



Industrial strategies on the Hydrogen value chain

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Clean Hydrogen Technologies R&D

Linde

Making our world more productive



Hydrogen Value Chain

Linde's capabilities ready to be leveraged, today



Production



- 500 plants built worldwide, more than 150 plants operated by Linde
- Steam methane reforming, autothermal reforming and partial oxidation of natural gas through heavy oil to coal
- Solvent and adsorption based carbon capture technologies ready for commercial application
- Large scale SMR H₂ plants in Linde's portfolio in the US gulf coast and mid-west

Liquefaction



- Global capacity leader with 170 TPD
- A range of liquefier capacities
- A network of five large scale liquefiers serving the current US market

Storage & Distribution



- 1000+ km of hydrogen pipeline, globally
- Major pipeline network in gulf coast (TX, LA)
- Large scale cavern storage in gulf coast
- Fleet of 1600+ trucks worldwide
 - GH₂: total load of 530 kg/trailer
 - LH₂: total load of 3,370 kg/trailer

Clean energy opportunity



Carbon Solutions



Carbon capture, utilization & storage

CO₂ removal from industrial processes with CO₂ storage or re-use

Clean Hydrogen



Blue Hydrogen

H₂ production from natural gas with CO₂ removal, storage or re-use



Green Hydrogen

Electrolysis powered by renewable energy, no CO₂ emissions

Hydrocarbon market - Today

\$6T Hydrocarbon sales⁽¹⁾

Clean Hydrogen Opportunity – 2030⁽²⁾

\$100B Clean H₂ sales
1.5% of today's hydrocarbon market

Significant opportunity despite uncertain timing

(1) Source: IHS

(2) Based on Hydrogen Council forecast of 24MMt H₂ demand by 2030 and Linde price assumptions

Building momentum for Hydrogen

Favorable Trends for Clean Hydrogen, but Uncertainties Remaining



Favorable trends for Clean H₂ ...



Strong push to limit carbon emissions

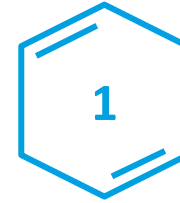


Strategic intent of national Clean H₂ roadmaps



Industry momentum growing

... but more needs to happen



H₂ technologies delivering on expected cost reductions



End-user adoption and ecosystem build-up



Regulatory framework creating supportive policies, while ensuring funding and access to renewable energy

Clean energy strategy



Strategy

Leverage +\$2B existing business & integrated supply network

Execute local market driven strategies in core geographies

Develop partnerships to accelerate opportunities

Advance technology leadership across the value chain

Recent projects under construction



Q1 2021

– \$290MM investment to develop **hydrogen infrastructure in South Korea**



Q1 2021

– \$35MM investment to build, own and operate **World's Largest PEM Electrolyzer** in Germany



Q4 2020

– \$35MM investment to **produce clean H2 for mobility market in California**

Making our world more productive



Enabling the energy transition

