Hydrogen Fuel Cell Solutions for Buses

David Yorke
Market Development Manager
Ballard Power Systems Europe
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Global fuel cell company

40+ years

1,100+ employees

Technology leadership & Customer Care

BALLARD™

Fuel cell electric buses powered by Ballard

The future of transit will be electric

- An electric powertrain is the efficient, quiet, zero-emission energy alternative to polluting diesel engines
- Electricity for the electric drive can be supplied from batteries or from an on-board fuel cell power generator or a combination of both – a hybrid architecture

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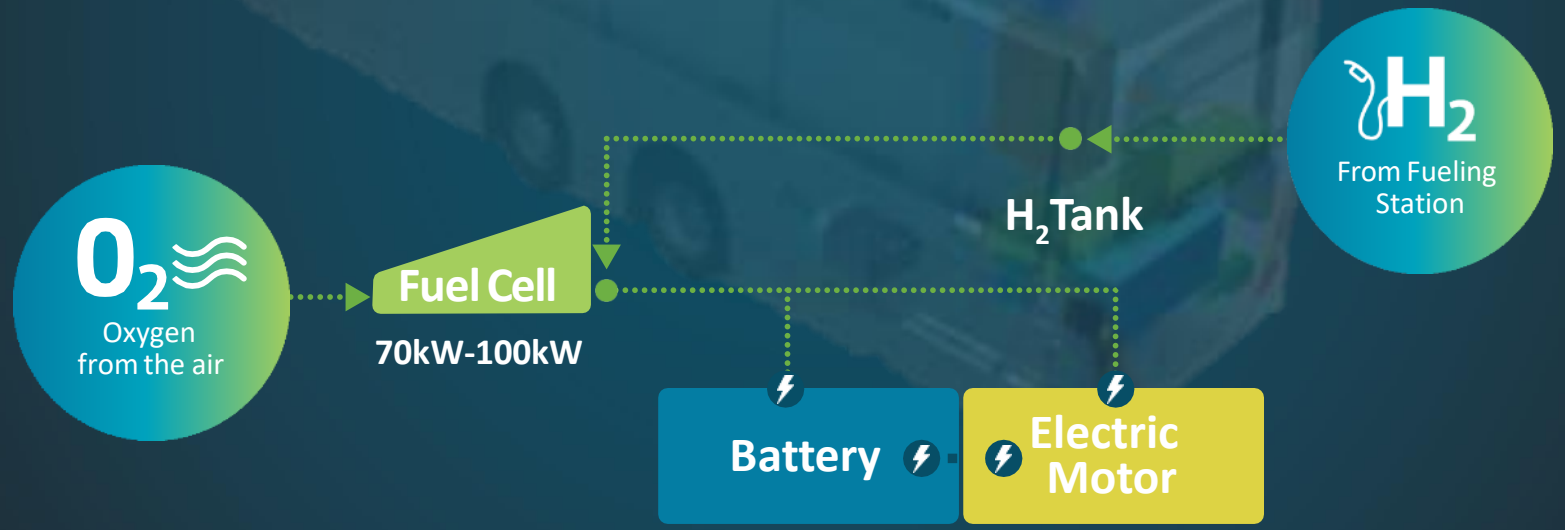
A hydrogen bus is an electric bus



Output=Water

H_2O

Zero Emissions

BALLARD™

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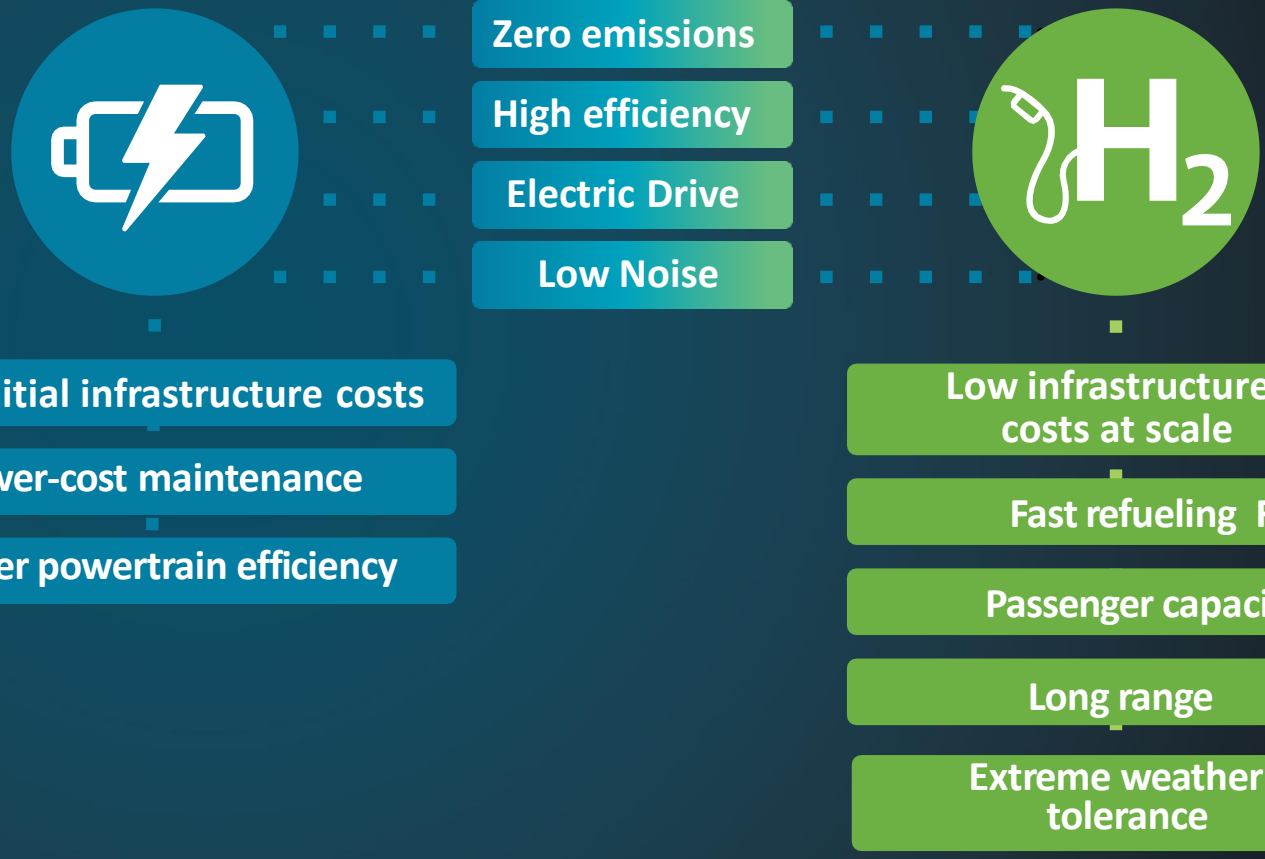
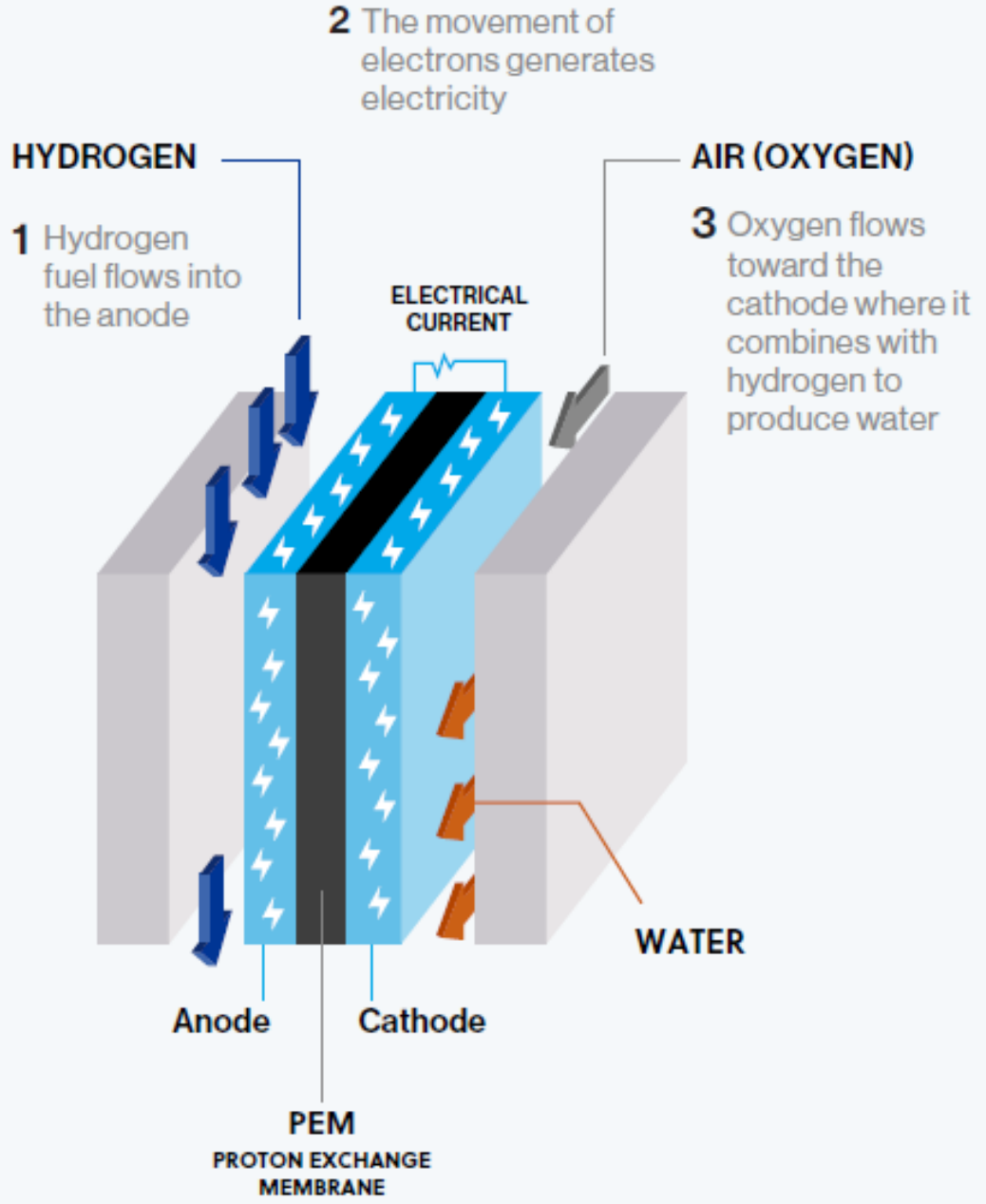


What is a fuel cell ?

- A device that converts chemical energy into electric energy
- A series of chemical reactions splits hydrogen into protons and a current of electrons and then combines them with oxygen, which produces water. The flow of electrons is the electric current. The electric current is used to power the batteries and ultimately power the bus.



FCmove™ platform

- Compact innovative design
- Low life cycle cost
- Engine bay and flat configurations for easy integration
- High performance, robust product with wide operating range
- 70kW and 100kW versions

BALLARD™

Fuel cell electric buses using renewable hydrogen are the most viable, true zero-emission option

Power to maintain speed on most demanding routes

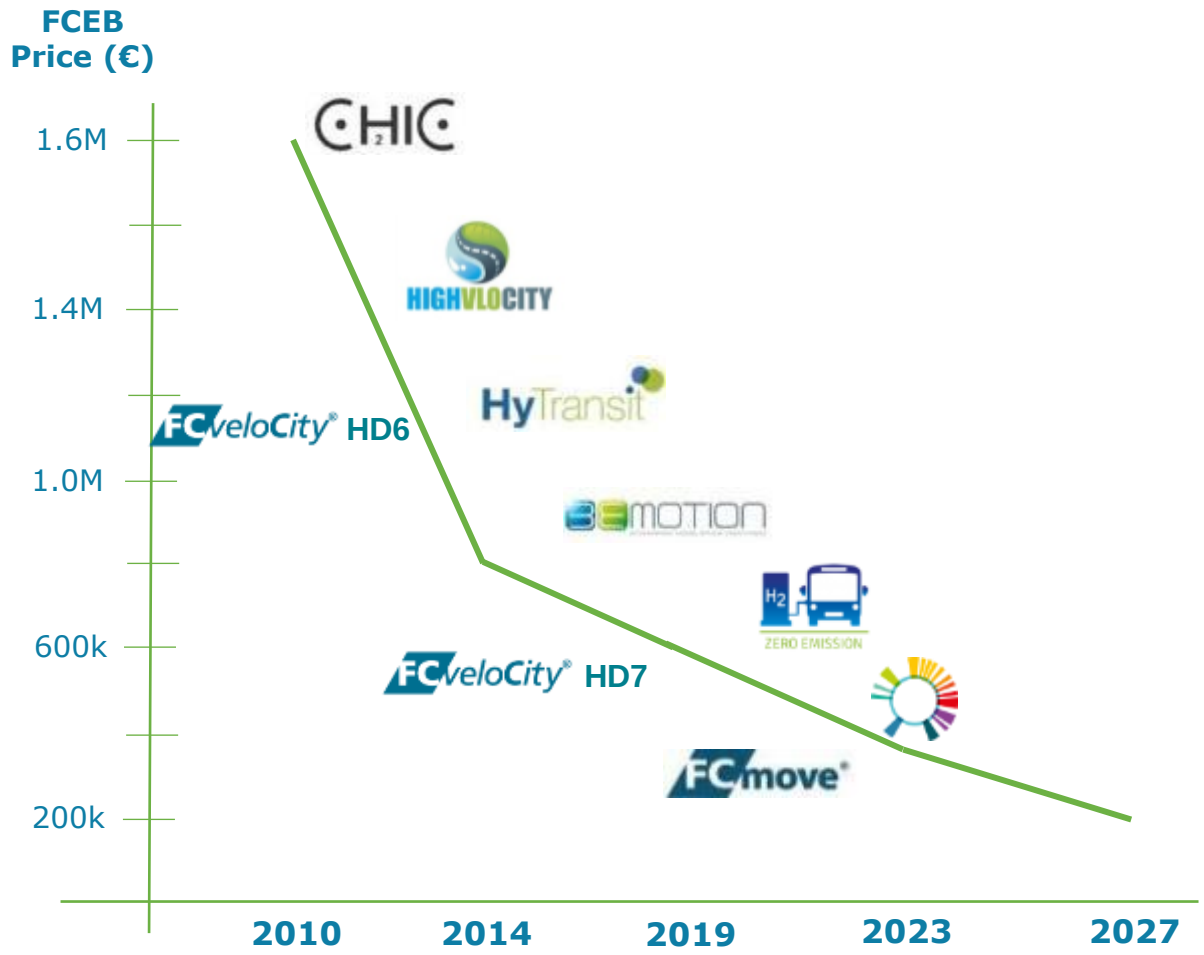
Extended range for route and service flexibility

High energy density to maximize vehicle performance

Rapid refueling ensures high utilization with scalable infrastructure

Fuel Cell Competitive Positioning

60% reduction in FCEB price over past 10 years



Key Drivers:

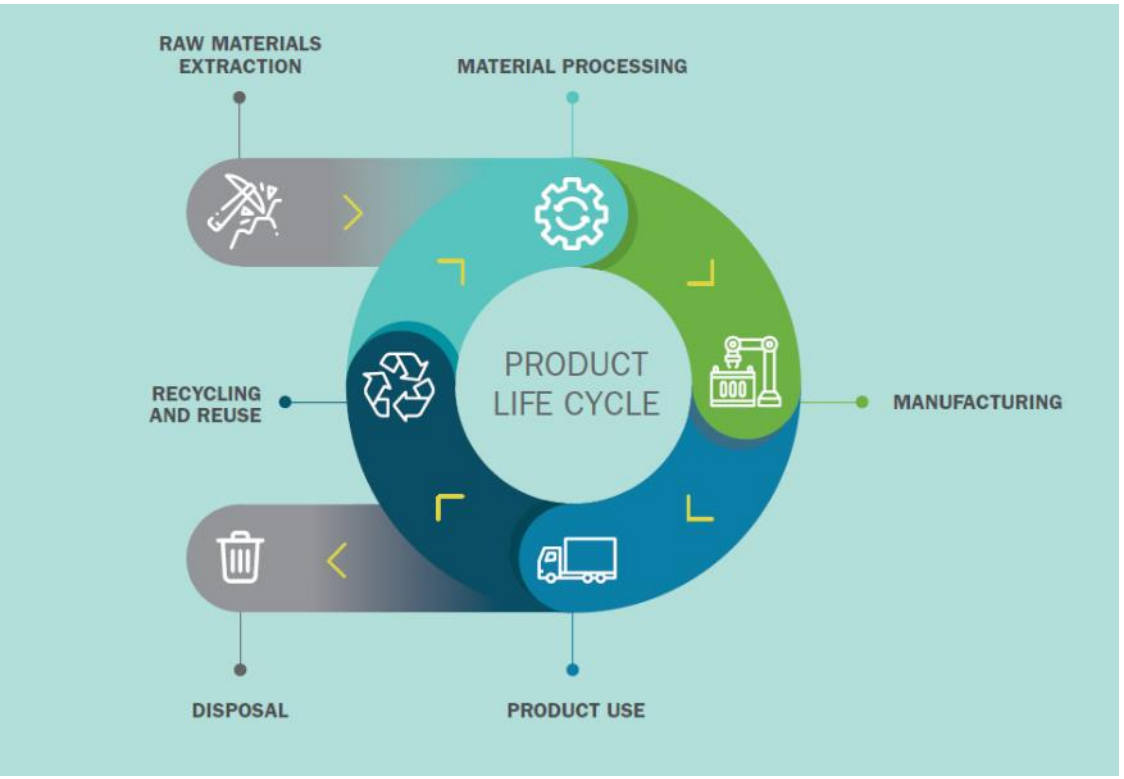
- ✓ Improvements in technology and products led to ~60% FCEB cost reduction in past 10-years (as well as ~50% service & maintenance cost reduction in just the past 5 years)
- ✓ Further lifecycle cost reductions going forward are expected to result from continued product innovation plus increased volumes, leading to –
  - Economies-of-scale in manufacturing (similar to diesel engines)
  - Lower cost of green hydrogen and lower cost hydrogen infrastructure (which is opposite for BEBs)

Service and Support

- Applications engineers working side-by-side with our customers to ensure the successful integration and operation of Ballard's products.
- Simulation and modeling software ensures the right fuel cell product is selected, based on vehicle drive cycle and operational requirements.
- Insights from our many years of experience with fuel cell systems help accelerate and optimize our customers' overall fuel cell vehicle design work and reduce integration risks
- We provide support during powertrain integration, testing, certification and vehicle commissioning
- Our after sales team takes over once the bus is on the road with comprehensive customer care packages including training, onsite assistance, warranty support, diagnostic and spare parts management.

Zero emission transit should also be sustainable

Fuel cells have a lower impact on the environment



At Ballard we:

- Design our product to minimize carbon footprint
- Refurbish fuel cell stacks at the end of life
- Re-use graphite bipolar plates
- Reclaim 95% of the platinum
- We are committed to be carbon neutral by 2030

Thank you

David Yorke
Market Development Manager
Ballard Power Systems Europe
djy@ballardeurope.com
+44 (0)7832 953225

ballard.com

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