

Accelerating toward

Destination Zero

Cummins will continue to innovate and invest as we advance along the path to zero, but we can't do it alone.

Action is required today

Progress requires partnership

Technology leadership is critical

ENERGY SOURCES



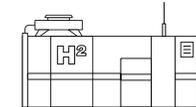
LOW CARBON FUELS



GREEN HYDROGEN ECONOMY

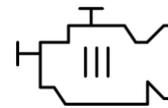


DECARBONIZED GRID



STORAGE

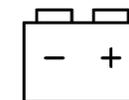
POWER SOLUTIONS



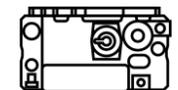
ADVANCED ENGINES



HYBRID



BATTERY ELECTRIC



FUEL CELL ELECTRIC



NATURAL GAS



DURABLE GASOLINE



HYDROGEN



HELM™

HIGHER EFFICIENCY. LOWER EMISSIONS. MULTIPLE FUELS.

UNIFIED GLOBAL PLATFORM: X15 SERIES

Reliable | Durable | Scale | Common



Natural Gas



Advanced Diesel



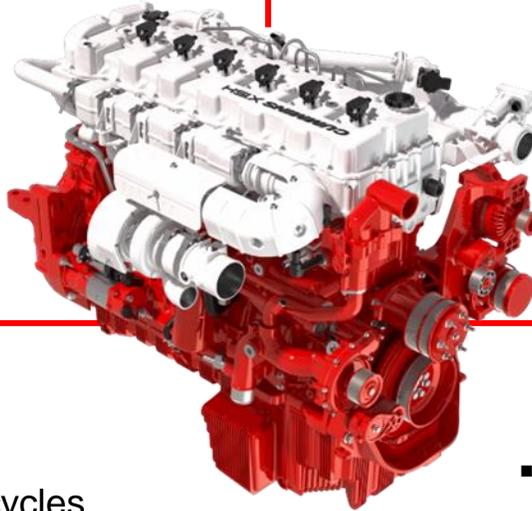
Hydrogen





Cummins Uptime Legacy

- Cummins-designed HELM Platforms championing +1 billion miles
 - Multi-fuel engine series derived from a common base allows for learning to be applicable to all fuel types
- Integrated powertrain for a full Cummins solution
 - Works seamlessly with Eaton Cummins Endurant Transmission, Cummins-Meritor Axles and Cummins fuel delivery systems



X15H™

Gets the Job Done



- Up to 500 hp and 1850 ft.-lb. of torque
- 1 to 1 vehicle replacement for diesel
 - Do the same jobs with same number of trucks & drivers
- Competitive initial cost
- Drop-in regional haul / long haul replacement
- Greater than 500 miles range with Cummins Fuel delivery system; spec the fuel capacity based on needs
- Fueling time similar to NG and comparable with diesel



Scalable and Commercially Viable

- Single fuel type can be used across a range of duty cycles
- Established supply chain for product production, to scale within the decade
 - Known technology
 - Familiar engine architecture for operators and service technicians
 - Opportunity to upskill
- Hydrogen ICE consumption demand to help drive down fuel cost with infrastructure build out taking place
 - Federal government pledged \$7 billion for network of hydrogen hubs

Sustainability



- Pairs clean zero carbon hydrogen fuel with proven technology of ICE
- Capable of meeting the new, more stringent 2027 NOx regulations
- **EPA recognizes hydrogen-fueled engines as a zero-carbon technology**
- Reduces GHG emissions in this decade, ultimately accelerating carbon reduction
- The Single Module™ is an ultra-high-efficiency aftertreatment developed to meet both customer needs and emission standards

Volvo Group Trucks



John Bartel – Volvo Trucks NA

Director Product Strategy, Powertrain



Volvo Trucks has set an ambition to reduce CO2 with 50% in 2030

2030

-50%

By 2030, CO2 emissions from sold trucks shall be reduced with 50% vs 2019.

2040

-100%

By 2040, 100% of new sales will be zero CO2 emissions

2050

Net zero

By 2050, Volvo Trucks population shall emit net zero CO2 emissions

V O L V O



H2

Outlook and Technology Roadmap

June 25, 2024

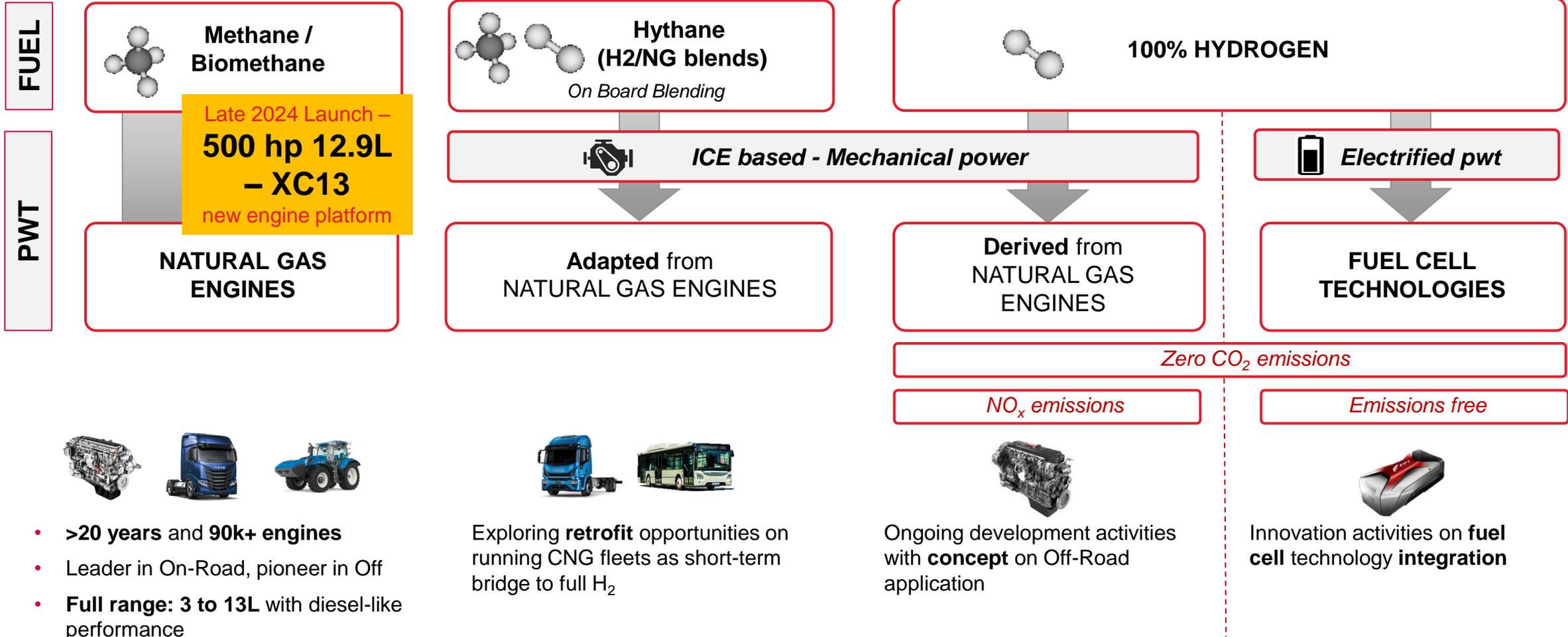
Chris Walters
North America Public Affairs

I V E C O
G R O U P

Natural Gas & Hydrogen – FPT activities

H₂ Technologies & FPT Projects

Towards Carbon Free Propulsion



- >20 years and 90k+ engines
- Leader in On-Road, pioneer in Off
- Full range: 3 to 13L with diesel-like performance



Exploring **retrofit** opportunities on running CNG fleets as short-term bridge to full H₂



Ongoing development activities with **concept** on Off-Road application



Innovation activities on **fuel cell** technology **integration**

FPT Gaseous ICE: Natural Gas to H2



Photo courtesy of New Holland, U.K.

New Holland Ag Tractor
Powered by NEF 180 hp methane CNG



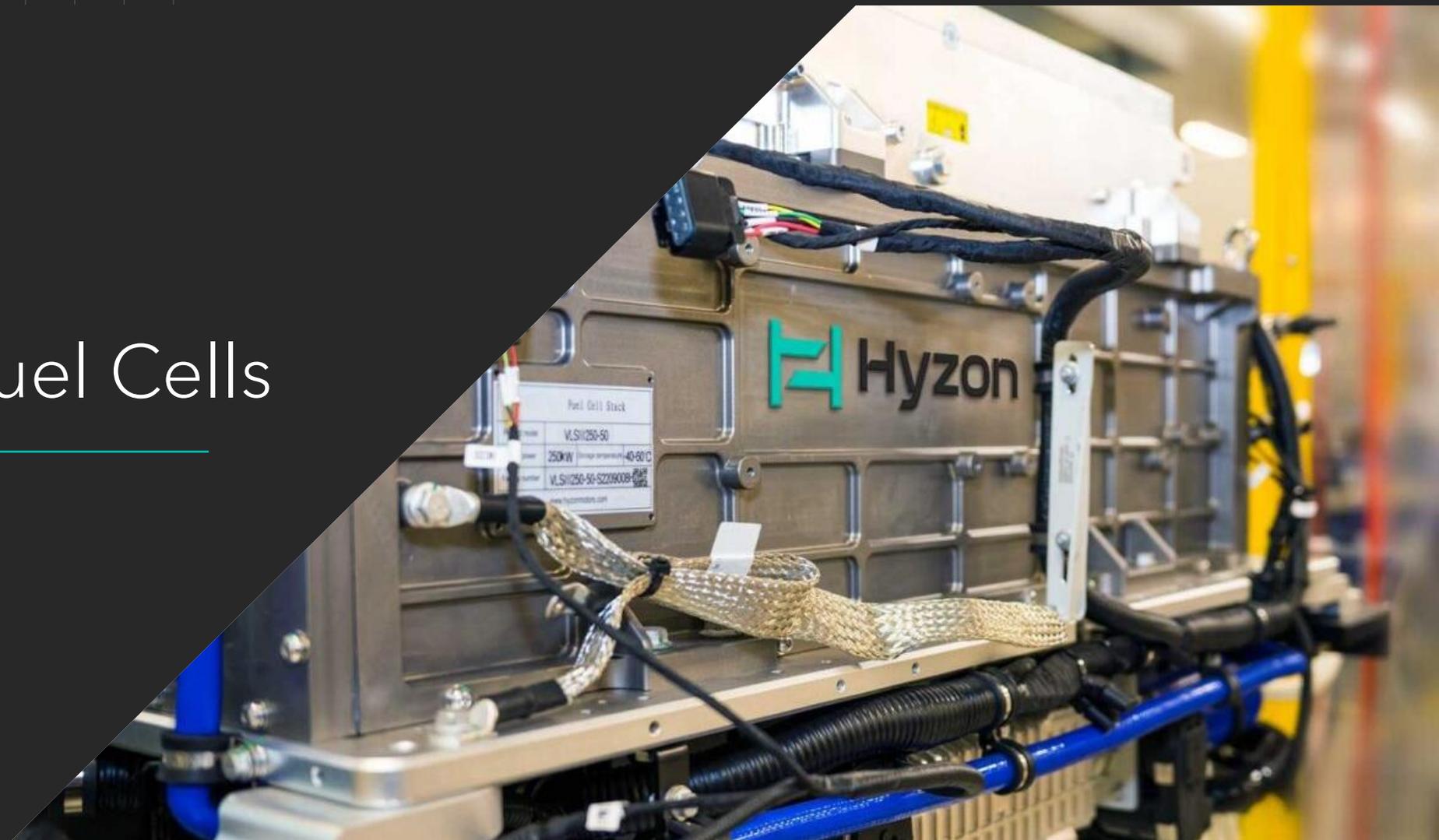
Snowgroomer
powered by FPT 460 hp XC13 H₂



Heavy Duty Fuel Cells

June 25th, 2024

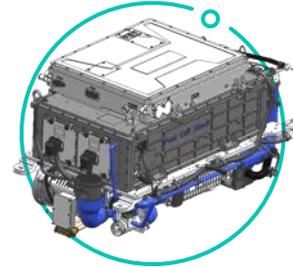
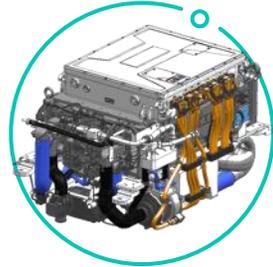
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Introducing Hyzon

Fuel Cell Technology Leader, Driving “Early Mover” Commercialization of Heavy-Duty FCEV Trucks

Proprietary fuel cell technology and 200 kW fuel cell system (FCS)



200 kW

Net fuel cell single stack system in on-road testing



Repowered fuel cell trucks



4.5 kW/L

Current generation power-density of PEM fuel cell stacks



Hydrogen relationships and investments

RAVEN

TC Energy

Woodside



172

Total patents granted and filed/pending¹

TRANSFORM MATERIALS

RECARBON, INC.



U.S.

Based

U.S. Fuel Cell Manufacturing

Bolingbrook, IL facility on track for 2024 Start of Production (SoP)

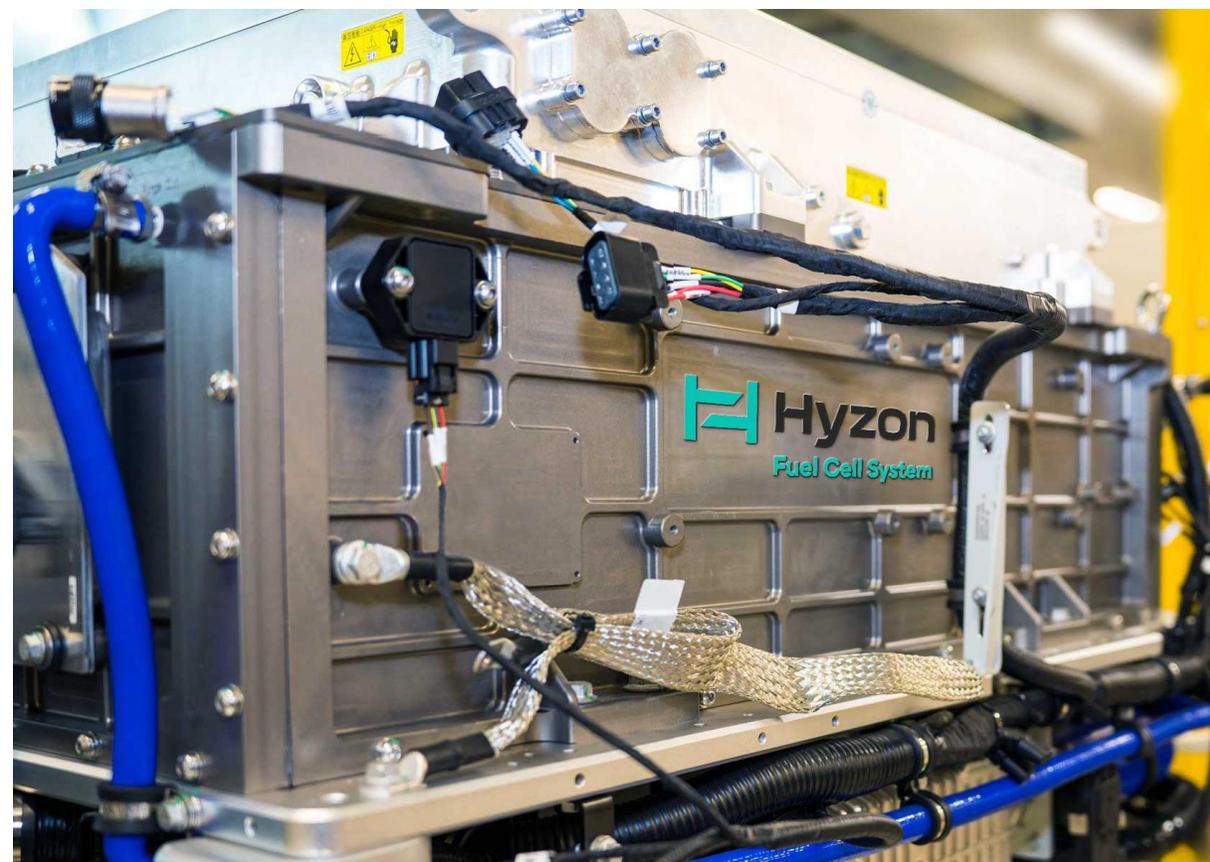


Membrane Electrode Assembly (MEA) production line commissioned and in production



200kW fuel cell system SoP and projected 700+ FCS initial annual capacity¹

¹. Assumes three shifts.



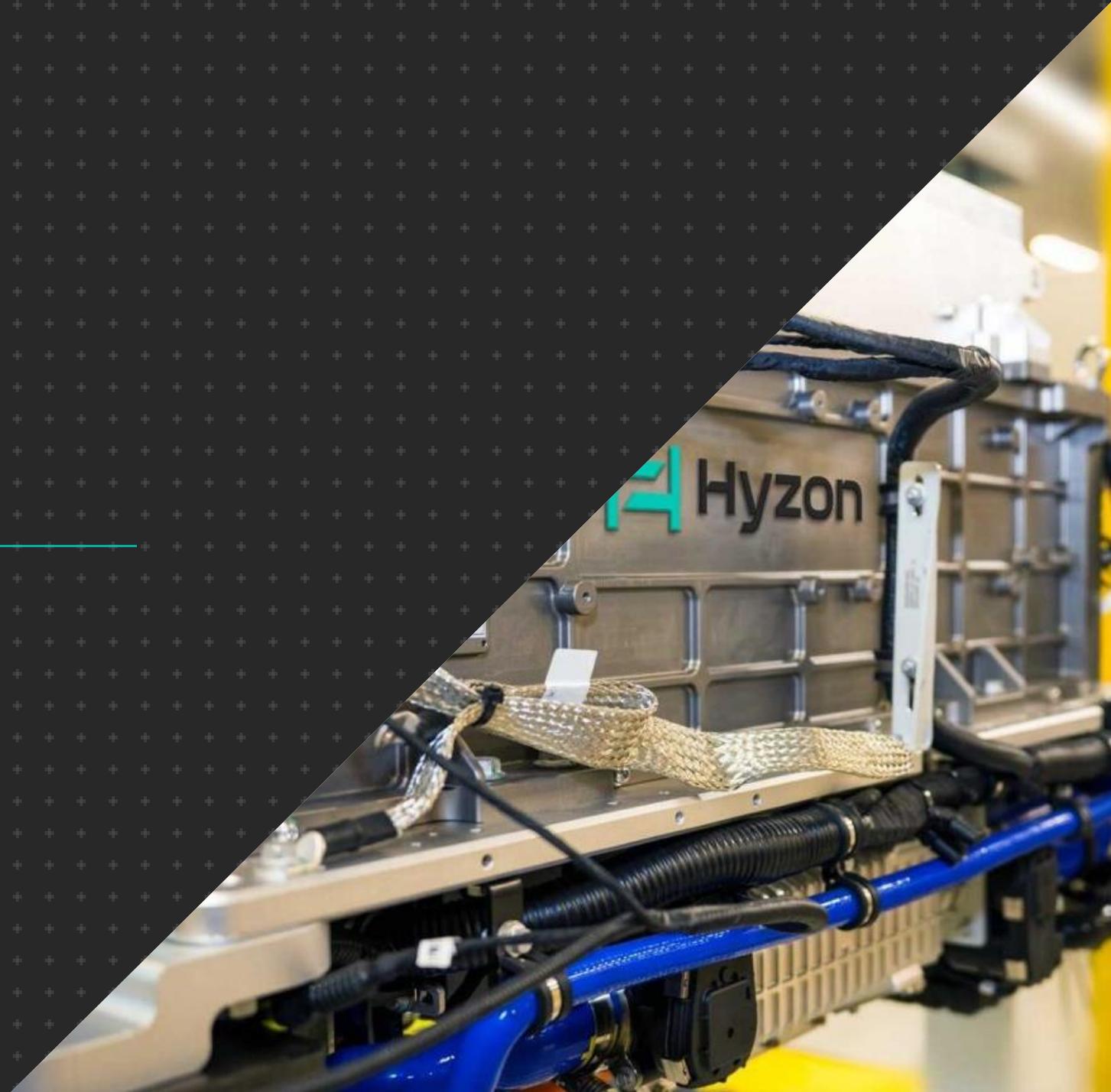
Why Hyzon?

- 200 kW Single Stack Technology
- Domestic Fuel Cell Production
- Proprietary Fuel Cell Development with 172 Patents
- Type 3 Tanks (same as CNG) @ 350 bar
- Lightest ZEV Truck Available
- Powertrain Provider - OEM Agnostic
- Management, Sales, Operations and Engineering Teams with North American OEM Class 8 Experience





Thank You





Why Dual Fuel Technology Works for Class 8 Trucks

- Keep your diesel fleet and begin the transition to CNG/RNG and biofuels
- Best total cost of ownership alternative fuel option for heavy duty trucks
- Industry-leading 500+ EPA approvals and multiple CARB Executive Orders
- Displace up to 60% (50% average) of diesel with CNG or RNG
- No loss of power or torque or increase in maintenance costs
- Significant reduction in NOx, PM, CO and NMHC from running Dual Fuel
- Dual Fuel running 50/50 diesel + dairy RNG yields > -104 CI score
- Net fuel savings of \$0.06 to \$0.12+ per mile, depending on fuel pricing



Bigger Bang for Your CapEx Investment Dollar



or



Vehicle / Engine Option	Capital Investment	Diesel Reduction
Purchase One with a Near-Zero NG Engine, Battery Electric Engine or Hydrogen Fuel Cell	\$400,000+	19,200 gal / year*
Convert 13 Existing Trucks to Dual Fuel @ 50% displacement 350-600HP	\$400,000	124,800 gal / year (= DGE of NG Sold)

* Base Diesel Assumption: 125,000 miles per year @ 6.5 mpg = 19,200 gallons / year

*Source: FreightWaves

Linde Overview | LNG in Fort Sask., Alberta Canada



Business

- 33B Global sales; 66,000 employees
- 3 Divisions
 - On-site and Merchant
 - Packaged Gases
 - Healthcare
- Supplying broad markets – manufacturing, steel, healthcare, food & beverage, oil & gas
- Facilities clustered in areas of population and industrial density



— Atmospheric Gases

- Nitrogen
- Oxygen
- Argon

• Rare gases: Krypton, Neon, Xenon

Ne, N₂, Ar, O₂, Kr, Xe



— Process Gases

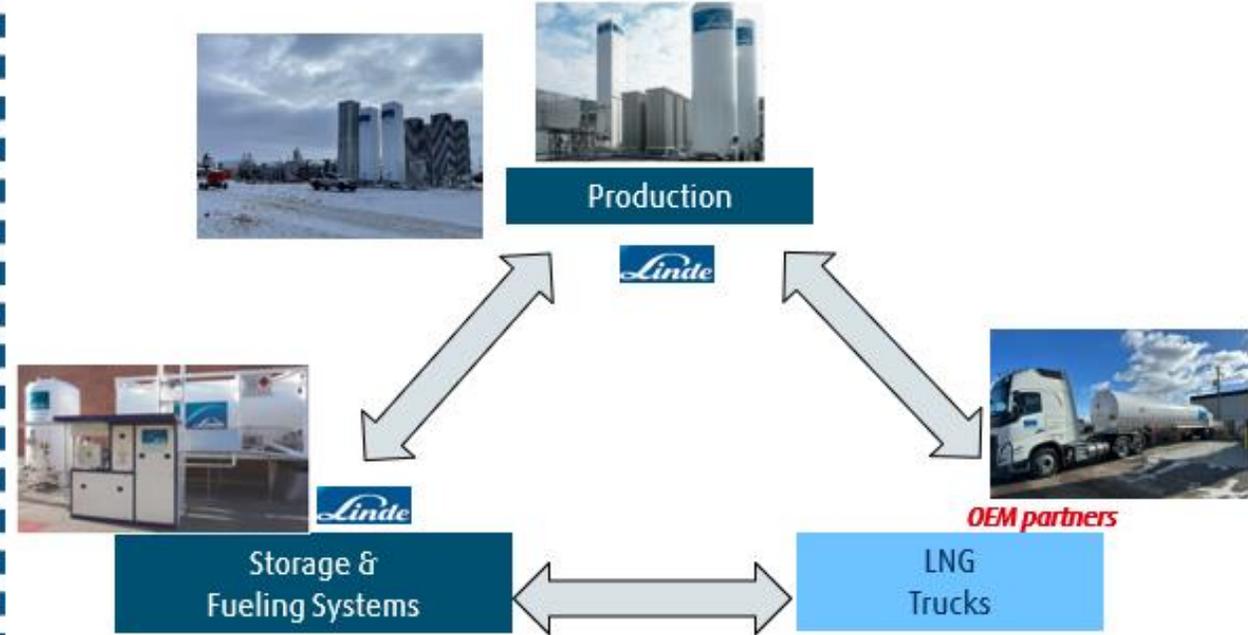
- Hydrogen
- LNG
- Carbon dioxide
- Helium

- Carbon monoxide
- Acetylene
- Propane

CH₄, H₂, CO₂, He, CO, C₃H₈

LNG Production Facility: Fort Sask., Alberta, Canada

- 20,000 gpd onstream in July '24 expandable to 130,000 gpd
- Uses LIN to condense methane; sub-cooled LNG
 - Low CAPEX, modular, easily replicable globally
- CI (wells to wheels) at 61.3 gCO₂e/MJ
- Longer Term: RNG processing and integration into r-LNG



Linde currently operating Five Volvo HPDI trucks to haul products

LINDE'S MILLION KILOMETER LNG CHALLENGE



LNG Benefits

COLDER & SAFER
Higher shelf life with 20 degrees C of extra subcooling. Low storage pressure (15 bar) compared to other clean fuels.

BETTER RANGE
Travel 1000 km on a single tank of LINDE LNG.

READY NOW
25,000+ LNG tractors fuel products across Europe and China today.



Save 20 - 40% on fuel spend

Reduce CO₂ emissions by 30% in your fleet today

Linde offers LNG and LNG fueling solutions today



Linde can deliver LNG to various customers across its network



DRIVER ACCOMPLISHMENT

Dave H completed first journey in our new Volvo class 8 tractor fueled by LNG.
The first windshield rock chip christened the journey
Enjoy the Quiet, Cleaner Burning, Silent Tractor Experience, TODAY!



CONNECT WITH LINDE

Reduce your Fuel Costs and Emissions Profile Today
Contact Linde:
Email: lsci@linde.com
Call: 403-369-6836

"The engine noise or cab interior noise is reduced by at least 25% so there is no noise fatigue, also visibility being a cab over is significantly increased. At the end of the day, this truck was designed to significantly reduce driver fatigue" - Dave H





Valvoline Global Operations

Alexey Stiop

Senior Technical Manager

PREMIUM BLUE ONE SOLUTION

GEN2

- Designed to protect engines fueled by diesel, natural gas, and gasoline under severe service in both on and off highway applications
- Outstanding oxidation resistance that supports long oil life in heavy duty diesel and natural gas engines
- Exceptional wear protection in heavy duty applications
- Superior deposit protection compared to industry requirements



Valvoline - a leader in omni-fuel enablement

- VGO is active with OEMs in supporting H₂ICE engine development
- Leading development in lubrication technology to enable broad usage of hydrogen and sustainable fuels
- Supporting Aramco's alternative fuel technology development with lubrication solutions

