

POLIS

CITIES AND REGIONS FOR TRANSPORT INNOVATION

ANNUAL
CONFERENCE

2022

30 November
1 December, 2022
Brussels, Belgium



#POLIS2022

4A: Bus Service without Compromise

Fuel Cell Electric Buses in Cities

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Market Development Manager

Ballard Power Systems Europe

Introduction - Ballard by Numbers

43

YEARS



>1,100
employees



1,400
patents &
applications



2030
commitment to
carbon neutrality



publicly listed company



>1,400
transit buses



>2,200
trucks



7 TRAIN
projects



8 SHIPS
in development



8 MW
of stationary
power projects



938 MW
fuel cell products
delivered*



>100 MILLION
kilometers in
operation*



1.6 GW
production capacity



>5.3 MILLION
MEAs
produced*

4

PRODUCTION
SITE
global footprint



Hydrogen Fuel Cell Bus in London



What is Required in a Zero-Emission Bus?



Drop in replacement for a diesel



No space reduction because of new technology



Range over all terrain and temperature



Fast turn around



No change in schedules



Battery Electric Has Limitations



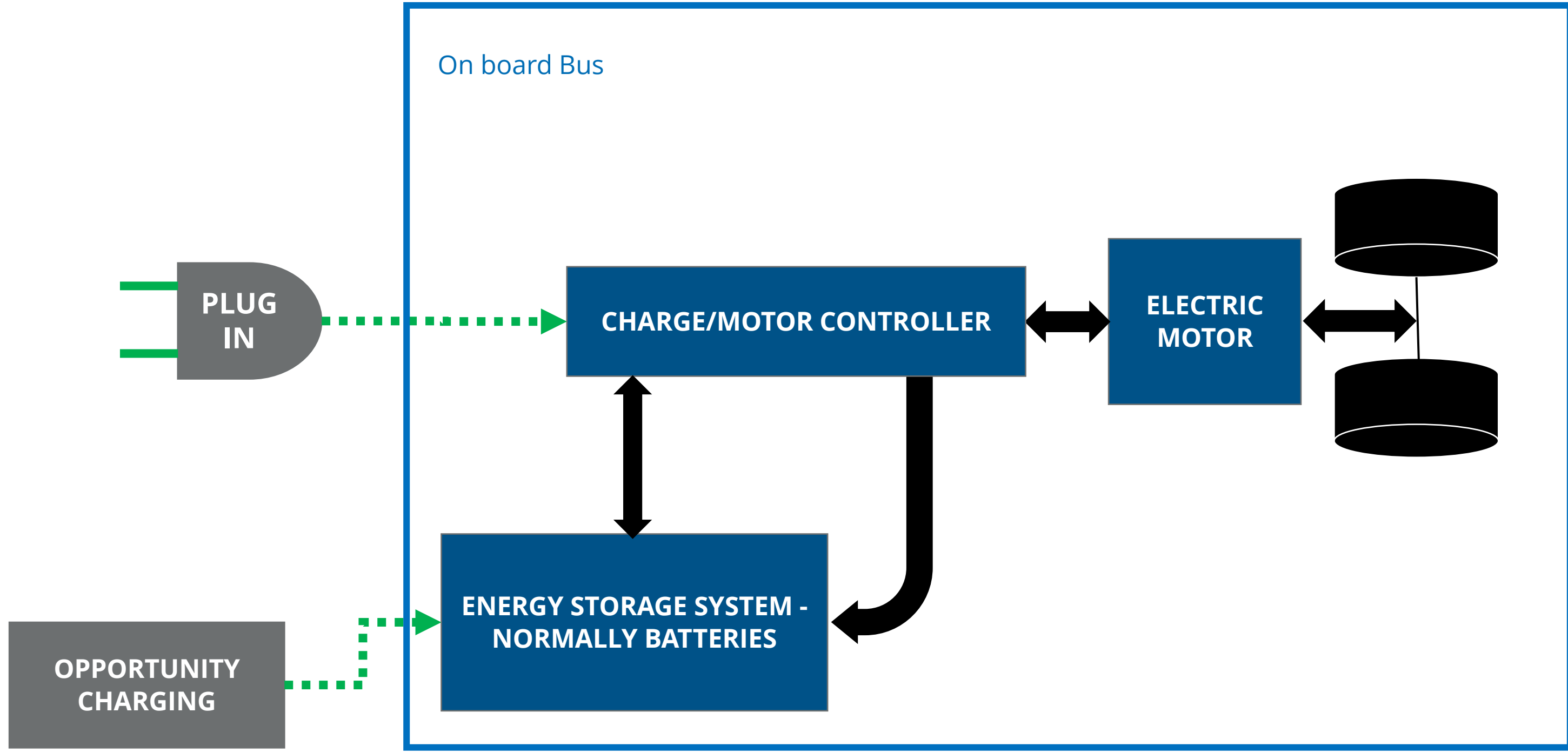
Hydrogen Fuel Cell Bus



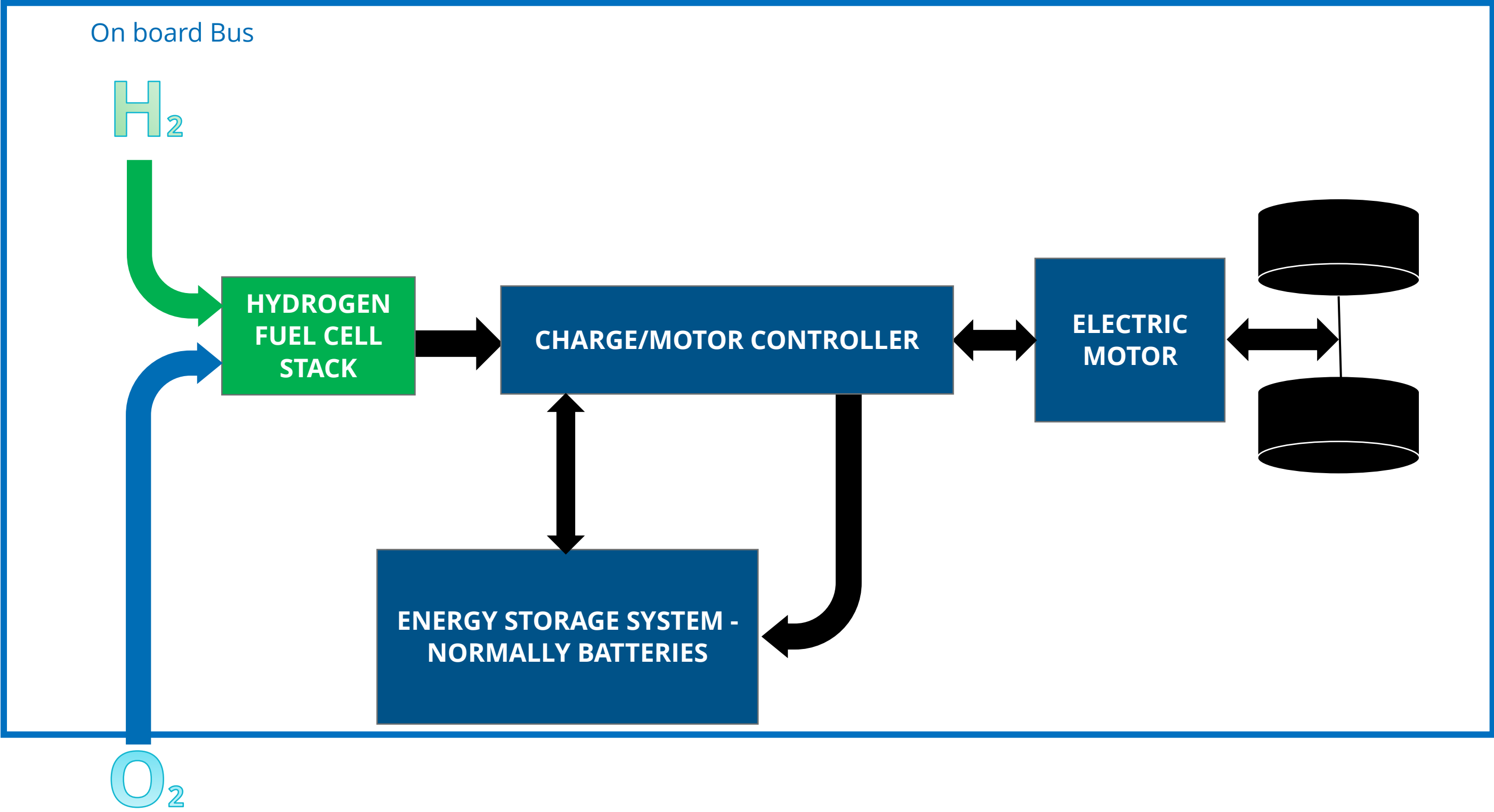
Hydrogen Fuel Cell



Plug-In Electric Bus



Hydrogen Fuel Cell Bus



Fuel Cell Electric Bus Advantages

BALLARD™



Zero emission

High Efficiency

Electric Drive

Low Noise



Low initial infrastructure costs

Lower-cost maintenance

Higher powertrain efficiency

Long Range

Fast Refuelling

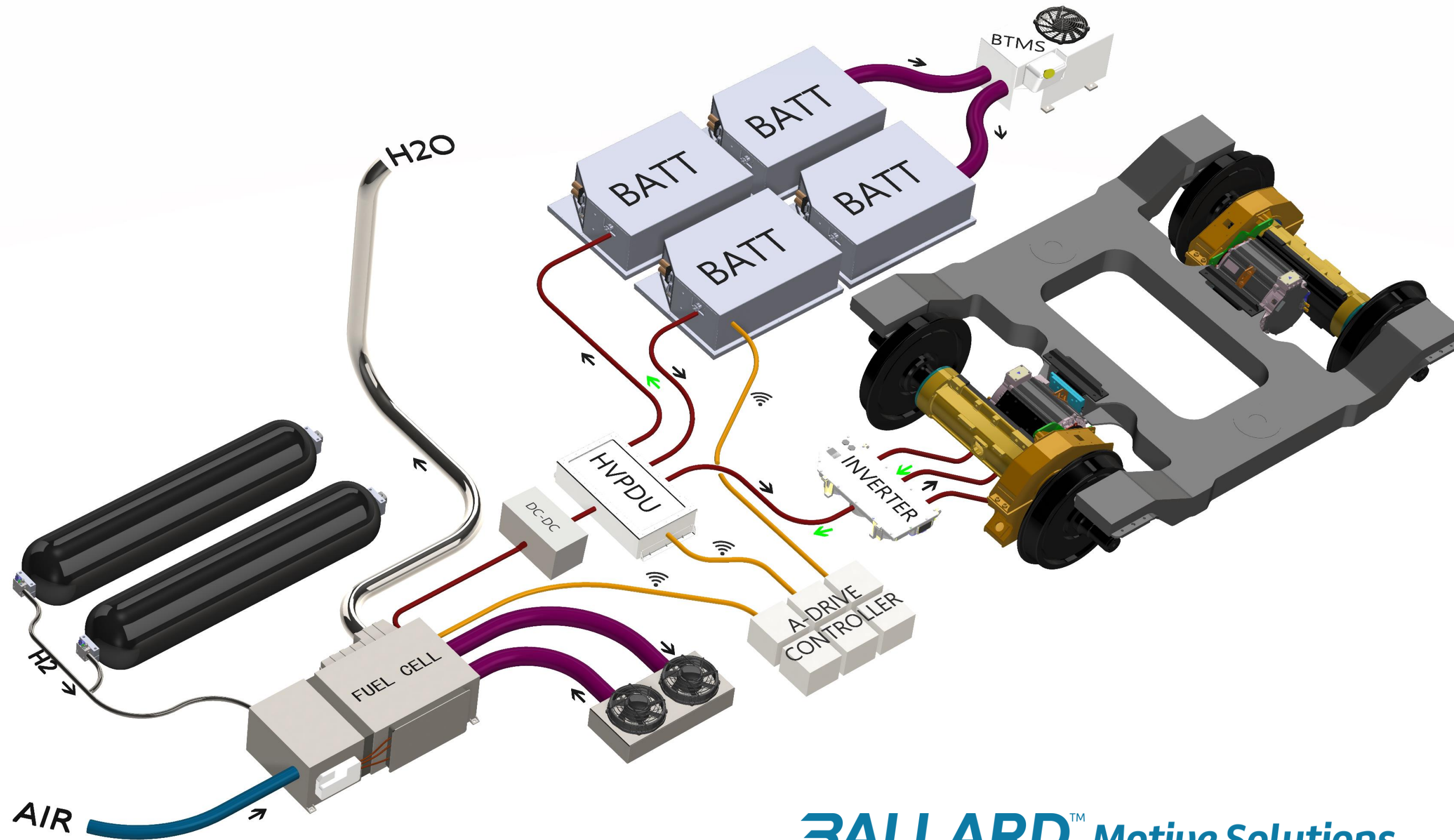
Passenger capacity

Extreme weather tolerance


Low infrastructure costs at scale



Hydrogen Fuel Cell Bus



Hydrogen Fuel Cell Buses

 NORTH AMERICA
87 | 106



 EUROPE
195 | 679



 ASIA
1398 | 718

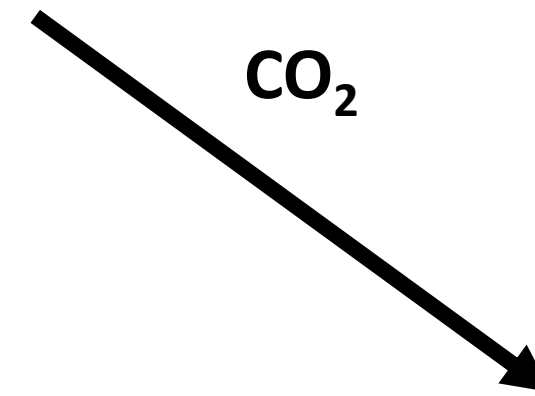
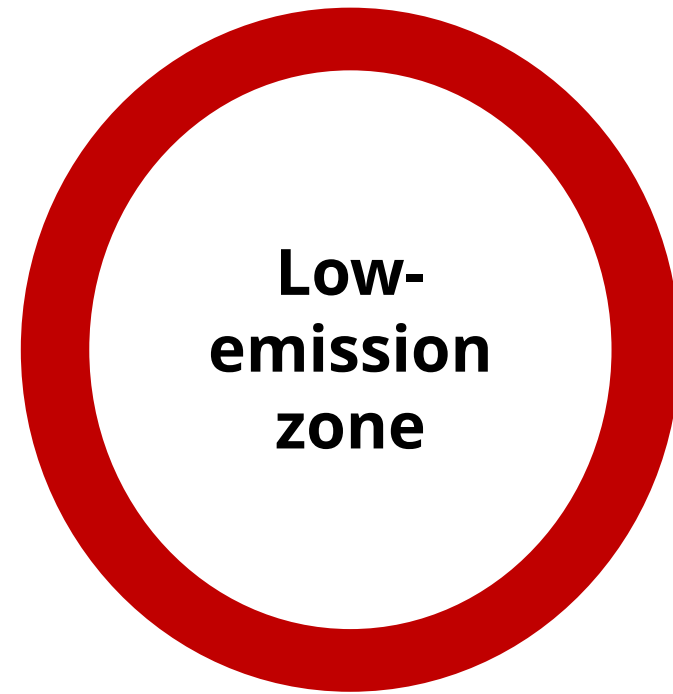


 **1600+**
FUEL CELL BUSES
DELIVERED

 **1400+**
FUEL CELL BUSES
ON ORDER



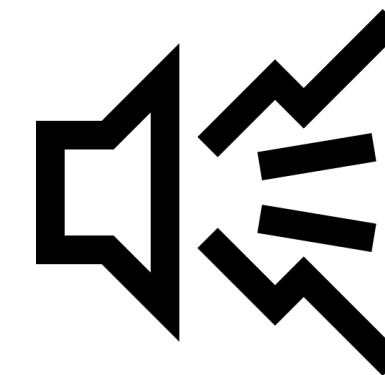
A Future-Proof Technology



Emission standards for buses



Clean Vehicles Directive



Noise regulations



Hydrogen Fuel Cell Operation



Hydrogen Fuel Cell Bus

BALLARD™

hydrogen storage

high voltage battery

air conditioning

bus auxiliary

fuel cell system

fuel cell cooling



Fuelling with Hydrogen



Fuel Cell Bus Maintenance

- Safety
- Workshop
- Technicians



Fuel Cell Buses and Heavy-Duty Transport



Decarbonizing Heavy Duty Transport



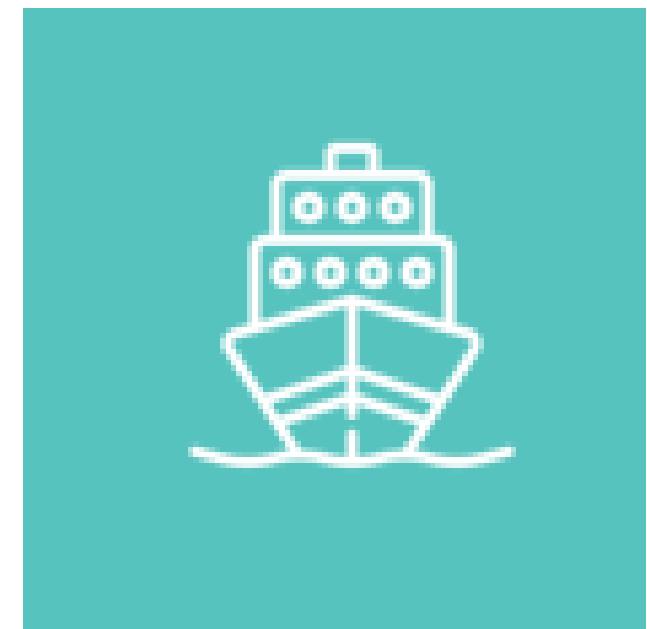
Buses & Coaches



Trucks



Trains



Vessels

Fuel cell technology is needed to decarbonize the heavy duty transportation sector



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Thank You

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