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Kick Starting H2 Heavy Duty in CA

Linde's Vision for Market Deployment

Presented at IEPR Workshop on Firm Zero-Carbon Resources and Hydrogen

Date: July 29, 2025

By: Wladimir Sarmiento- Darkin

Making our world more productive

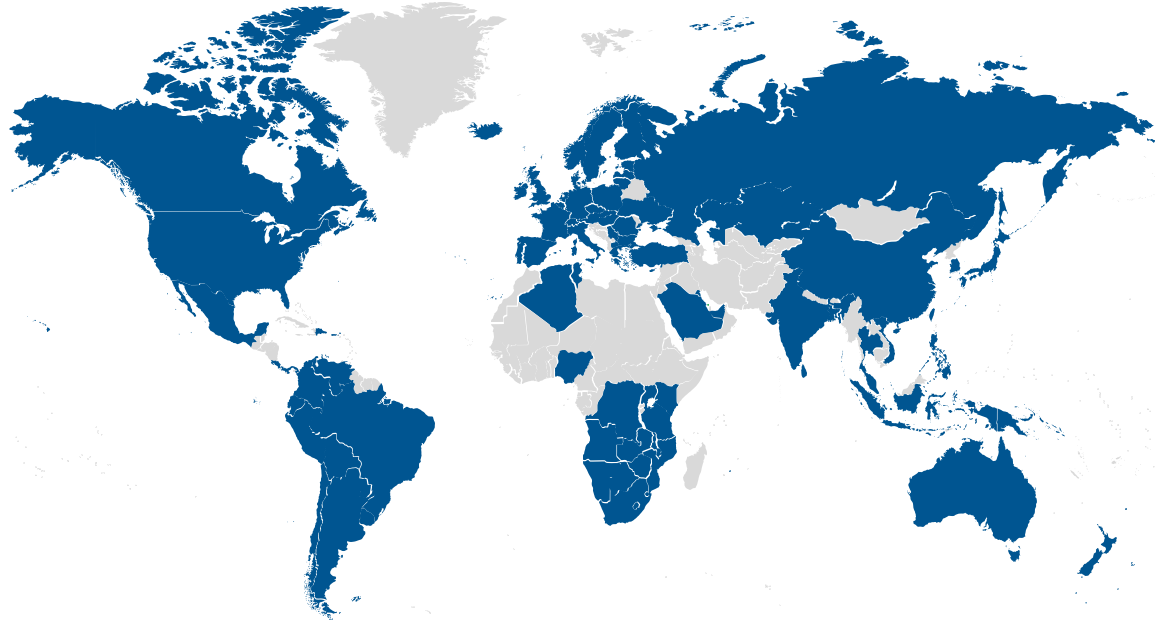
Disclaimer

Numbers shown in this document are indicative and intended for illustrative purposes only.



Over 140 years of technological progress

Introduction to Linde



100+

countries

Enabling strong, complementary positions in all key geographies and end markets

~65,000

employees

Achieving our full potential, individually and collectively

\$33 billion

2024 sales

Established presence where customers are and where their operations are growing

6,500+

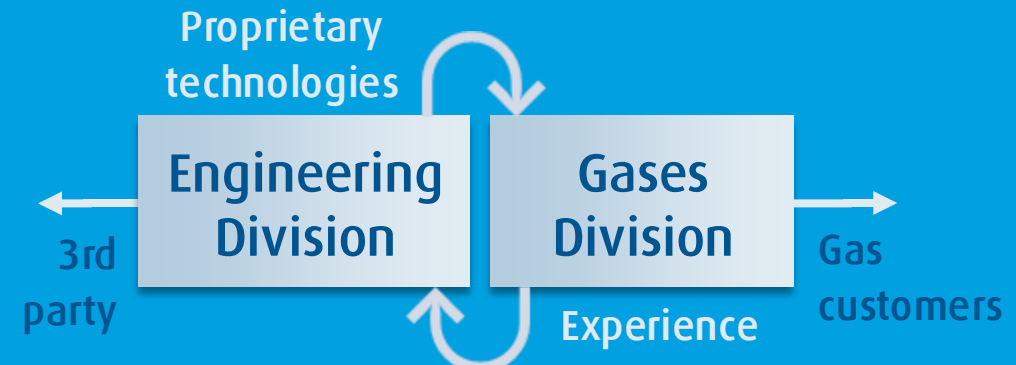
active patent assets worldwide

Leading with innovative products, solutions and technologies

Our Mission

We live our mission of *making our world more productive every day*. Through our high-quality solutions, technologies and services we are making our customers more successful and helping to sustain and protect our planet.

Linde Profile



H₂ Technologies and Operations

Linde is the world's largest operator along the H₂ value chain



Operating >150 hydrogen plants

- Specializing in all technologies (steam reforming, ATR, POX)
- Extensive experience with carbon capture from hydrogen production

Largest liquid hydrogen production (operating 170 mTPD)

- and distribution in the world based on proprietary technologies.



Linde H₂ liquefaction plant



H₂ plant featuring various technologies

Large hydrogen pipeline operation & storage cavern

- H₂ pipeline networks, e.g. in the US and Germany (>1000 km)
- World's first high-purity cavern.

Growth in electrolyzers

- Installed 80+ electrolyzers, 40 MW capacity
- JV with ITM Power and ownership in ITM power



Linde steam reformer

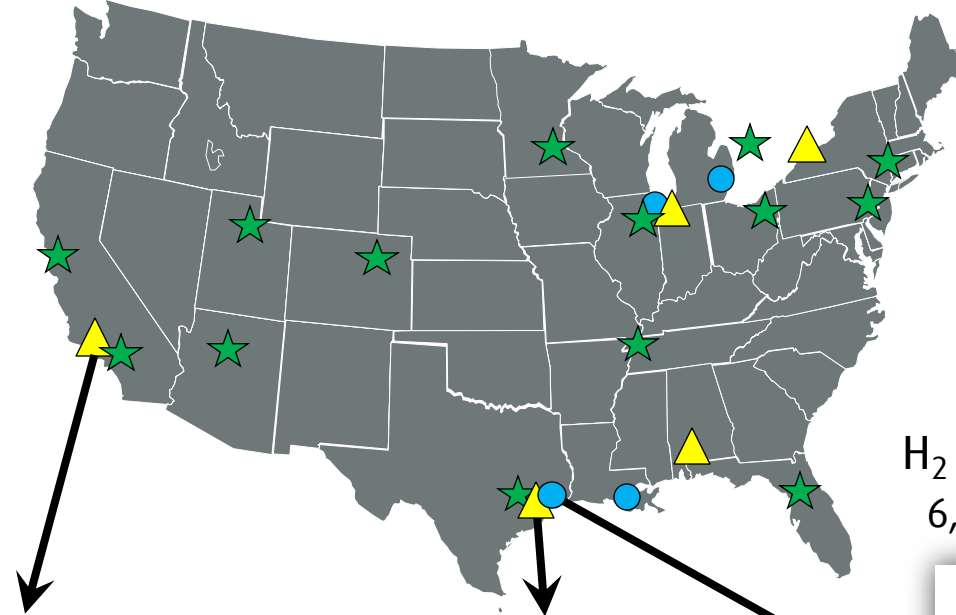


Hydrogen pipeline

North America's Largest Merchant Hydrogen Supplier



- ▲ 5 hydrogen liquefiers
More than 150 MTPD
- 4 hydrogen pipeline networks
- ★ 15 gas hydrogen trans fill stations
180 bar & 500 bar capability



Linde Green™ Hydrogen Available

- From all Linde liquid hydrogen production locations
- Can “Green Up” to any requirement



* Present delivery mechanism uses diesel-based fuels

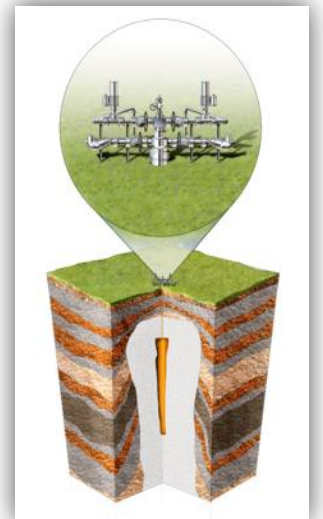


Green H₂ from
Ontario, CA



30+ MTPD LH₂
LaPorte, TX

H₂ Storage Cavern
6,000 MT Storage



Unmatched Efficiency & Reliability



Transfer Losses
Trailer → Linde LH2 Tank

- Total: <1% of transferred volume for large tank sizes (18,000 gal)
- Only hydrogen that runs through hose gets billed to customer



Tank losses over time

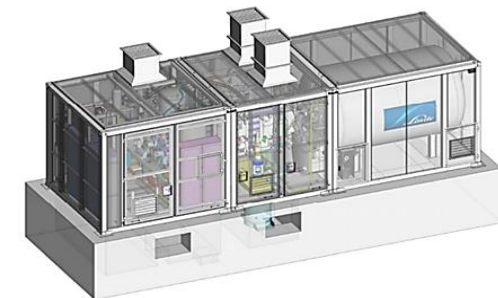
- Total: <1% per day for large tanks (18,000 gal) with multilayer insulation
- Pressure buildup caused by heat input over time



CP90 Pump
Standby and operational losses

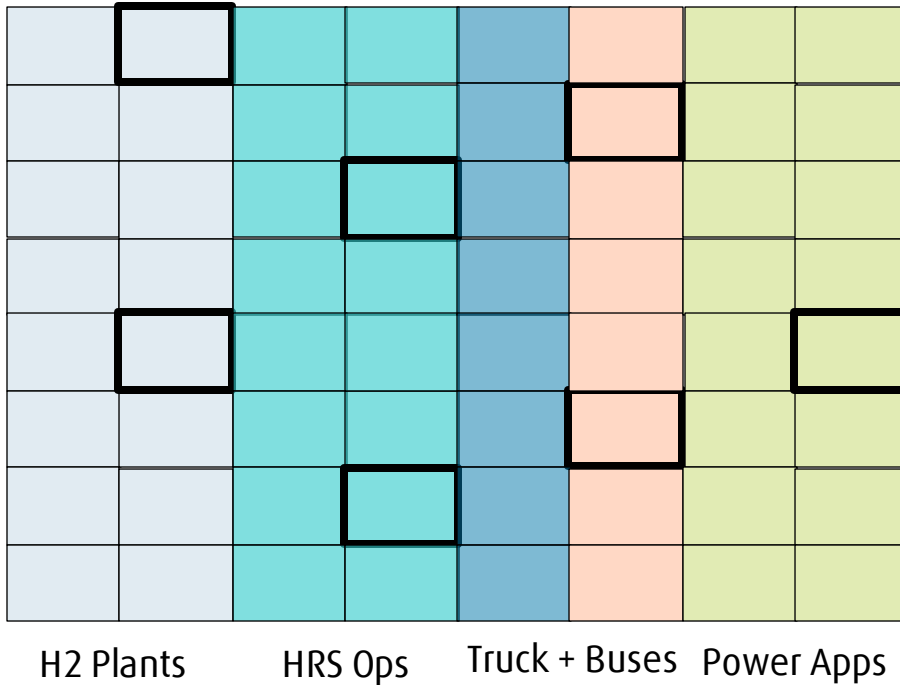
- Total: <5 % for high demand stations
- Daily utilization scenario:
- 16 hrs operational time per pump
 - Fueled mass >1,600 kg per pump

- *Integrated cooling – no external chiller required*
- *Low inlet pressure – no loss blowing down tank for LHY delivery*
- *Linde offering contractual low loss guarantee*
- *H2 refueling stations Installed worldwide >230*
- *Linde equipment uptime 93% vs industrial avg of 67%*



Cryo Pump based hydrogen refueling stations

CA's Compartmentalized View of H2 Market



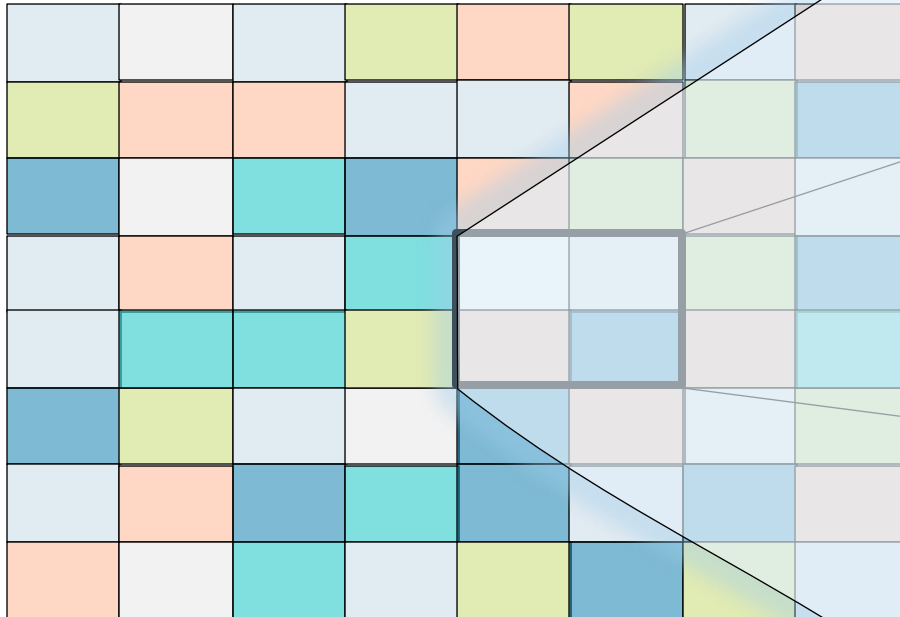
- CA is approaching the H2 market formation from its parts, establishing specific plans and strategies for its separated components
- This is a complex task with many players and multiple driving forces for each sector
- Incomplete information is inherent to this approach

Sector Specific Strategies are Effective but do not offer Wholistic View of the System

Linde's View - Approaching Projects as Micro Ecosystems/Projects



H2 Market Matrix



Roles for Each Partner

H₂

Trucks



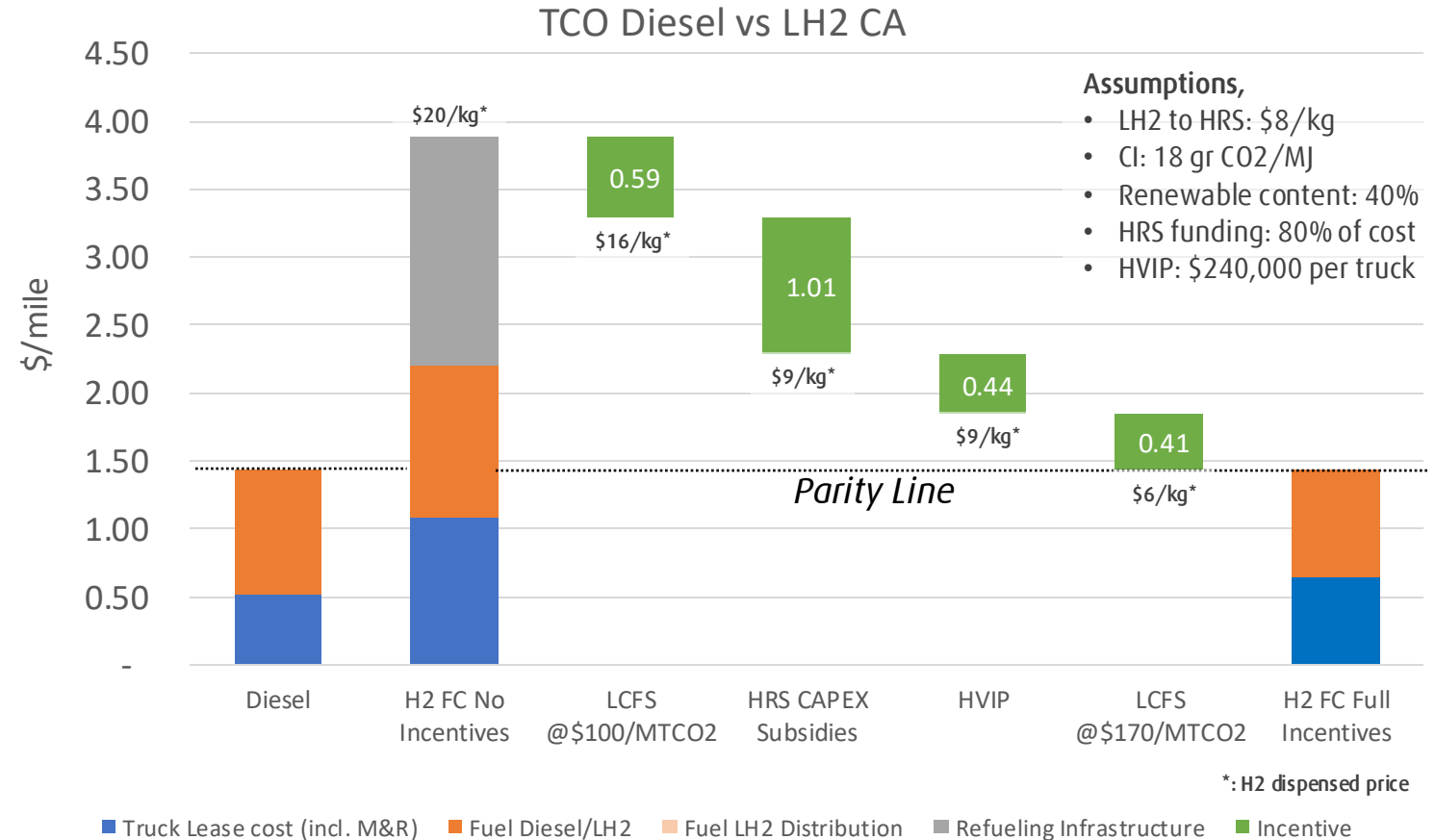
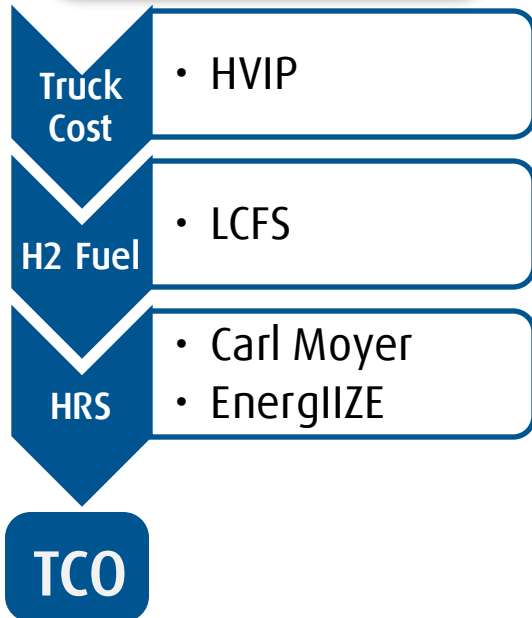
- Competitive Pricing
- Reliability/Network
- Renewable content
- Long term LH2 PSA with HRS / Fleet owner

- Deploy HRS
- Optimize CA funding
- Long term LH2 refueling contracts with fleet owner

- Performance Guarantees
- Service Network
- Sell/Lease Trucks to Fleet owner

Whole Value Chain Integrated in ONE FULL PROJECT – Full Path View for All Players

Short Term TCO Scenario Evaluation – 50 Class 8 Trucks



H2 FC trucks TCO At Diesel Parity Is Possible With Existing Subsidies + Robust LCFS Value



- TCO should be “Key Metric” to deploy resources in the HD market
- Collaborative Inter-Agencies effort to identify parties for Micro-Ecosystems/Projects
 1. Use Linde’s existing plant for short-term seeding projects (i.e. 50 trucks)
 - Linde has real state available to double production on its plant for Expansion Phase (i.e. 800 trucks)
 2. HRS Operator – Pilot, Trillium, etc.
 3. OEMs – Hyundai, Toyota, Symbio, Autocar, Daimler, New Flyer and Gillig
- Approach fleet owners with TCOs numbers in hand and wholistic approach
- Initiate discussions to instrument projects



Background Slides

Why working with Linde?



1



Strong financial position with best-in-class reputation in the industry and highest safety standards

2



More than 100 years experience, operating more than 150 H_2 plants today worldwide - diverse technology (i.e. ATR, SMR, POX, ELY)

3



Know-how and experience across the entire H_2 value chain

4



Largest network of liquid H_2 production in the US – industry leading reliability and back-up capabilities

5



Included in the Dow Jones Sustainability World Index (DJSI World) for twenty-one consecutive years

Strong partner with long history of success in H_2 production and commercialization globally