

# BALLARD®

NASDAQ:BLDP • TSX:BLD

## Smarter Solutions for a Clean Energy Future

## Fuel Cell Systems for Backup Power

## MYANMAR

# Who We Are

BALLARD
NASDAQ:BLDP • TSX:BLD

- **Ballard Power Systems, Inc. is a recognized global leader in clean energy PEM fuel cells**
  - Design, manufacturing, distribution, support
  - Commercial market focus
- **355 employees**
- **Operations:** Canada, U.S.A. (University of Maryland; Bend, OR), Mexico, Denmark, Malaysia
- **ISO 9001 and 1400**
- **Public listed company**








*Ballard headquarters facility – Burnaby, BC, Canada*

# Ballard Fuel Cells in the Field

BALLARD
NASDAQ:BLDP • TSX:BLD

## Approaching 2,500 installed telecom systems







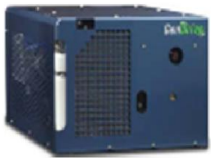




## >3,500 forklift trucks operating









## ~45 fuel cell buses operating







## +300 fuel cell cars operating










# Telecom Backup Power
## *Approaching 2,500 Systems Shipped Globally*

BALLARD
NASDAQ:BLDP • TSX:BLD



# Telecom Backup Power

BALLARD
NASDAQ:BLDP • TSX:BLD

- **Strong 2013 performance**
  - Increase in system shipments ~100% over 2012
  - Key markets include Japan, Indonesia, East Timor, China, South Africa, Philippines, Caribbean
  - Launch of New ElectraGen™- ME system in June 2013
  - July ESA with Azure for 220 ElectraGen™ systems in China market, shipped in 2013

- **Future growth driven by:**
  - Deeper penetration in existing geographies
  - Expansion into new geographies
  - Strong channel partners

**Key End-Customers**

vodacom, Hutchison Telecom, Globe, SoftBank



*Ballard ElectraGen™- ME fuel cell system installed by Nokia Solutions and Networks (NSN) at test site in Japan*

| Ballard Channel Partners – *Sample* | No. Systems Shipped to Partners |
|---|---|
| Cascadiant | 500 |
| Nokia Solutions and Networks | 350 |
| Inala Technologies | 300 |
| Azure Hydrogen | 170 |
| Motorola | 150 |
| Precision Power & Air | 145 |
| TOTAL | ~2,400 |

# Telecom Backup Power
## *Market Drivers*

BALLARD
NASDAQ:BLDP • TSX:BLD



### Unreliable Electricity Grids

- Regular – even daily – outages
- Includes geographies such as Asia, Africa, Latin America
- Grid outages can interrupt wireless telecom service … batteries & diesel generators not always able to provide necessary run time
- Fuel cell systems are reliable; deliver extended duration run time



### Crisis Situations

- Concern over potential grid outages lasting for extended periods
- Includes geographies which experience extreme weather, floods, earthquakes, potential security breaches
- Benefits of ElectraGen™ are being demonstrated in the Caribbean and in Japan with NSN

# Value Proposition

BALLARD
NASDAQ:BLDP • TSX:BLD





## High Reliability

- Commercially proven
- Industry leading technology

## Autonomous Solution

- Extended duration runtime
- Remote monitoring
- Flexible fueling

## Reduced Operating Costs

- Minimal maintenance
- Longer lifecycle – less frequent replacement
- Not subject to pilferage issues
- Up to 20% more efficient than alternatives

## Environmentally Friendly

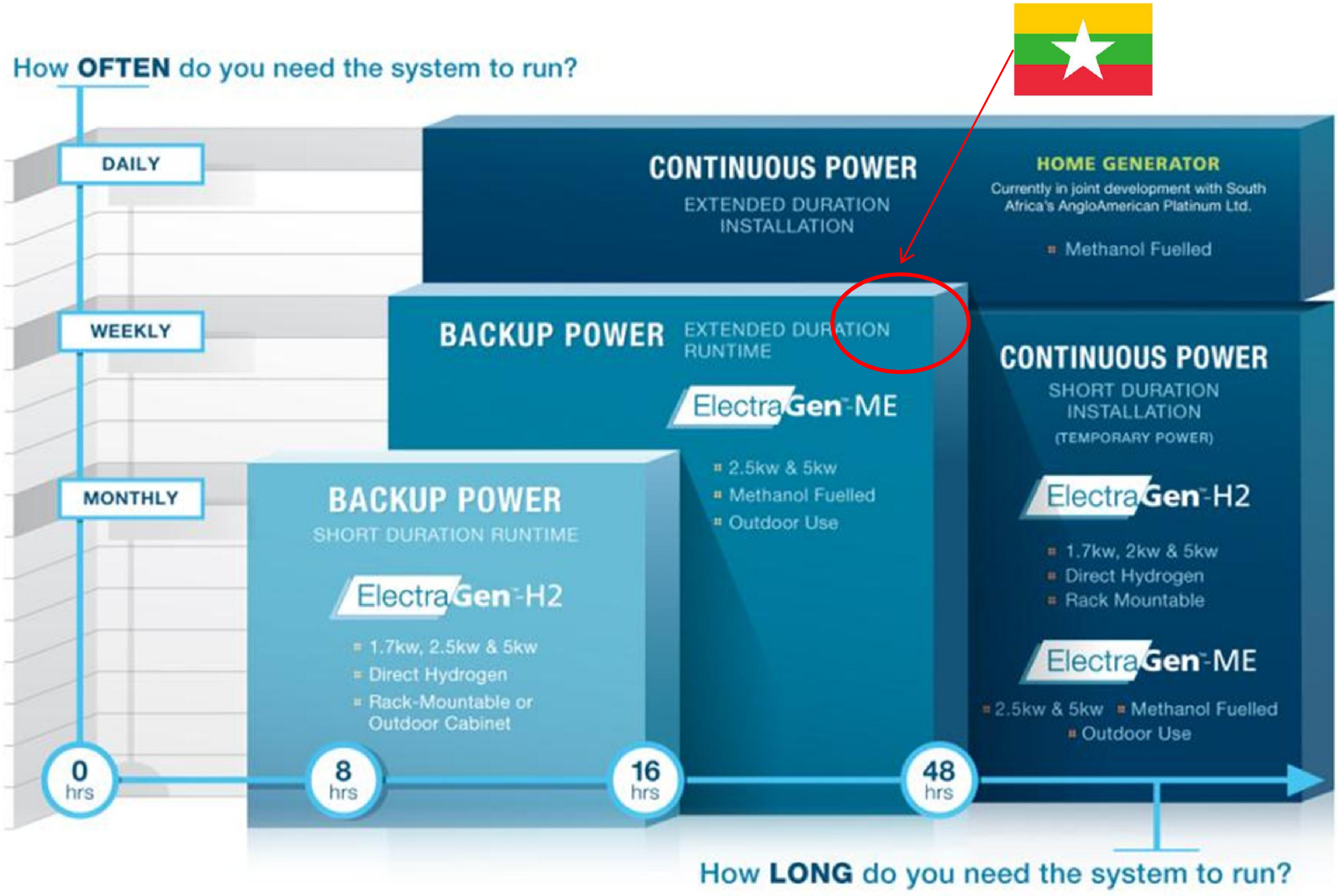
- 20-50% reduction in $CO_2$
- > 95% reduction in CO, NOx and SOx
- Zero particulate matter

## Flexible Siting

- Light weight, small footprint
- Quiet - no vibrations
- Low emissions

# Target Applications

BALLARD
NASDAQ:BLDP • TSX:BLD




**ElectraGen™ portfolio addresses a wide range of backup power requirements**

# Backup Power System Highlights

BALLARD
NASDAQ:BLDP • TSX:BLD





## ElectraGen™ – H2

### Product Configurations
- 2kW, 2.5 kW or 5 kW
- 48 Vdc
- Fuel: Hydrogen
- Indoor and outdoor configurations

### Benefits
- Low Cost of Ownership:
  - Low first cost
  - High efficiency
  - Low maintenance
- Ease of use:
  - Installation & operation
  - Service & maintenance
- Modular & Scalable
- Clean Technology – Zero Emissions

## ElectraGen™– ME

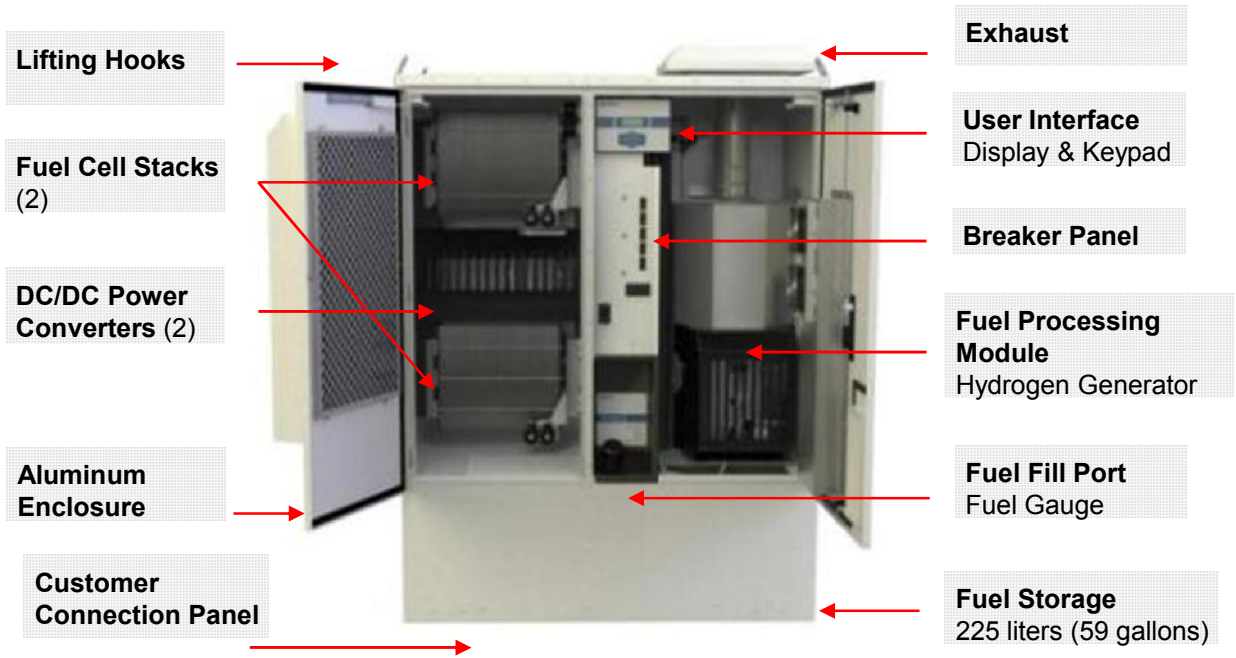


### Product Configurations
- 2.5 kW or 5 kW
- 24 Vdc or - 48 Vdc
- Standard (-5C to 46C) or Cold (-40C to 46C)
- Fuel: HydroPlus (Methanol-Water liquid fuel)
- CE and ANSI/CSA FC-1 certified
- Integrated fuel cell (PEM) + reformer system
- 225 liter tank (up to 40 hrs autonomy @ 5kW)
- Customer user interface keypad with LCD display for set-up and diagnostics (no PC required)
- Dry contacts (8) + SNMP interface (remote monitoring)

### Benefits
- Low operating costs
- Maintenance only once per year
- Efficient operation
- **Easy to site: quiet, light weight, no vibration, low emissions**
- Easy refueling

# ElectraGen™- ME Specifications

BALLARD
NASDAQ:BLDP • TSX:BLD




| ElectraGen™- ME | 2.5kW | 5kW |
|---|---|---|
| Voltage | -48 to -56 | -48 to -56, and 24 to 28 |
| Temperature, C | -5 to 46 | -5 to 46; optional -40 to 56 cold |
| Location | Outdoor | |
| Certifications | CE, ANSI/CSA FC-1, Telcordia GR-63-CORE Seismic Zone 4, UL/CSA/EN 61010-1 | |
| Fuel | HydroPlus™ MeOh & water; 225L/193kg onboard fuel tank | |
| Fuel Consumption, L/kWh | 1.3 | 1.1 |
| Run Time at rated load, H | 69 | 40 |
| Communications | SNMP, Dry Contacts, LCD with Key Pad, optional GPRS & SMS modems | |
| Size, W x D x H | 135 x 115 x 176 | |
| Weight (dry), kg | 281 | 295, (309 cold) |

## Key Features

- Integrated fuel cell (PEM) + reformer system
- Up to 40 hrs autonomy @ 5kW (225L tank)
- 2 x 2.5 kW stack design (alternate usage, redundancy)
- 4,000 hours operating lifetime specification for typical backup power applications
- Customer user interface keypad with LCD display for set-up and diagnostics (no PC required)
- Ripple voltage <100mVpp @ 30MHz bandwidth
- Four 12V 150AH batteries (minimum recommended battery size for 5kW system)
- Remote monitoring and diagnostics capability

# Business case for Myanmar

BALLARD
NASDAQ:BLDP • TSX:BLD

Our focus today for Myanmar Telecom deployment is:

***Hub/Transmission sites***: ***2kW to 5 kW @ 48VDC***

***Grid connected sites*** *(with power downtime from 1 to 12 hrs per day depending on the location and season)*

***Urban areas (rooftops, near houses, small space…)***

***Business case:*** *Standby genset alternative and reduction of battery size*

**Attractive TCO compared to battery + standby genset solution**





# Business case for Myanmar

BALLARD
NASDAQ:BLDP • TSX:BLD

**Site profile:**

- DC equipment: 2.5kW @ 48VDC
- Operating profile: up to 8hrs per days
- Fuel cell solution (EGME 5kW) vs battery +standby diesel generator
- Urban critical site (rooftop; poor grid…)



| 5 year TCO – 2.5kW load | Diesel Genset | Fuel cell |
|---|---|---|
| kWh over TCO period | 36,500 kWh | 36,500 kWh |
| Total cost over TCO period | 144,960 $ | 141,570$ |
| Total cost per month | 2,416 $/month | 2,360 $/month |
| Cost kWh | 3.97$ /kWh | 3.88$ /kWh |

Fuel cell solution has a similar cost as standby diesel generators but will provide higher site availability with easier installation & operation in urban area (rooftops)

# Business models for Myanmar

BALLARD
NASDAQ:BLDP • TSX:BLD

**Ballard Power Systems** is offering the following options in Myanmar:

- **CAPEX solution**
  - Equipment supply
  - Installation and site acceptance
  - Training
  - Service and maintenance
  - Refueling services
  - Remote monitoring

  } **KTSCL/Cascadiant**

- ***Managed Energy Service*** with our regional partner CASCADIANT
  *(Cascadiant currently operates over 600 fuel cell systems in Indonesia; East Timor and Pakistan)*

- ***OPEX model*** with EQUIS (PowerCo approach)
  - 100% OPEX model where Equis will be committed to provide the end-to-end managed energy services on a monthly fee basis over the contract term
  - Comprehensive O&M on all equipment including spare parts management, refueling and on site support

- ***Local support*** through KTSCL/Cascadiant technical team in Myanmar + Ballard regional service & support center in Malaysia

CASCADIANT

Equis Funds Group

# Conclusion

BALLARD
NASDAQ:BLDP • TSX:BLD

- **Fuel Cell power generation systems are financially attractive in comparison to alternative lead acid battery /diesel generator solutions for grid-connected urban hub sites in Myanmar**
  - And deliver the added benefit of environmentally-friendly operation and rooftop installations
- **Fuel cells have been deployed over 5,000 telecom sites worldwide**
- **Ballard Power Systems is a world leader in development, manufacture sale and servicing of PEM fuel cells**
  - Active in leading markets for fuel cell commercialization, including North America, Europe, **Asia,** Caribbean & Latin America and South Africa
  - Provide complete package including installation, commissioning, service, maintenance and refueling with our local partner (KTSCL), Managed Energy Service contract (Cascadiant) and financing solutions (EQUIS)