



November 3, 2011




# BALLARD<sup>®</sup>

**Terry Howe**  
Manager,  
Solutions Engineering

## PEM Fuel Cell Systems for MW-Scale Distributed Power Generation

■ A Clean Energy Growth Company | [WWW.BALLARD.COM](http://WWW.BALLARD.COM) | **TSX: BLD** **NASDAQ: BLDP**

# About Ballard

- **Company founded in 1989, ~400 employees**
- **Portfolio of proven fuel cell solutions**
- **Strong delivery capabilities:**
  - Unrivalled IP portfolio with  **esencia**™ technology in every product
  - High volume manufacturing facility, 100MW+ of fuel cell products shipped

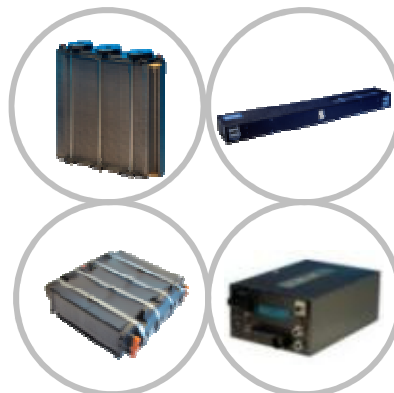
## MARKET FOCUS

- Multi-market growth focus



## POSITION

- Global leader in PEM fuel cell technology & products



## STRATEGY

- Leverage product leadership and build key channel partnerships to establish first-mover advantage



# Distributed Power Generation with Fuel Cells

- **Focus:**

- Clean baseload or load-following power for chemical plants, remote communities and others

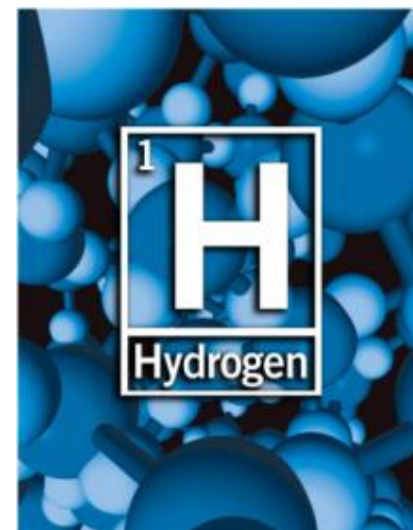
- **Market Drivers:**

- Availability of low cost by-product hydrogen
- Supportive feed-in tariff policies
- Increased utility focus on clean energy generation



# Availability of Hydrogen

- **Sources of hydrogen suitable for CLEARgen™ system -**
  - **By-product hydrogen**
    - : Hydrogen created as a by-product of chlor-alkali production, at carbon monoxide plants & other chemical production facilities
  - **Electrolysis from renewable energy sources**
    - : Large-scale energy storage using hydrogen produced during off-peak times
  - **Steam-reformation of biogas**
    - : California hydrogen pipeline supplied with renewable bio-gas generated at a landfill
  - **Gasification of biomass**
    - : Converts organic waste to a hydrogen-rich gas stream



## Case Study: *FirstEnergy Corp, Ohio*

- **1MW CLEARgen™ system, the largest PEM fuel cell system in North America, has been installed at FirstEnergy Corp.'s Eastlake plant**
- **Utility load management demonstration project - generator operated during periods of peak demand**
- **Results during the first year of operation have been positive**
- **Benefits:**
  - Takes strain off the power grid
  - Ensures uninterrupted power to customers
  - Mobile, so it can provide peaking power when and where it's needed

**FirstEnergy**



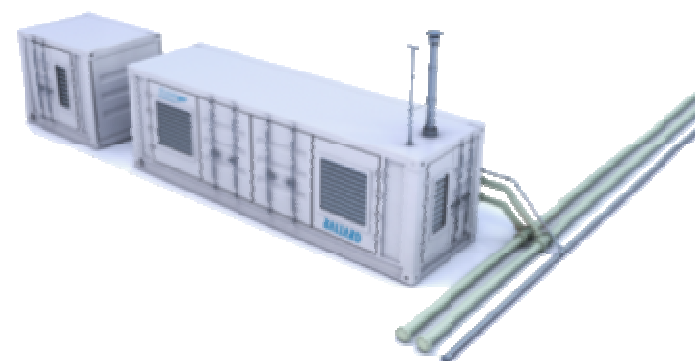
## Case Study: *GS Platech, South Korea*

- **Hydrogen produced by plasma gasification of municipal organic solid waste**
- **Generates 50kW with Dantherm Power's DBX5000 fuel cell system**
- **Successful demonstration achieved, delivering power to the grid**
- **Benefits:**
  - **Treats 5 tons of waste per day**
  - **Drastically reduced emissions vs. conventional waste combustion**
  - **Good source of high quality hydrogen**
  - **When scaled-up, can provide demand side management for Korea East West Power Co. (electric utility)**



## Case Study: *K2 Pure Solutions, California*

- **Fuel cell system will convert by-product hydrogen from bleach production into load-following electricity**
- **Benefits:**
  - Independent power production for K2 Pure Solutions
  - Demand side management for PG&E (electric utility) - offsets power demand on site
  - Lower overall energy costs
  - 48% efficiency
  - Zero GHG emissions



## Case Study: *Toyota Motor Sales, California*

- **Hydrogen produced by steam-reformation of renewable bio-gas generated at a landfill, supplied to site via pipeline**
- **1MW fuel cell system to provide peak power and heat at Toyota's 5,000-employee campus**
- **Benefits:**
  - Demand side management for Southern California Edison (electric utility) - offsets power demand on-site
  - Reliable power for critical applications
  - Heat will provide hot water & space heating at employee activity centre
  - Avoids 10,000 tons of CO<sub>2</sub> emissions annually



## Fuel Cells for DG – Growth Enablers

- **Current product development effort focused on cost reduction:**
  - New automated fuel cell production line
  - Extension of product life
- **Growth will come through:**
  - Clean energy mandates (RPS, Clean Energy Act)
  - Feed-in tariffs
  - Capital purchase incentives
  - Net metering programs



November 3, 2011



# BALLARD<sup>®</sup>

**Terry Howe**  
**Manager,**  
**Solutions Engineering**

## PEM Fuel Cell Systems for MW-Scale Distributed Power Generation

■ A Clean Energy Growth Company | [WWW.BALLARD.COM](http://WWW.BALLARD.COM) | **TSX: BLD** **NASDAQ: BLDP**