

The image features a white semi-truck with a large white trailer, moving through a city street at night. The background is blurred, showing city lights and buildings, suggesting motion. In the top left corner, there is a blue square containing the Ballard logo. A semi-transparent white box is overlaid on the left side of the image, containing text.

**BALLARD**<sup>®</sup>

Fuel Cell  
Electric Trucks  
Solutions for  
Zero-Emission  
Freight Transport

# The Future of Freight Transport will be Electric

Air pollution is a serious climate and public health issue. And the transport sector is one of the biggest contributors to the problem. The freight industry needs zero-emission solutions, and fast. The good news is, electric powertrains are moving the industry toward reducing emissions.

Fuel cell electric trucks offer fleet operators the operational experience of legacy diesel, while also delivering the benefits of electrification, including zero tailpipe emissions, low noise, low vibration, and fast and smooth acceleration.

Hydrogen fuel cells are the most viable solution to reduce emissions and create a cleaner future – without any compromise in operation or payload.

A black semi-truck with a white trailer is driving on a highway. The truck is in the foreground, moving towards the viewer. The background shows a lush green forest with sunlight filtering through the trees, creating a bright, hazy atmosphere. The road is a multi-lane highway with a concrete barrier on the right side.

*“In less than 10 years, it will become cheaper to run a fuel cell electric vehicle than it is to run a battery electric vehicle or an internal combustion engine vehicle for certain commercial applications”*

Deloitte Report (2020)

# Superior Performance for Trucks

Fuel cell trucks have the potential to be full-service trucks, offering all the benefits of zero-emission electric trucks with the same capabilities as conventional diesel trucks.



## Longer Range

The range of a fuel cell truck has the potential to be equivalent to a traditional diesel-powered truck. For the freight industry this is revolutionary: there is now a zero-emission option that can handle similar routes to diesel fleets.



## Greater Power

Compared to batteries, fuel cell technology provides more power for travelling long distances and on challenging terrains. Fuel cell trucks can handle highways and long steep grades without compromising speed.



## Higher Payload Capability

The higher energy density by weight of hydrogen fuel means that fuel cell powered trucks can carry more freight. Fleet operators don't need to compromise their payload to meet the weight limitations of a battery powered vehicle.



## Fast, Flexible Refueling

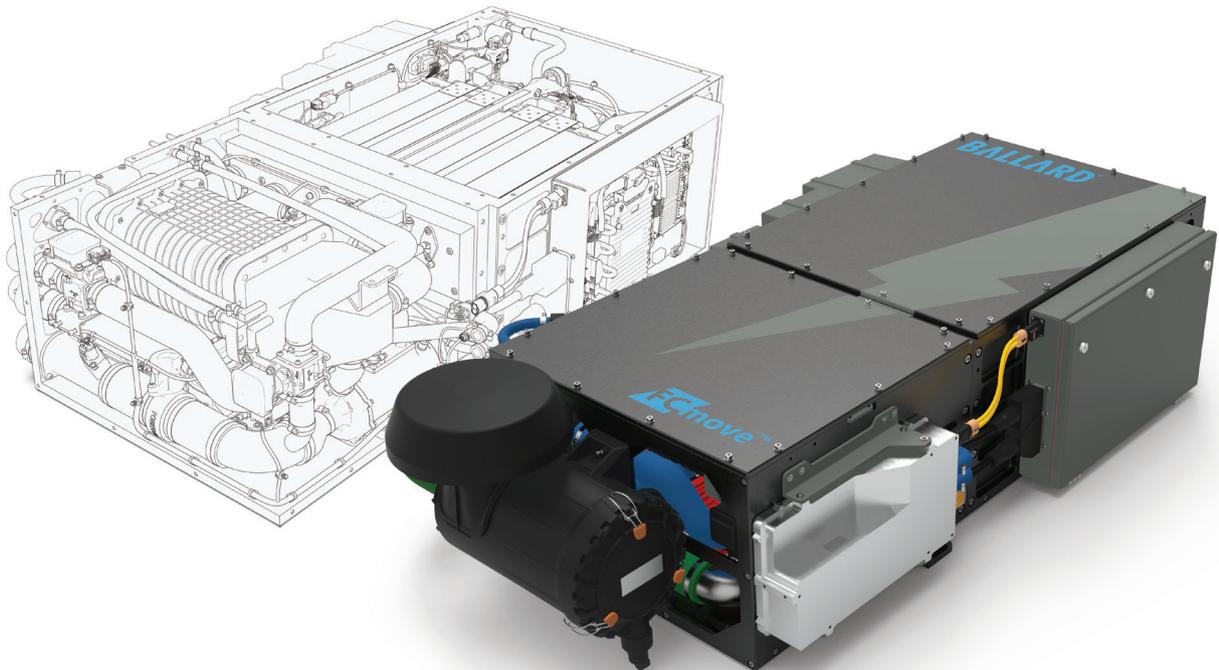
A fuel cell truck is refueled in five to fifteen minutes, ensuring the truck is on the road generating revenue for the fleet operator. For commercial vehicles, where time is money, charging batteries can take vehicles off the road for hours at a time.

# Fuel Cell Technology

Fuel cells improve the performance of zero-emission electric trucks by generating onboard power from hydrogen to recharge the batteries.

A fuel cell truck is an electric vehicle that includes both a fuel cell and batteries working seamlessly together to provide efficient zero-emission power without compromised range or payload capability. In this hybrid architecture, the fuel cell provides energy to keep the batteries charged, works with the batteries to provide peak traction power, and provides the energy necessary for the auxiliary loads.

There is no need to plug in the truck to recharge the batteries. Hydrogen stored onboard provides the entire daily energy need of the truck. The remaining truck components (chassis, electric drive, etc.) are common across all electric trucks.



# Putting Fuel Cell Electric Trucks to Work

Fuel cell electric trucks are ideal for applications needing combinations of high utilization, heavy payloads, and long range:

- Drayage trucks
- Refuse trucks
- Cement trucks
- Delivery trucks
- Utility trucks
- Mining trucks

Fleet-based medium and heavy duty trucks (Class 4 to 8 and >6t) present the lowest barriers to entry for hydrogen refueling. These trucks typically return to base at the end of the shift and can be quickly refueled at a centralized hydrogen refueling station at the depot.



# Scalable, Sustainable Hydrogen Fueling

Hydrogen is a safe and flexible fuel suitable for energy intense applications like medium and heavy duty trucks. The cost per vehicle decreases as the fleet and hydrogen consumption grow, becoming less expensive than electric charging infrastructure. Today, several companies provide turnkey hydrogen infrastructure solutions for centralized refueling at the depot.

When fueled with green hydrogen produced from renewable energy, fuel cell electric trucks are the cleanest option from both a lifetime emissions and environmental impact perspective.





# Ballard's Experience

Ballard's fuel cell technology is proving itself in more than 2,200 fuel cell electric trucks deployed in China, Europe and North America.

**BALLARD HEAVY DUTY MOTIVE MODULES ARE POWERING:**

- Multiple fleets of fuel cell delivery trucks in China
- Kenworth Truck Company's fuel cell hybrid drayage truck in California
- UPS Class 7 truck in California
- Anglo American's and Weichai's ultra heavy duty mining trucks
- A refuse truck built by E-Trucks Europe
- Alberta Zero-Emissions Truck Electrification Collaboration (AZETEC) project in Canada

<p><b>40</b> YEARS</p>	<p><b>900</b> employees</p>	<p><b>1,400</b> patents &amp; applications</p>	<p>25 years <b>Nasdaq</b> 27 years <b>TSX</b> publicly listed Company</p>
<p><b>670 MW</b> fuel cell products delivered</p>	<p><b>&gt;5.5million MEAs</b> produced</p>	<p><b>&gt;30million</b> kilometers in operation</p>	<p><b>&gt;30,000hours</b> operation of fuel cell stack in London buses</p>

# Industry Leading Fuel Cells for Medium and Heavy Duty Trucks

Ballard's FCmove™ fuel cell modules provide power solutions from 30 to 200+ kilowatts for medium and heavy duty trucks (Class 4 to 8 and >6t). Our expanding heavy duty product line and proprietary technology, combined with our extensive stack design and system integration capabilities, deliver unparalleled customer value.

## **BALLARD FUEL CELL POWER MODULE FOR TRUCKS DELIVER:**

- Efficiency
- Durability & Reliability
- Power Density

Fuel cell technology is a proven solution that is ready to be deployed in commercial vehicles around the world.

Contact us to begin the journey to fuel cell electric trucks.



**We deliver fuel cell power  
for a sustainable planet**

# **BALLARD**®

**Ballard Power Systems**  
9000 Glenlyon Parkway  
Burnaby, BC V5J 5J8  
Canada

(P) +1-604-454-0900

[www.ballard.com](http://www.ballard.com)



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