



# **Cummins Hydrogen Day**

NOVEMBER 16, 2020

PUBLIC

# Disclosure Regarding Forward-Looking Statements

Information provided in this release that is not purely historical are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, including statements regarding our forecasts, guidance, preliminary results, expectations, hopes, beliefs and intentions on strategies regarding the future. These forward-looking statements include, without limitation, statements relating to our plans and expectations for our revenues and EBITDA. Our actual future results could differ materially from those projected in such forward-looking statements because of a number of factors, including, but not limited to: market slowdown due to the impacts from COVID-19 pandemic, other public health crises, epidemics or pandemics; impacts to manufacturing and supply chain abilities from an extended shutdown or disruption of our operations due to the COVID-19 pandemic; supply shortages and supplier financial risk, particularly from any of our single-sourced suppliers, including suppliers that may be impacted by the COVID-19 pandemic; aligning our capacity and production with our demand, including impacts of COVID-19; a major customer experiencing financial distress, particularly related to the COVID-19 pandemic; any adverse results of our internal review into our emissions certification process and compliance with emission standards; increased scrutiny from regulatory agencies, as well as unpredictability in the adoption, implementation and enforcement of emission standards around the world; disruptions in global credit and financial markets as the result of the COVID-19 pandemic; adverse impacts from government actions to stabilize credit markets and financial institutions and other industries; product recalls; the development of new technologies that reduce demand for our current products and services; policy changes in international trade; a slowdown in infrastructure development and/or depressed commodity prices; the U.K.'s exit from the European Union (EU); labor relations or work stoppages; reliance on our executive leadership team and other key personnel; lower than expected acceptance of new or existing products or services; changes in the engine outsourcing practices of significant customers; our plan to reposition our portfolio of product offerings through exploration of strategic acquisitions and divestitures and related uncertainties of entering such transactions; exposure to potential security breaches or other disruptions to our information technology systems and data security; challenges or unexpected costs in completing cost reduction actions and restructuring initiatives; failure to realize expected results from our investment in Eaton Cummins Automated Transmission Technologies joint venture; political, economic and other risks from operations in numerous countries; competitor activity; increasing competition, including increased global competition among our customers in emerging markets; foreign currency exchange rate changes; variability in material and commodity costs; the actions of, and income from, joint ventures and other investees that we do not directly control; changes in taxation; global legal and ethical compliance costs and risks; product liability claims; increasingly stringent environmental laws and regulations; the performance of our pension plan assets and volatility of discount rates, particularly those related to the sustained slowdown of the global economy due to the COVID-19 pandemic; future bans or limitations on the use of diesel-powered products; the price and availability of energy; our sales mix of products; protection and validity of our patent and other intellectual property rights; the outcome of pending and future litigation and governmental proceedings; continued availability of financing, financial instruments and financial resources in the amounts, at the times and on the terms required to support our future business; and other risks detailed from time to time in our SEC filings, including particularly in the Risk Factors section of our 2019 Annual Report on Form 10-K and Quarterly Reports on Form 10-Q. Shareholders, potential investors and other readers are urged to consider these factors carefully in evaluating the forward-looking statements and are cautioned not to place undue reliance on such forward-looking statements. The forward-looking statements made herein are made only as of the date of this press release and we undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise. More detailed information about factors that may affect our performance may be found in our filings with the SEC, which are available at <http://www.sec.gov> or at <http://www.cummins.com> in the Investor Relations section of our website.

# The world is transitioning to a low carbon future

**45%**

## Reduction needed

in greenhouse gases by 2030 and 100% by 2050 from 2010 levels to keep the earth's warming to 1.5 degrees Celsius from pre-industrial levels



**66**

## Countries

have announced net-zero emissions as a target by 2050



**2050**

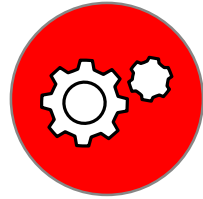
## Aims To Achieve

by when Cummins aims to achieve net-zero carbon emissions as included in our environmental strategy, PLANET 2050

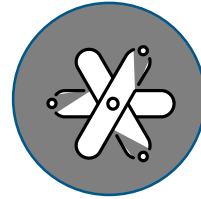
# Hydrogen will play a critical role in lowering global emissions



**ABUNDANT**



**VERSATILE**



**ENERGY DENSE**



**RENEWABLE**



**GREEN**

# Cummins participation in hydrogen economy

## Hydrogen Production



- On-site & on-demand generation
- PEM & alkaline technologies
- <100kg - >10T per day capability

## Hydrogen Dispensing and Storage



- 350 & 700 bar stations
- Easy integration with on-site generation solutions
- NPROXX Gas Storage Vessels

## Fuel Cell Stack & Module



- Low cost, high reliability fuel cell modules
- Integrated balance of plant
- Multi-module systems for widest range (kW-MW)

# In 2025

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## \$400M

## 100 Trains

### Cummins Electrolyzer business revenue in 2025

- Based on 3.5GW of industry electrolyzer sales (in line with Hydrogen council estimates)
- Cummins market share of ~15%
- Electrolyzer price of \$750k per MW (assumes ~5% annual cost decline from current levels)

Fuel Cell systems provided for 100 trains by 2025

# Hydrogen / electrolyzer / fuel cell efficiency



## Hydrogen Energy Density

1kg of hydrogen = ~3kg  
(1 gallon) of diesel in terms of energy



## Electrolyzer Efficiency

Alkaline: 55% - 70%  
PEM: 65% - 80%  
Solid Oxide: 75% - 90%



## System Efficiency

PEM Fuel Cell: ~60%  
Solid Oxide Fuel Cell: ~80%\*  
Diesel Engine: ~50%  
Natural Gas Engine: ~35 – 37%

\*80% when utilized in combined heat and power (CHP) application

# Overview of green hydrogen costs

- Renewable energy costs range from **\$0.05 - \$0.10 per kWh**
- Electrolysis requires **~50kWh to produce 1kg of Hydrogen**
- Resulting in roughly **\$2.50 - \$5.00 of electricity to produce 1kg of Hydrogen**
- PEM electrolyzer costs ~\$1m per MW: equates to about **\$0.60 per kg of Hydrogen over the useful life**
- Pre-distributed cost of hydrogen is approximately **\$3.10 - \$5.60 per kg**
- Distribution costs bring the cost at the pump to **upwards of \$10 per kg**
- Lowering energy costs to \$0.05 per kWh and capex costs by 50% **reduces pre-distributed cost to \$2 - \$3 per kg**



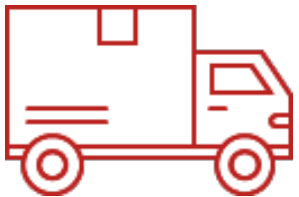
# Potential total addressable markets



**Current hydrogen production today is 70m tons**  
350 GW of electrolyzer capacity, or roughly \$350b at current prices



**Steel production is estimated to require 47 – 67m tons**  
300 GW of electrolyzer capacity, or roughly \$300b at current prices

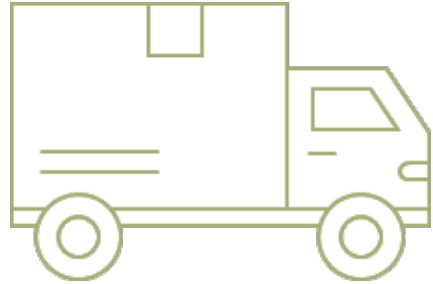


**Replacing diesel will require roughly 500m tons**  
2,500 GW of electrolyzer capacity, or roughly \$2.5t at current prices

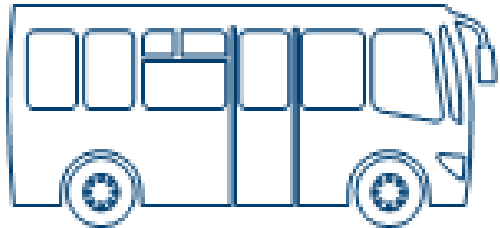
*In each market, we have assumed:*

- 1 MW electrolyzer currently costs ~\$1m
- 1 MW electrolyzer currently produces ~190 tons of hydrogen annually

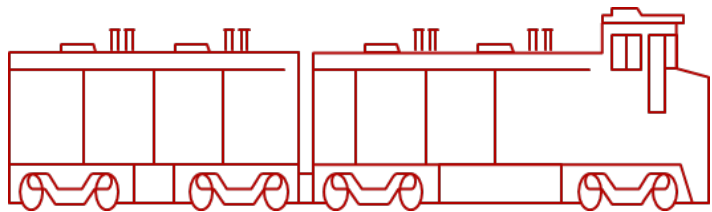
# Market adoption of fuel cells



Global Heavy-Duty Truck Market  
**2.5% of sales 2030**



Global Bus Market  
**10% of sales in 2030**



Global Train Market  
**10% of sales in 2030**

*% of trains currently powered by diesel*