

BALLARD[®]

NASDAQ:BLDP • TSX:BLD

Smarter Solutions for a Clean Energy Future

Fuel Cell Systems for Telecom Backup Power

Green Power For Mobile
Kampala, Uganda, May 2013



- **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

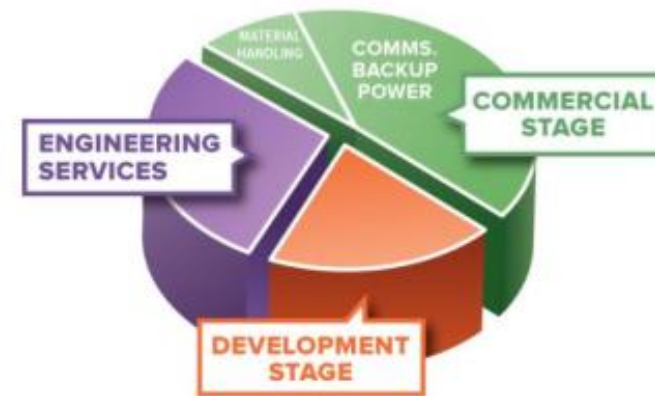


*Ballard headquarters facility –
Burnaby, BC, Canada*

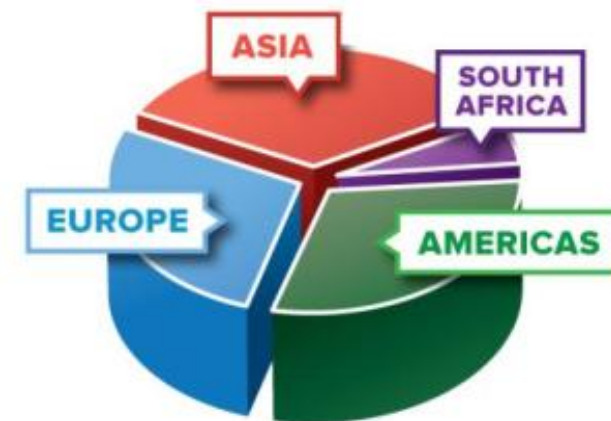
- **Commercial stage markets**
 - Telecom backup power
 - Material handling
- **Engineering services**
- **Development stage markets**
 - Bus
 - Distributed Generation



Indicative 2013 Revenue Mix
Relative Contribution, By Market



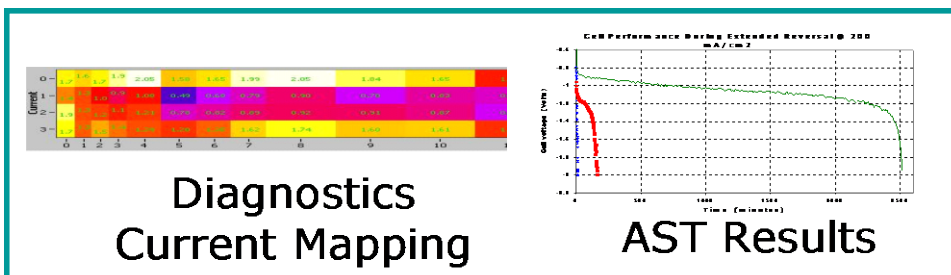
Indicative 2013 Revenue Mix
Relative Contribution, By Geographic Region



Ballard is the best positioned company to capitalize on the large scale potential of commercial fuel cell applications

- **World class test facility**


















- 58,000 sq. ft. state-of-the-art test lab sets industry standard for PEM fuel cell development and testing
- 60+ test stations collect 400,000+ hours of testing annually
- Test station capacity < 100 W to 333 kW
- Test capability from -40°C to $+140^{\circ}\text{C}$
- Three fully equipped failure analysis labs
- Integrated data collection and reporting
- Specialized Accelerated Stress Test (AST) equipment and protocols
- Advanced development testing tools
- Custom predictive modelling tools



- **Ballard's Plant 1 is the world's largest PEM fuel cell manufacturing plant**
 - 50,000 sq. ft. state-of-the art mfg facility sets industry standard for fuel cell production
 - Automated assembly equipment and processes reduce labour and materials and increase production capacity
 - Implement Lean Manufacturing and Six-Sigma
 - ISO 14001 (Environment), OHSAS 18001 (Health & Safety) and ISO/TS 16949 (Quality Automotive)
 - Manufacturing capacity sufficient for commercial product sales with capability to scale up with growing demand
- **Fuel Cell System Manufacturing**
 - Flexible low-cost manufacturing facilities located in Hobro, Denmark and Tijuana, Mexico
 - Annual capacity for 5,000 ElectraGen™ units



Product Portfolio & Market Overview

<h2>Fuel Cell Stacks</h2>	  <p>FCgen[®]-1020ACS</p> <ul style="list-style-type: none"> • 500W-2kW • >4k hrs 	  <p>FCgen[®]-1300</p> <ul style="list-style-type: none"> • 2kW-8kW • Up to 30k hrs 	  <p>FCvelocity[®]-9SSL</p> <ul style="list-style-type: none"> • 4kW-20kW • Up to 12k hrs 	  <p>FCvelocity[®]-1100</p> <ul style="list-style-type: none"> • 100kW • >5k hrs
<h2>Fuel Cell Modules</h2>	  <p>FCvelocity[®]-HD6</p> <ul style="list-style-type: none"> • 75kW-150kW • Up to 12k hours 			
<h2>Complete Fuel Cell Systems</h2>	 <p>ElectraGen[™]-H2</p> <ul style="list-style-type: none"> • 2kW & 5kW • Direct hydrogen • Indoor (rack-mountable) & outdoor use  	 <p>ElectraGen[™]-ME</p> <ul style="list-style-type: none"> • 2.5kW & 5kW • Methanol fuelled • Outdoor use 	 <p>ClearGen[™]</p> <ul style="list-style-type: none"> • Multi-MW power 	

Ballard product portfolio includes industry-leading fuel cell stacks, fuel cell modules and complete fuel cell system solutions

Distributed Generation Market Overview

- ClearGen™ PEM DG system a strong fit for applications where low-cost hydrogen or biomass is available and government support is in-place
- ClearGen™ provides 'Levelized Cost of Energy' ~\$0.15 per kilowatt hour¹
- Growth in overall power demand expected to be driven by emerging markets and U.S., based on GDP growth and retirement of coal fired plants

Recent Commercial Developments

- Announced 175kW ClearGen™ system sale to Blue Lake Rancheria in CA for biomass-to-fuel cell pilot
- Announced 175kW ClearGen™ system sale to Azure for deployment in China



1MW ClearGen™ system at Toyota campus – Torrance, CA

¹ Assumes H₂ cost at lower heating value of natural gas

- **Target environment**

- Cell sites susceptible to severe weather, natural disasters or poor electric grid reliability

- **Customer value**

- Reliable, clean, short & extended run backup power solution with low lifecycle cost & low operating costs

- **Industry trends favor fuel cell systems**

- Frequency of grid outages
- Increased network reliability requirements
- Regulations to reduce diesel genset usage
- Rising diesel costs
- Focus on reducing site power requirements
- Government initiatives / corporate sustainability programs



Recent Commercial Developments

- ~2,000 systems deployed worldwide
- **Nokia Siemens Networks & Ballard develop product solution for mobile networks**
 - Passed NTT DoCoMo evaluation tests and Japan statutory approval for power supply
- **ElectraGen™ proves 100% reliable during Hurricane Sandy**
- **Shipped 500th methanol system since being added to product portfolio in August 2012**
 - Deployments in Asia, South Africa & Caribbean

- **Target environment**
 - High volume distribution centres with large fleets (> 30 forklifts) and multi-shift operations
- **Customer value**
 - Productivity gains vs. battery-powered forklifts generate rapid payback in less than 1-year
 - Full suite of fuel cell systems meets most material handling customer needs

Recent Commercial Developments

- ~3,500 systems deployed in North America
- Plug Power received order for 65 GenDrive™ systems from new customer Ace Hardware
- Plug Power has implemented GenDrive™ systems for numerous customers
 - Six Fortune 100 companies have Plug GenDrives™ operating in multiple facilities
 - Including: 4 Procter & Gamble sites; 3 Walmart sites; 7 Sysco sites; 2 Coca-Cola sites



Plug Power GenDrive® Systems are available for all classes of lift truck

- Ballard's engineering services provide a high-value means to accelerate customers' fuel cell development efforts
- Ballard's team provides tools and technologies for development, optimization, integration and validation of fuel cell components, stacks and systems
- Facilitates development of new business opportunities through access to new applications
- Leverages a high level of competency across a range of specialized activities, including –
 - Applications engineering
 - Reference systems
 - Product development
 - Fuel cell testing services
 - Simulation and modeling
 - Failure analysis
 - Infrastructure improvement



Ballard test facilities in Burnaby, BC

Recent Commercial Developments

- **Signed long-term engineering services contract to advance Volkswagen AG fuel cell automotive research program**
 - The expected contract value is in the range of C\$60-100 million
- **Partnered with Anglo American Platinum on develop of methanol fuelled 'home generator' product**

- **Government supported zero-emission transit programs**
- **Product cost reductions moving fuel cell hybrid buses to competitive position vs. diesel hybrids**
- **400,000+ new buses manufactured per year**
 - Emerging segment of clean transit alternatives

Recent Commercial Developments

- **Fleet of 20 fuel cell buses in Whistler, BC (largest fleet anywhere) has logged more than 1.9M miles (3.1M km) of revenue service**
- **Shipped 3 modules in Q1; 2 to Van Hool in Europe and 1 to CTTransit in Connecticut**
- **Announced C\$2M in SDTC funding for 1-year extension to commercial development program**
- **8 more modules to Van Hool planned in 2013 ... will bring total Van Hool European fuel cell buses to 22, including 10-bus fleet in Aberdeen, Scotland**

World Bus Demand, 2009
(404,000 units)



Transit Buses - 2009
65,000 units (16%)

Clean Energy Buses - 2009
6,000 units (9%)

Fuel Cells in Telecom Industry

Generators can be:

- Unreliable
- Maintenance intensive
- Noisy, heavy, emissions
- Theft issues

Batteries can be:

- Expensive to maintain
- Unreliable after aging
- Temperature sensitive
- Heavy

Fuel cells are:

- Reliable
- Low Maintenance
- Clean



Service Provider Challenges & Industry Trends

- Frequency of grid outages
- Increased network reliability requirements
- Regulations to reduce diesel genset usage
- Rising diesel costs
- Focus on reducing site power requirements
- Government initiatives & corporate sustainability programs



Ballard Products

FCgen[®]-1020ACS



- Direct hydrogen air cooled stacks

ElectraGen[®]-H2



- 2kW & 5kW
- Direct hydrogen
- Indoor (rack-mountable) & outdoor use
- Direct hydrogen outdoor cabinet



ElectraGen[®]-ME



- 2.5kW & 5kW
- Methanol fueled
- Outdoor use



Value Add

- Up to 20% more efficient
- More environmentally friendly
- 20-50% reduction in CO₂
- > 95% reduction in CO, NOx and SOx
- Zero particulate matter
- Reduced operating cost
- Not subject to diesel fuel pilferage
- Requires less repair and maintenance
- More reliable
- Able to cycle on and off multiple times
- Runs for longer periods of time
- Light weight, quiet, no vibration

DIRECT CHANNEL

Fuel Cell Systems
BALLARD[®] and Distribution Partners

Network /
Service Providers

INDIRECT CHANNELS

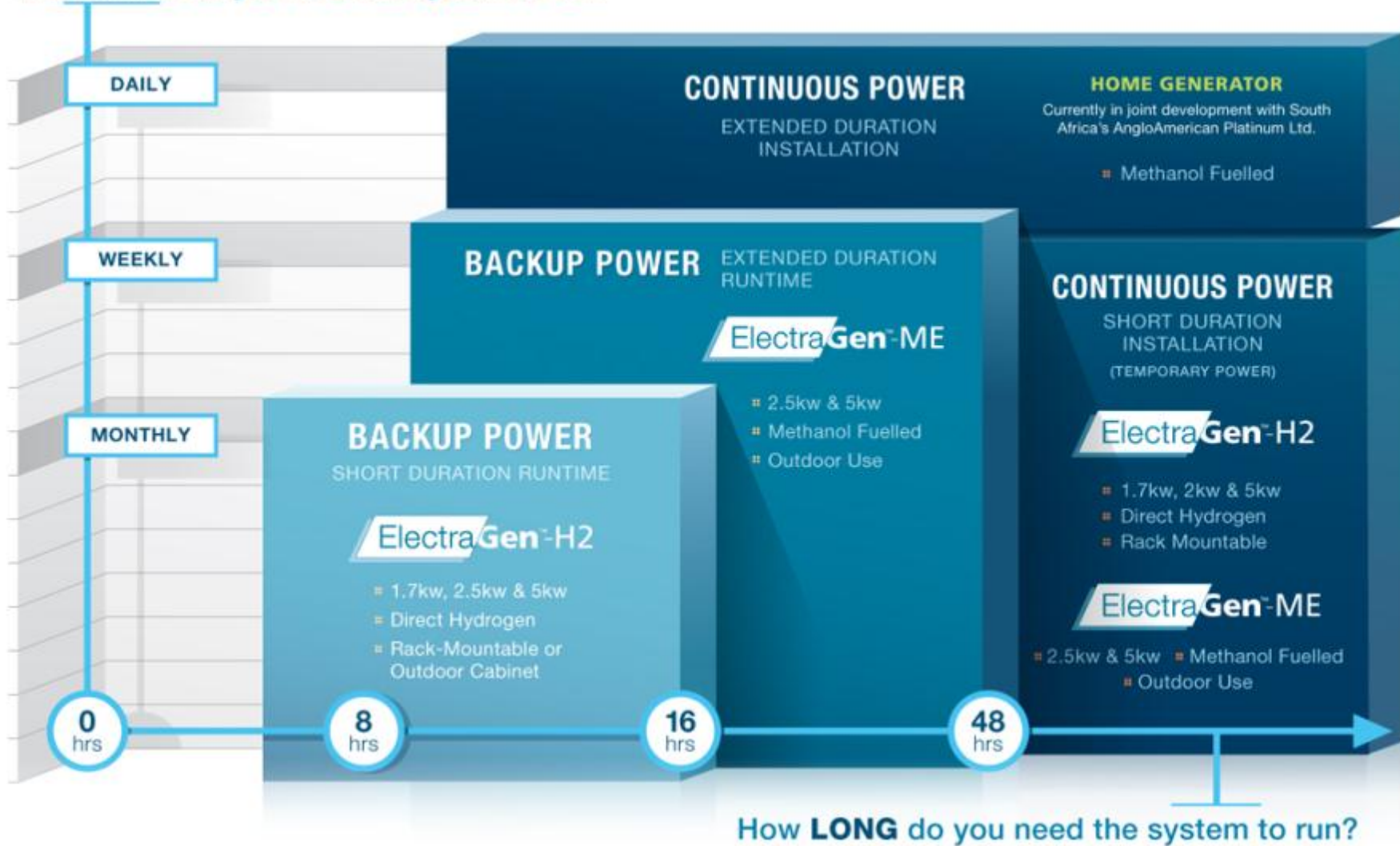
Fuel Cell Stacks
BALLARD[®]

System Integrators

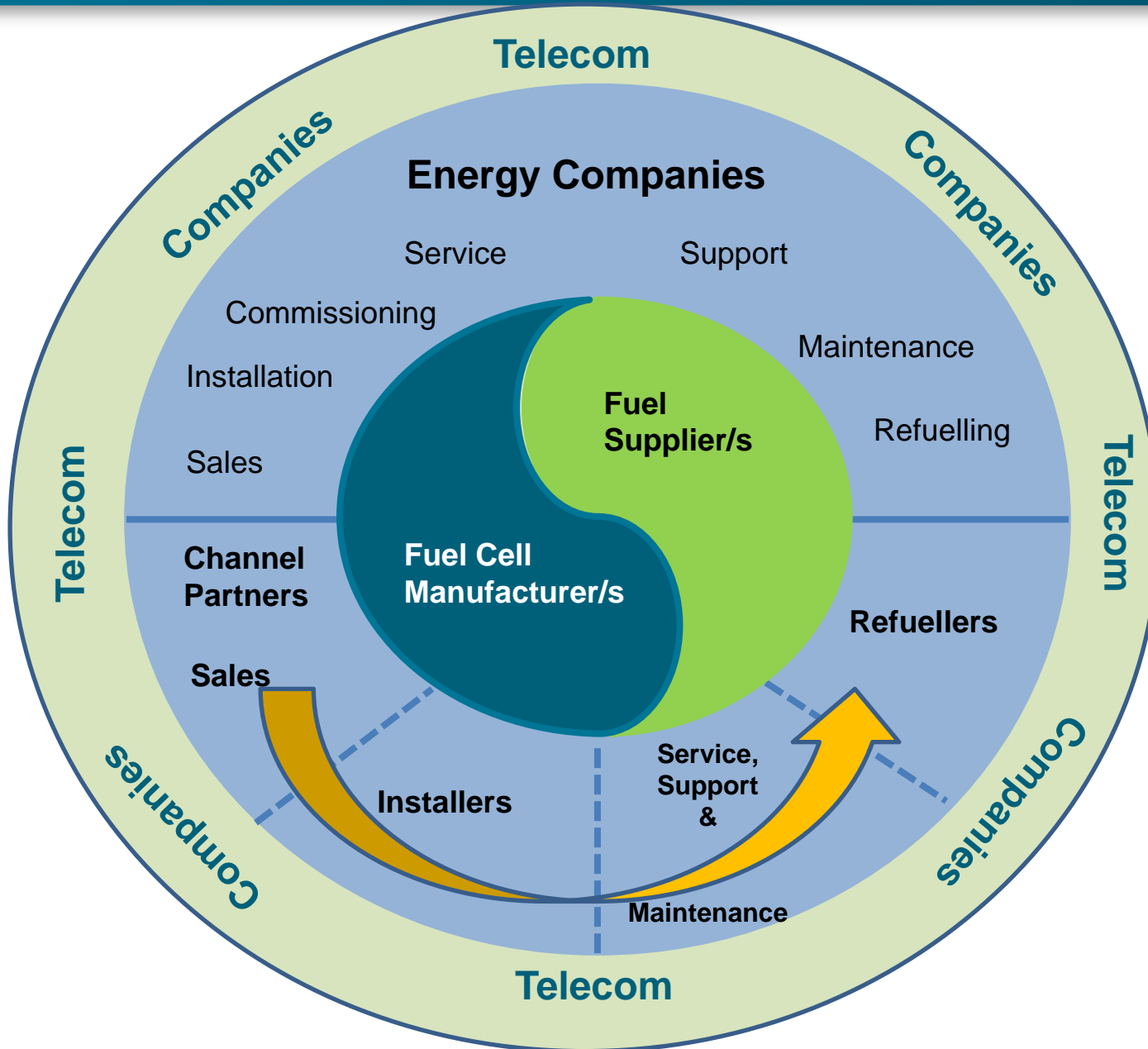
Network /
Service Providers

Target Applications

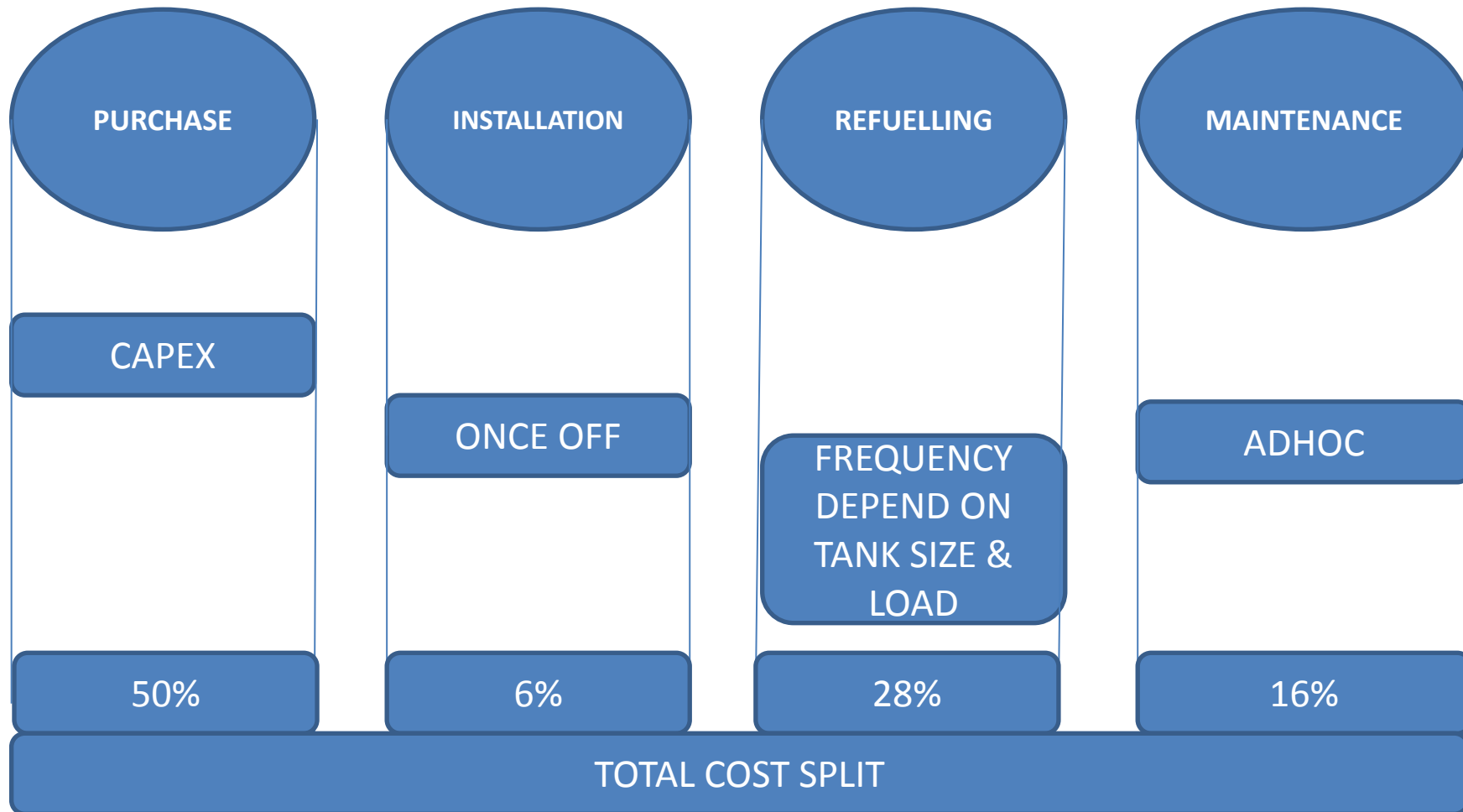
How **OFTEN** do you need the system to run?



ElectraGen™ portfolio addresses a wide range of backup power requirements



COST BREAKDOWN

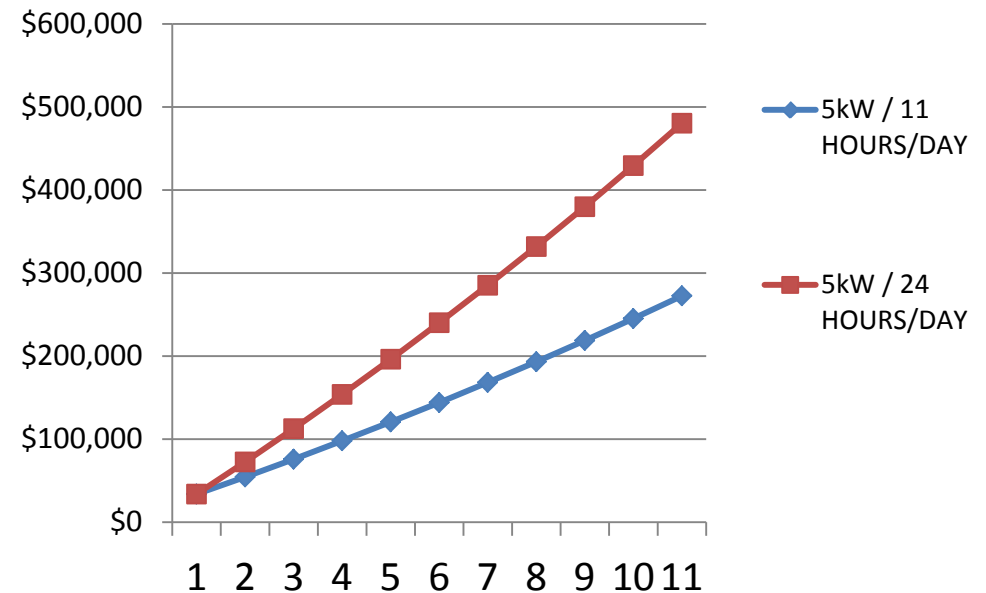
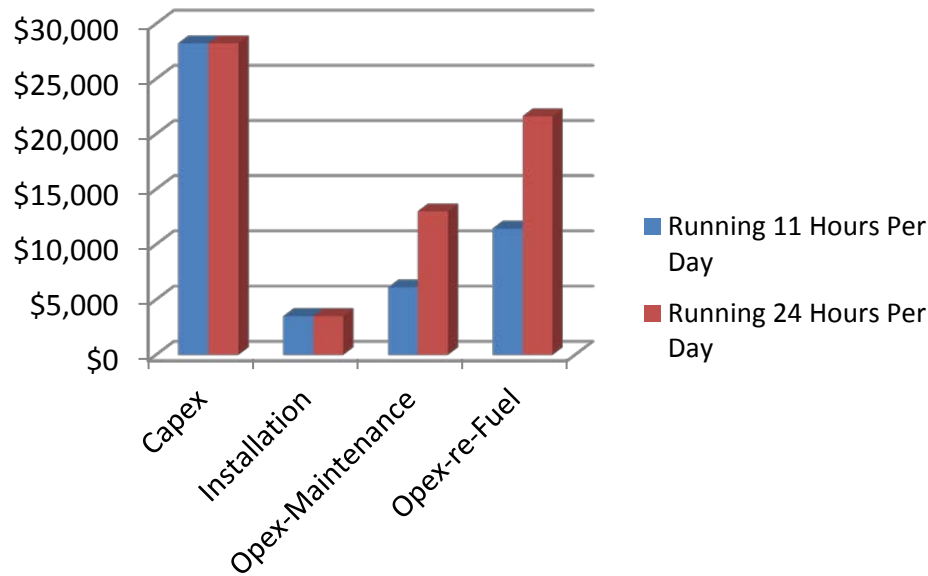


- Total cost**

- Reformed methanol fuel cell solution
- Running 11 and 24 hours per day
- External tank 1,000 liters

- Economic benefits**

- Positive payback over lifecycle, driven by: reduced maintenance requirements; reduced cooling expense; longer lifetime associated with fuel cell system; and reduced fuel theft issues
- Savings grow linearly with number of sites



- **Composition**
 - 62% methanol & 38% de-ionized water
- **Methanol is a common liquid**
 - Global production in 2010 – 57 billion liters
- **Methanol applications**
 - Windshield washer fluid (up to 50% methanol)
 - Fuel additive – Over 3.5 billion liters in China 2007
 - Solvent
 - Manufacture of plastics and building products
- **Benefits of methanol based fuel**
 - Easily transported liquid fuel
 - Water miscible, biodegradable and sulfur-free
 - Extremely low freezing point < -60° C
 - May be stored for years without degradation
- **Renewable sources of methanol**
 - Produced by crude glycerol in mass production
 - Waste CO₂, wood waste, and others are in development
 - Global production of bio-methanol now greater than 280 million liters annually
- **HydroPlus supply chain**
 - 33 vendors in 18 different countries where Ballard is deploying fuel cells



Methanol is an ideal fuel for fuel cells

- Consistent high quality: manufactured to chemical standards (IMPCA).
- Very low sulfur content(max 0.5 ppm): simplifies the reforming process; reduces the capital, operating and maintenance costs of the fuel cell system; and reduces the risk of fuel cell contamination
- Widely distributed and cost-competitive: one of the most widely distributed chemical feedstocks in the world
- Low energy chemical bonds: methanol can be reformed to hydrogen in a fuel cell at relatively low temperatures (250°C to 350°C). Other hydrocarbon fuels require reforming temperatures of 800°C to 900°C. This lower reforming temperature ensures faster startup, improved system efficiencies, lower fuel processor capital costs, and a longer life for the fuel cell system.
- Environmentally friendly & biodegradable in air, soil, & water (<1000ppm); MeOH = 5000 pound reportable quantity; HydroPlus: 8065 pounds / 1100 gallon (USEPA, USDOT)
- Stable over a wide temperature range
- Less hazardous than other fuels; reduced set-back compared to Hydrogen

HydroPlus™ Refueling

- Siphon: < \$20
- Hand pump: < \$200
- Electric pump (needs flooded suction): < \$500
- Centrifugal pump (will prime): < \$500
- Custom Refueling Unit: ~ \$10,000



Drum Pump Chile



0017408



Jiggle Siphon



Custom Mobile Refueling System



Siphon Pump, Indonesia



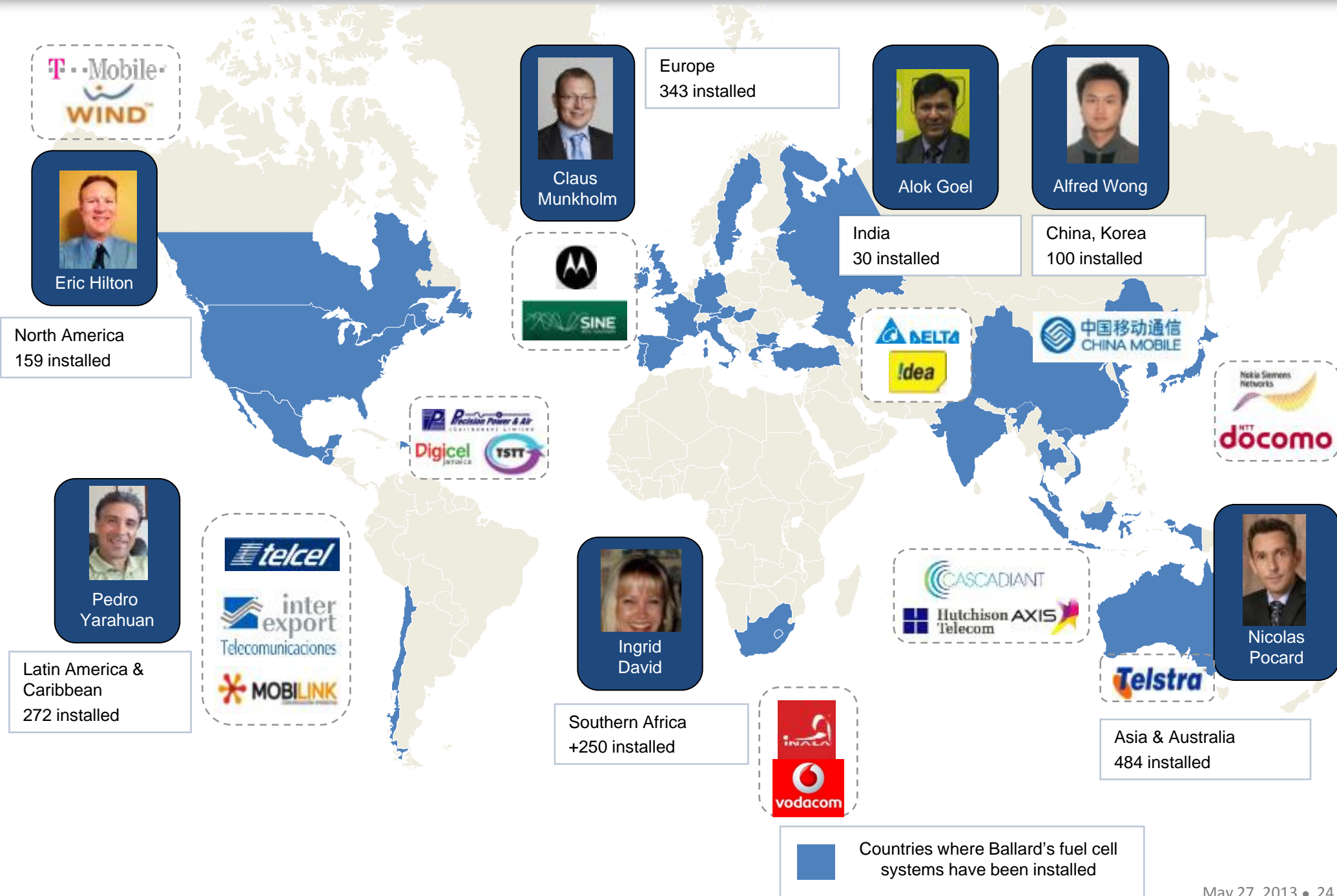
12VDC Pump Jamaica

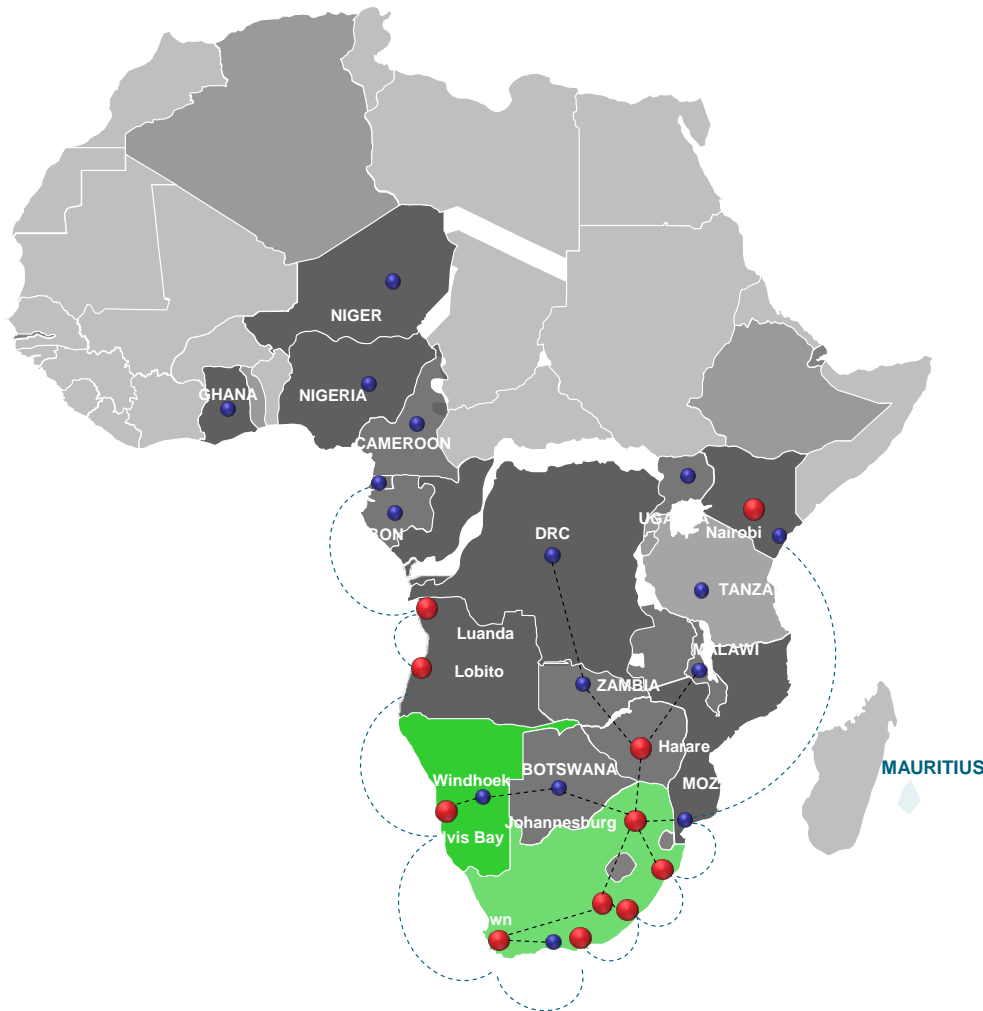
Commercial Growth

Telecom Backup Power ~ 2,000 Systems Installed

BALLARD

NASDAQ:BLDP • TSX:BLD





— — *Distribution by ship*
 *Distribution by road*

Channel: Inala Technologies

- Channel partner since 2008
- 120 Employees, Annual Revenue \$60M
- HQ Johannesburg, South Africa
- Major supplier to Vodacom, SA
- Present in Ghana, DRC and Tanzania

Client: Vodacom

- 250+ installations in South Africa
- Largest telecom company in South Africa
- Active data customers in excess of 18.5M
- Excess of 8,000 base stations in SA
- Strategic focus: greenhouse gas reduction, Operational cost reduction through rollout of green technologies

Client: MTC

- 2 installations in Namibia

HydroPlus Fuel Distribution

- Protea Chemicals
- HUB – Larger distribution sites with blending and repacking capacity
- SPOKE – Sales and distribution

Case Studies

Case Study: Fuel Cell *Prime Power System* for Vodacom

BALLARD
NASDAQ:BLDP • TSX:BLD

Customer:

- Vodacom, a leading African communications group
- Location: Johannesburg
- Industry: Telecommunications

Challenge:

- No grid (installation delays)
- Community complaints about generator noise
- Huge theft issues on generators and batteries

Solution: **ElectraGen-ME**

- Configuration: 5kW, 48 Vdc
- Fuel: HydroPlus™ (Methanol-Water liquid fuel)
- Added external 1,000 liter tank

Advantages:

- Small footprint
- Reduced noise
- Reduced emissions
- High efficiency
- Minimal maintenance
- Renewable energy supply

- Running since June, 2012 > 335 days
- Excess of 8,040 hours
- Excess of 10,819 kWh



Case Study: Fuel Cell Backup Power System for Vodacom

BALLARD
NASDAQ:BLDP • TSX:BLD

Customer:

- Vodacom, a leading African communications group
- Location: South Africa
- Industry: Telecommunications

Challenge:

- Remote location
- Unreliable grid
- Aim to reduce maintenance costs
- Minimize impact on environment

Solution:

- Over 250 systems deployed
- Configuration: 5kW, 48 Vdc
- Fuel: HydroPlus™ (Methanol-Water liquid fuel)

Advantages:

- High efficiency
- Improved reliability
- Minimal maintenance
- Renewable energy supply
- Zero emission



Thank You