



**2022 IAA – Virtual Press Conference**

September 8<sup>th</sup>, 2022

# Welcome and Agenda

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- David Johnson, CEO
- Ulf Lundqvist, Director Business Development, Heavy-Duty OEM
- Anders Johansson, Vice President, Heavy-Duty OEM

Note: Our conference is being recorded. We will post to our website and the link emailed tomorrow.



Hydrogen  
Station



Changing the way w



Hydrogen  
Mobility

HPDi



HPDi

Westport  
Fuel Services



Westport  
Fuel Services



Westport  
Fuel Services



Westport  
Fuel Services

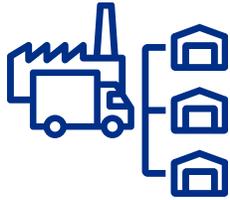


**David Johnson, CEO**

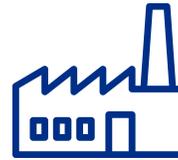


# We're Changing the Way the World Moves

Driving Cleaner Performance by delivering advanced, alternative-fuel systems for today's combustion powered vehicles reduces carbon emissions without compromising.



Tier 1 Supplier to Diverse Transportation Markets



7 Global Manufacturing Locations



Full Suite of Renewable and Alternative Fuels



Sales in 70 Countries



100+ Distributors Worldwide



1,400+ Patents & Applications

# Our Opportunity



Climate change requires urgent attention: if we continue to emit CO<sub>2</sub> at current levels, we have only ten years remaining in the global carbon budget before we breach the 1.5-degree Celsius threshold, emphasizing the need for immediate action.

Hydrogen Council //  
"Path to Hydrogen Competitiveness" report,  
January 2020, p. 2





# Why Westport?

- Deep expertise in clean, low carbon fuels for all transportation products and markets
- Products in production, available now
- Affordability of our solutions which enables scale (which is critical to making a difference)
- Proven low-carbon HPDI technology using Natural Gas available now
- Global recognition of hydrogen and bio-methane is increasing, and we have the necessary enabling technologies to respond



# Strategy

1

Drive sustainable growth in our existing markets through a diversified portfolio of technology, products, and services

2

Unlock new and emerging markets through the delivery of clean, affordable transportation solutions

3

Drive operational excellence and enhanced reputation as a Tier 1 supplier with enhanced quality and reliability

# **Sustainability**

# Sustainability is Foundational

Sustainability is at the core of our technology strategy, our product portfolio, and our operations



## Governance

- Formed a 10-member ESG Steering Committee, led by the CEO, to oversee core programs and targets, integrating ESG into the company's goals and processes



## Our ESG Strategy

- Our ESG strategy is focused on taking concrete steps to ensure that the way we do business has positive impacts throughout our value chain



## Stakeholder Engagement

- Learning, improving and ensuring our strategies, activities and reporting are aligned with the needs and interests of those affected by our business



## Diversity and Inclusion

- ~50% gender representation on the Board of Directors
- Over 30% female representation across global workforce



## Environment

- Helping our customers to be leaders in affordable, sustainable, and efficient transportation solutions



## Our Carbon Footprint

- We have committed to developing a Climate Action Plan that outlines our path to net-zero GHG emissions and aligns our climate-related disclosures with TCFD recommendations

# Delivering Emission Reductions Through Alternative Fuel Capabilities

## LPG

Liquefied Petroleum Gas / Propane / Autogas



- Favourable price advantage over diesel in key markets
- Strong and growing refuelling network in Europe
- Most commonly used alternative fuel in the world

## CNG

Compressed Natural Gas



- Over 4,000+ CNG stations in Europe
- Indian CNG market a major growth opportunity for Westport
- Price advantage over diesel in select markets

## LNG

Liquefied Natural Gas



- Key driver of heavy-duty growth
- China, Europe both large refuelling infrastructure
- Renewed focus on BIO-LNG as result of Russia-Ukraine conflict, supports our products

## H<sub>2</sub>

Hydrogen



- Strong OEM interest in H<sub>2</sub> HPDI offering
- Global recognition of H<sub>2</sub> as the future zero-emissions fuel increasing
- H<sub>2</sub> HPDI can offer better economics and performance

All available as renewable fuels  
Substitute for fossil-based fuels

# Westport Fuel Systems Inc.



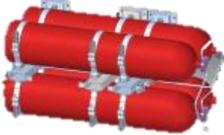
## Leading Technology Position

- Long history and deep technology innovation and engineering capabilities
- Strong intellectual property position
- Existing and applied-for patents covering CNG, LNG, LPG and H<sub>2</sub> components and systems worldwide
- Significant investment in research and development for gaseous fueled transportation applications

## Market-Ready Solutions

- LPG & CNG kits and components for aftermarket vehicle conversions and Delayed OEM installations
- Components and systems for Tier 1 OEM supply in LPG, CNG & H<sub>2</sub>, including Engine Management Systems and Engine Controllers ready for the latest emission regulations
- Westport HPDI 2.0™, the solution for heavy-duty trucking

# We Design, Engineer, and Manufacture Fuel Systems and Components

Fuel Tank Systems	Valves	Regulators	Injectors	Electronics
 <p>Type 1 CNG Tank System</p>  <p>LPG Tank System</p>  <p>LPG Level Sensor</p>  <p>HPDI LNG Pump</p>  <p>HPDI LNG Tank Module</p>	 <p>CNG Tank Valves</p>  <p>CNG Fill Valves</p>  <p>Solenoid Cylinder Valves</p>  <p>Integrated Tank Valve Regulator</p>  <p>H2 Tank Valves</p>	 <p>CNG Pressure Regulators</p>  <p>LPG Pressure Reducers</p>  <p>HPDI Gas Conditioning Module</p>  <p>H2 Pressure Control Modules</p>	 <p>Natural Gas Injectors</p>  <p>Injector Rails</p>  <p>HPDI Injector</p>	 <p>CNG Electronic Control Modules</p>  <p>Bi-Fuel Electronic Control Modules</p>



**Ulf Lundqvist- Director Business  
Development, Heavy-Duty OEM**



# Innovation



# Recent Developments

- Unveiled demonstrator vehicle with hydrogen HPDI fuel system for internal combustion engines for heavy-duty truck applications
- Westport Hydrogen HPDI truck pulling a Ray Lee's/Ozark trailer fueled with hydrogen for the first time in America in August at the West Sacramento Station



## **HPDI: Cost-effective**

HPDI is the most cost-effective way to reduce CO<sub>2</sub> in long-haul trucking and other high-load, long-haul applications.

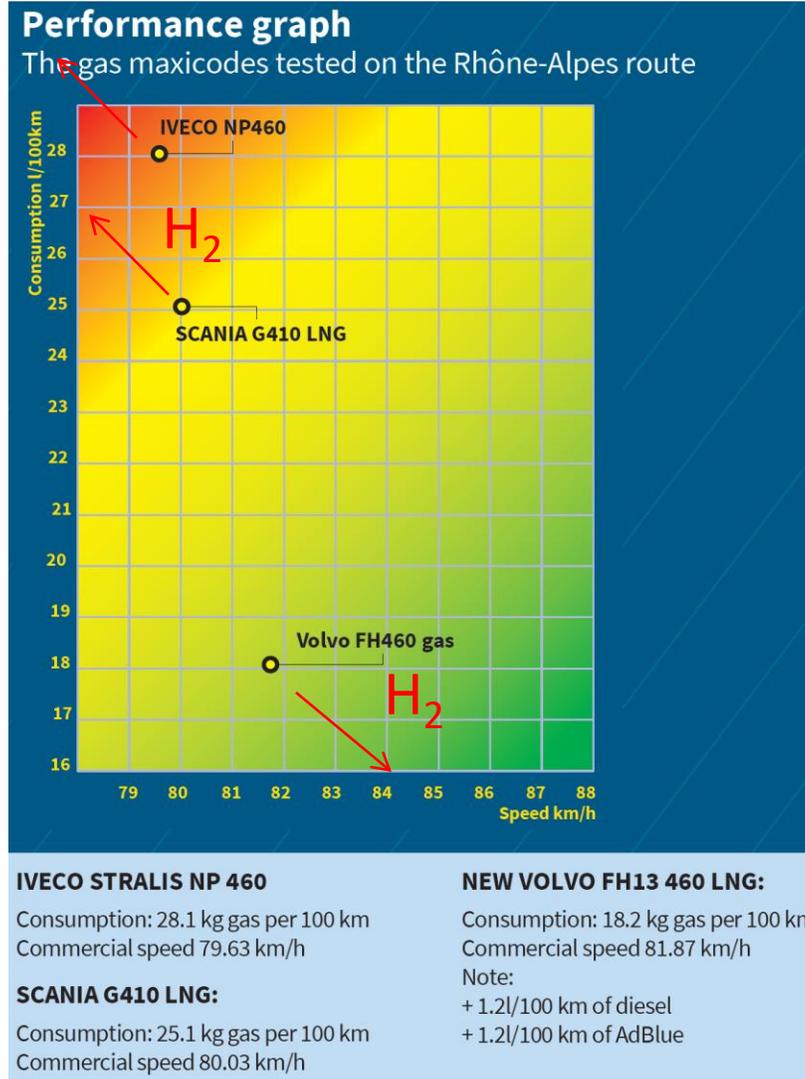
### **HPDI: LNG**

- Same torque, efficiency, and reliability as diesel engines
- **20% CO<sub>2</sub> reduction tailpipe**
- **100% CO<sub>2</sub> reduction with Bio-LNG**
- No change to vehicle or engine architecture

### **H<sub>2</sub> HPDI**

- 20% more power, 15% more torque
- **Near Zero CO<sub>2</sub> emissions**
- **Lowest cost to CO<sub>2</sub> compliance**
- Preserve existing engine manufacturing

# Fuel Consumption Comparison HPDI vs SI LNG



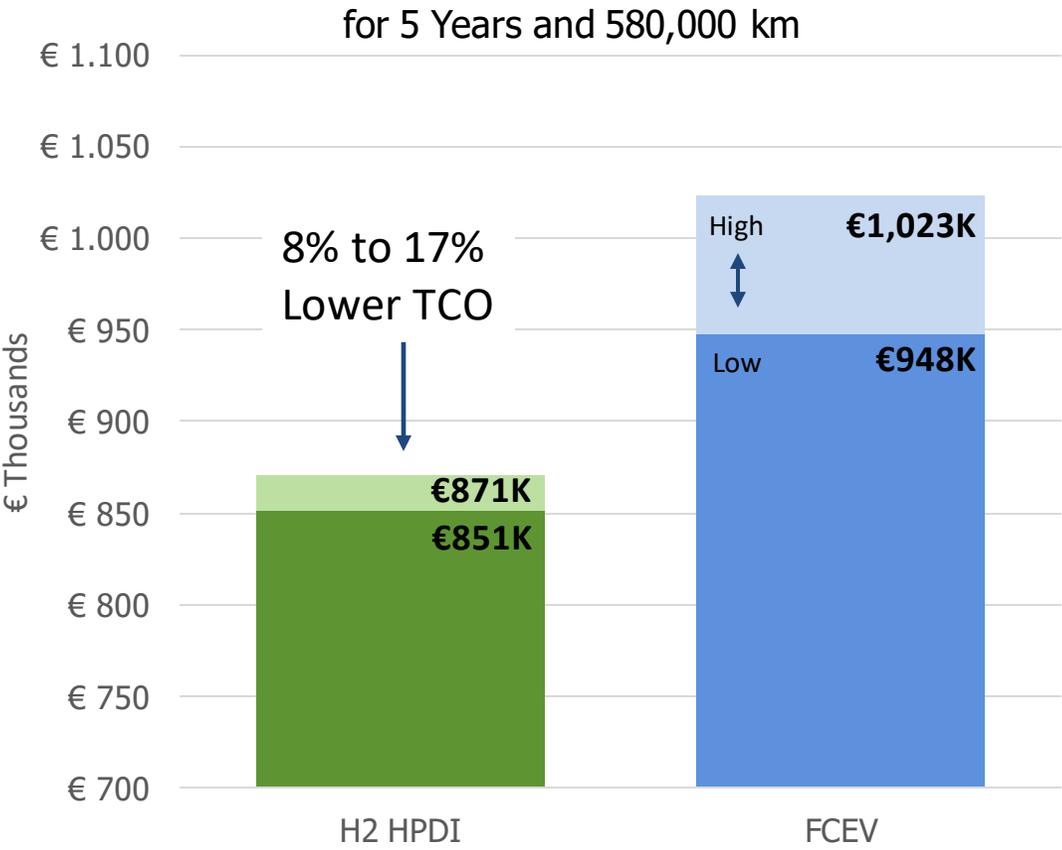
- 3 brands were compared in a defined route by magazine "FrenchRoutes" April 2022. HPDI has by far lowest fuel consumption and in the same time highest commercial speed during the mission

- When operating on Hydrogen (H<sub>2</sub>) the HPDI system will:
  - Achieve higher efficiency than a fuel cell vehicle
  - Perform better than a fuel cell vehicle

**To a fraction of the cost of a fuel cell vehicle**

# Pathway to Zero Carbon Fuel – Hydrogen ICE

## Total Cost of Ownership (TCO)



## Benefits vs. Fuel Cell



### For the Truck Customer

- Lower upfront acquisition costs
- Proven truck design and durability
- Familiar truck operation



### For the OEM

- Low product development cost
- Preserve current manufacturing, supply chain, and service infrastructure
- Avoid manufacturing investments for fuel cells, batteries, and motors



### For the Environment

- Renewable, zero carbon fuel
- Lower investment path to reduce CO<sub>2</sub> in heavy-duty, long-haul trucking

Source: AVL / Westport TCO study, 2021  
 \*High equals best case assumptions, low equals worst case assumptions



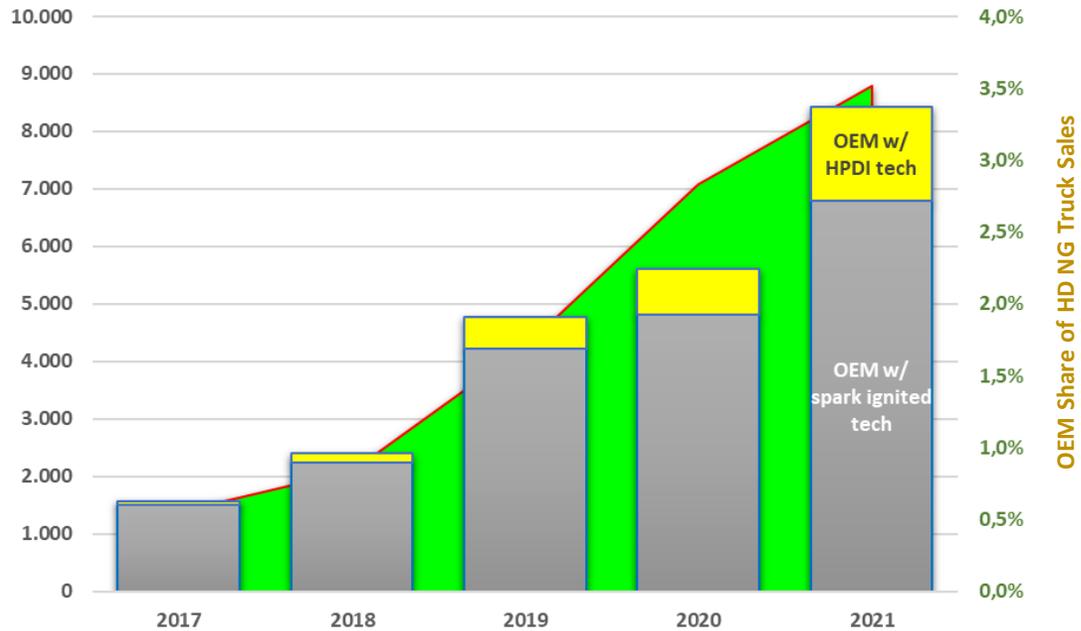
**Anders Johansson**  
**Vice-President, Heavy-Duty OEM**



# **Market and Future Opportunities**

# HPDI Growth In European Heavy-Duty Trucking

Europe HD NG Truck Registrations

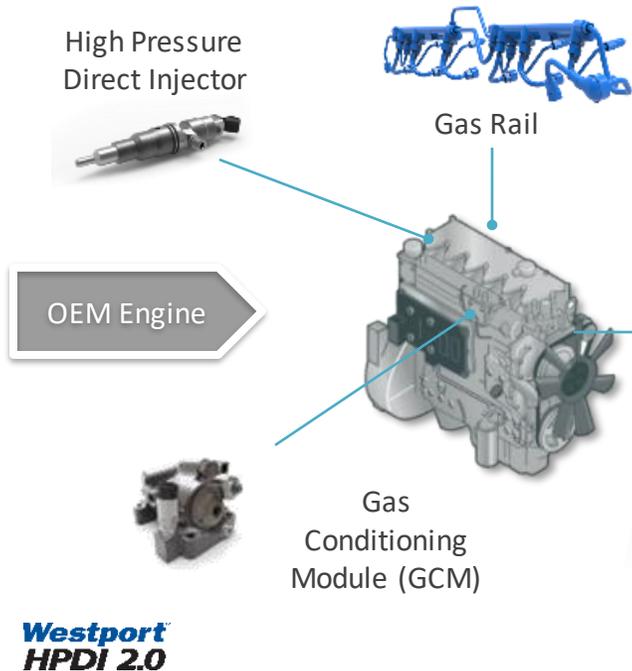


Sources: IHSMarkit, ACEA, WFS analysis



# HPDI 2.0™ is a High-Performance, Low-Emissions Fuel System Solution for Today's Combustion-Powered Heavy-Duty Trucks

## On Engine



## On Chassis



## On LNG Tank



# Introducing H<sub>2</sub> HPDI

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Hydrogen combustion is a nascent solution but could fill an important niche by harnessing established technologies and supply chains.

Bernd Heid, Christopher Martens, and Anna Orthofer

*“How Hydrogen Combustion Engines Can Contribute to Zero Emissions”*,  
McKinsey & Company article, June 2021

”



# H<sub>2</sub> HPDI Fuel System

Compared with the diesel engine to which we apply the Westport™ HPDI fuel system:

- Up to 20% more power than diesel
- Up to 15% more torque than diesel
- Near Zero CO<sub>2</sub> emissions
- Preserve existing diesel architecture
- Preserve existing engine manufacturing
- Lower cost to CO<sub>2</sub> compliance

**Visit us @IAA Booth H12 B70**



Driving cleaner performance for heavy – duty trucks to meet stringent carbon reduction regulations.



September 8, 2022

# Thank You

Driving Cleaner Performance Together

# HPDI and the EU regulations framework

## HPDI

- **Over 500 LNG stations serving HD truck fleets across the EU, continuing to grow.**
- **The AFIR proposals include targets for member states to continue to grow LNG refuelling infrastructure**
- **We are confident that the revision of the Regulation on HDV CO2 Standards will recognise the value of all technologies, including biomethane and H2 ICEs, available for the decarbonisation of the heavy-duty vehicles sector**
- **As the share of bioLNG increases, and the size of the deployed fleet increases, the total CO2 reductions (Well To Wheel) accumulate rapidly. Continuing this momentum is key to mitigating the full effects of climate change, and speed of mitigation is paramount.**

## H2 HPDI

- **Within the RePower framework, the Commission has set a target of 10 million tons H2 domestic production by 2030, with an additional 10 million tonnes from imports, to replace natural gas, coal and oil, in industry and transport.**
- **we are evaluating the use of renewable fuels for ignition, and carbon free ignition approaches, both of which will further reduce the Well To Wheel CO2 footprint.**



# Appendix



# HPDI for OEM is an Aggressive Profit Driver

## OEM

### HPDI to be the primary driver of growth

- Adoption by large-scale OEM
- Growth driven by entry and expansion into the North American and Chinese markets
- Development of HPDI technology for hydrogen uses
- Development of systems for off-road applications
- Achieve economies of scale and expand gross margin

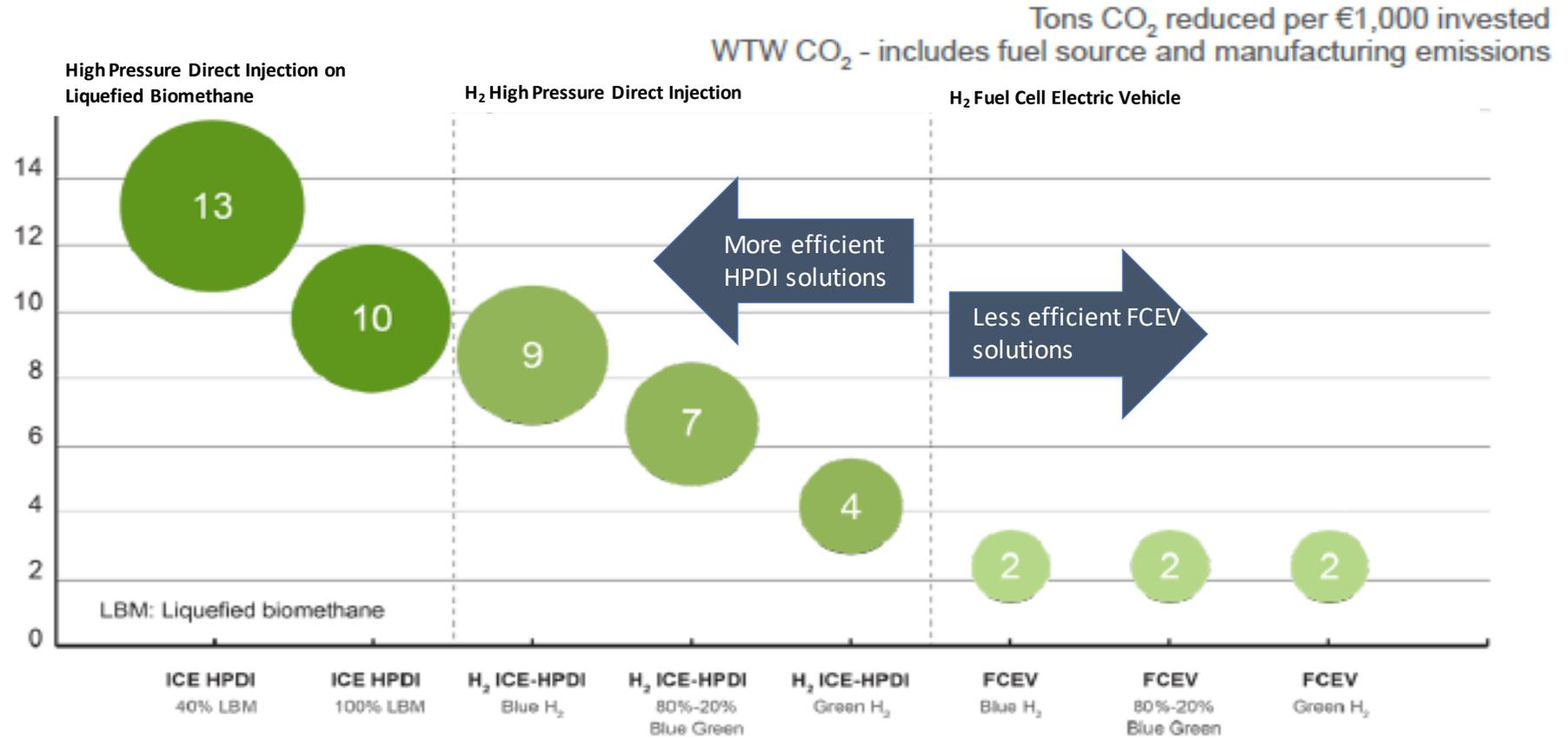
5-year growth CAGR ~X%



# HPDI Growth Story Driven by Cost Efficiency

## HPDI solutions are more cost effective than fuel cells for CO2 abatement

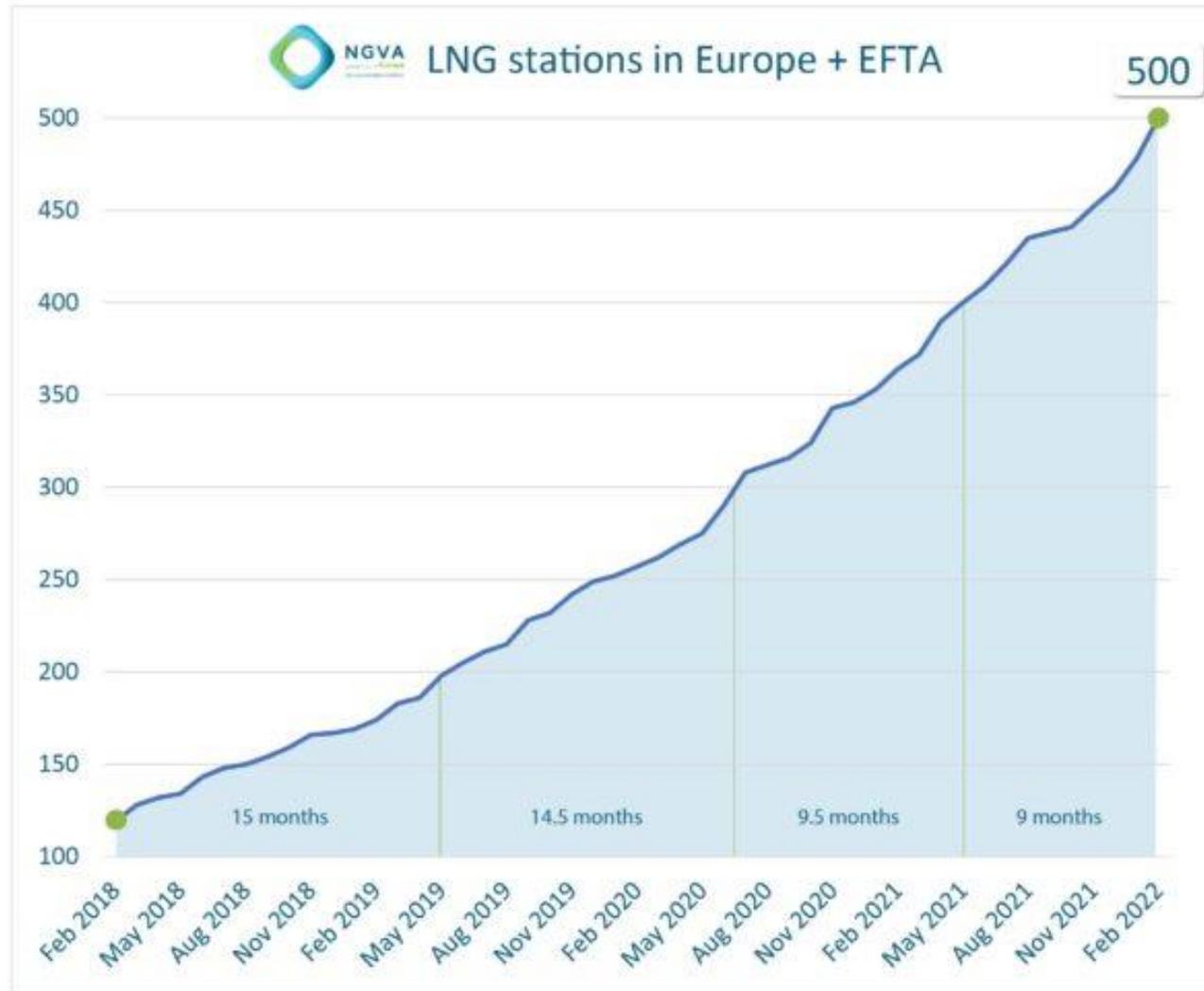
- 4x more cost effective using blue hydrogen
- 6x more cost effective using 40% liquid biomethane. HPDI is doing this today in markets like Germany where LNG is already 60% bio-LNG



**HPDI for heavy-duty, long-haul applications offers superior fuel efficiency**

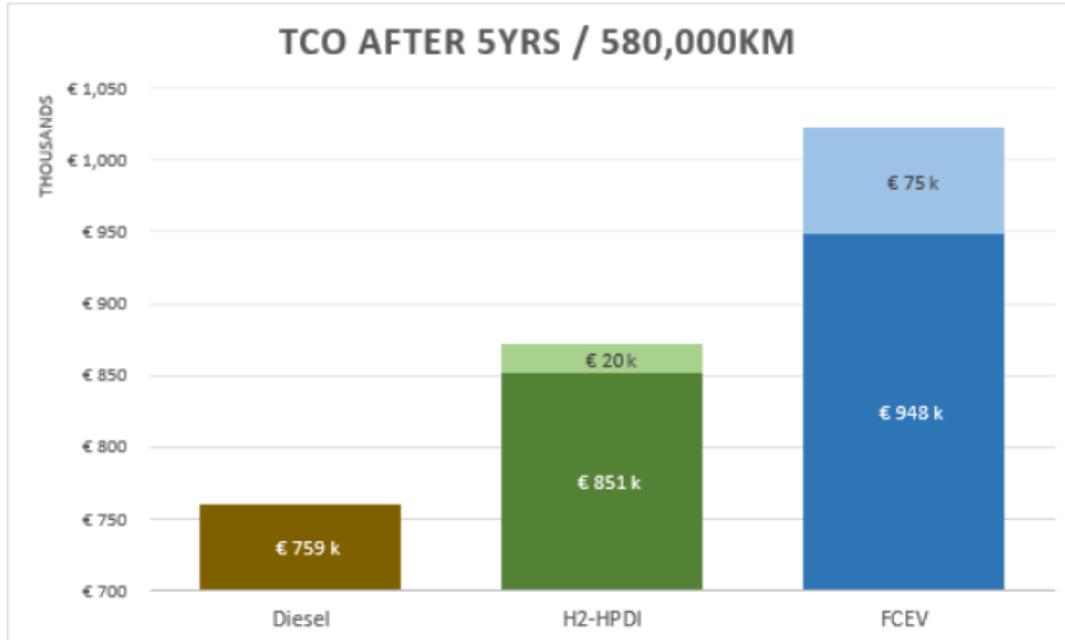
# Growing Recognition of Alternative Gaseous Fuels

- Number of LNG fueling stations in Europe up 2x in the past two years
- In 2021 alternative-fueled trucks had 3.6% market share in Europe – reflects 40% YoY growth
- Natural Gas now part of EU Taxonomy
- OEMs need a portfolio of solutions that respond to regulations
- Fleets need affordable solutions, we can address this

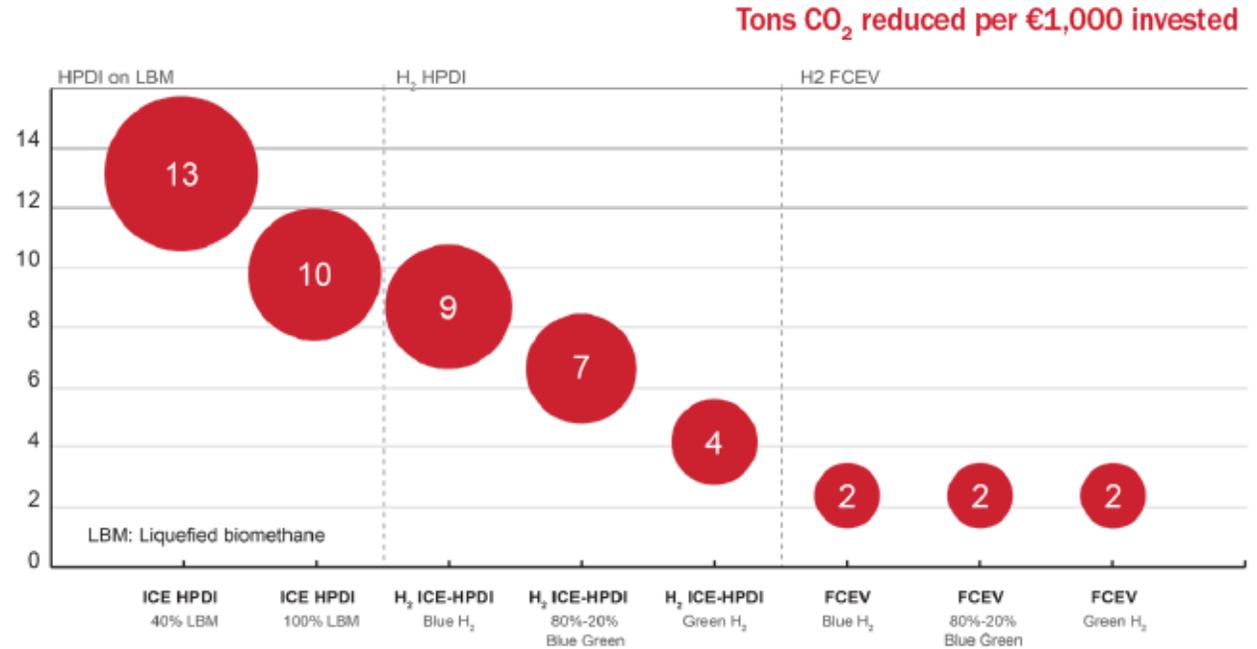


Source:  
[www.ngvaeurope.com](http://www.ngvaeurope.com)

# H2 HPDI – The Path To Zero Carbon



- H2 HPDI offers compelling TCO for high load applications
- Growing interest in H2 HPDI from OEMs
- H2 HPDI offers a pathway to green hydrogen



Scania development project underway

Additional development underway with Tupy and AVL

Hydrogen infrastructure investment growing globally