbH





Profile

- Independent expert for sustainable energy and mobility for over 30 years
- Bridging technology, markets, and policy
- Renewable energies, fuels, infrastructure
- Technology-based strategy consulting,
  System and technology studies,
  Sustainability assessment
- Global and long term perspective
- Rigorous system approach – thinking outside the box
- Serving international clients in industry, finance, politics, and NGOs

References

- VDA – *E-Fuels Study*
- UBA – *Power-to-Liquids for Aviation*
- BMVI – *Integrated Energy Concept 2050*
- BMVI – *Mobility & Fuels Strategy*
- EC/FCH2JU – *CertifHy – EU-wide green H_2 guarantee of origin scheme*

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HyBalance
From windpower to
GREEN HYDROGEN
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HYDROGENICS
SHIFT POWER | ENERGIZE YOUR WORLD
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LBST role in the project:
Proposal coordination
Environment analysis

Environmental performance: methodology & pathways

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- Fossil reference: Hydrogen from steam methane reforming of natural gas trucked in from Germany
- Hydrogen via water electrolysis assuming
  - Grid mix Denmark (production mix)
  - 100 % wind power
- Methodology:
  - Preliminary assessment based on nominal plant capacities
  - Cumulated energy efforts: efficiency method according to IEA, EUROSTAT, ECE
  - GHG balance according to JRC and EU RED/FQD

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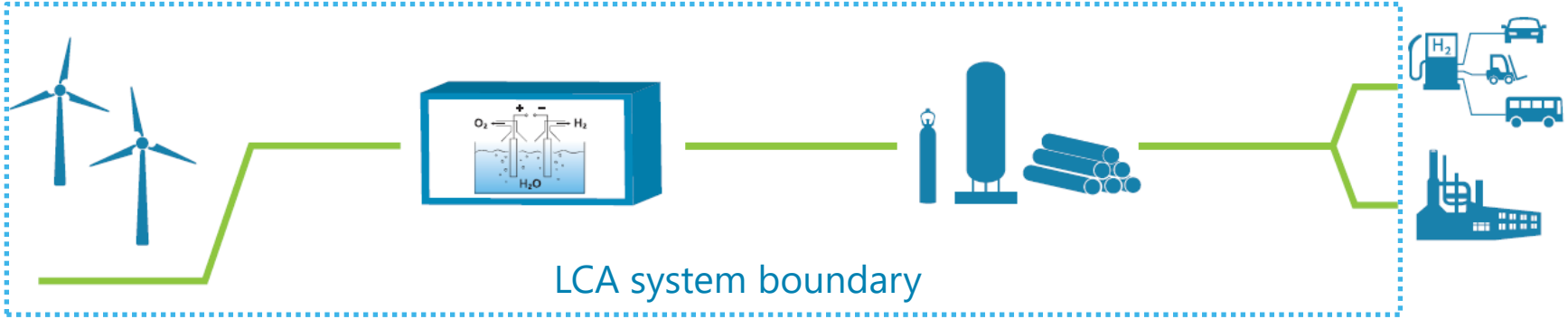
HyBalance pathways for H_2 supply



- Danish electricity grid mix (based on 194 g_{CO2}/kWh [Energinet 2018])
- 100 % wind power (0 g_{CO2eq}/kWh [JEC 2014])

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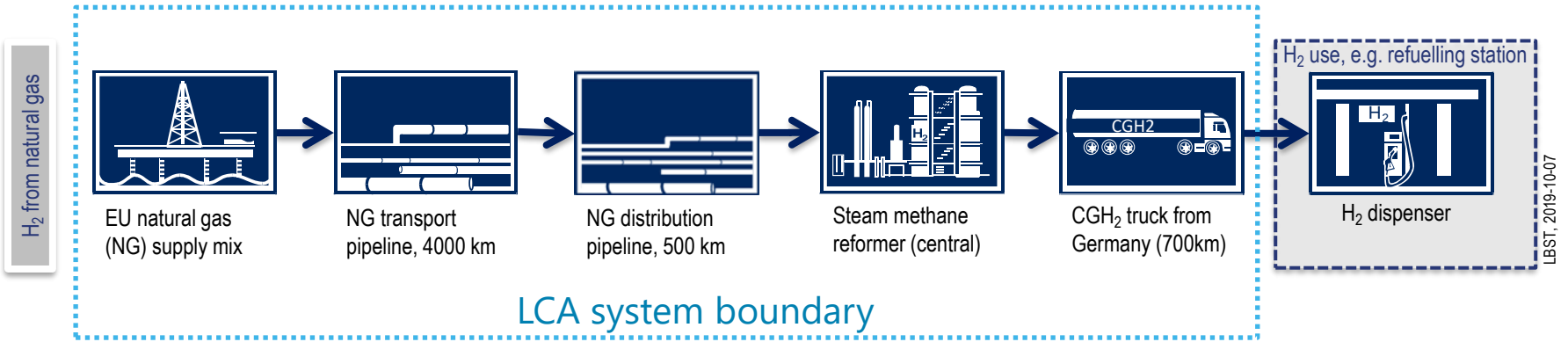
Fossil reference pathways for H_2 supply



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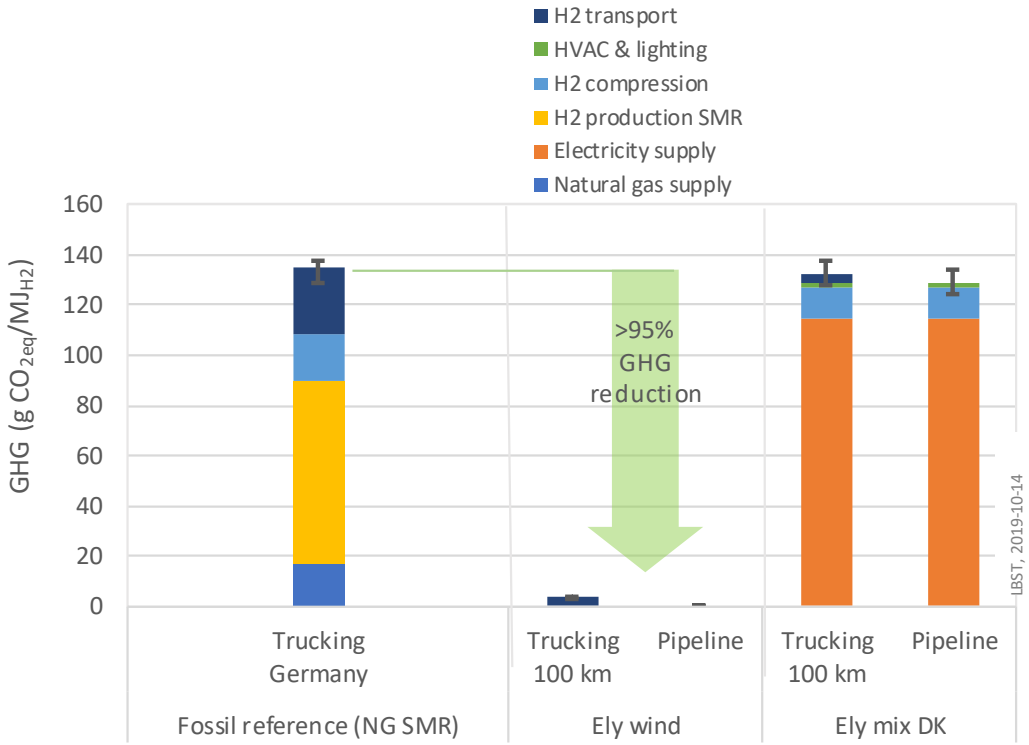
Preliminary results: Greenhouse gas emissions

- Danish **electricity grid production mix** has been improving and already breaks-even with the fossil reference, i.e. hydrogen from steam methane reforming of natural gas trucked in from Germany.
- Increasing the **share of renewable electricity** and increasing the **efficiency of the electrolysis** plant reduce GHG emissions in the future.
- Using **100% wind** power for hydrogen production reduces greenhouse gas (GHG) emissions by almost 100% compared to the fossil reference.



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Take-away

- Fast renewable power deployment rate is critical to cater energy transition towards net zero carbon EU 2050
- All required technologies are in principle available
- Power-to-hydrogen is a key building block in the energy ‘big picture’
- Further technology improvements and cost reductions require a trajectory of capacity deployments
- Strong sustainability framework needed to give stakeholders confidence for building value chains (company strategies, venture bankability, public acceptance)

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Thank you for your attention

Questions?

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hybalance.eu

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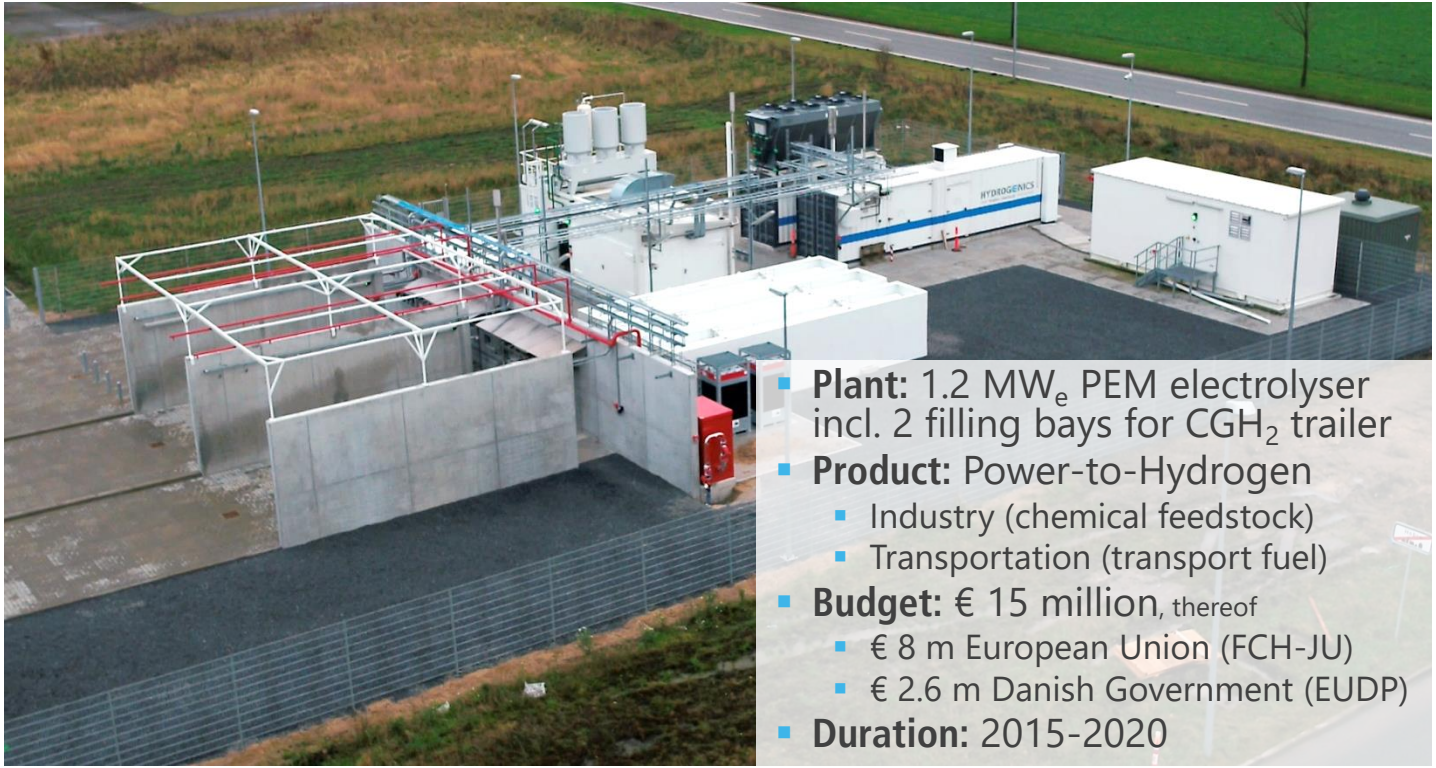
HyBalance plant



- **Plant:** 1.2 MW_e PEM electrolyser incl. 2 filling bays for CGH_2 trailer
- **Product:** Power-to-Hydrogen
  - Industry (chemical feedstock)
  - Transportation (transport fuel)
- **Budget:** € 15 million, thereof
  - € 8 m European Union (FCH-JU)
  - € 2.6 m Danish Government (EUDP)
- **Duration:** 2015-2020

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