

#### "Investor & Analyst Day 2020"

Tony Guglielmin Vice President & CFO



1

### **BALLARD** Today's Agenda

**Ballard Strategy** 

**Growth Platforms** 

Randy MacEwen, CEO

Rob Campbell, CCO Dr. Kevin Colbow, CTO

#### **Key Geographic Markets**

- o China
- Europe
- California

Alfred Wong, Managing Director – Asia Pacific Jesper Themsen, CEO – Ballard Power Systems Europe A/S Oben Uluc, Sales Director - EMEA Nicolas Pocard, Director of Marketing

**Panel Discussion – "Fuel Cell Value Proposition and Competitive Positioning"** 

### BALLARD Today's Agenda (Cont'd)

**Product Roadmap** 

**Cost-Reduction Strategy** 

**Operations Update** 

**ESG & People** 

**Financial Review** 

Wrap-Up

Dr. Kevin Colbow, CTO

Dr. Lee Sweetland, Director of Advanced Manufacturing

Jyoti Sidhu, Vice President - Operations

Jan Laishley, Vice President – Human Resources

Tony Guglielmin, CFO

Randy MacEwen, CEO

### **BALLARD** Forward-Looking Statements

This presentation contains forward-looking statements, including: estimated revenue; gross margin; cash operating costs; adjusted EBITDA; product cost reductions; liquidity; market size and growth projections; customer value propositions; and expected sales and product shipments. These forward-looking statements reflect Ballard's current expectations as contemplated under section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. Any such forward-looking statements are based on Ballard's assumptions relating to our financial forecasts and expectations regarding our product development efforts, manufacturing capacity, and market demand.

These forward-looking statements involve risks and uncertainties that may cause our actual results to be materially different, including, general economic and regulatory changes, detrimental reliance on third parties, successfully achieving our business plans and achieving and sustaining profitability. For a detailed discussion of these and other risk factors that could affect Ballard's future performance, please refer to our most recent Annual Information Form. Readers should not place undue reliance on Ballard's forward-looking statements and Ballard assumes no obligation to update or release any revisions to these forward-looking statements, other than as required under applicable legislation.

All amounts are consolidated to include Ballard Power Systems Europe A/S, Ballard Unmanned Systems, Inc., and Guangzhou Ballard Power Systems Co., Ltd. Results are in U.S. dollars, unless otherwise noted.



#### Ballard Corporate Strategy

Randy MacEwen President & CEO





### What's different? Key factors impacting the hydrogen and fuel cell sector

- 1. Strong supporting policy & sector-coupling
- 2. Growing number of vehicle deployments
- 3. PEM fuel cell value proposition
- 4. Reduction in cost of renewables
- 5. Compelling TCO reports
- 6. Corporate investments
- 7. ESG

### BALLARD

# We are becoming a $CO_2$ -regulated world

#### BALLARD

### **Our Vision:**

We deliver fuel cell power for a sustainable planet

### BALLARD

#### **Our Mission:**

We use our fuel cell expertise to deliver valuable and innovative solutions to our customers globally, create rewarding opportunities for our team, provide extraordinary value to our shareholders and power the hydrogen society.

#### BALLARD°

#### Why Medium- and Heavy-Duty Motive Applications?



Strong value proposition

#### Centralized depot refueling

Disproportionate emissions from hardto-abate mobility

### **BALLARD** TCO Reports



Fueling the Future of Mobility Hydrogen and fuel cell solutions for transportation Volume 1 Deloite China

Financial Advisory



Power to Change the World

### **BALLARD** Ballard by the Numbers



### **BALLARD** Ballard Strategy: e12345





### Ballard's Sustainable Competitive Advantages

- > Deep fuel cell expertise and talent pool
- > Leading PEM technology
- > Comprehensive product portfolio
- > Vertical integration
- > Unparalleled field experience
- > Customers and industrial partnerships
- > Powerful brand

### **BALLARD** Key Strategic Priorities

Deliver outstanding customer experience	Invest in our leading fuel cell technology & products	Drive aggressive product cost reduction	Forge key industrialization partnerships – execute on WBJV & Mahle partnerships	Invest in advanced manufacturing & capacity expansion
Grow our local presence in key markets	Continue to be "a great place to work"	Grow a sustainable global organization with ESG responsibility	Drive improved financial performance (strong organic growth, GM expansion, cost leverage, solid balance sheet)	Pursue complementary M&A opportunities



#### Power Products Growth Platform

Rob Campbell Vice President & CCO





#### AGENDA

#### We Are Ballard Ballard's progress since 2017

#### The Right Markets at the Right Time

Validation of the market for heavy-duty vehicle applications Key Levers for Market Expansion

**Key Levers for Market Expansion** Reducing TCO, removing friction points, accelerating adoption

#### BALLARD®

PEM is the most commercialized type of fuel cell today,

Its low operating temperature (50-100°C), short start time and use of atmospheric air make **PEM ideal for mobility solutions**.



#### BALLARD°

#### **Delivering Results**

Since 2017, Ballard has made tangible progress in the market

#### **Heavy-Duty Motive**

Focusing where fuel cells deliver the strongest value proposition

#### **Notable Growth**

In key markets and regions globally

#### Leadership

In technology, market share and cost reduction



# BALLARD PROJECT WITH

Class 8 drayage truck in operation at Ports of LA and Long Beach

FCveloCity<sup>®</sup>-HD

C ENER

**HENWORT** 

ZERO

EMISSICS

CARGO

TRANSIRT

A.A

BAE SYSTEMS

# BALLARD PARTNERS WITH

First-ever fuel cell tram-buses for a full bus rapid transit system

Eight ExquiCity tram-buses now in revenue service

0-1

FCveloCity®-HD

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# BALLARD PARTNERS WITH ABB MARINE & PORTS

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Development of fuel cell systems to power marine applications

First unit delivered and displayed at Royal Caribbean event

FCveloCity<sup>®</sup>

TITITI

L.B. MARTIN

THE DUE

### BALLARD PARTNERS WITH SIEMENS

Development of fuel cell engine to power Mireo commuter train Mireo

FCrail

### BALLARD PROJECT WITH **DONGFENG**

Deployment of 500 fuel cell trucks now delivering goods throughout Shanghai

HI.L.

FCvelocity<sup>®</sup>-9SSL

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Ballard fuel cell stacks manufactured in China and integrated by Re-Fire into the fuel cell engine

# BALLARD LAUNCHES **FCgen®-LCS**

Next-generation high performance liquid-cooled fuel cell stack for the heavy-duty motive market

Features significantly reduced costs, ultra-high durability, improved power density, impressive freeze start capability, enhanced efficiency, and high performance



# BALLARD POWERS

Ballard fuel cell modules power two port terminal yard trucks at Port of LA



# BALLARD POWERS

Ballard fuel cell modules power California UPS trucks in CARB-funded clean energy project

30kW range extender boosts driving range to provide certainty of service

Fuel Cell Electric Vehicle

FCveloCity<sup>®</sup>-MD

# BALLARD PARTNERS WITH WEICHAI POWER

Strategic collaboration includes joint venture with technology transfer and \$163.6 million equity investment,

Factory is now in operation

joint venture facility

WEICHAI

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# BALLARD POWERS HYDROFLEX TRAIN

Ballard modules power the U.K.'s first fully sized hydrogen demonstrator refurbished train

FCveloCity<sup>®</sup>-HD

# BALLARD LAUNCHES **FCmove™**

8<sup>th</sup> generation high performance fuel cell module for heavy-duty motive market

Offers attractive customer value based on high reliability, simplified system integration and lower total life cycle cost



#### BALLARD ESTABLISHES MARINE CENTER OF EXCELLENCE

Dedicated to fuel cell marine applications at Ballard's engineering, manufacturing and service facility in Hobro, Denmark

Annual production capacity of more than 15 MW of fuel cell modules

Marine-Center of

Excellence

# AZETEC PROJECT

Ballard modules power 2 tractortrailer trucks as part of the Alberta Zero-Emissions Truck Electrification Collaboration project

Trucks will move freight year-round between Edmonton and Calgary



# BALLARD POWERS MINING TRUCKS

Ballard modules powers Ultra heavy duty mining truck for Anglo, the world's largest platinum group metals mining company

Anglo expects to deploy more trucks, each with MW scale fuel cell power, at other operations around the world FCveloCity<sup>®</sup>-HD

# BALLARD POWERS **PUSH BOAT**

Ballard supplied BEHALA with fuel cell modules to power German push boat on river in Germany

FCveloCity<sup>®</sup>-HD

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### BALLARD PARTNERS WITH

Ballard supplies 200kW module to Norled to power ferry in Norway

The Norled vessel will be the first liquid hydrogen fuel cell-powered ferry in commercial operation globally



SHIP NAME

# BALLARD PARTNERS WITH SOLARIS

Solaris is the first European bus manufacturer to integrate Ballard's latest generation FCmove™ module

FCmove<sup>™</sup>

SOLARI

HYDROGEN

Ballard fuel cell modules will be powering Solaris buses in the Netherlands, Germany and Italy
# BALLARD PARTNERS WITH WRIGHTBUS

Ballard is supplying fuel cell modules to Wrightbus for bus to operate in England, Northern Ireland and Scotland CveloCity®-HD

Wrightbus is a leading industry champion for fuel cell electric buses on U.K. roads

WRIGHT

# BALLARD PARTNERS WITH **NEW FLYER**

Ballard-powered New Flyer are ready to deliver zero-emission transit throughout North America ELVER

FCveloCity®-HD

YDROGEN POWERED

SR 1925

New Flyer offers a 40-foot and 60foot Altoona-tested fuel cell electric buses

# BALLARD LAUNCHES **FCwave™**

Ballard introduced fuel cell industry's first commercial zeroemission module to power ships

The 200-kilowatt modular unit can be scaled in series up to the multimegawatt power level





We are powering thousands of heavyduty vehicles globally.







#### Hydrogen is most competitive in heavy duty motive applications

Our focus is on applications where hydrogen fuel cells have a clear advantage

Others are joining us...



### **BALLARD** Key trends in macro landscape





#### The advantages of fuel cells over battery electric vehicles

Only fuel cell vehicles can directly replace diesel, route for route





All weather performance



Range and payload



#### Refueling time

### **BALLARD** Scaling Up Infrastructure

- Adding vehicles to an established fuel cell fleet does not require adding additional infrastructure.
- The cost decreases as fleet size increases.



Graph concept courtesy of the Center for Transportation and Environment (CTE)

#### Heavy Duty mobility market represents a very large BALLARD opportunity for Ballard

Estimated Total Addressable Market over **\$130b** (engine)

and 1 million MW per year by 2030



**\$14 billion** 450,000 buses & coaches

100kW/bus



\$100 billion 4 million MHD trucks

200kW/truck



\$4 billion 8,500 electric hybrid trains

600kW/train



\$13 billion 8,000 propulsion systems 2 MW/vessel

#### BALLARD°

Off highway vehicles represent a new market opportunity with \$30b TAM (engine market)



## BALLARD<sup>®</sup> Mai

#### **Market readiness**

Heavy duty mobility is moving from demonstration to commercial deployment within next decade



Hydrogen Road map Europe

## BALLARD

# Investing in comprehensive fuel cell stack and module platforms to address mobility markets

#### **Fuel Cell Stacks**

- Air and Liquid cooled stack platforms from 5 kW to 150kW
- Designed for recycling and refurbishing

#### **Fuel Cell Power Modules**

- Product platforms to cover applications from 45 kW to 450 kW
- Modular approach based on common design and building blocks



Optimized performances and product life cycle cost

### BALLARD°

# 3 platforms of liquid cooled stacks to address all mobility applications

	Power level	Applications	Features	Availability
FCvelocity®-9SSL	Up to 25 kW/stack Mobility Stack	<ul> <li>Material handling</li> <li>Range extender</li> <li>LD truck</li> <li>Bus</li> </ul>	<ul> <li>15,000hrs</li> <li>1.5kW/L to 2.5kW/L</li> <li>Operating 70°C</li> </ul>	Now Over 10,000 stacks produced to date
FCgen <sup>®</sup> -LCS	Up to 50 kW/stack Heavy Duty Stack	<ul> <li>Material handling</li> <li>LD &amp; MD truck</li> <li>Bus</li> <li>Rail &amp; Marine</li> </ul>	<ul> <li>&gt;25,000hrs</li> <li>2kW/L to 2.5kW/L</li> <li>Freeze start (-30c)</li> <li>Operating 80°C</li> </ul>	Now
FCgen <sup>®</sup> -HPS	>100 kW/stack High Power Stack	<ul> <li>Automotive</li> <li>HD trucks</li> <li>Coaches</li> <li>Rail &amp; Marine</li> </ul>	<ul> <li>&gt;25,000hrs*</li> <li>4.3kW/L</li> <li>Freeze start (-28c)</li> <li>Operating &gt;90°C</li> </ul>	Q4/2020

#### BALLARD

# Ballard will have the most extensive fuel cell product platforms to address different heavy duty applications

	Power level	Applications Features	Availability
FCveloCity®	30kW, 85kW, 100kW Legacy platform	<ul> <li>Range extender</li> <li>LD truck</li> <li>Bus</li> <li>15,000hrs</li> <li>IP 56</li> <li>Air and cooling kits</li> </ul>	Now
FCmove™	45kW to 360kW Road Mobility	<ul> <li>LD commercial</li> <li>MHD trucks</li> <li>Bus</li> <li>Off-road vehicles</li> <li>And the second s</li></ul>	Now* (2021-2023) * For 60 and 70kW
FCwave™	200kW Marine Mobility	<ul> <li>Ferry &amp; barges</li> <li>Tug boats</li> <li>Hotel loads</li> <li>Section 2000 - 25,000 hr</li> <li>Marine certified</li> <li>Cabinet configuration</li> <li>Multiple modules to MWs</li> </ul>	Now
FCrail™	200kW Rail Mobility	<ul> <li>EMU (passenger)</li> <li>Shunt locomotive</li> <li>Retrofit</li> <li>Shunt locomotive</li> <li>Multiple modules to MWs</li> </ul>	2022

#### Product line expansion opens new mobility markets and increases our TAM \$130bn



BALLARD





#### Key levers for market expansion





#### **Technology Improvement**



#### **Product Industrialization**



#### **Application Integration**



**Eco-System Development** 





#### **Technology Improvement**

We have fuel cell expertise and experience with leading technology to deliver on required improvements



Major cost reduction levers are H2 cost, fuel cell stack and system/tank cost HDT long haul, TCO in EUR/km, Europe

We are well positioned to execute **70% cost reduction** to meet commercialization targets



McKinsey & Company - Path to Hydrogen Competitiveness (2020)

**Product Industrialization** 

BALLARD

BALLARD Product Industrialization

We are capitalizing on our **strategic partnerships** to execute our product industrialization WEICHAI









We are developing our **customers and partners** to deliver our growth plan and accelerate technology adoption





#### **Eco-System Development**





#### BALLARD

Ballard technology continues to lead with comprehensive product platforms

We will meet cost reduction targets to commercialization

We are using an effective partnership strategy to maximize market reach.





#### Technology Solutions Growth Platform

Dr. Kevin Colbow Vice President & CTO



## **BALLARD** Technology Solutions

**Mission:** Help customers solve difficult technical & business challenges and address new business opportunities

**Solution:** Technical expertise, IP portfolio, supply of prototype technology to drive future opportunities

Customized Technology	/ Solutions to	support all stages	of technology development
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Product Development	Testing Services & Stations	Licensing & Technology Transfer	Component Design & Manufacturing	Systems Design & Integration
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### **BALLARD** Objectives

- 1. Reduce customer commercialization friction points
- 2. Build high contribution margin revenue pipeline
- Enable long term market opportunities and product sales
- Build and cross-leverage IP portfolio, advancements and know-how
- 5. Align programs with similar core competencies



## **BALLARD** Intellectual Capital

- ~900 total employees and contractors worldwide
- ~4,700 person-years of experience
- ~400 Engineers, Scientists & Technologists
  - o 46 PhD's
  - o 164 Masters
  - o 316 Bachelors
  - o 138 Diplomas
- 10-year average tenure of core technical staff



#### **BALLARD** Intellectual Property

- Ballard owns, licenses and has access to ~1,400 patents & patent applications
- Deep know-how includes:
  - Catalyst layer processing
  - MEA manufacturing and sealing
  - o Plate design in carbon and metal
  - Plate manufacturing
  - Fuel cell system control strategies
  - System modeling & optimization

Breakdown of Patent & Patent Application Areas



### **BALLARD** Technology Solutions Markets



#### **BALLARD** Case Study #1: Product Development for Audi

- 9-year engineering services contract with Audi, to mid-2022
- Development of high-power density fuel cell stack for passenger car program
- Ballard's IP rights:
  - Passenger Car \*
  - Truck \*
  - o Bus
  - o Rail
  - $\circ$  Marine
  - Off-Road Vehicles
  - Stationary

\* As per MOU announced with Audi



Rated power	140 kW
Power density <sup>1</sup>	4.3 kW/L
Efficiency <sup>2</sup>	52%
Operating Temperature	95C
Freeze Start Temperature	-28C

<sup>1</sup> excludes compression hardware
 <sup>2</sup> beginning of life





### **Case Study #2: \$90m Development & Technology** BALLARD Transfer to Weichai-Ballard Joint Venture (WBJV)

- Develop bus, truck and forklift stacks & modules for WBJV assembly in China; retain rights for ROW
- FCgen<sup>®</sup> stack & FCmove<sup>®</sup> module • development complete; next-gen modules in development
- Fuel cell production know-how • transferred for plate production, stack & module assembly
- Assembly lines for FCgen<sup>®</sup> & • FCmove<sup>®</sup> established; production processes to be optimized through 2020
- Project began 11.2019, to complete in • 2022





Plate Manufacturing Line

Stack Assembly Line



Module Assembly Line

#### **BALLARD** Case Study #3: Siemens Rail Module Development

- Multi-year agreement to develop fuel cell system for Siemens Mireo<sup>®</sup> regional commuter train
- Rooftop mounted system using FCmove<sup>®</sup> module, optimized weight & footprint for maximum range
- Prototype module expected to be delivered in September 2021
- Achievements:
  - $\circ$  Freeze start from -25C
  - Peak efficiency >55%
  - Peak power >200kW
  - o Meets rail standards
  - Uses Ballard long life LCS stack and advanced BoP
- Siemens now quoting Mireo® fuel cell-powered train to customers







#### **China Market**

Alfred Wong Managing Director – Asia Pacific





Power to Change the World

#### BALLARD

#### China: World's largest and fastest growing commercial FCEV market

- World's largest bus and • commercial truck market
- Hydrogen identified as a strategic focus in national energy plan 2019
- Centralized plan to ٠ achieve 1,000,000 FCEVs & 1,000 HRS by 2030
- 7,200 FCEVs and 80 **HRS** demonstrated

	China FCV Road		China HRS De	velo		
Year	2020	2025	2030	Year	2020	
Number	5,000	50,000	1,000,000	Number	100	



China HRS Development Plan					
Year	2020	2025	2030		
Number	100	300	1,000		



#### **BALLARD** Notice on Development of Fuel Cell Vehicle Demonstration

- 4-year policy framework announced on 16-Sep-2020
- "以奖代补" replacing subsidies with awards
- State government to provide financial incentives to demonstration regions that meet requirements based on:

Completeness of industry base with leading enterprises

Competitive hydrogen energy supply and economics

Prior fleet demonstration of FCEV applications

Guaranteed local policy to support FCEV industry

• Demonstration programs expected to leverage both national and regional funding



财建〔2020〕394号

各省、自治区、直辖市、计划单列市财政厅(局)、工业和信息化主管部门、科技厅(委、局)、发展改革委、能源局

为推动我国燃料电池汽车产业持续健康、科学有序发展,财政部、工业和信息化部、科技部、发展改革委、国家能源局(以下 简称五部门)决定开展燃料电池汽车示范应用工作。现将有关事项通知如下:

一、支持方式

针对产业发展现状,五部门将对燃料电池汽车的购置补贴改荣,课整为燃料电池汽车示范应用支持政策,对将合条件的城市群 开展燃料电池汽车关键核心技术产业化攻关和示范应用给予奖励,形成布局合理、各有侧重、协同推进的燃料电池汽车发展新模 式。

示范期暫定为四年。示范期间,五部门将采取"以奖代补"方式,对入国示范的城市群按照其目标完成情况给予奖励。奖励资 金由地方和企业统筹用于燃料电池汽车关键核心技术产业化。人才引进及团队建设,以及新车型、新技术的示范应用等,不得用于 支持燃料电池汽车整车生产投资项目和加氢基础设施建设。

二、示范内容

示花城市群应聚集技术创新, 我谁应用场景, 构建完整的产业链。一是构建燃料电池汽车产业链条, 促进链条各环节技术研发 和产业化。要依托发头企业, 以客户需求为导向, 组织相关企业打造产业链, 加强技术研发, 实现相关基础材料、关键零部件和整 车产品研发突破及初步产业化应用, 在示范中不断完善产业链条, 提升技术水平。二是开展燃料电池汽车新技术、新车型的示范应 用, 推动建立并完善相关技术指标体系和剥试评价标准, 要明确合适的应用场景, 重点推动燃料电池汽车在中运途、中重型商用车 领域的产业化应用。要运用信息化平台, 实现燃料电池汽车示宽全过程、全链条监管, 积累丰辆运行数据, 完善燃料电池汽车和氢 能相关技术指标、测试标准。三是探索有效的商业运营模式, 不断提高经济性。要集中聚集优势企业产品推广, 逐步形成现模效 应, 降低燃料电池汽车成本。要为燃料电池汽车示宽应用提供经济、安全稳定的氢烯保障, 探索发展绿氢, 有效降低车用氢能成

#### **BALLARD** Continuing Momentum Expected From Strong Regional Support



## Over 36 regions have announced incentive plans for FCEVs and HRS

Regional FCV Promotion Plan in China				
Region	Year	FCEVs	HRSs	
Vangtza Divar Dalta	2021	5,000	40	
faligize River Deita	2025	50,000	200	
Fachan Quandand	2025	9,110	43	
Foshan, Guanguong	2030	15,650	57	
Hebei Province	2022	4,000	+10 New	
Chandeng Dravines	2022	3,000	30	
Shandong Province	2025	10,000	100	
	2022	3,000	+10 New	
Snanxi Province	2024	7,500	+20 New	
Beijing City	2025	10,000	74	
### **BALLARD** Ballard is Well Positioned to Meet Government Targets

• Demonstration aims to accelerate commercialization of FCEVs by advancing industrialization of core components



### **Ballard in China**



### Guangzhou Ballard Power Systems Co., Ltd

- WFOE established 2017.01
- Operation center to support Chinese customers, licensees, and JV partners

### Weichai Ballard Hy-Energy Technologies Co., Ltd.

- 51:49% JV established 2018.11
- Exclusive manufacturer of FCvelocity<sup>®</sup>-LCS FC stacks and FCmove<sup>®</sup> modules in China

### Synergy Ballard Hydrogen Energy Technology Co., Ltd.

- 90:10% JV established 2016.08
- Exclusive manufacturer of FCvelocity<sup>®</sup> -9SSL FC stacks in China



### **BALLARD** Strategic Collaboration with Weichai Power Established in 2018





- Global employees: 90,000
- Revenue in 2019: \$25.5B USD (174B CNY)
- Ranked 1<sup>st</sup> in HD Engine Sales in the World
- Ranked 2<sup>nd</sup> in domestic sales of HD Trucks
- Ranked 3<sup>rd</sup> in export sales of HD Trucks
- Vertically integrated with strong OEMs

#### **OEM** affiliates



Zhongtong Bus Holding Bus, coach, logistics truck & trailer

Shandong



Shandong China National Heavy Duty Truck Group Coach, heavy-duty vehicle & special vehicle



Shaanxi Shaanxi Heavy Duty Automobile

Heavy-duty truck & tractor



Germany
 KION Group

Industrial truck & forklift

ASIASTAR

Jiangsu Yangzhou Yaxing Motor Coach

Coach & bus



山推工程机械股份有限公司



SHANTUI Shandong Shantui Construction Machinery

Special vehicle





Passenger car

### Weichai Ballard Hy-Energy Technologies Co. Ltd. (WBJV)

- Located at Weifang, China
- GIGA SHANDONG ONE
  - Floor space: 225,000 sq ft.
  - o Certification: IATF16949; LC720161
  - Capacity: 34,000 stacks (2GW equivalent)
    - 20,000 modules
- Exclusive licensed manufacturer of LCS fuel cell stacks and LCS-based modules in China
- 180 employees as of August 2020





## **BALLARD** Weichai Ballard Technical Center

#### Joint technology & product development teams

- 115 engineers (mechanical, electrical, controls, H2 safety)
- 4 module development programs (45kW to 150kW)
- 2 stack development programs (LCS 1.1 and 2.0 next-gen)





#### Access to world class testing & evaluation capabilities

- Full array of stack and module test stations
- Complete balance of plant components test stands
- Access to prototyping facility and specialty equipment including shock & vibration, EMI/EMC, and hydrogen testing



## **BALLARD** First Batch of Local Modules in Operation



LCS-based WEF60 module



宇通客车 Yutong Bus



重汽豪沃 Sinotruk Howo



亚星客车 Asiastar Bus

- Over 100 modules built and commissioned
- Integrated in 4 bus and 1 truck platforms
- FC buses operating in 3 public transit routes



中通客车 Zhongtong Bus



陕重汽 Shanxi Sinotruk

### **BALLARD** Ballard Technology Powering ~45% of FCEVs in China Today

- 17 OEMs
- 3,250 vehicles
- 42 million kilometers







■ 7-10M Bus

- 10-12M Bus
- 7-7.9T Truck
- 8-9T Truck





## Ballard Technology Inside 65 MIIT-Certified Vehicles



























### Fuel Cell Buses powered by Ballard

## • Over 1,030 buses deployed

- 7 different bus OEMs
- Operations in > 10 cities
- Vehicle sizes: 8.5M, 9M, 10.9 M, 12M
- Over 13m kilometers in service



### Fuel Cell Trucks powered by Ballard

- Over 2,220 trucks deployed
- 6 different truck OEMs
- Operations in > 20 cities
- Vehicle sizes: 7.5T to 9T
- Over 29m kilometers in service
- Multiple strong end-users









### Fuel Cell Tram powered by Ballard

- FIRST commercial tram line worldwide
- Tram OEM: CRRC Qingdao Sifang
- Route: 17.4km, 20 stops
- Maximum Passenger Capacity: 394 persons
- Maximum Range: 125km
- Over **91,451 kilometers** in service (since Dec-2019)



### **Emerging Opportunities** powered by Ballard

- Mining trucks
- Forklifts
- Passenger cars
- Marine vessels



### **BALLARD** Looking to the Future....

- China will continue to be a dominate force in commercialization of FCEVs
  - World's largest commercial vehicle market
  - Strong government support with ambitious roadmap targets
- Ballard has contributed significantly to early Heavy- and Medium-Duty Motive demonstrations in multiple regions....now well positioned for growth with WBJV
  - Focus on cost reduction and advancing localization
- Significant untapped opportunities in emerging applications



### **Europe Market**

Jesper Themsen President & CEO, Ballard Power Systems Europe A/S

Oben Uluc Director of Sales – EMEA





### Europe is at the Forefront of Implementing Green Hydrogen Production at Scale

Policies and funding supporting green economic recovery include hydrogen across many countries in Europe



- Green Deal includes climate neutral goal by 2050 €750b "Green Recovery" plan
- Hydrogen strategy with 40GW of green hydrogen production



Green transition package of NOK 3.6 billion and hydrogen strategy



Hydrogen forms a key pillar of the Climate Agreement with 3-5GW green H2 capacity by 2030



- Committed €9b for hydrogen and 10GW of green H2 capacity by 2040
- £90 million package to tackle emission including funding for low-carbon hydrogen



Committed €7b for hydrogen and 6.5GW of green H2 capacity by 2040



Hydrogen strategy which foresees investments of €7b by 2030

### Ballard is Growing in Europe to Support Significant Market Opportunities

- European HQ in Denmark
- 80 dedicated employees
- 18 years in Europe
- Presence in Germany, UK, France and Norway
- Service centers in Denmark, Germany and UK



# **BALLARD** European Cities Have Committed to Zero-Emission Buses

- Low emission zones are being deployed across Europe
- Procurement of new buses could reach 66% of ZEB by 2030
- 10 of the largest European cities have committed to buy 100% Zero Emission Buses from 2025
- UK government announced first "hydrogen bus only town"





# European FCEB Fleets Growing Rapidly 25,000 FCEBs estimated by 2030

- ✓ 225 FCEBs powered by Ballard are in revenue service or contracted at 17 European Cities
- ✓ 848 additional FCEBs are in planning phase
- ✓ Ballard market share > 80 %
- ✓ Up to 100,000 ZEB will be deployed in next 10 years



Ballard's partners are bringing more FCEB models to market







### **Truck Emission Reduction Requirements Now In Place**

- OEMs will be required to cut CO<sub>2</sub> emissions from new trucks on average by:
  - o 15% from 2025
  - o 30% from 2030

compared with 2019 levels

• Regulations expected to be expanded to buses in 2022



### Ballard Strategy in Europe 100,000 fuel cell trucks estimated by 2030

Participate in FC trucks demonstration projects



Product operation testing Field data collection



Foster partnerships with European OEMs and Tier 1



Improve product integration Product industrialization

Develop eco-system partnerships



Reduce adoption friction points Improve TCO



Alliance to develop and produce fuel cell engines for MHD trucks



### **BALLARD** Demand Growing for Hydrogen Passenger Trains Operating on Non-Electrified Routes

- Demand in Germany, UK, France, Italy, Austria and Netherlands forecast to reach 1,000 trains by 2030
- "Hydrogen Multiple Unit trains can potentially replace 30% of diesel volumes as the most market-ready application by 2030." <u>Shift2Rail</u> study 2019



### **BALLARD** Strategic Partnerships Being Developed to Demonstrate Technology & Secure Market Access

#### **REGIONAL PASSENGER TRAINS**

- GERMANY
  - ✓ Development of 200kW Fuel Cell Project for Siemens Mireo Plus H Train
  - Siemens Mobility has begun bidding for hydrogen train projects in Germany

### UNITED KINGDOM

- HydroFLEX train refurbishment demonstration successfully completed with Porterbrook
- Project partners secured funding to develop detailed final production design & testing of HydroFLEX train for commercial service

### **SHUNT LOCO**

- Currently 65,000 shunt locos in Europe
- First powered-by-Ballard shunt loco demonstration project contract expected in H2 2020





Zero-emission requirements are coming to the marine industry



IMO phasing-out GHG: **\$\$50% by 2050** 

### Norway protecting heritage fjords: 100% zero-emission by 2026

Europe EMSA to cut CO<sub>2</sub> 50% by 2050

### BALLARD Gaining Marine Experience & Building Partnerships

- Development of MW scale systems for cruise ships with ABB
- HySeas III, the world's first seagoing renewables-powered ferry
- H2PORTS project to facilitate
  hydrogen power at Europe's ports
- FLAGSHIPS project to power:
  - Norled ferry in Norway
  - o River barge in France (ABB)
- Norled Hjelmeland liquid H2 ferry
- ELEKTRA fuel cell river barges in Germany







# **BALLARD** Ballard is Investing in the Emerging Marine Market

- Estimated 2,000 MW opportunity by 2030
- Marine Center of Excellence
  established in Denmark
- FCwave<sup>™</sup> 200kW product launched in September 2020





### **California Market**

Nicolas Pocard Director of Marketing



### BALLARD California is Leading the Move Towards Hydrogen Mobility With Strong Regulations Now In Place

- Executive order directing that all new cars and passenger trucks sold in California be ZEV by 2035
- •
- 8,475 fuel cell cars on the road
- 48 fuel cell buses in service
- More than 20 trucks in operation or in assembly for demonstration projects
- 42 hydrogen refueling stations (HRS) in service and 15 in construction & planning



### Zero-Emission Bus Mandate Innovative Clean Transit Regulations



- 25% new purchases of ZEBs by 2023; 50% by 2025
- Beginning in 2029, 100% of new bus purchases must be ZEBs
- By 2040, <u>all 10,000</u> transit buses in California to be ZEBs



Innovative Clean Transit Regulations

### **BALLARD** Ballard is the Market Leader in California



- 37 buses in operation at OCTA, AC Transit & Sunline
- 350 mile range tested in operation at AC transit
- >97% availability of FC system in 2020
- New Flyer (40ft &60ft) and Eldorado (40ft) FTA Altoona tested
- 95% market share (new FCEBs since 2010)

"The hydrogen buses are incredibly impressive. There are no range issues. They fuel as quick as a diesel bus does. Our reliability has been as good, if not better, than a standard 40-foot diesel bus."

Michael Hursh, General Manager – AC Transit

Transit Unplugged: Episode 076

ICT planning studies confirm that, as fleet size increases the cost of hydrogen infrastructure per vehicle decreases



Data collected from CARB published ICT roll out plans

### Foothill Transit's ICT study demonstrates that the TCO of FCEBs is lower than BEBs

- Foothill Transit study compares the cost of deploying 20 zero-emission buses on a 42-mile roundtrip route (up to 263 miles per daily block)
- Due to the range limitations of BEBs, it was determined the line would require 34 BEBs vs 23 FCEBs.



#### 12-year Lifecycle Cost Comparison

Cost Savings with FCEB: \$12,943,726 (20%)

Foothill Transit Executive Board Meeting (July 24, 2020)

# **BALLARD** As a Result of ICT Planning, There is Growing Demand for FCEBs

Initial ICT plans submitted by transit agencies to CARB show that **30%** of all ZEBs deployed will be fuel cell electric buses .... representing **an opportunity for 3,000** FCEBs



Data collected from CARB published ICT roll out plans

## OCTA plans to transition100% of its 500+ bus fleet to FCEBs

"The 100 percent FCEBs scenario showed a slightly lower overall cost than the mixed technology fleet given current vehicle, fuel, and support infrastructure pricing. ...FCEBs offer an extended range and better match to OCTA's current operating parameters. In comparison, the current range of BEBs may require more vehicles and drivers to meet similar service levels."

Orange County Transportation Authority

OCTA Zero Emission Bus Rollout Plan





### Sunline Transit fleet will be zeroemission by 2035, with 85% FCEBs

- Sunline transit has been operating FCEBs since 2000 – now operating 16 FCEBs in one the hottest regions of the U.S.
- The final fleet composition 67 fixed FCEBs, 18 fixed route BEBs and 39 paratransit fuel cell vehicles – was determined to maximize performance and minimize cost

Sunline ZEB roll out plan 2020



### Zero-Emission Truck Mandate Advanced Clean Truck Regulations

- Regulations begin 2024, by 2035 zero-emission truck/chassis sales must be:
  - $\circ~55\%$  of Class 2b 3 truck
  - $\circ$  75% of Class 4 8 straight truck
  - $\circ$  40% of truck tractor
  - And 100% for HD trucks by 2045
- This will represent 300,000 trucks sold by 2035 (\$7.5b engine market)
- 15 States signed a joint MOU for 30% of new MHD truck sales to be zero-emission by 2030; 100% by 2050



Advanced Clean Truck Regulations


Ballard is partnering with industry leaders to develop & demonstrate fuel cell electric trucks







# BALLARD

- As market leader, Ballard is well position to support deployment of heavy duty mobility in CA
- Renewable energy is the source for green hydrogen and is a new opportunity for fuel cell power generation
- CA is leading adoption and is expected to showcase potential of the Hydrogen Economy for other states







**Guy McAree - Moderator** Director of Investor Relations Ballard Power Systems



Dr. Kenneth J. DeWoskin, Ph.D., Senior Advisor to Deloitte



**Bernd Heid** Senior Partner – McKinsey & Company



**Dr. David Hart,** Director – E4tech



# **Product Roadmap**

Dr. Kevin Colbow Vice President & CTO





# AGENDA

### **Fuel Cell Technology**

Description and nomenclature, current status

### **Product Portfolio Strategy**

Technology evolution to meet market needs

### **Product Focus Cases**

Product roadmaps for bus and truck applications

# BALLARD PEM Fuel Cell Technology

- Solid state power generator
- High efficiency
- Zero-emission
- No toxic materials
- Fuel: air & hydrogen



# **BALLARD** Ballard Technology Nomenclature



# **BALLARD** Vehicle System Boundary Definitions



# BALLARD

# **Comprehensive Range of Fuel Cell Products to Address Multiple Applications**



# **BALLARD** Product Innovations Achieve Significant Performance & Lifecycle Cost Improvements

### *Current generation FCmove*<sup>TM</sup> *product improvements*



# **BALLARD** Product Portfolio Strategy

- Products for a range of motive applications target improvements in these areas –
  - High power "Building Blocks" for scalable power up to 450 kW
  - $\circ\,$  Cost reduction
  - Power density
  - $\circ$  Fuel efficiency
  - $\circ$  High temperature operation



FCgen<sup>®</sup>-HPS highperformance fuel cell stack

# **BALLARD** Evolution of Stack Technology Attributes



- Market requirements require stack attribute improvements
- Technology will be bundled and injected for iterative improvements across all power levels

# **BALLARD** Technology Advancements Demonstrate Next-Gen Fuel Cell Performance



Current Generation Stack LCS-M1 — Next Generation Stack LCS-M2

# **BALLARD** Ballard Motive Stack Product Family

A family of high power density stacks to cover the full range of bus, truck, rail and marine applications



\* Additional stack products are available for other applications, such as forklifts, backup and stationary power

# **BALLARD** Ballard Motive Stack Product Roadmap



Technology & Product Development	Limited Prototype	Product	Next Gen
•			

# BALLARD

### Critical Component Development Catalyst Content

Catalyst reduction is addressed through several avenues, with a focus on lifecycle cost



Some of our collaborators:

# Ballard engages in significant collaborative research to feed into future products



Ballard, U. of Waterloo, U. of

Western Ontario, CUTRIC

Example: The Development of Low-Cost, High Performing and Durable Polymer Electrolyte Membrane (PEM) Fuel Cells Project

Synthesized advanced catalyst





### **BALLARD** Critical Component Development Bi-Polar Plates

Ballard's carbon plates provide:

- Plate life exceeds durability requirements of >30,000 h ✓
- Eco-footprint Plates are re-used ✓
- Lowest cost at all volumes ✓



# **BALLARD** Bus Module Market Requirements

Application	Light Duty Bus	Medium Duty Bus	Intercity Bus	<ul> <li>Exof</li> <li>ap</li> <li>In</li> </ul>
Market Requirements				u
Power Level (KW)	40-50	60-100	150-200	
Stack Lifetime, 1000's of hours, (Years)	25-50, (10y)	25-50, (10y)	25-35, (10y)	
Module Power Density (W/L)	150	180 - 200	200	
Stack Power Density (kW/L)	1.7 - 2.5	1 - 2.5	2.5 - 3.5	
Operating Temperature (°C)	85 - 90	85 - 90	95	
Operating Freeze Start Temp (°C)	-25 to -40	-15 to - 40	-30 to -40	

- Expansion of product offerings across bus applications
- Industry leading durability

# BALLARD

### Bus Module Product Roadmap Range of Power Levels to Serve Many Applications

FC Move <b>™</b> Product Offerings				
AVAILABILITY	2020	2021	2021	2022
POWER LEVEL (KW)	70	100	120-240	70-100
Stack Lifetime, 1000's of hours	>30	>30	>30	>30
Module Power Density (W/L)	200	275	>400	315
Max Operating Temperature (°C)	85	85	95	90
Operating Freeze Start Temp (°C)	-25	-25	-35	-40

# **BALLARD** Truck Module Market Requirements

Application	Light Duty Truck	Medium Duty Truck	Heavy Duty Truck
Market Requirements			
Power Level (KW)	40 – 50	60 – 100	150 – 450
Stack Lifetime, 1000's of hours, (Years)	25 – 50, (10y)	25 – 50, (10y)	25 – 35, (2 – 10y)
Module Power Density (W/L)	150	180 – 300	450
Stack Power Density (kW/L)	1.7 – 2.0	1.0 – 3.0	2.5 – 3.5
Operating Temperature (°C)	85 – 90	85 –95	95 – 105
Operating Freeze Start Temp (°C)	-25 to -40	-15 to -40	-15 to -40

- Range of power levels
- High fuel efficiency ensures low total cost of ownership (TCO)

### **Truck Module Product Roadmap**

**BALLARD** Power from 40 to 450 kW to Cover all Medium and Heavy-Duty Truck Applications

Truck Product Offerings			
PRODUCT	FCMove-MD	FCMove-HD+	FCMove-XD
AVAILABILITY	2020	2021-2022	2021-2022
POWER LEVEL (KW)	45	100-150	240-360
Stack Lifetime, 1000's of hours	>30	>30	>30
Module Power Density (W/L)	180	370	>400
Max Operating Temperature (°C)	90	95	95
Operating Freeze Start Temp (°C)	-30	-35	-35

\* 450 kW power range expected to be addressed with next generation of truck products, to be developed in partnership with MAHLE



# Product Cost Reduction Strategy

Dr. Lee Sweetland Director of Advanced Manufacturing



# **BALLARD** Competitive Positioning





FCEBs currently offer TCO parity with BEBs for some use cases .... FCEVs are projected to be less expensive to run than BEVs and ICE vehicles for a range of applications within 10-years.

3

With a scale-up in production and planned additional product innovation, Ballard anticipates further reducing stack cost 70% by 2024, and similar reductions on the system as volumes grow.

# BALLARD

### **Fuel Cell Competitive Positioning**

60% reduction in FCEB price over past 10-years

#### **Key Drivers:**

- ✓ Improvements in technology and products led to ~60% FCEB cost reduction in past 10-years, along with ~50% service & maintenance cost reduction in past 5-years
- Further lifecycle cost reductions going forward are expected to result from continued product innovation plus increased volumes, leading to –
  - Economies-of-scale in manufacturing (similar to diesel engines)
  - Lower cost of green hydrogen <u>and</u> lower cost hydrogen infrastructure (which is opposite for BEBs)



# **BALLARD** Competitive Positioning



In the past 10-years, with limited production volume, FCEV price (e.g. transit bus) has been reduced ~60% .... primarily driven by innovations in technology and products.



FCEBs currently offer TCO parity with BEBs for some use cases .... FCEVs are projected to be less expensive to run than BEVs and ICE vehicles for a range of applications within 10-years.

3

With a scale-up in production and planned additional product innovation, Ballard anticipates further reducing stack cost 70% by 2024, and similar reductions on the system as volumes grow.

# Allard white paper "Eveling the Euture of Mobility: Hydrogen and

Source – Deloitte-Ballard white paper "Fueling the Future of Mobility: Hydrogen and fuel cell solutions for transportation", January 2020



# **Competitive Positioning**

Expected impact of increased volumes on fuel cell system lifecycle cost



BALLARD

# **BALLARD** Competitive Positioning



In the past 10-years, with limited production volume, FCEV price (e.g. transit bus) has been reduced ~60% .... primarily driven by innovations in technology and products.

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# **BALLARD** System Cost Breakdown



Programs are designed to address cost reduction of both stack and BoP components

BALLARD	Ballard '3x3' Cost Reduction Plan	Labour ck ware
$\frown$	Ρ	Plates
(3)	x3' fuel cell STACK cost reduction project targeting >70% reduction	Contribution to Cost Reduction
	Engineering Design delivering MEA and Plate, performance and lifetim improvements with lower cost materials	າe <u>41%</u>
	Supply Chain developing suppliers and agreements for volume supply	24%
	Advanced Manufacturing minimising waste (materials and labour) and developing high volume automated manufacturing solutions providing high yield	35%

'3 x 3' plan expected to deliver 70%+ cost reduction by 2024 for the stack in 3 key functional areas

# **BALLARD** MEA Cost Reduction

Ballard's MEA technology provides the highest durability in the market, thereby reducing TCO. We are driving cost down by:





#### **Engineering Design**

- Increasing unit cell performance (W/cm<sup>2</sup>) by up to 28% with next generation technology
- Reduce Pt loadings whilst maintaining durability with enhanced catalyst layer performance
- Enable membrane thickness reduction of 20% with Ballard technology to maintain durability
- Reduce GDL thickness to enable higher current density operation



#### **Supply Chain**

- Suppliers of MEA materials in scale-up, leveraging volumes from bus, truck and passenger car
  - Supply and development agreements with key component suppliers
  - Increasing roll widths and processing speeds, along with increased catalyst batch size

#### Advanced Manufacturing (Scale-up)

- Direct labour reduction of 68% through wider roll processing, faster line speeds and automation
- Reduced material waste and increased yield in key processes to >99%

#### Ballard's MEA technology development critical to driving stack cost down and durability up (lowering TCO)





# **BALLARD** Plate Cost Reduction

Ballard's flexible graphite plate technology provides the lowest cost at low and high volume for bus and truck applications. Plate lifetime exceeds that of the vehicle, with no impact on MEA durability. We are driving down this cost curve by:



#### Engineering Design

- Advanced carbon plate to enable high current density operation
- Reducing plate thickness for high power density, enabling direct material reduction of 54%
- Metal plates for passenger car remains an option



#### Supply Chain

• Low cost flexible graphite material sourcing and supplier development for next generation materials

#### Advanced Manufacturing

- Investment in plate manufacturing at WBHE to drive down direct labour cost
- Developing next generation plate manufacturing processes for high volume



Source: Strategic Analysis. Making the Case for Graphite Bipolar Plates 2019 Fuel Cell Seminar & Energy Exposition, November 2019, Long Beach, CA

Next-generation plate delivers increased stack performance with costs in line with DoE estimates

# **BALLARD** Fuel Cell Stack: '3 x 3' Plan Timing Summary



Stack '3 x 3' plan expected to deliver a 70%+ cost reduction by 2024 in 3 phases

### **BALLARD** System Cost Reduction Expected impact of BoP cost reduction



Major BoP component (Air compressor, HRB, Humidifier, Coolant Pump) cost reduction based on **partnerships** with Tier 1 suppliers, leveraging bus and passenger car volumes



System cost breakdown based on 2020 FCmove 70 kW, low volume, including warranty. Other includes DL for assembly, VOH, Delivery

Major BoP component costs expected to reduce by >70% as Tier 1's transition to 'series' production

Air Compressor Cost Reduction

# BALLARD System Cost Reduction

### Expected impact of BoP cost reduction



BoP forecasted to reduced 83% through lower component count & complexity, along with new manufacturing technologies

### **Fuel Cell Cost Reduction Summary**

**BALLARD** Volume growth, BoP industrialization, technology development <u>PLUS</u> sustainabilty




#### **Operations Update**

Sarbjot (Jyoti) Sidhu Vice President – Operations



BALLARD

#### **Operational Excellence 2023**



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#### **BALLARD** Environment, Health & Safety Systems (EHS)

- "Sending our people home safely at the end of each day"
- Carbon Neutral by 2030
- Environmental management system certified to ISO14001
- Comprehensive response to COVID-19



### **BALLARD** Quality Systems

- Quality Systems certified to:
  - Automotive industry Standard IATF 16949
  - o ISO 9001
  - In progress for VDA (German Standard)
- This is to certify that:

bsi.



#### Certificate of Registration

QUALITY MANAGEMENT SYSTEM - IATF 16949:2016

Ballard Power Systems Inc. 9000 Glenlyon Parkway Burnaby British Columbia V5J 5J8 Canada

 Lean Six Sigma (6σ) principles in our POWER guide continuous improvement

6 Master Belts, 6 Black Belts, 21
 Green Belts, 49 Yellow Belts

operates a Quality Management System which complies with the requirements of IATF 16949:2016 for the following scope:

Design and Manufacture of Fuel Cell Products such as MEA, Fuel Cell Stacks assembly and Fuel Cell Module Assemblies.

#### **BALLARD** Global Manufacturing Capacity



#### **BALLARD** 6x MEA Production Capacity Expansion

- ~\$20M investment made in MEA manufacturing technology to achieve 6x capacity increase
- Demonstration of manufacturing unit operations for scale
- Increased use of automation
- In-line quality inspection and control with full part traceability 2021
- Driving up yields for assembly to >99%



#### **BALLARD** 6x Bi-Polar Plate Production Capacity Expansion

- Weichai-Ballard JV investment in plate manufacturing will provide 7.4m plates/year, with space to double capacity
- Cycle time reduced by over 50%
- Next generation processes being developed for scale up of high power density flexible graphite plates



#### **BALLARD** 6x Stack Assembly Production Capacity Expansion

- Investments to provide annual capacity of:
  - o 27k stacks/year in Vancouver
  - 34k stacks/year at WBJV\*
- In-line quality inspection and control late 2020
- Semi-automated process reducing cycle time by 50%



\* Based on 24-hour, 7 day/week operation

#### **BALLARD** 6x Module Assembly Production Capacity Expansion

- Vancouver low volume FCmove™ line capable of 5k systems per year, expandable to 10k
- Weichai-Ballard JV high volume FCmove<sup>™</sup> line capable of 20k systems per year, expandable to 80k
  - High Volume 20k semiautomated line established
- Quality improvement driven by:
  - Component traceability
  - o Animated work instructions
  - Critical torque data capture



#### **BALLARD** Production System

- Advanced Automation Equipment & Process toward mass production
  - Real time monitoring of cycle time, downtime and first through yield; summarised using Overall Equipment Effectiveness (OEE)
- Adoption of Industry 4.0, IoT technologies
- Focus on KPI Metrics



#### **BALLARD** Supply Chain Strategy Value Chain Integration, Accountability & Focus on Lowest TCO

- Centrally negotiated global multi-year supply agreements for key components
- Growing number of auto Tier 1 suppliers entering component market
- Increased use of integrated systems to further improve supply chain efficiency
- Close Collaboration with WBHE
- Improved supplier selection, assessment & development
- Sustainable supply chain management





#### **ESG & People**

Jan Laishley Vice President – Human Resources





#### **BALLARD** ESG Commitment

#### We issued our **inaugural ESG Report** in April 2020.

The Company is committed to continued enhancement of ESG reporting.





#### BALLARD ESG Commitment Carbon Neutral by 2030

- Improving understanding of climate impacts of our products & operations
- Reducing corporate & product carbon footprints
- Reducing waste & energy consumption
- Responsible production
- Minimize waste in manufacturing
- Monitoring / reducing GHG Emissions
- Reducing energy consumption
- Fuel cell refurbishing & recycling
- Reducing raw materials by design
- Waste management





#### **BALLARD** Environmental Commitments

- Mission Carbon Zero Team
- Completed GHG inventory (2017/2018)
- Completed life cycle analysis for FCveloCity<sup>®</sup>-HD85 module and FCvelocity<sup>®</sup>-9SSL stack
- Completed baseline assessments for 2017 and 2018 GHG emissions intensity; subsequently completed 2019
- Emission-reduction initiatives identified for 2020 and beyond

#### Ballard Canada's 2017 & 2018 GHG Emissions Intensity

	(tCO <sub>2</sub> e/ employee)	(tCO <sub>2</sub> e/ employee)	Trends
Scope 1			
Natural Gas	2.82	2.01	✓ 29%
Gasoline	0.0015	0.001	✓ 28%
Subtotal	2.82	2.01	✓ 29%
Scope 2			
Electricity	0.56	0.38	✓ 32%
Subtotal	0.56	0.38	✓ 32%
Scope 3			
Air Travel	2.03	2.12	<u>∧</u> -4%
Employee Commute	1.18	1.15	✓ 3%
Paper	0.05	0.04	✓ 30%
Water	0.03	0.02	✓ 30%
Waste	0.02	0.01	✓ 30%
Hydrogen	3.04	2.14	✓ 20%
CO <sub>2</sub> Purchased	0.025	0.017	✓ 20%
Hotels	0.05	0.04	✓ 20%
Shipping	1.25	1.34	∧ -7%
Subtotal	7.69	6.87	✓ 11%
Total GHG emissions	11.08	9.27	✓ 16%



#### **BALLARD** Social Commitment – Our People

- 1) Corporate Culture
- 2) Employee Value Proposition
- 3) Great Place to Work

Listen and Deliver ISTEN AND DELIVER **Ballard Quality Always** Values GUALITY **Inspire Excellence** INSPIRE EXCELLENCE XX **Row Together** ROW TOGETHER **Own It** OWN



#### BALLARD

#### Social Commitment – Our People Employee Value Proposition

At Ballard, our culture is focused on our customer and rooted in innovation, safety, quality and a deep sense of pride and ownership. This is important to us – like really important! We are passionate about transforming the future of zero-emission energy to save the planet. This gets our global team fired up every day.

We have the **Power to Change the World**<sup>®</sup> because we are powered by exceptional people. We care about career growth and development. We believe in work-life balance with tons of flexibility, rewarding benefits and performance-driven compensation.

Our diverse team is more than the sum of the parts. We value the unique talents and perspectives that each of us brings. We know the only way to achieve success is - *Row Together*.

### BALLARD

# Diversity & Inclusion





#### **BALLARD** Social Commitment – Our People Focus & Key Initiatives

- Employee Engagement
- Leadership Effectiveness
- Team Effectiveness
- Training & Development
- Mentoring
- Wellbeing





### **BALLARD** Social Commitment – Our People





#### **BALLARD** Social Commitment – Our People

#### Workforce by Gender



Leadership by Gender			
Fen	nale Male		
22%	Board	78%	
33%	Executive	67%	
18%	Senior Leadership Team	82%	
20%	Management Level	<b>80</b> %	

Employees by Age Exployee by Generation 3% Less than 20 16% 20-29 23% 30-39 27% 40-49 25% 50-59 9% 60-69

In March 2020, Ballard was named to the Globe & Mail "Women Lead Here" list, which identifies 73 Canadian companies at the forefront of women in leadership positions



#### BALLARD

#### Social Commitment – Our People Employee Engagement

- Annual employee
   engagement survey
  - 95% completion rate
- Results provide actionable insight on employee views and engagement





### BALLARD

#### Social Commitment – Our People Key Reasons for High Retention

- Purpose driven alignment with Vision, Mission & Values
- Focus on People & Culture
- Opportunity to Innovate
- Career Growth & Development
- Flexible Environment
- Total Compensation





#### **BALLARD** Governance Commitment

- Code of Conduct
- Whistleblower Policy
- Ethics and Anti-Corruption
- Ethics and Our Supply Chain
- Political Contributions
- Board of Directors





### **BALLARD** Governance Commitment

Metrics tracking and

reporting in relation to

the Ballard board of

directors

Size of Board	9
Independent directors	8
Separate Chair and CEO	Yes
All committee independent	Yes
M / F directors	7 M, 2 F
Board diversity policy	No
Annual director elections	Yes
Individual director elections	Yes
Majority voting policy	Yes
Board interlocks (#)	None
Limit on external board service of independent directors	Yes
Annual say on pay	Yes
Board, committee and director evaluations annually	Yes
Board orientation and education program	Yes
In-camera sessions at every board & committee meeting	Yes



## Our Team..... Ballard is Powered by People





#### **Financial Review**

Tony Guglielmin Vice President & CFO



#### **BALLARD** Fuel Cell Industry Inflection Point



Revenue Scaffolding across four MHD Motive applications expected to create a significant growth ramp over this decade

#### BALLARD®

**Current Order** Backlog PLUS 50% **YTD** increase in sales pipeline PLUS inhouse programs underpin significant revenue growth trajectory over next few years





Power to Change the World

Investor and Analyst Day 2020 / September 29 175

#### BALLARD

#### A Market Share Approach

- TAM = \$130b (does not include other motive applications – such as material handling, passenger cars, unmanned vehicles, off-road vehicles – as well as stationary power applications)
- \$26b = 20% Fuel Cell market penetration
- \$5.2b = 20% Ballard share of Fuel Cell industry revenue

#### **Total Addressable HMD Motive Market = \$130b\***



**\$14 billion** 450,000 buses & coaches

100kW/bus



**\$100 billion** 4 million MHD trucks

200kW/truck



**\$4 billion** 8,500 electric hybrid trains

600kW/train



**\$13 billion** 8,000 propulsion systems

2 MW/vessel

\* TAM figures are 2030 estimates



#### "Sanity Check" on Market Share Implication

- 2020 consensus revenue
  \$115m
- 46% CAGR drives ~\$5.2B\* revenue in 2030
  - Consistent with 20% Ballard share of fuel cell industry

\* Does not include other motive applications – such as material handling, passenger cars, unmanned vehicles, off-road vehicles – as well as stationary power applications







#### **Gross Margin** improvement from product cost and operational efficiencies

#### BALLARD®

Operating Expense ... existing investment leveraging revenue scaling to reduce bottom line impact

#### Annual Operating Expense (\$millions)





# Based on 20% **EBIT** margin\* (\$20m) 2020 2025 2030

#### Earnings Before Interest and Taxes (\$millions)

\*Includes WBJV EBIT contribution

**Profitability** scaling with growth



**Cash Reserves** are sufficient to fund the business to positive earnings ... current ATM enables fortification of balance of sheet



\* Includes: funding of operating losses; contribution to WBJV; investments in product development and working capital
## **BALLARD** Investment Thesis

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Strong Policy Complex is Developing Underpinned by MegaTrends

- Decarbonization; air quality improvement; electrification of vehicles
  - Large Attractive Addressable Markets
    - Business model leverage & diversification with TAMs totaling >\$130b

## Global Leadership Position in PEM FCs for M/HD Motive

• 40 years of investment; highest market share; >50m km in the field

### Sustainable Competitive Advantages

Talent; IP; technology; product portfolio & roadmap; customers and partners

#### High Growth Trajectory

• Revenue scaffolding with potential for >\$5b top line by 2030

### Strong Financial Position

Solid balance sheet; revenue ramp; GM expansion; costs leverage; capacity

### Embedded Optionality

Long-term exposure in automotive, material handling, aerospace, off-road and stationary

## **BALLARD** Potential Catalysts

Investors should watch for these potential **catalysts** over next 12-months

- Continued public policy support
- Completion of advanced manufacturing program
- Progress on product cost reduction plan
- Progress at Weichai-Ballard JV
- Progress with Mahle-Ballard collaboration
- Further product development activity
- Growth in order book and sales pipeline
- M&A transaction

## BALLARD

# 2020 has been an unusual and challenging year

## BALLARD

# Thank you