

BALLARD[®]

NASDAQ:BLDP • TSX:BLD

Smarter Solutions for a Clean Energy Future

Fuel Cell System Challenges Utilizing Natural Gas and Methanol

Chris Tesluk, manager Fuel Processing CoE

- ⚡ Global leader in clean energy proton exchange (“PEM”) fuel cell products and services ... design, manufacturing & deployment
 - ⚡ Telecom Backup Power → 2,500 systems ... 9MWs of power
 - ⚡ Material Handling → 4,000 stacks ... 10M hrs of runtime
 - ⚡ Engineering Services → C\$ 60 – 100M contract with Volkswagen
 - ⚡ Licensing → power module assembly for buses in China



*Ballard HQ facility –
Vancouver, B.C., Canada*

⚡ 355 employees

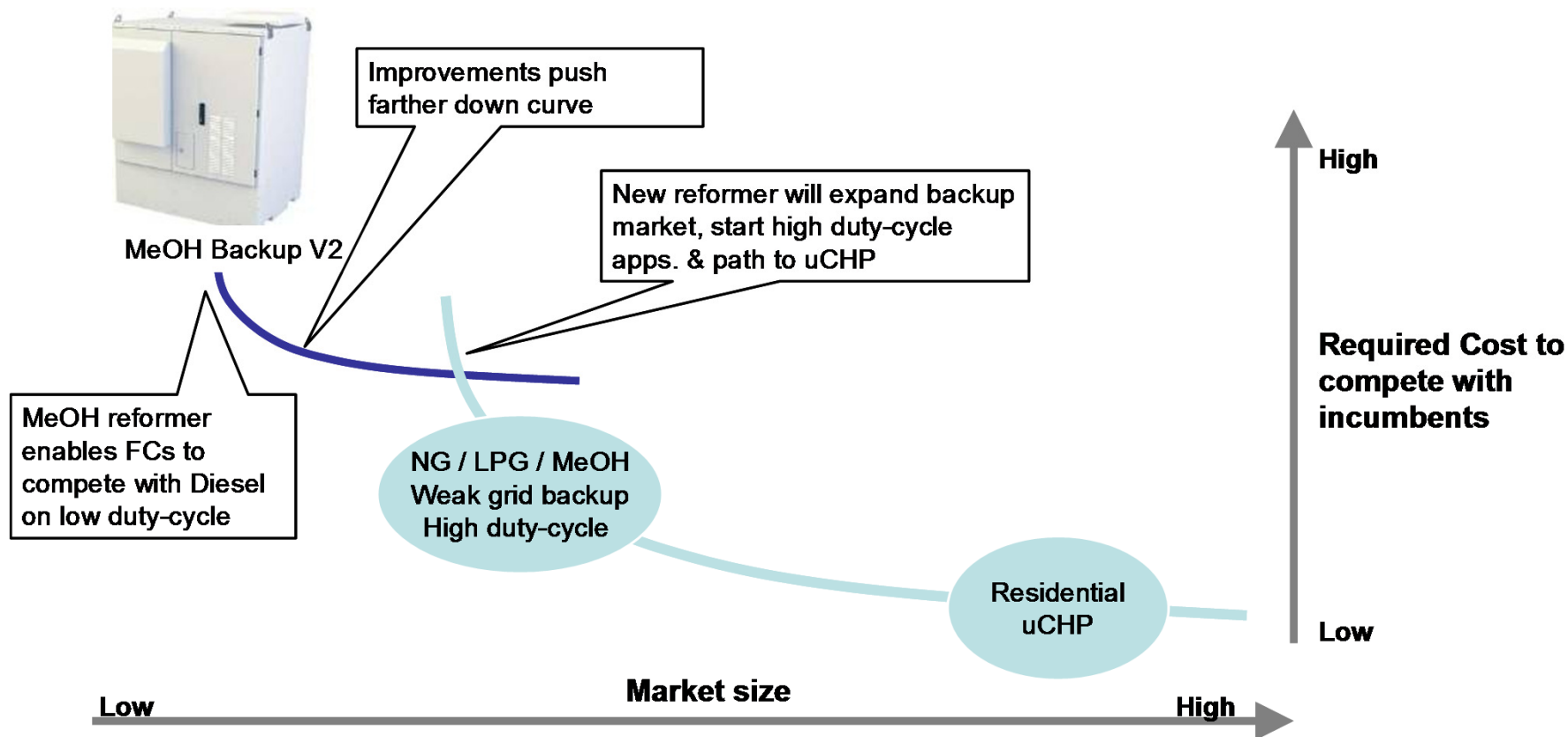
- ⚡ HQ in Vancouver, Canada
- ⚡ Product Engineering and R&D in: Vancouver, Bend OR, College Park MD, and Hobro Denmark
- ⚡ Manufacturing in Vancouver and Mexico

Fuel Processing Center of Excellence

Focus on development of low cost & high durability fuel processing hardware and system integration

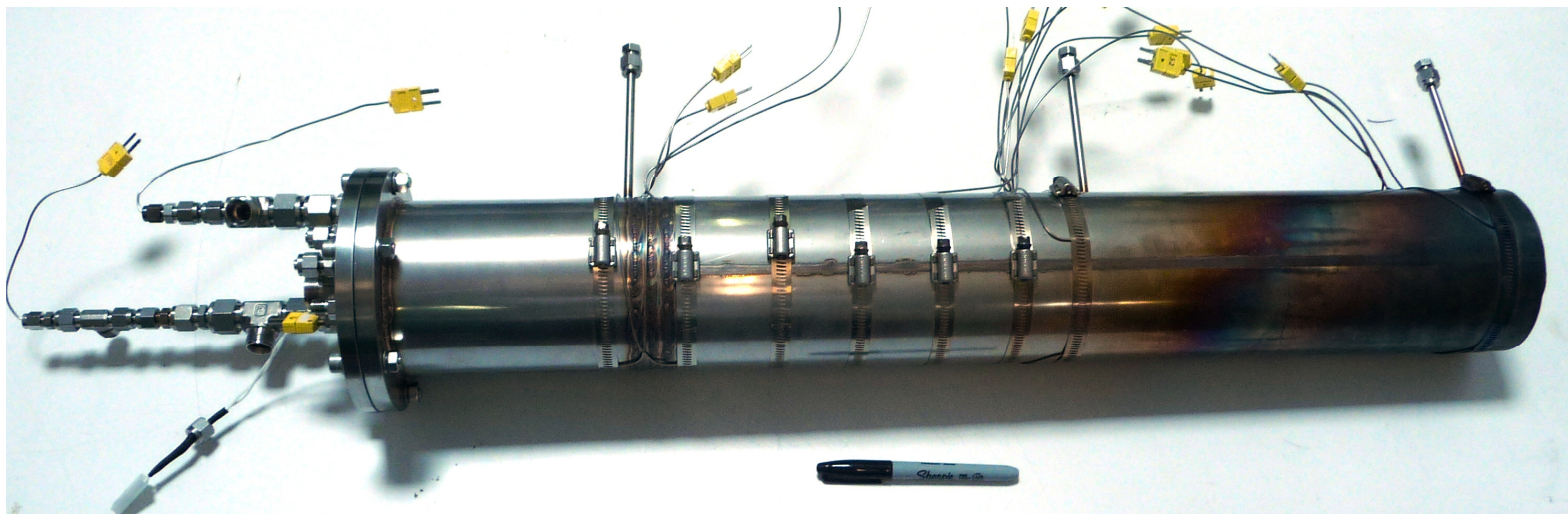
Path to greater FC use of NG

Highlights fuel contamination hurdles



- ⚡ Ballard's Maryland team developing low-cost fuel processor to expand systems to new markets
- ⚡ Moving into larger market applications requires longer run time (**higher durability**) and **lower costs**
- ⚡ Both requirements make fuel contamination affects **MORE** important

- ⚡ NG/LPG systems require low ppb sulfur levels for long life (40k hrs)
 - ⚡ Questions about S levels in feed stream force over-design of S mitigation
 - ⚡ At low ppb level, no way to determine if mitigation is performing properly
 - ⚡ Fuel processor becomes the fuse
- ⚡ Sulfur and chlorine appear to be main problems for MeOH systems
 - ⚡ Contamination during distribution suspected as major source
 - ⚡ Suppliers push back against lowering spec – cite need for better / lower cost analysis



2.5kW NG Prototype

- ⚡ Effort to determine types, sources and quantities of contaminants in commercial MeOH and NG / LPG in N. America
- ⚡ Development of liquid phase desulf
- ⚡ Development of compact, low cost hydro-desulf for NG / LPG
- ⚡ Development of an accelerated contamination life test method for reforming catalysts
- ⚡ Low cost ppb-level S detection (liquid & gas)