

BALLARD®

power to change the world

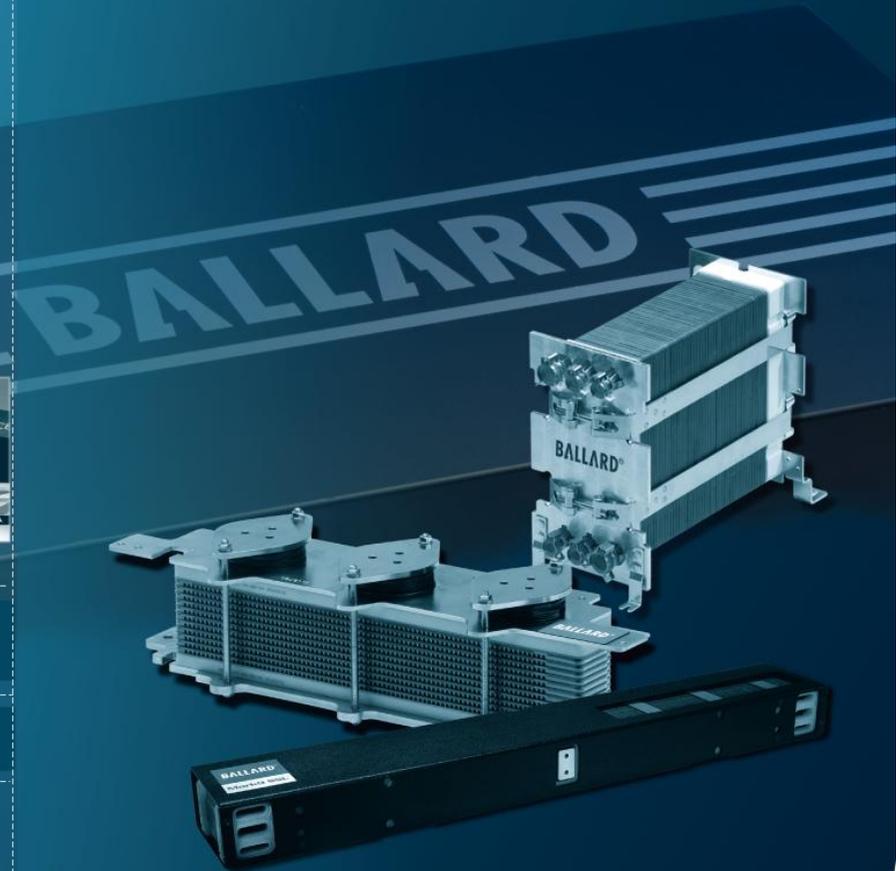


▶ **BALLARD POWER SYSTEMS**

ACCELERATING FUEL CELL MARKET ADOPTION

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2009



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Ballard Profile



■ CLEAN ENERGY FUEL CELL PRODUCTS...

– OUR COMPANY

- Approximately 500 employees
- World-leading R&D & manufacturing facilities
- Locations in Vancouver, Canada (HQ), Lowell, MA

– OUR BUSINESS

- Design, manufacture, sale & service of hydrogen fuel cell products

– OUR CUSTOMERS

- System integrators and OEM's addressing end-user needs: materials handling, telecom backup power, residential cogeneration, and transit buses

– OUR FOUNDATION

- Technology Leadership
- Production Expertise
- Expanding Go-to-Market Capabilities



Solid Foundation

BALLARD[®]

■ Technology Leadership

- Extensive fuel cell IP portfolio
- Deep technical fuel cell strength
- Most advanced testing facility worldwide
- Automotive IP rights

■ Production Expertise

- State-of-the-art manufacturing facilities
- High quality manufacturing standards

■ Expanding Go-to-Market Capabilities

- Broad portfolio of fuel cell products
- Growing set of strategic relationships
- Industry-leading customer support



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Facilities & Locations



WORLD'S MOST ADVANCED FUEL CELL FACILITIES

■ Corporate Headquarters / R&D

- Located in Burnaby, BC (Metro Vancouver)
- Research, development, engineering, testing
- 5800 m² hydrogen-safe test lab
- 85 fuel cell test stations, ~400,000 hrs annual



■ Manufacturing – Plant 1

- Adjacent to HQ, commissioned in Dec 2000
- World's first high-volume FC manufacturing facility
- 11000 m² for production, assembly, service
- Over 100 MW products shipped



■ Ballard Material Products

- Located in Lowell, Massachusetts
- Sales, research, development, manufacturing of carbon fiber products for fuel cells and automotive applications



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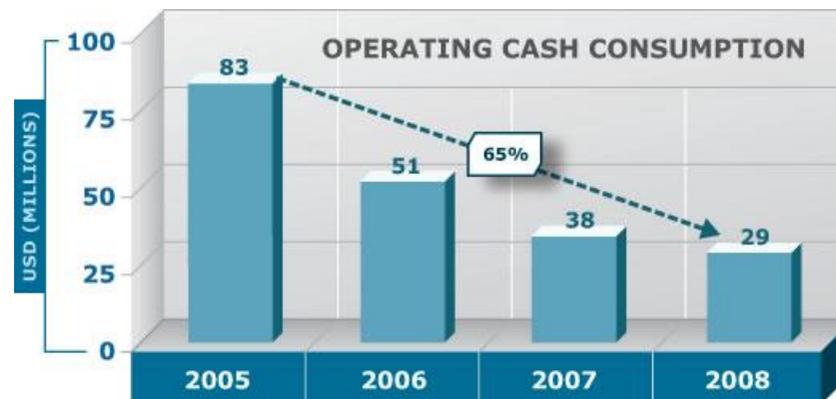
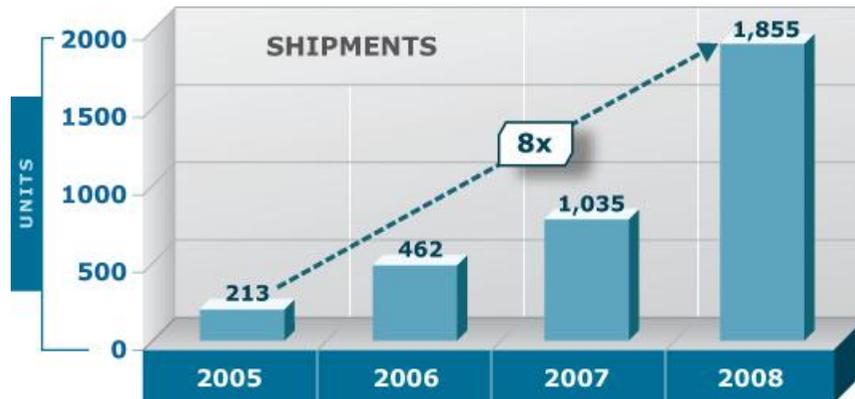


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Building Momentum

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Lines of Business



Clean Energy Fuel Cell Products

Motive Power

Stationary Power



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Environmental Dividend



- **Fuel cells will be an important part of the alternative energy mix**
- **Key environmental advantages over incumbent technologies**
 - No toxic material to dispose
 - Less noise
 - Reduction in GHG emissions
 - More efficient energy source



Why Fuel Cell Buses ?



■ Reduced Greenhouse Gas Emissions on a well to wheel basis

- A single Fuel cell bus using hydrogen from renewable sources will displace up to 380* tonnes of CO₂e /year depending on bus drive cycle and annual mileage

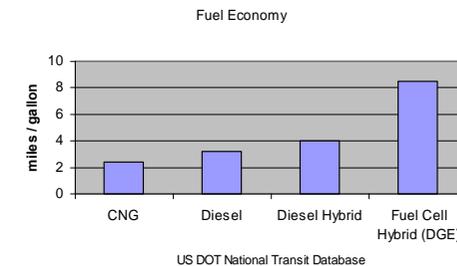
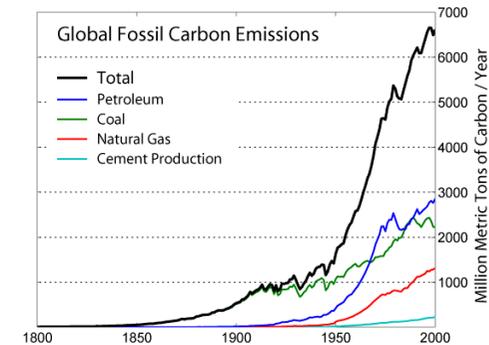
*The Center for Energy Efficiency and Renewable Technologies (CEERT) CEERT, GHG Emissions Reductions

■ Completely eliminates tailpipe emissions

- Nox, Sox, PM

■ Improved fuel efficiency

- 2-3x improvement over conventional diesel buses on an energy equivalent basis



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Bus Program Evolution



1991 - 1992



Phase 1
Proof of Concept

1993 - 1995



Phase 2
Commercial Prototype

1996 - 1999



Phase 3 Fleet
Demonstration
Alpha Sites

1999 - 2002



Phase 4 Fuel
Cell Engines
Beta Sites

2002 - 2009



Phase 5
Serial
Production

Power 90 kW /
125 HP

205 kW /
275 HP

Location(s)

Vancouver

Vancouver

Chicago (3)
Vancouver (3)

California

5 Continents
CUTE (30),
Perth (3)
California (3)
Beijing (3)

Lessons Learned

Proof of
concept

Full-size bus
integration

Field service
Site
homologation

System
optimization
Cost reduction -
single motor
concept

International
homologation
Reliability growth
Real world usage

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Next Generation Heavy-Duty Fuel Cell Module **FCvelocity™-HD6**

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- **FCvelocity™-HD6 fuel cell module has greater power density and durability while maintaining some of the time tested components of the previous design.**
 - Applies next generation fuel cell stack technology
 - Offered with a 12,000 hr, or 5 yr warranty

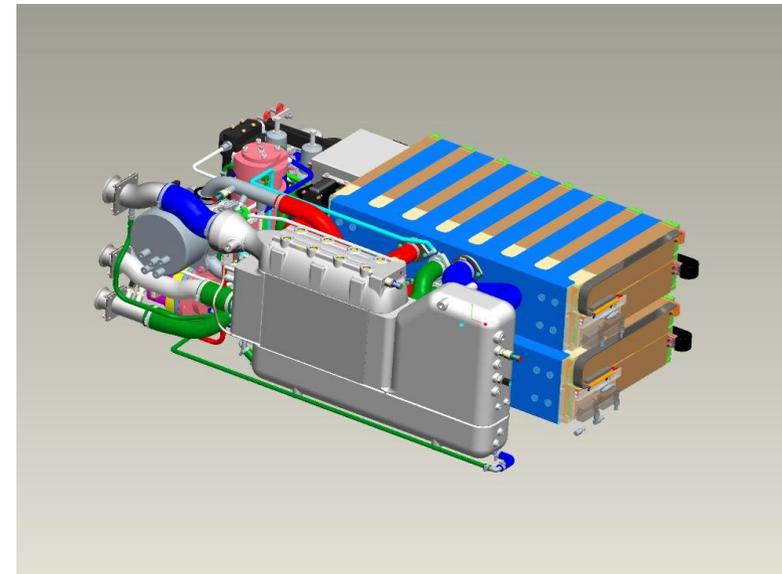


HD6 Module

Next Generation Heavy-Duty Fuel Cell Module **FCvelocity™-HD6**

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- **BOP Includes:**
 - air humidification system
 - hydrogen re-circulation
 - condenser for water management
 - CAN and power supply connections
 - control system
- **150 or 75 kW configurations**



HD6 Module

Path to Commercialization

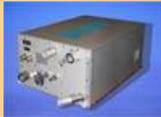


Heavy-Duty Fuel Cell Module Development

2002-2008

2009-2012

> 2013



Technology Demonstration



Pre-Commercial Trials

Commercial
Production

Key attribute improvements of each generation

- **Performance**
- Reliability
- Power density

- **Durability (Warranty)**
- Cost reduction
- Fuel Efficiency

- **Cost reduction**
- Design for manufacture

Fuel Cell Bus Capital Costs

>3.0M ●

▶ <1.0M

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UNDP Brazil Fuel Cell Bus Project

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– Phase I

- Ballard's automotive fuel cell stacks have been used for Phase I of the UNDP/GEF fuel cell bus program in Brazil
- This bus is now commissioned and operating in Sao Paolo



– Phase II

- UNDP/GEF Phase II project will incorporate Ballard HD6 modules for up to three buses that will operate in San Paolo

EMTU

 **Marcopolo**

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tuttotrasporti

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Thank you



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