Transportation Electrification at Scale - Power of Cummins

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June 16, 2021
2021

ABOUT CUMMINS INC.

190 Countries

57.8K Global Employees

1.3M+ Engines built in 2020

8K Distributor & dealer locations

$903M Invested in research & development in 2020

102 Years of industry leadership
Global partnerships

Companies listed on this slide reflect a view of top customers globally but is not an exhaustive list of global partnerships. Companies are listed in no particular order.
We serve many markets and applications

Heavy-duty Truck  Medium-duty Truck  Bus  Construction  Oil & Gas  Fire & Emergency  Power Generation

Electrolysis  Marine  Mining  Light-duty Automotive & Recreational Vehicle  Defense  Agriculture  Rail

This is not an exhaustive display of Cummins-powered markets. Please refer to cummins.com for the most updated product information.
THE ENERGY SHIFT
Cummins has been innovating alternative power for several decades. In 2017, we started considering this as a commercial entity.

PRE-2017

2017

The Electrification Business Development Initiative officially launched.

2018

FEB

Acquired Brammo, a primarily low-voltage battery designer, located in North America.

Acquired Johnson Matthey Battery Systems, a primarily high-voltage battery designer, located in the United Kingdom.

Announced that the electrification business will become Cummins’ fifth reporting segment, called the Electrified Power segment.

JULY

2019

Acquired Silicon Valley-based Efficient Drivetrains Inc. (EDI), a developer of plug-in hybrid and fully electric powertrain systems for commercial vehicles.

Acquired solid oxide fuel cell (SOFC) technology and assets to expand capabilities in stationary power options.

JULY

Announced a minority investment in Loop Energy, a fuel cell technology developer based in Vancouver.

SEP

9th
18th
26th

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Signed a MOU with Hyundai Motor Company to collaborate on hydrogen fuel cell technologies.

NOV

2020

FEB

OCT

The Electrified Power segment is renamed New Power, better reflecting its growing alternative power portfolio.

JUNE

Cummins Journey

JUN

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JUNE

Cummins Journey
Cummins is a global technology leader with a broad portfolio of power solutions
Cummins Core Technologies

**NEW POWER**

**ELECTRIFIED POWER**
Creating technologies and products for commercial battery electric vehicles
- On-highway: transit bus, school bus, medium-duty truck, walk-in van
- Off-highway: construction equipment, terminal tractor, material handling

**FUEL CELLS**
Creating and integrating components for hydrogen fuel cell electric vehicles and rail
- Electric vehicles: urban transit bus, commercial fleet, utility vehicle, electric lift truck
- Installation: freestanding electrical power plant

**HYDROGEN GENERATION**
Creating solutions for industrial and commercial hydrogen generation and MW-scale energy storage
- Industrial processes and fueling stations: PEM generator, alkaline hydrogen generator
- Critical and uninterruptible power supply, power-to-gas technology
Cummins Complimentary Technologies

ZERO-EMISSION POWER

System Offerings

FUEL CELL & IC ENGINE HYBRIDS

Full Electric

Components

BATTERY MATERIALS, MEAS'S & CELLS
Fuel cells + Battery pack + Inverters & converters + Controls + Accessories, cooling, wiring + Storage = INTEGRATED POWERTRAIN SYSTEM

CHARGING, CONNECTIVITY, HYDROGEN GENERATION + SUPPLY

Motor generator
Gear boxes
 Engines

INTEGRATED POWERTRAIN SYSTEM

BATTERY/STACK REUSE OR RECYCLE
CUMMINS NEW POWER APPLICATIONS

In the Field

BATTERY ELECTRIC
1. GILLIG battery electric transit bus
2. Blue Bird School Bus

FUEL CELLS
1. Scania Trucks
2. Alstom passenger train
3. Refuse Truck: Cummins fuel cells power FAUN electric refuse trucks on the road today in Europe

ELECTROLYZERS
1. Hybalance - 1.2-megawatt PEM electrolyzer
2. Cummins-Enbridge Power-to-Gas Facility
3. 5-megawatt PEM electrolyzer for Douglas Co Public Utilities District in Washington State (US)
4. HyLYZER 1000 – 20 MW PEM electrolyzer system
5. Uniper (power-to-gas)

HYDROGEN FUELING STATION
1. Hydrogen fueling station: Delivered electrolyzers for more than 50 hydrogen fueling stations
PLANET 2050 aspirational targets

COMMUNITIES ARE BETTER BECAUSE WE ARE THERE

2050 Targets
- Net positive impact in every community in which we operate
  $= \text{sum of environmental good} > \text{local environment footprint}$
- Near zero local environmental impact

DOING OUR PART TO ADDRESS CLIMATE CHANGE AND AIR EMISSIONS

2050 Targets
- Customer success powered by carbon neutral technologies that address air quality
- Carbon neutrality and near zero pollution in Cummins' facilities and operations

USING NATURAL RESOURCES IN THE MOST SUSTAINABLE WAY

2050 Targets
- Nothing wasted
  - Design out waste in products and processes
  - Use materials again for next life
  - Reuse water and return clean to the community

NOTES
References to “facilities” relate to all consolidated operations and joint ventures subscribing to Cummins’ Enterprise Environmental Management System. Goals will be periodically assessed for progress and continued practicability.
“Our industry is in a transition. Technology, regulations and customer expectations are changing rapidly, requiring our teams to innovate so they can deliver the value our customers expect.”

Vice President and Chief Technical Officer Jim Fier